

## **PhD THESIS DECLARATION**

The undersigned

Surname : Crespi Reghizzi

Name : Olivier

PhD registration number : 2000212

Thesis title: A long run perspective on urban water and sanitation infrastructure financing : essays in public finance

PhD in International Law and Economics

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Candidate's tutor : Professor Lanfranco Senn

Joint PhD with the Institut des Sciences et Industries du Vivant et de l'Environnement (AgroParisTech)

Candidate's tutor at AgroParisTech : Dr. Bernard Barraqué

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Date : July 20th 2014

SURNAME : Crespi Reghizzi

NAME : Olivier

“Unlike some economic purists of today, I admit to more than only a scientific motivation ; intelligent and civilized conduct of government and the delineation of its responsibilities are at the heart of the democracy. ...Intelligent conduct of government requires an understanding of the economic relations involved; and the economist by aiding in this understanding, may hope to contribute to a better society. This is why the field of public finance has seemed of particular interest to me ; and this is why my interest in the field has been motivated by a search for the good society, no less than by scientific curiosity”

Richard Musgrave,

*The Theory of Public Finance: A Study in Public Economy.* McGraw-Hill 1959



## Abstract

This PhD research examines the financing history of water and sanitation infrastructure through the lens of public finance theory.

The urban water sector is highly capital intensive. How to finance water infrastructure is a key challenge for policy-makers both in Europe where it is necessary to upgrade an ageing water infrastructure and in developing countries where an expansion of water infrastructure is needed to provide access to water and sanitation services for all.

The core of this thesis is composed of six essays which are currently in the submission process to be published in journals and collective books.

The first three essays analyze how water infrastructure was financed in Paris and Milan during its early expansion phase between the 19th century and the 1920s. The two municipalities used municipal bonds and loans with fixed interest rate and long-term maturities to finance the infrastructure. Initially endogenous revenues (*Tariffs* according to the OECD 3Ts) were not high enough to cover the total costs (including debt service). Some costs were covered by exogenous revenues i.e. from municipal budgets (*Tax* according to the OECD). Indeed, at that time municipalities had a great financial autonomy: municipal budgets were mainly funded through local taxes (local exogenous revenues - *Tax* according to the OECD) and not through annual transfers from the central government (national exogenous revenues - *Transfer* according to the OECD). Only later did endogenous revenues became high enough to fully cover the total costs of the water and sanitation service. Two additional factors made it possible to lower the total costs: the high inflation of the years 1910-1930 which lowered the debt service in real terms and land value capture instruments largely implemented in Paris during Haussmann's urban renovation.

Two other essays examine the development of drinking water and wastewater services in Milan from the second half of the 20th century to present day.

A sixth essay compares the past and present institutional framework of urban water services in France and Italy regarding their legal status tariff regulation and how investments are financed.

In addition to the six essays, the thesis consists of an introduction and a conclusion. The introduction first discusses the key public finance theories in the field of local infrastructure financing. Then it focuses specifically on the water and sanitation sector and it proposes an original matrix of the trade-offs to be made by water and sanitation policy-makers. Among these: compulsory or voluntary membership ? Endogenous or Exogenous revenues? Institutional nature of the collective consumption unit ? fiscal or non-fiscal nature of the endogenous revenues ? Local or national exogenous revenues ? Which level of government is responsible of the infrastructure cycle ? Are there some tools of spatial equalization ?

The conclusion analyzes the long run evolution of Italian and French water and sanitation services using the trade-offs matrix previously developed. A comparative analysis based on existing literature and focused on the early expansion phase in other countries (UK, USA and Germany) is also made. Last but not least, based on the retrospective analysis, the thesis challenges present financing policies for the water sector both in Europe and in developing countries.



## Résumé

### **Une analyse de long terme du financement des infrastructures urbaines d'eau potable et d'assainissement : essais en économie publique.**

Cette thèse analyse l'histoire du financement des infrastructures urbaines d'eau et d'assainissement en France et en Italie à travers le prisme de lecture de l'économie publique.

Le secteur de l'eau en milieu urbain est hautement capitalistique et exige des infrastructures coûteuses et à très longue durée de vie. Financer ces infrastructures est un défi pour les décideurs publics, tant en Europe (où il est nécessaire de renouveler des infrastructures vieillissantes) que dans les pays en développement où l'expansion des infrastructures est nécessaire pour permettre l'accès à l'eau et à l'assainissement pour tous.

La thèse se compose de six essais indépendants qui ont été présentés à des conférences et des séminaires, puis envoyés à des revues et à des éditeurs internationaux en vue d'une publication.

Les trois premiers essais fournissent une analyse détaillée des modalités de financement des infrastructures d'eau et d'assainissement réalisées à Paris et Milan entre le 19<sup>ème</sup> siècle et les années 1920. Les infrastructures ont été financées par les deux municipalités grâce à des prêts et à des obligations municipales à taux fixe et à longue durée de remboursement. Dans un premier temps, les revenus endogènes (Tarifs selon l'OCDE) n'étaient pas suffisants pour couvrir les coûts totaux (y compris le remboursement de la dette) qui ont été partiellement couverts par des revenus exogènes c'est-à-dire par le budget municipal général (Taxes selon l'OCDE). Les municipalités avaient, en effet à l'époque, une grande autonomie financière : leurs revenus reposaient principalement sur de la taxation locale (Taxes selon l'OCDE) ; elles ne recevaient pas de subventions récurrentes de la part de l'Etat Central (Transferts selon l'OCDE). Dans un deuxième temps, les revenus endogènes étaient suffisamment élevés pour couvrir, à eux seuls, les coûts internes totaux du service public d'eau et d'assainissement. Deux autres facteurs ont permis d'absorber et de réduire une partie des coûts totaux: il s'agit de la forte inflation des années 1910-1930 et des instruments de captation de la plus-value foncière qui ont été utilisés à Paris lors des rénovations urbaines Haussmaniennes.

Les essais quatre et cinq étendent l'analyse du service public d'eau et d'assainissement de Milan respectivement à la deuxième moitié du 20<sup>e</sup> siècle, et au temps présent. Un sixième essai compare les régimes institutionnels et les trajectoires passées et présentes des services urbains de l'eau en France et en Italie sur les thèmes du statut juridique, de la réglementation tarifaire et du financement des investissements.

En plus des six essais, la thèse comprend deux grandes parties introductive et conclusive. L'introduction discute d'abord les principales théories de l'économie publique applicable au financement des infrastructures publiques locales. Elle se concentre ensuite sur le secteur de l'eau et propose une matrice des choix à faire par les décideurs. Parmi ceux-ci: adhésion volontaire ou obligatoire? Coûts couverts par des revenus endogènes ou exogènes ? Nature fiscale ou non fiscale des revenus endogènes? Origine locale ou nationale des revenus exogènes? Statut juridique de l'entité en charge du service? Partage des responsabilités entre les autorités locales et le gouvernement central?

La conclusion reprend certains résultats issus des 6 essais et analyse l'évolution du secteur de l'eau en France et en Italie, à la lumière de la matrice des choix définie auparavant. Une analyse comparative du financement des infrastructures urbaines d'eau et d'assainissement dans la phase d'expansion initiale au sein d'autres pays (Royaume-Uni, Etats-Unis, Allemagne) a également été réalisée sur la base de la littérature existante.

Enfin, l'analyse historique réalisée fournit quelques éléments de réflexion qui visent à questionner et améliorer les politiques publiques d'aujourd'hui en Europe et dans les pays en développement.





## Riassunto

### **Un'analisi sul lungo periodo del finanziamento dell'infrastruttura idrica urbana : saggi in scienza delle finanze**

La presente ricerca fornisce un'analisi della storia del finanziamento dell'infrastruttura idrica urbana in Francia e in Italia attraverso il prisma di lettura della scienza delle finanze.

Il settore idrico urbano è caratterizzato da una forte intensità di capitale. Finanziare le infrastrutture idriche rappresenta una sfida per il decisore pubblico sia in Europa (dove è necessario rinnovare le infrastrutture idriche realizzate in passato) che nei paesi in via di sviluppo dove l'espansione delle infrastrutture idriche è necessaria per fornire l'accesso al servizio acqua potabile e acque reflue a tutta la popolazione. La tesi analizza le modalità di finanziamento delle infrastrutture idriche nel passato non solo in un'ottica di storia economica ma anche per fornire elementi utili per l'elaborazione delle politiche pubbliche del presente e del futuro.

La tesi è costituita da sei saggi indipendenti che sono stati presentati in conferenze e workshop e poi inviati a riviste e editori internazionali in vista di una pubblicazione.

I primi tre saggi forniscono un'analisi dettagliata delle modalità di finanziamento dell'infrastruttura idrica realizzata a Parigi e Milano tra il 19esimo secolo e gli anni 1920. Le infrastrutture sono state finanziate dalle due municipalità tramite obbligazioni e prestiti a tasso fisso e a lungo termine. In un primo tempo i redditi da fonti endogene (Tariff secondo l'OCSE) non permettevano di coprire i costi totali (incluso il rimborso del debito) che erano in parte coperti da fonti esogene ossia dai bilanci comunali (Tax secondo l'OCSE). In effetti all'epoca i comuni avevano una grande autonomia finanziaria : i loro redditi provenivano principalmente da tasse locali (Tax secondo l'OCSE) e non ricevevano trasferimenti annuali da parte dello stato centrale (Transfer secondo l'OCSE). Solo in una seconda fase i redditi endogeni divennero sufficientemente alti da coprire interamente i costi totali del servizio acque potabili e acque reflue. Due fattori aggiuntivi permisero di assorbire e diminuire una parte dei costi totali : l'alta inflazione degli anni 1910-1930 e gli strumenti di land value capture usati a Parigi durante le operazioni urbane di Haussmann.

Altri due saggi estendono l'analisi del servizio acqua potabile e acque reflue di Milano rispettivamente alla seconda metà del 20esimo secolo e al tempo presente. Un sesto saggio confronta l'assetto istituzionale presente e le traiettorie passate dei servizi idrici urbani in Francia e in Italia per quanto riguarda la forma giuridica, la regolazione tariffaria e le modalità di finanziamento degli investimenti.

In aggiunta ai sei saggi, la tesi è composta da due ampie parti di introduzione e conclusione. La parte introduttiva discute le principali teorie di scienza delle finanze in materia di finanziamento delle infrastrutture pubbliche locali prima di focalizzarsi nello specifico sul settore idrico e fognatura e proporre una matrice di analisi dei principali trade-offs a cui il decisore pubblico deve rispondere. Tra questi citiamo : adesione obbligatoria o volontaria ? costi coperti da redditi endogeni o esogeni ? natura fiscale o non fiscale dei redditi endogeni ? origine locale o nazionale dei redditi esogeni ? forma giuridica dell'ente gestore del servizio ? ripartizione delle responsabilità tra enti locali e governo centrale ?

La parte conclusiva riprende quanto dimostrato nei 6 saggi e analizza il finanziamento delle infrastrutture idriche urbane in Francia e in Italia alla luce della matrice dei trade-offs elaborata nella parte introduttiva. Basandosi sulla letteratura esistente si realizza un'analisi comparativa del finanziamento delle infrastrutture idriche urbane nella fase di espansione iniziale in altri paesi (Regno Unito, Stati Uniti, Germania).

Infine basandosi sull'analisi storica realizzata si forniscono spunti di riflessione per ripensare le politiche pubbliche odierne in Europa e nei paesi in via di sviluppo.



## Preface

Infrastructure, Water, Public Finance and History. These four keywords summarize my PhD thesis. These four keywords evoke some key personal experiences and choices that made me so passionate about these issues. This passion is why I was very happy to devote three years of my life to this subject.

### Infrastructure

Just after finishing High School, in 2002, I spent two weeks in Bosnia as a member of a group of young Italian volunteers. The scars of the recent war were still largely visible both in Sarajevo and in the rural village where we spent some days helping people rebuild their houses which had been destroyed. Of course the efforts of nineteen year old boys and girls were more a symbol than a significant help in Bosnia's reconstruction.

I had left Italy with the naïve idea of helping to rebuild Bosnia, but I came back with the feeling that I had received much more than the two bricks that I helped to move. I returned more mature with an awareness of how much a war can negatively affect a country, particularly in terms of infrastructure endowment. This may be why, after my experience in Bosnia, I chose undergraduate studies in Civil Engineering at *Politecnico di Milano*.

### Water

My interest in water dates from my last year in High School when I decided to choose "water" as the interdisciplinary research topic to present at the *maturità* (Italian High School final exam).

A few years later, in 2005, a short internship at the EU delegation in Mauritania made me aware of the key importance of water in such an arid country. Back in Europe, I chose the hydraulics branch within the MSc in Civil Engineering and pursued two internships in hydraulics engineering and hydrology consultancies and research centres.

Between 2009 and 2011, water also brought me to Senegal where I spent more than two years working on infrastructure projects financed by the *Agence Française de Développement* (AFD).

## Public Finance

As an AFD officer in Senegal, I had the perfect standpoint for observing the infrastructure challenges faced by a developing country and its financing needs. However, as a freshly graduated engineer, I became frustrated with not having a thorough enough background in economics and finance to fully understand what was going on.

This made me increasingly thirsty to deepen my knowledge in economics and public policies related to infrastructure and public services. This thirst led me a few years later to choose to analyze water and sanitation services through a public finance theory lens in my PhD thesis.

## History

In Dakar, I was staying in a building up to European standards with water and electricity available 24 hours a day thanks to a large water tank on the rooftop and to an independent power generator. At the same time, most of the Senegalese households in Dakar were facing the real life challenges of a discontinuous electricity<sup>1</sup> supply even if they were paying water and electricity at relatively high rates. Additionally, in most sectors, the country had huge infrastructure gaps and no easy solution for the short or medium term.

I was puzzled. While I was living in Senegal, from time to time I would travel back to Europe for vacations. Each time I would realize how good our network infrastructure and public services are. Progressively, I became curious to understand what public policies around water services in Europe have rendered it possible to have “the best water and sanitation services in the world<sup>2</sup>”

Thanks to Bernard Barraqué, I was able to formulate a research project on how European municipalities managed to finance their water and sanitation in the expansion phase of modern water and sanitation services which started in the 19<sup>th</sup> century. *Eau de*

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<sup>1</sup> At that time water shortages were not present in Dakar. Critical water shortages happened in September 2013 in Dakar.

<sup>2</sup> *On peut considérer que l'Europe a en moyenne les meilleurs services publics d'eau et d'assainissement [...]*, Barraqué and Isnard on ParisTechReview, <http://www.paristechreview.com/2012/10/23/eaux-urbaines-ingenierie/> retrieved online on April 7th 2014

*Paris*, the *Association Nationale de Recherche en Technologie* and the *Agence Nationale de la Recherche* were kind enough to fund such a research project.

This research question made it possible to focus my research efforts both on European Water and Sanitation policies and on the urban infrastructure challenge in rapidly developing cities like Milan and Paris were more than a century ago.

The present situation of many cities in the global south has many similarities with the past experiences of European cities. Looking into history can inform and give more depth to the present policy debate in developing countries.



## Remerciements

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## Key terms and acronyms

In the table here below we make a list of the most important terms and acronyms developed in Part I. For each term the table gives the acronym and the paragraphs in which the term is detailed. When multiple terms with the same meaning do exist they are also listed in the table.

Key term	Acronym	Other similar term	§
Ability-to-pay approach			2.2.2
Allocation Branch		Government intervention in the case of market failure	2.1
Autonomy			4.3
Benefit approach			2.2.1
Capital expenditures	CAPEX		
Club-finance		Endogenous revenues Toll-finance Tariff	2.6 2.9.2 2.10 5.1.5
Collective Consumption Unit	CCU		2.5 4.6
Club good & common pool resources			2.4
<i>Comité National de l'eau</i>	CNE	National Water Committee	
Decentralization principle			4.2
Delegated model	DM	Affermage Lease contract	Box 1
Direct Public Management	DPM	Public provision and production	Box 1
Equalization			4.4 4.7
Financial Economies of Scale			5.2
Fiscal equivalence principle			2.10
Full Cost Recovery	FCR		5.1
Generations			3.1
Key Trade Offs Matrix			5.3
Local Government Unit	LGU		4
Local Public Good	LPG		4.2
Membership & exclusion			2.6
Merit good		Merit wants	2.3
Millenium Development Goal	MDG		1.1.1
Natural Monopoly			2.9
Organisation for Economic Cooperation and Development	OECD		
Operational Expenditures	OPEX		
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## Part I. Introduction

### 1 A thesis built on three pillars

The core of this thesis is composed of six essays which are inserted in Part II and Part III. The six essays are currently in the submission process to be published in journals and collective books. In addition to the six essays, this thesis is composed of an introductory part (Part I here below) and a conclusive part (Part IV).

This thesis is built on three pillars: from a **disciplinary** point of view it is deeply rooted in **public finance**, it focuses on the **water and sanitation sector** and from a **methodological** point of view it is based on the use of a **long run perspective**. Part I focuses on those three pillars and in particular on an in-depth discussion of some key aspects of the public finance theory.

In this Section we start by discussing in the next paragraph why financing the infrastructure is so relevant for the water and sanitation sector (§1.1). Afterwards we review the literature on the historical approach (§1.2) and we detail our own research approach (§1.3).

In Section 2 we review some public finance theory with a specific focus on the membership rules and financing mechanisms which apply to public goods and club goods. Land value capture tools are also analysed.

Section 3 focuses on the use of repayable finance to finance infrastructure.

Water and sanitation infrastructure is most of the time a local issue: that is why Section 4 gives some details on local public finance.

We chose to keep the literature and theoretical discussions in Sections 2, 3 and 4 as general as possible on infrastructure without limiting its relevance to the water and sanitation sector. On the contrary, in Section 5 we specifically focus on the water and sanitation sector. Using the theory developed in Sections 2, 3 and 4 we build a trade-offs matrix for the water and sanitation sector (§5.3).

## **1.1 Urban water and sanitation infrastructure : relevance of the issues**

### **1.1.1 Expanding the infrastructure in developing countries**

Access to clean water and sanitation is a key factor of development as it implies many positive externalities on the community (eg. epidemics control and mortality reduction). Improved access to water and sanitation is still a key issue for many developing countries (DCs) and has been included as one of the millennium development goals (MDGs) targets.

While on a global scale the 2015 MDGs<sup>3</sup> water access target has been already met in 2010 (UN 2013), international institutions estimate that 768 million<sup>4</sup> people still lack of access to an uncontaminated water distribution point. If one adds additional criteria such as enhanced drinkability standards and continuity of supply, the estimation jumps to 2 billion people in the world not meeting the criteria.

On the sanitation side of the equation the situation is worse as access to improved sanitation is still far behind the 2015 global targets<sup>5</sup>. More than 2.5 billion people in the world still lack of access to an improved sanitation.

These average estimations at global scale hide huge disparities among countries and among regions. Think for example of Sub-Saharan Africa where only 63 % and 30% of the people respectively have access to clean water and improved sanitation<sup>6</sup>.

In terms of static equilibrium the water and sanitation infrastructure gap is particularly striking in rural areas while urban areas are better endowed. This is however not true if one thinks in terms of dynamic equilibrium as in many regions of the world a fast and furious migration process is taking place from rural to urban areas. As pointed out by the OECD general secretary “With urbanisation outpacing connections to water, there are now more city dwellers without water access than in 1990”(Gurria 2012). Under a huge demographic pressure many cities in the developing world are turning into megalopolis with vast peri-urban areas. Developing the water and sanitation

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<sup>3</sup> Millenium Development Goals

<sup>4</sup> Figures from the *Agence Française de Développement* water and sanitation strategy (AFD 2014, 1)

<sup>5</sup> 77% of the people having access to an improved sanitation

<sup>6</sup>(AFD 2014, 20)



infrastructure at the fast rhythm imposed by rural migration and demographic growth is a key challenge which implies large financing needs.

### **1.1.2 Reproducing a mature infrastructure in Europe**

Sufficient and sustainable financing for water infrastructure is a crucial factor not only in developing countries where modern water services are still in an expansion phase but also in Europe where they are now a “mature industry with an increasing need to reproduce the (huge) infrastructure capital which was set up over decades”(Barraqué 2009).

Such a fact had been pointed out by the OECD general secretary at the Marseille World Water Forum :

“In fact, OECD economies face huge costs to replace and modernise ageing water infrastructure, and to upgrade systems to meet stricter quality standards. The global capital costs of maintaining and developing water and sanitation infrastructure in OECD countries, together with Brazil, China, India and Russia, could amount to between 0.35 and 1.2% of their GDP. This corresponds to total projected annual needs of nearly 800 billion dollars by 2015, up from a current estimated expenditure on water infrastructure of close to 580 billion dollars annually.”(Gurria 2012)

In France a report focused on the financing and on the sustainability has been published by the National Water Committee (*Comité National de l'eau*) in February 2013 (CNE 2013). Based on an Ernst & Young study, it estimates the financing required to reproduce the French water and sanitation infrastructure between 5.4 and 9.7 billion euros per year (CNE 2013, 47).

These kinds of figures at a national or at a global scale are only imprecise estimations full of uncertainties. Nevertheless, the financing need is real and takes place in a context where sold water volumes are decreasing and the full cost recovery principle has rigidified the system.

Indeed, the sustainability of water services in Europe is presently challenged by two contradictory changes. On one hand, compliance with stricter sanitary and environmental standards and networks renewal's burden induce an increase in water

costs. On the other hand water consumption is decreasing in many large cities such as Paris (Barraqué et al. 2011; Souriau 2011) and Milan (Crespi Reghizzi forthcoming e). Water industry is characterised by costs which are mainly fixed while income is mainly proportional to sold volumes. The economic, social and environmental sustainability (as defined by Correia 2001; Barraqué 2003a; Barraqué 2005; Lejars and Canneva 2009) of water industry is thus challenged. This is the field of research of the EAU&3E project which seeks to analyze this major sustainability challenge (<http://eau3e.hypotheses.org/>) from various points of view (environmental, social, economic, governance).

## 1.2 History and long run perspective

We have shown that financing needs for water and sanitation infrastructure are huge both in developing countries and in the Western world. How to finance them is an open question on which a rich policy debate is going on (refer to Section 5).

For example, the water financing issue was at the core of the 2012 World Water Forum in Marseille within the “Condition for Success 2 - Financing water for all” theme. In those sessions many speakers made references to what were the financing solutions adopted in the past stating that “looking back at how water investments have been financed in the past can give us clues as to which solutions could be defined in the future” (Tremolet 2012a). From the beginning, how to finance infrastructure has constantly been a major concern, not always easy to solve. To what extent can we look into the past to enlighten the present policy debate?

That brings us to the wide debate on whether history can be used to enlighten the present policies. Additionally, what are the interlinks between history, economics and other social sciences? How can each discipline dialogue with the others in interdisciplinary approaches? This is a rich controversy on which much has been written by historians, economists and other social scientists. We do not have the ambition to enter into such a debate but we wish to discuss the ideas of some authors that helped us to define our approach.

### 1.2.1 History and the present

In 1958 Fernand Braudel pointed out already to « the utility of history within the debate which takes place among all human sciences”. He stressed the importance of the “time

dialectics” (*la dialectique de la durée*<sup>7</sup>) and of the long run (*la longue durée*<sup>8</sup>) as considered and used by historians:

« Raison de plus pour signaler avec force dans le débat qui s'instaure entre toutes les sciences de l'homme, l'importance, l'utilité de l'histoire, ou plutôt de la dialectique de la durée, telle qu'elle se dégage du métier, de l'observation répétée de l'historien ; rien n'étant plus important, d'après nous, au centre de la réalité sociale, que cette opposition vive, intime, répétée indéfiniment, entre l'instant et le temps lent à s'écouler. Qu'il s'agisse du passé ou de l'actualité, une conscience nette de cette pluralité du temps social est indispensable à une méthodologie commune des sciences de l'homme » (Braudel 1987, 10).

In his paper, Braudel strongly argued in favour of interdisciplinarity between history and other social sciences :

« Aussi bien, n'imaginons pas entre l'historien et l'observateur des sciences sociales les barrières et différences d'hier. Toutes les sciences de l'homme, y compris l'histoire, sont contaminées les unes par les autres. Elles parlent le même langage ou peuvent le parler » (Braudel 1987, 18).

However Braudel was conscious that the dialogue between history and the other social sciences is not so easy as these tend to discard historical approaches: « il faut bien convenir que les sciences sociales, par goût, par instinct profond, peut-être par formation, tendent toujours à écarter l'explication historique » (Braudel 1987, 19). The long run (*la longue durée*) was considered by Braudel as a one of the possible common languages between all social sciences<sup>9</sup>.

Another possible common language is the “change of scene” (*le dépaysement*) which provokes amazement and surprise which are powerful tools of analysis (Braudel 1987, 21 quoting; Ariès 1954, 298). The change of scene may be provoked by travel either around space or through time<sup>10</sup> : it is the essence of comparative and historical analysis

<sup>7</sup> This is the title of a 1950 book by Gaston Bachelard

<sup>8</sup> Franck Scherrer thesis adopts the *longue durée* concept to analyze the sewer system in Lyon (Scherrer 1992).

<sup>9</sup> « *Ce que je voudrais souligner aussi pour conclure, c'est que la longue durée n'est qu'une des possibilités de langage commun en vue d'une confrontation des sciences sociales* » (Braudel 1987, 36)

<sup>10</sup> « *Philippe Ariès a insisté sur l'importance du dépaysement, de la surprise dans l'explication historique : vous butez, au XVIe siècle, sur une étrangeté, étrangeté pour vous, homme du XXe. Pourquoi cette*

respectively. Our research applies both approaches since it focuses on two countries and on the long run.

Braudel argued that the relationship between history and the other social sciences is not an adverse but rather a complementary one, where “past and present enlighten each other of their mutual light”:

« Historiens et *social scientists* pourraient donc éternellement se renvoyer la balle sur le document mort et le témoignage trop vivant, le passé lointain, l'actualité trop proche. Je ne crois pas ce problème essentiel. Présent et passé s'éclairent de leur lumière réciproque » (Braudel 1987, 21).

Lucien Febvre wrote “history, science of the past, science of the present”<sup>11</sup> and inspired Braudel who considered history as being able to explain our society in its present reality:

« L'histoire, dialectique de la durée, n'est-elle pas à sa façon explication du social dans toute sa réalité ? et donc de l'actuel ? » (Braudel 1987, 24)

According to Braudel, “history is the sum of all the possible stories and based on a wide collection of skills and points of view of yesterday, of today and of tomorrow”<sup>12</sup> (Braudel 1987, 18).

### **Economics and History**

In a famous 1924 essay on Alfred Marshall's life John Maynard Keynes stated that

“[...] the master-economist must possess a rare combination of gifts. [...]. He must be mathematician, historian, statesman, philosopher—in some degree. [...] He must study the present in the light of the past for the purposes of the future.” (Keynes 1924, 322)

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*différence ? Le problème est posé. Mais je dirai que la surprise, le dépaysement, l'éloignement — ces grands moyens de connaissance — ne sont pas moins nécessaires pour comprendre ce qui vous entoure, et de si près que vous ne le voyez plus avec netteté. Vivez à Londres une année, et vous connaîtrez fort mal l'Angleterre. Mais, par comparaison à la lumière de vos étonnements, vous aurez brusquement compris quelques-uns des traits les plus profonds et originaux de la France, ceux que vous ne connaissiez pas à force de les connaître. Face à l'actuel, le passé, lui aussi, est dépaysement. » (Braudel 1987, 21)*

<sup>11</sup> « Histoire science du passé, science du présent » (Lucien Febvre quoted by Braudel 1987, 24).

<sup>12</sup> Author's translation. « Pour moi, l'histoire est la somme de toutes les histoires possibles, — une collection de métiers et de points de vue, d'hier, d'aujourd'hui et de demain » (Braudel 1987, 18).

In more recent times, Harold James<sup>13</sup> discussed some other interesting views on the interplay between economic history and present policy issues in the context of financial crisis (James 2012). From his point of view history can achieve three goals:

1. Firstly “history can be a source of policy advice. It can instil a sense of the predictability of policy outcomes, and also justify a particular policy approach.”(James 2012, 1021)
2. “Secondly, there is history as a source of patterns [...]. History would be a way of making for a better knowability of outcomes.”(James 2012, 1022).
3. “Thirdly, history shows us something about the multiple possibilities of any given moment. In technical language, it constantly tells us multiple equilibria stories.”(James 2012, 1025)

And to sum up, “the best way of thinking about history is as a way of testing conventional hypotheses”(James 2012, 1025)

### **1.2.2 Social scientists and policy analysts looking into the past**

Not only long run history can contribute to present policies but also researchers concerned with present-time issues might look into the past. Indeed there are many social scientists (economists, sociologists, urbanists...) concerned with present policy issues which adopt retrospective long run analyses to look into the past.

This was for example the approach followed by the members<sup>14</sup> of the *Groupe Réseaux* (an interdisciplinary research group composed of urbanists, geographers and other social scientists) founded in Paris<sup>15</sup> in the 1980's and at the origin of the *Cahiers du groupe Réseaux* which in 1989 became the journal *Flux*. Gabriel Dupuy and the *Groupe Réseaux* were in contact with the works of Joel Tarr who is an historian “particularly interested in using history to understand contemporary problems<sup>16</sup>”. In 1985 he produced a paper with the purpose of using “the history of government intervention in the provision of water, electricity, and cable television to gain greater insight into the

<sup>13</sup> Harold James is professor of economic history at Princeton university

<sup>14</sup> Among which Bernard Barraqué, Gabriel Dupuy, Kostantinos Chatzis et Franck Scherrer

<sup>15</sup> Many members were professors and researchers at the *Institut d'urbanisme de Paris* and at the *Ecole Nationale des Ponts et Chaussées*.

<sup>16</sup> <http://www.history.cmu.edu/faculty/tarr.html>, retrieved online on March 21<sup>st</sup> 2014

kinds of activities that can be efficiently performed by the public and private sectors”(Tarr, Klepper, and Jacobson 1985, 2).

Tarr is particularly concerned with technology. In the 1970’s he coordinated a research group on retrospective technology assessment and theorized the idea of using retrospective analysis to nourish technology assessment. “Unlike the future, history has data, and these data should be useful in forecasting and anticipation” (Tarr 1977, 655). “History, because of its long time perspective, its perception of social values, and its holistic nature, would be of value to technology assessment”(Tarr 1977, 658)

Another attempt to link history research and policy analysis for the water sector has been made by Juuti and Katko who coordinated the research project “Water Time” (Juuti and Katko 2005). The subtitle of their final report was “history matters for the futures”. Indeed in another paper by some of the same authors it is written that “Future Research and Historical Research could jointly form a decision-making framework, which seeks to integrate both historical and future perspectives into today’s decision-making processes”(Kaivo-oja, Katko, and Seppälä 2004, 540) ensuring that both “the diversities of the past and pluralities of the future [...] are taken into account in decision-making”. Future research “points out the need to “look in the rear-view mirror while driving the car into the future”(Kaivo-oja, Katko, and Seppälä 2004, 545).

### **1.2.3 The history of infrastructure finance**

In 2010 the European Investment Bank launched a call for proposals to award a research grant focused on “The History of European Infrastructure Finance” since the issue “has resonance today<sup>17</sup>”. Although our PhD was not funded on the EIB research project we had the chance to be associated with the interdisciplinary research team and participated to the 2012 Milan European Economy Workshop. Its focus was “the analysis of the outcomes of public engagement in public infrastructure provisioning in Europe as well as with an identification and exploration of European best practice examples for infrastructure financing that provide lessons learnt for contemporary policy debates”<sup>18</sup>. After the workshop our paper on the financing of Paris urban water and sanitation

<sup>17</sup><http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2010:142:0030:0032:EN:PDF>, retrieved online on March 21<sup>st</sup> 2014

<sup>18</sup><http://www.massimoflorio.com/milan-european-economy-workshops/milan-european-economy-workshops/>retrieved online on March 21<sup>st</sup> 2014

infrastructure (CrespiReghizzi forthcoming a) was then selected for inclusion as one of the chapters of a forthcoming collective book.

#### **1.2.4 Precautions to be used**

In the same context of that EIB funded research project, De Luca and Lorenzini (2013) made a very rich and complete historical long run review of infrastructure financing mechanisms in Europe. Their work was motivated on the grounds that “the analysis of how infrastructure has been financed in the long run may allow us to better delve and grasp the inner dynamics of infrastructure provision, concentrating on one of the most determinant, as well as bias-reconstructed, elements of its success or failure”(De Luca and Lorenzini 2013, 2). Their research hypothesis “is that the effectiveness of an infrastructure financing system is correlated with a set of variables that embraces both supply-side and demand-side factors, whose interplay is path-dependent”(De Luca and Lorenzini 2013, 3). This brings them to the conclusion that “history teaches us that one single model or pattern, fitting all at the same time, does not exist. The same financing system can be successful in one country while it can fail in others, or even in other parts of the same state”(De Luca and Lorenzini 2013, 26).

The same kind of warning is made by Jacobson and Tarr when they write that “lessons of the past cannot be uncritically applied by contemporary decision-makers without close attention to context”(Jacobson and Tarr 1995, 32). Retrospective analysis should “emphasize the generalizable rather than the particular features of the historical event” (Tarr 1977, 658).

Harold James also points out that “A simple-minded application of historical lessons can provide a really bad policy guide. It does not offer self-evident patterns either. The best way of thinking about history is as a way of testing conventional hypotheses”(James 2012, 1025).

This is something that Braudel had also thought when he looked at the long run as an ocean where models and hypothesis could be tested:

“L'intérêt pour moi, le navire construit, est de le mettre à l'eau, de voir s'il flotte, puis de lui faire monter ou descendre, à mon gré, les eaux du temps. Le naufrage est toujours le moment le plus significatif”(Braudel 1987, 30).

The long run can be used to test conventional hypotheses. Nevertheless, we should always keep in mind that history is a whole “field for research and analysis rather than the simple aggregate of facts to pillage in order to corroborate a theory”(De Luca and Lorenzini 2013, 2)

### **1.3 A long run perspective on water and sanitation infrastructure**

#### **1.3.1 Existing literature on water and sanitation history**

There has been already a large amount of research on the history of water and sewer systems from the point of view of the history of technology and of environmental and urban history. A research branch on the history of the networks has been very active in France<sup>19</sup> (but also in the USA with Joel Tarr, Martin V. Melosi and others) and produced very interesting pieces of literature (Dupuy and Knaebel 1982; Tarr and Dupuy 1988; Guillerme 1983; Goubert 1985; Chatzis 1993). More recently a collective book has been published in honour of one of the engineers at the origin of Paris water system Eugène Belgrand (Deutsch and Gautheron 2013).

Indeed, the socio-technical history of Paris water and sanitation infrastructure has been largely treated in the previous literature (Cebron de Lisle 1991; Bellanger, Pineau, and SIAAP 2010; Beaumont-Maillet 1991; Bocquet, Chatzis, and Sander 2008; Chatzis 2006; Graber 2009). This is not the case for the history of Milan’s water service on which the literature is not largely developed (Bigatti 1997; Bigatti 2000; Colombo 1984; Motta 1989a; Gentile, Brown, and Spadoni 1990).

In both countries much less has been written on water and sanitation services (WSSs) from the economic history perspective. There are very few (if any) economic history studies on the financing history of water infrastructure. Sometimes financing solutions adopted in the past are mentioned in the literature quoted above and referred to in the policy-makers circles. However the financing solution is not the main focus of those studies and often it is not treated with the necessary quantitative in-depth analysis.

#### **1.3.2 Our research approach**

There is a knowledge gap on how water infrastructure was financed in the past and no quantitative and detailed studies are available on how was the network expansion

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<sup>19</sup> See above the references to the *Groupe Réseaux* and to its journal *Flux*.



financed<sup>20</sup>(Barraqué 2011a, 4). One of the goals of our research is to start filling such a gap.

*L'histoire est fille du présent* (History is the daughter of the present) is a famous expression<sup>21</sup>. We are conscious that we are not historians and that we are not defending a PhD thesis in History but in Economics. Our research originates from the knowledge of the real infrastructure challenges faced today both in the western world and in developing countries (§1.1). Infrastructure, and particularly in the water and sanitation sector, has a very long life time. This could be a reason *per se* for adopting a long run perspective. Clearly it is not the only one as the previous paragraphs showed (§1.2).

Our approach is deeply rooted in public finance theory which we shall discuss in detail (Sections 2, 3, 4 and 2.11). Based on such a theory we adopt a long run (*la longue durée*) time frame on one hand and a comparative approach on the other hand to fuel the research with the necessary amazement and surprise (*le dépaysement*)(Braudel 1987).

### **A thesis based on a core of six essays**

Our time frame starts with the genesis of “modern” water and sanitation services and lasts till the end of the 20<sup>th</sup> century.

The core of this thesis is composed of six essays which are inserted in Part II and Part III. The six essays are currently in the submission process to be published in journals and collective books. By construction each essay is an autonomous piece of research. This implies that there might be some redundancies between the essays. In advance we invoke the reader’s indulgence.

Most papers are the result of an initial study presented at one or more conferences or workshops which were later published online as “working papers”. One or two papers have been produced from each of our three initial working papers. A summary table in Appendix 2 gives the full details on the working papers, on the conferences and workshops and on the final publications.

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<sup>20</sup> « *On ne dispose malheureusement pas d’analyses historiques quantitatives pour reconstituer les modes de financement de l’extension des services et leur évolution* » (Barraqué 2011, 4).

<sup>21</sup> The expression has been used by Christophe Granger who wrote that « *c’est dans le présent, dans ses hardiesses et ses inquiétudes, que l’historien tire de quoi soutirer du sens au passé et de quoi, en retour, le suturer au présent* »(Granger 2013, 12).

Our analysis is based on the existing literature when available and on municipal documents (in particular the yearly financial reports) as primary sources.

Specifically, our analysis has been particularly deep and based on municipal primary sources for the genesis phase of Milan and Paris water services (1888-1925 and 1853-1925) which is analysed in the three papers present in **Part II** (CrespiReghizzi forthcoming a; CrespiReghizzi forthcoming b; CrespiReghizzi forthcoming c).

**Part III** includes two papers on Milan water service respectively today and in the second half of the 20<sup>th</sup> century (CrespiReghizzi forthcoming f; CrespiReghizzi forthcoming d). These two papers are based on existing literature, on primary municipal sources and on interviews for the more recent years.

The third paper in Part III (CrespiReghizzi forthcoming e) enlarges the frame to the long run financing paths of Water and Sanitation Services (WSSs) in Italy and France.

### **The other parts of the thesis**

It was only after having finalized and submitted to editors the six essays that we started writing the introductory part (Part I) and a conclusive part (Part IV) of the thesis.

Through various sections of **Part I** we discuss many aspects of public finance theory. Section 5 discusses some general issues on water and sanitation services. Using the public finance theory we build an original matrix of the trade-offs faced by water and sanitation policy-makers (§5.3).

In the conclusive part (**Part IV**) we summarize the path of water and sanitation services in Paris and in Milan (and in France and in Italy) and analyze it in terms of the trade-off matrix (Section 6). We also draw some comparisons with other countries (Section 7). In the last Section (Section **Erreur ! Source du renvoi introuvable.**) we give some conclusions both from a policy and academic perspective.

## 2 Public finance theory and club goods

This section discusses some aspects from public finance theory. Some other aspects will be analysed in the forthcoming sections too (Sections 3, 4). We adopt a definition of public finance (or public economics) given by Rosen and Gayer :”the field of economics that analyzes government taxation and spending” (Rosen and Gayer 2010). This could also be the definition of “public economics” but we prefer to stick to the term of “public finance”.

### 2.1 The trilogy of state functions

According to one of the most famous classics in public finance theory (Musgrave 1959) government intervention needs to respond to a trilogy of objectives implemented by three branches of the government :

- 1)The Stabilization branch – to secure economic stabilization.
- 2)The Allocation branch – to secure adjustment in the allocation of resources
- 3)The Distribution branch – to secure adjustments in the distribution of income and wealth.

Many decades after Musgrave (1959), the government intervention is still classified by public finance scholars according to a slightly revisited trilogy to which we shall also refer (Hindriks and Myles 2013, 119–123). Government intervention might take place to fulfil one of the three following objectives :

- 1) The Minimal State (including property rights, contract laws, police and defence).
- 2) Government intervention in the case of market failures (based on a positive criterion and on efficiency grounds).
- 3) Government intervention that do not involve market failure (based on a normative criterion and on equity grounds)

Within the “Minimal State” branch the first role of the public sector is to assist with the attainment of economic efficiency by providing an environment in which trade can flourish. The minimal state provides contract laws, polices it and defends the economy against outsiders” (Hindriks and Myles 2013, 120–121).

Once the Minimal state missions are fulfilled, there is room for government intervention either to solve market failures (Musgrave's Allocation Branch) or in fields where no market failures are involved (Musgrave's distribution branch). We let aside the first and third branch and focus our attention on government intervention in the case of market failures (Allocation branch).

Government intervention in the allocation branch is based on a positive criterion and justified to solve the inefficiency due to various market failures: externalities<sup>22</sup>, public goods and case of imperfect competition (Hindriks and Myles 2013, 121).

## 2.2 Benefit Vs Ability-to-pay principles in taxation

One central question is how should be financed Musgrave's allocation branch and how this is linked with the transfers in income distribution made by the distribution branch. Historically, there were two distinct views<sup>23</sup> on taxation :

- a) The *benefit* approach and
- b) The *ability-to-pay* approach.

Before going further into each one of these approaches it is worthwhile to remember Adam Smith's point of view on the topic as expressed by Musgrave:

On one hand "the cost of public expenditures should be allocated, wherever possible according to benefit ; and general contributions should be used only where expenditures cannot be allocated on a benefit basis".

On the other hand "everyone is benefited by such services and everyone should contribute to the cost of sustaining them. But how is the individual benefit and cost-contribution to be measured? Since there is no practical way of doing this, a general rule of thumb is needed in place of individual imputation. This rule according to Adam Smith is provided by "*taxing individuals in proportion to their respective abilities; that is the revenue they respectively enjoy under the protection of the state*". Smith thus shrewdly inserted an ability element into the weak link of the benefit rule" (Musgrave 1959, 66–67).

<sup>22</sup>As pointed out by Cornes and Sandler (1996, 6): "public goods can be thought of special cases of externalities". Moreover "externalities represent not simply a further source of market failure, but a much broader family of market failures of which public goods constitute a member."

<sup>23</sup> These two views are discussed in detail by Musgrave (1959).

### 2.2.1 The Benefit approach

This is a very ancient view on taxation according to which “taxes were considered a price to be paid for protection or for a membership fee in the association of organized society”(Musgrave 1959, 64). The relation between the taxpayer and the government is essentially seen in *quid pro quo* terms.

At the end of the 19<sup>th</sup> century in Europe there was a *renaissance* of the benefit approach where “taxes were considered more or less as voluntary payments rendered by the individuals in exchange for services supplied by the government in accordance with personal evaluation of such services”(Musgrave 1959, 69). This new school included authors such as Pantaleoni, Mazzola and de Viti de Marco in Italy, Sax in Austria and Lindahl in Sweden<sup>24</sup>. This new view on the benefit approach introduced an important change compared to the traditional doctrine : taxation according to benefit was not based anymore on a “standard of justice” but as a “condition of equilibrium”(Musgrave 1959, 69).

According to Musgrave (1959, 62), on the one hand such a view makes sense for the allocation branch<sup>25</sup> as it has “the great merit of tying the choice of public services to the preferences of the individual members of the community. On the other hand he points out the great limits of the benefit approach when applied to public goods:

“There remains the vital question of just how benefits are to be determined. [...] If we think of the benefit principle as implemented by a market mechanism, as the later writers did, we must make the unrealistic assumption that the exclusion principle and, hence, the principle of voluntary exchange are applicable to the satisfaction of public wants”(Musgrave 1959, 63)

The benefit approach somehow considers taxation as a “membership fee” to an “association”. This is something on which we shall discuss further in §2.5 in terms of “clubs” and “collective consumption units”.

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<sup>24</sup>Some of these essays have been translated and published in English more recently (Musgrave and Peacock 1994)

<sup>25</sup>While “the benefit approach by its very nature cannot solve the problem of the Distribution and Stabilization Branches” (Musgrave 1959, 62).

Indeed, the above quotation makes clear that two conditions are required for the benefit approach to be applied: i) possibility of exclusion and ii) voluntary exchange. We shall see that these are not always met or easily implemented (§2.6).

### **2.2.2 The ability-to-pay approach**

Early views on this approach focused only on the tax collection part of the problem and were based on the ideas that taxation should be imposed by the state in an “equitable or just fashion”. Later, a second view considered taxation as a matter of welfare maximisation rather than justice : the tax burden should be spread among citizen so as “to minimize the total sacrifice involved” or “equating the marginal sacrifice of all taxpayers”(Musgrave 1959, 90). As in the early views, the public expenditures side of the problem was not even considered.

A third view (Pigou 1962; Dalton 1923) considered welfare as the best approach to the determination of tax shares but it “extended the argument to the expenditure side of the budget”. And the public budget as a whole started being considered by Pigou (published first in 1929) as aimed at maximising the welfare :

“Public expenditures should be pushed to the point where the satisfaction from the last dollar expended is equal to the satisfaction lost from the last dollar taken in taxes” (Pigou 1962, 31; quoted by Musgrave 1959, 113)

In such a view the issue of how to charge public services to the user is treated independently from that of benefits received. “Taxes are seen as compulsory payments and the revenues-expenditure process is seen as a planning problem not subject to a solution by the automatic functioning of the market”(Musgrave 1959, 62). On one hand such an approach “has the merit of recognizing the compulsory nature of taxation and viewing the determination of the public household as a planning problem”. On the other hand it “disregards the expenditure side of the problem or at best provides us with the dictum that expenditures should be planned so as to maximize welfare”(Musgrave 1959, 63).

## **2.3 Social wants and merit wants**

According to Musgrave, the allocation branch has a role to play when an adjustment in the market resource allocation is required. In his opinion two major categories of goods

and services require an intervention from the allocation branch: *social wants* and *merit wants*.

“**Social wants** are those wants satisfied by services that must be consumed in equal amounts by all. People who do not pay for the services cannot be **excluded** from the benefit that result ; and since they cannot be excluded from the benefits, they will **not engage in voluntary payments**. Hence, the market cannot satisfy such wants”(Musgrave 1959, 8).

In practice, Musgrave’s “social wants” are somehow another expression for “public goods”<sup>26</sup>.

**Merit wants** are goods or services which could be “subject to the exclusion principle” and which “are satisfied by the market within the limits of effective demand”. They become “merit wants if considered “so meritorious that their satisfaction is provided for through the public budget over and above what is provided for through the market and paid for by private buyers”(Musgrave 1959, 13).

The concept of merit wants expresses the need of government-action based on a normative judgment of goods or services particularly meritorious. Merit goods raised some criticism as in Musgrave’s conception merit wants were a “mysterious object, a sort of *deus ex machina*” (Massarutto 2013, 3).

Rosen and Gayer (2010, 49) quote Baumol and Baumol(1981) and their criticism on the merit good concept:

“The merit good approach is not really a justification for support – it merely invents a bit of terminology to designate the desire to do so” (Baumol and Baumol 1981, 426–427 quoted by ; Rosen and Gayer 2010, 49)

Indeed, Massarutto reminds us that “liberal thought [...] has always been reluctant to accept the idea that something could be superior to the sovereign will of the individual; to that extent the imposition of collective preferences built through a political process

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<sup>26</sup> On the contrary we shall not retain Musgrave’s definition of “public good” which implies public production too (Musgrave 1959, 43–44).

was considered as a paternalistic intrusion in people lives which violates the liberty principle<sup>27</sup>” (Massarutto 2013, 3).

## 2.4 The continuum between private and public goods

Since Samuelson’s works (Samuelson 1954; 1955)<sup>28</sup>, economists have given an increasing attention to public goods.

“At first economists focused on the two poles of a spectrum of goods, the poles consisting of pure public goods<sup>29</sup> and pure private goods”(Cornes and Sandler 1996, 3).

After Olson’s and Buchanan’s works (Olson 1965; Buchanan 1965) a growing attention was given also to impure public goods : meaning the broad spectrum of goods between fully private and fully public good (Figure 1). “Once economists understood that few **public goods** at the local, state, national or international level possess the **non excludability** and **strict indivisibility of benefits** properties required for pure publicness, the allocative principles of club theory as they applied to **impure public goods** took on added importance”(Cornes and Sandler 1996, 4).

In a 1977 essay (re-published later in 1999), Vincent and Elinor Ostrom (1999) underline the distinction between Club Goods and Common pool resources (Figure 1). **Club goods are not rival in consumption while their benefits are excludable. Common pool resources are instead rival in consumption while their benefits are not excludable.** We should bear in mind however that the 4 categories in the matrix below are not so sharply distinct. “In fact it is helpful to envisage a continuum of goods that gradually vary in nature as they become more rivalrous or more easily excludable” (Hindriks and Myles 2013, 149).

<sup>27</sup> “Il pensiero liberale, culminato nella scuola chicagiana della *public choice*, ha sempre diffidato dell’idea che qualcosa si sovrapponesse alla volontà sovrana dell’individuo; l’individuo; l’imposizione di preferenze collettive costruite per via politica rappresenta un’intrusione paternalistica che viola il principio di libertà”, our own translation.

<sup>28</sup>Using other terminology some early views on public goods had been given in the early 20<sup>th</sup> century by some European economists including Lindhal, Sax and Wicksell. Some of these essays have been translated and published in English more recently (Musgrave and Peacock 1994).

<sup>29</sup>“Private goods could be parceled out among individuals and efficiently allocated by markets, whereas public goods could not be divided among individuals, owing to non rivalry and non excludability problems” (Cornes and Sandler 1996, 3).



A good might be considered rival if an additional user generates additional marginal costs. This has a huge implication for infrastructure which has very low marginal costs in the short run : once the infrastructure is built the marginal cost of an additional user is not significant as long as some marginal capacity is available. On the contrary, in the long run, when one considers the capital expenditures required for building the infrastructure marginal costs are not negligible. Indeed, an infrastructure might be considered unrival in the short run but rival in the long run (Massarutto 2013, 6).

Exclusion might be theoretically possible but too costly to enforce. The cost of the exclusion mechanism might evolve significantly thanks to technological innovation. Thus, Massarutto reminds us that both rivalry and excludability are not an unchanging characteristic of a good or service and can evolve significantly through the time(Massarutto 2013, 6). This is why a long run analysis is a useful approach.

**Figure 1 : Two-entry matrix on Rivalry in Consumption and Excludability of Benefits**

		Rivalry in Consumption	
		yes	no
Excludability of Benefits	yes	Private or Market Goods	Toll or Club Goods
	no	Common Pool Resources	Fully Public Goods

Source : (Barraqué 2009), originally from (Ostrom and Ostrom 1999 first publication in 1977)

## 2.5 Club Goods and collective consumption units

According to Cornes and Sandler (1996, 347), “a club is a voluntary group of individuals who derive mutual benefit from sharing one of the following : production costs, the members’ characteristics or a good characterized by excludable benefits”.

Elinor and Vincent Ostrom introduced the twofold concept of “collective consumption units” (CCU) and “production units” (PU) to analyze clubs which deliver public services :

“Governments, like households, might be viewed first as collective consumption units. Once the collective consumption aspects of governmental organization have been identified, we can turn to the production side” (Ostrom and Ostrom 1999, 83).

According to Bernard Barraqué, clubs imply the application of the two key principles of *liberté* and *égalité* as they developed with the Age of Enlightenment: everybody is free to choose whether to become a member of the club or not and all members are equal. While we agree with this view in general terms, we find this definition of clubs too narrow for our purpose and prefer to use the concept of collective consumption unit.

We shall refer further to publicly run clubs as “**collective consumption units**” (CCU). Moreover in §4.6 we shall discuss the variety of institutional forms that a CCU can assume fully within a local government or through autonomous or external legal entities.

## 2.6 Voluntary membership to the collective consumption unit ?

We have already summarized (§2.2) the debate on whether publicly provided goods could be considered to be voluntarily exchanged through quasi-market mechanisms (as suggested by the benefit approach view) or not (as argued by the ability-to-pay view). Within the benefit approach school, Emil Sax<sup>30</sup> had made in 1924 a subtle distinction between “*personal collective wants* which can be met by voluntary payment of fees and *collective wants proper* which cannot be satisfied in this fashion”.

More recent club theory tells us that while “privately owned and operated clubs must be voluntary” as “members choose to belong because they anticipate a net benefit from membership”, this is not the case when the club good is publicly provided as “voluntarism, at least in terms of taxes, may not be possible” (Cornes and Sandler 1996, 347).

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<sup>30</sup>This has been quoted by Musgrave (1959, 70) based on the 1924 version of Emil Sax works. The essay is available in English (Sax 1994).

Indeed, relying on the voluntary participation to the collective consumption units (CCUs - §2.5) is not always sufficient. “Arrangements must be made for levying assessments, taxes, or user charges on beneficiaries. Strictly voluntary efforts to supply public goods and services will fail to yield satisfactory results. Authority to levy taxes or assessments or to coerce user charges is necessary to avert holdouts and to supply funds for jointly used goods or services”(Ostrom and Ostrom 1999, 83).

The application of the exclusion mechanism implies that users’ fees can be monitored and free-riders can be barred from the club (Cornes and Sandler 1996, 349). The above quotations show that membership to collective consumption units (CCUs) cannot be always be left on a voluntary basis since applying exclusion is not always feasible or wishable.

We shall make two working statements to clarify our thought on the issue of voluntary membership, exclusion and participation to a CCU:

**Working Statement 1 : the application of an exclusion mechanism for a CCU is a necessary and sufficient condition for voluntary membership.** This statement defines a **CCU with voluntary membership and exclusion**. Indeed think of a CCU without an exclusion mechanism, how could the individuals wishing to be members show their interest to be members? How could non-members be separated from members?

**Working Statement 2 : the lack of an exclusion mechanism for a CCU is a necessary and sufficient condition for everyone to be a coerced member of the CCU.** This statement defines a **CCU with coercion**.

To the purpose of our research collective consumption units may be classified according to two questions :

- a) **Possibility of exclusion:** is it possible technically to implement exclusion from the CCU?
- b) **Choice and degree of exclusion:** from a normative point of view is it desirable to apply an exclusion mechanism? Up to which level should the policy maker set the exclusion level?

Answers to these two questions give us 3 CCU categories:

- a) **CCU A1 – CCU with voluntary membership and exclusion** : a CCU where the implementation of the exclusion mechanism is technically possible and is desirable
- b) **CCU A2 – CCU open by choice** : a CCU where the implementation of the exclusion principle is technically possible but is not desirable
- c) **CCU B – CCU open by constraint** : goods or services where the implementation of an exclusion principle is technically impossible or too costly

When the exclusion principle is not applied (CCU A2 or CCU B) all individuals are members and non-members do not exist. We shall refer to this situation as an **Open CCU with coerced membership**. This is clearly the case of a collective consumption unit providing a fully public good.

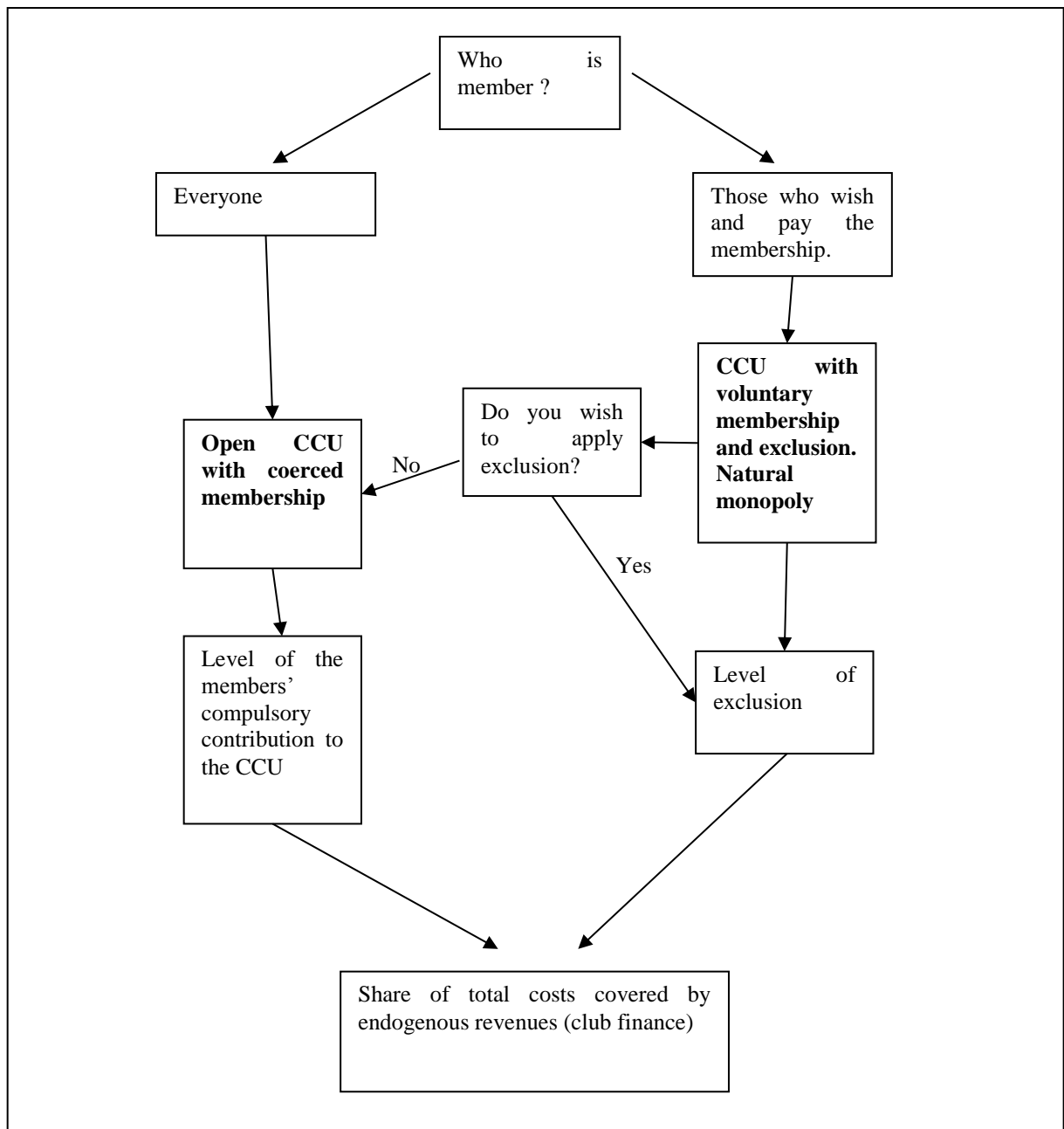
We showed that there is a continuum of different kinds of goods between fully public and fully private ones (§2.4). Similarly, there is continuum of possible choices in the degree of implementation of the exclusion mechanism. In practice, the degree of exclusion is often expressed in terms of level of collective consumption unit costs covered by user charges.

If the costs of the CCU are covered by revenues collected from the members of the CCU we shall talk of *club-finance* and of “*endogenous revenues*” (toll-finance in Musgrave’s expression).

If the costs of the CCU are covered by general taxation we shall talk of *tax-finance* and of “*exogenous revenues*”.

The terms “endogenous” and “exogenous” sources of revenues have been proposed by Massarutto (2002, 3) who gives the following definitions applied to water and sanitation services :

- “Endogenous sources are payments that are directly obtained from service users, regardless the nature of the payment (fiscal or not), with the only requirement that payments are correlated with service consumption and dedicated to the separate accounting of the environmental service.
- Exogenous sources are payments that are made to general budgets, which on their turn contribute, yet without a direct relation, to the service balance.”

**Figure 2 : CCUs & level of exclusion**

Source : author's elaboration

These concepts are schematized in Figure 2 and we discuss this issue in more detail in §2.9.2 and § 2.10. Also this concepts are addressed for the water sector in § 5.1.5.

## 2.7 User fees & information on user preferences

Elinor and Vincent Ostrom pointed out that “the income received for providing a private good conveys information about the demand for that good.” On the contrary when the membership to a CCU is not voluntary, the user fees “collected under the threat of

coercion say little about the demand for a public good or service. Payment of taxes indicates only that taxpayers prefer paying taxes to going to jail. Little or no information is revealed about user preferences for goods procured with tax-supported expenditures”(Ostrom and Ostrom 1999, 84).

Indeed, user and CCU membership fees in presence of coercion fail to reveal the user’s willingness to pay (WTP). Such an evidence generates at least two questions: a) how can we give voice to user preferences in collective consumption units? and b) what is the share of the costs to be covered by club-finance (toll-finance) and those left to tax-finance? The latter question is central in our research and shall be given a specific attention in §2.9.2 and § 2.10.

The first question is given some attention in Elinor and Vincent Ostrom’s paper. A “set of rules” needs to be defined for each collective consumption unit in order to “take account of citizen-consumer interests”. “Such rules provide mechanisms for articulating and aggregating demands in the absence of market prices and for translating demand into decisions about the level of service to be procured”(Ostrom and Ostrom 1999, 85).

Such an issue had been already pointed out somehow by Richard Musgrave as the “central problem“ left unsolved both by the benefit and ability-to-pay theories (§2.2). According to Musgrave the solution could be found in “budget planning through voting” on which he focused an entire chapter.

To solve it, “a technique must be found by which individuals are induced to reveal their preferences for social wants [public goods] (even though the exclusion principle cannot be applied) and by which a choice can be made among all the solutions that are optimal. Without this, neither the benefit nor the ability-to-pay approach has much content. [...] Since these problems cannot be solved by the mechanism of the market, we must turn to a process of political decision making”(Musgrave 1959, 116).

Even if this is an interesting issue we shall leave it aside as it is not so key for our research topic.

## 2.8 Provision and production of public services

A public finance textbook distinction needs to be reminded to the reader: it is the one between “provision” and “production” of a public good. By “provision” we refer to the task of “organizing the consumption functions in a public economy” while by “production” we refer to the task of organizing the “production function”(Ostrom and Ostrom 1999, 86).

According to Musgrave the “provision” of the public good implies that the goods or services must be paid for out of general revenue. “The goods and services must be supplied free of direct charge to the user ; at the same time, they need not be produced under the direct management or supervision of the government”(Musgrave 1959, 15) Public provision of public goods does not necessarily require public production which can also be left to the private sector.

The distinction between provision and production initially thought for pure public goods applies in fact to impure public goods too and in particular to club goods / natural monopolies. The response to the imperfect competition can be either private production with public control (public provision) or full public provision and production. And either of these two solutions can be applied to the cases of a break-even, subsidized or profit-making collective consumption unit.

As stated by Musgrave :

“Where controls over allocation are needed, the government may control the policies of private firms ; it may replace private firms by public production or it may adopt various in-between forms of ownership and control. The most efficient solution in any particular case depends upon the degree of control necessary and on the complexity of the tasks.[...] The choice of technique will frequently be a matter of judgement, not subject to a clear cut decision on the grounds of efficiency”(Musgrave 1959, 45–46).

One issue is the share of the collective consumption units costs to be covered by club-finance and those left to tax-finance (general taxation). A completely different issue is the choice of who produces: i) the collective unit could choose to produce on its own (publicly owned production unit) or ii) a contract could be signed with a private

production unit. This is the ever-lasting public Vs private debate on which so many words have been written.

While our research is very much concerned with the first issue (see next paragraphs) we chose to leave completely aside the public Vs private issue. The choice between public or private production is not central to our subject as we focus on infrastructure expenditures which are most of the time under the public sector responsibility in the water sector (CrespiReghizzi forthcoming e, 1). In the Box 1 here below we make the distinction between the three models of management in the water sector.

**Box 1 : Three models of management of water and sanitation services**

Management of water and sanitation services is schematized by Linares et al.(2012) through three models : Delegated Management (DM), Regulated Monopoly (RM) and Direct Public Management (DPM).

DM is also known as *affermage* or *lease contracts*, i.e. a contractual agreement through which the LGU keeps the responsibility on the infrastructure while it delegates to a private partner the management and daily operations (including maintenance).

RM is also known as the concession model where both the infrastructure investments and the daily operations are delegated to a private partner.

DPM refers to the case where the public authorities keep full responsibility of the service (infrastructure and daily operations responsibility)

Of course there are many possible hybrids between the three models. e.g. management contracts (*gérance, régie intéressée*)

With the notable exception of the RM model (full private concession) investment in bulk water and sanitation infrastructure is under the responsibility of the public sector.

Source : author's elaboration based on Linares et al.(2012)

## **2.9 Natural monopolies as collective consumption units with voluntary membership and exclusion**

Natural monopolies are a classic topic in public and welfare economics. A good definition is given by Hindriks and Myles :



“The essence of a natural monopoly is that there are increasing returns in production and that the level of demand is such that only a single firm can be profitable” (Hindriks and Myles 2013, 279).

Indeed, competition by duplication is not a viable solution to the market failure implied in natural monopolies (welfare loss due to the lack of competition). The classic policy response to natural monopoly consists of either public ownership or private ownership with an associated regulation. In other terms the policy response might be public provision with private production or public provision with public production too.

As we already stated (§2.8) we let aside the private Vs public debate and focus our attention instead only on the public provision part of the natural monopoly rather than on the production. In French terms this means that we focus on the *maitre d'ouvrage* of the infrastructure rather than on the *délégitaire*.

While studying natural monopoly issues with club theory lenses, we consider a natural monopoly as a CCU with voluntary membership and possible exclusion (CCU A1- §2.6 and Figure 2). This view is very consistent for example with the classical natural monopoly example of a bridge in presence of toll or with a urban public transport system.

### 2.9.1 Pricing publicly run natural monopolies

In the case of a state owned natural monopoly firm, its price should be chosen to maximise social welfare subject to the budget constraint on the firm. This is the well known *Ramsey price* (Ramsey 1927):

“The budget constraint may require the firm to break even or to generate income above production cost. Alternatively, the firm may be allowed to run a deficit that is financed from other tax revenues. Assume that all other markets in the economy are competitive. The Ramsey price for a public firm subject to a break even constraint will then be equal to marginal cost if it satisfies the constraint. If losses arise at marginal cost, then the Ramsey price will be equal to average cost” (Hindriks and Myles 2013, 280).

Indeed, utilities in natural monopolies have increasing return to scale (decreasing marginal costs) as they have very large fixed costs and relatively small operational

costs. This is particularly true for the water industry. When the first-best Long Run Marginal Cost Pricing (LRMC) does not allow break even, economics theory suggests Average Cost Pricing (AC) or Ramsey pricing (RP) as the second-best alternative allowing to recover fixed costs.

### **2.9.2 Club-finance or tax-finance in natural monopolies ?**

Ramsey pricing theory does not tell much on whether the natural monopoly collective consumption unit should be asked to generate an income, to break-even or authorised to run a deficit that is financed from some tax revenues. This is what we called the trade-off between “club-finance” (toll-finance in Musgrave’s terms) and “tax finance” (or between endogenous and exogenous revenues (§2.6). This had been already discussed by Musgrave who stated that “the choice between the two policies of toll finance and tax finance is a matter of judgment, depending on the specific case”(Musgrave 1959, 139).

While studying natural monopoly issues with club theory eyes, we argued that a natural monopoly is a CCU with voluntary membership and exclusion (CCU A1 - §2.6). The trade-off between club-finance or tax-finance raises an additional normative question: even when the exclusion principle can be applied from a technical point of view, should it be applied? In other terms should we keep the CCU membership voluntary in presence of exclusion (CCU A1) or should we open the door of the CCU to everyone (avoiding exclusion) and thus impose membership (CCU A2) ?

Once again, Musgrave gives us an answer:

“We have then a paradoxical situation where the exclusion principle can be applied but where such application results in an inefficient solution. [...] All this leads to the conclusion that the building of the bridge (and similar facilities) must be determined by the same political process that determines the satisfaction of social wants in the budget of the Allocation Branch. Even though the exclusion principle can be applied in the technical sense that barriers can be established, use of the principle is inadmissible because decreasing cost prevails”(Musgrave 1959, 138–139)

A natural monopoly is a voluntary CCU where exclusion is possible. Musgrave's analysis shows that applying the exclusion principle does not always make sense and is "a matter of judgment".

We add another issue to the discussion and argue that choosing the share of the costs covered by toll-finance and those covered by tax-finance is a key normative trade off to be made by policy-makers. Is the membership to the natural monopoly CCU to be left voluntary or should the policymakers encourage (or force) everybody to be member of the CCU ? The choice depends on the policy makers' judgment on the delivered good or service. To which extent do they consider it as a merit good (§ 2.3)?

Things in fact are not completely black or white and "some attempts can be made to compromise between the two policies [tax-finance or club-finance]." For example "the tax [...] might be drawn from people who are most likely to use the facility"(Musgrave 1959, 139).

This intermediate solution is very close to the "fiscal equivalence" principle which might be used to share the costs of a collective consumption unit without exclusion as we shall see next in §2.10.

## **2.10 Club-finance or tax finance in CCUs without exclusion ?**

Let us try to extend the analysis of the trade-off between club-finance and tax-finance to a CCU where the implementation of the exclusion mechanism is not possible (CCU B) or not desirable (CCU A2).

We consider here a collective consumption unit in presence of coercion (no voluntary membership and no exclusion). The term "club-finance<sup>31</sup>" refers here to the money collected by the CCU on its members (compulsory contribution). A CCU membership fee in presence of coercion fails to reveal the user's willingness to pay (WTP). Nevertheless, the question here is how much should the collective consumption unit charge the coerced user for the specific good or service through membership fees (club-finance) ? Should the total cost be charged to the user (CCU member) ? or only a part of the costs? By definition costs uncovered by club-finance are covered by general taxation (tax-finance).

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<sup>31</sup> This could also be referred to as 'common pool finance'.

An indication in favour of club-finance expressed as “fiscal equivalence” is given by Elinor and Vincent Ostrom(1999, 91):

“Without market prices and market transactions, the act of paying for a good generally occurs at a time and place far from the act of consuming the good: individual costs are widely separated from individual benefits. Yet a principle of fiscal equivalence—that those receiving the benefits from a service pay the costs for that service—must apply in the public economy just as it applies in a market economy. Costs must be proportioned to benefits if people are to have any sense of economic reality. Otherwise beneficiaries may assume that public goods are free goods, that money in the public treasury is "the government's money," and that no opportunities are foregone in spending that money. When this happens the foundations of a democratic society are threatened. The alternative is to adhere as closely as possible to the principle of fiscal equivalence and to proportion taxes as closely as possible to benefits received”.

The fiscal equivalence principle is clearly very close to the benefit approach in taxation previously described (§2.2.1). In fact the “fiscal equivalence’ principle had been forged by Olson (1969) talking of “The Division of Responsibilities Among Different Levels of Government”:

“We must argue that there is a need for a separate governmental institution for every collective good with a unique boundary so that there is a match between those who receive the benefits of a collective good and those who pay for it. This match we define as “fiscal equivalence”(Olson 1969, 483).

Olson argued in favour of a fiscal equivalence between the beneficiaries of a service provided by a given collective consumption unit and the citizen and voters fuelling the budget of the collective consumption unit through taxes.

In practice fiscal equivalence might be implemented through ear-marked taxes or levies which are set for a specific public service and flow into that public service specific budget.

This bring us to a key and useful distinction : from a legal point of view, endogenous revenues can be collected from the users as Tariffs (non fiscal) or as ear-marked taxes or levies with a fiscal nature.

Thus, two steps of distinction have to be made. Costs can be covered by :

- 1) Endogenous revenues
  - 1a) Tariff (with no fiscal nature)
  - 1b) Ear-marked tax or levy with fiscal nature
- 2) Exogenous revenues

Olson's fiscal equivalence is very much connected to the nature of intergovernmental relations and to the shape of Local Public Finance on which Section 4 focuses.

## **2.11 Urban development & land value capture tools**

In the previous paragraphs we have discussed the key distinction between club-finance and tax-finance (between endogenous and exogenous revenues). We argued that by definition costs uncovered by endogenous revenues are covered by exogenous revenues. By "exogenous revenues" we were making reference to general taxation. In fact some revenues may also come from the land value increase due to the built infrastructure if specific arrangements are available to capture it.

Indeed, Jacobson and Tarr point out three kinds of funding arrangements for government owned utilities in the United States : " [a]Funded by user fees, [b] Free to users, funded by tax assessments and [c] Free to users, funded by assessments on abutting property holders [or d] a combination of any of the above"(Jacobson and Tarr 1995, 3).

In the following sub-paragraphs we discuss how land value capture tools may be implemented to make the property holders contribute to urban infrastructure projects.

In our papers in Part II, we shall discuss the role of land-value capture tools in the financing of Paris and Milan water infrastructure (Crespi Reghizzi forthcoming a; Crespi Reghizzi forthcoming b; Crespi Reghizzi forthcoming c).

### **2.11.1 Land value capture**

The idea of taxing land value had already been proposed in 1879 by Henri George as a tool for confiscating rent on land:

“It is not necessary to confiscate land—only to confiscate rent. Taking rent for public use does not require that the state lease land; that would risk favoritism, collusion, and corruption. No new government agency need be created; the machinery already exists. [...] Government already takes some rent in taxation. With a few changes in our tax laws, we could take almost all.[...].Therefore, I propose that we appropriate land rent for public use, through taxation”(George 1879, 239; quoted by Sumiraschi 2013).

According to present day value capture theory, urban infrastructure can be financed endogenously if the local authorities are able to design proper legal mechanisms to capture the added value created by urban growth. In other terms through a value capture financing scheme a public administration can monetize a part of the positive externalities of an infrastructure project (Brugnoli 2010, 15).

There is a large variety of land value capture financing tools which can allow to do this as the table below shows. The first classification we make is whom do we capture the contribution from, i.e. who is the payer ? a) The Developers or b) the Community ? “The community consists of all property owners in the direct vicinity of the infrastructure (direct beneficiaries)”(ReUrba 2006). The other useful distinction is the one between “mandatory tools” based on coercion and “voluntary ones” based on cooperation between actors. The last line in the table below mentions another category of land value capture tools based on an internalization of all costs when the developer undertakes jointly a profitable operation and a less profitable operation with an implicit cross-subsidy taking place.

**Table 1 : Value capture financing tools**

Capture from (Who is the payer?)	Voluntary tools	Mandatory tools	Comments
Developers	Joint development	-Development exaction and impact fees - Public land acquisitions and resale	Expansion areas / integrated urban renovation operation
The community	No	-Betterment levies -General tax on land value gains	Built up areas
Within	-Internalization (integrated urban developer) -Linkage capture	No	

Source : author’s elaboration based on concepts from various sources (ReUrba 2006; Peterson 2009; Brugnoli 2010)

### 2.11.2 Mandatory tools capturing funds from the community

According to Peterson(2009) a distinction has to be made between

- “**betterment levies**” *stricto sensu* which raise a lump-sum tax among property owners in the neighborhood of an infrastructure and,
- a “**general tax on land value gains**” which is paid on a broader base by property owners. Such a tax is less tightly connected to a specific infrastructure. To be effective in capturing the land value gains, this solution requires to constantly monitor and update the cadastral values of properties.

### 2.11.3 Mandatory tools capturing funds from the developers

In this category one has to distinguish:

- Development exaction** : “Developer installs on-site and neighbourhood-scale infrastructure at own expense”(Peterson 2009, 14).
- Impact fees** : “Developers pay the cost of system wide infrastructure expansion needed to accommodate growth” (Peterson 2009, 14).
- Public land acquisition and resale policy** : the municipality owns or acquires “lands near by an infrastructure project and then sells it upon completion of the project” at a higher value (Peterson 2009, 41).

The latter policy was largely implemented in Paris in the second half of the 19<sup>th</sup> century. It contributed to financing a significant part of the water supply and sewer system infrastructure costs (Crespi Reghizzi forthcoming a).

### 2.11.4 Some historical facts on land value capture fiscal tools

In the second half of the 19<sup>th</sup> century various countries (England, USA, Prussia) were taxing property value increases in order to finance investments in urban infrastructure<sup>32</sup>. In England, according to the 1895 Victoria act, municipalities could impose a “betterment-tax” on all side-residents if their property had received a value increase thanks to the realization of a public infrastructure. The yearly betterment-tax amount was computed as follows : 3% on the half of the property value’s increase<sup>33</sup>. Similarly

<sup>32</sup> Most of the following informations are taken from Marongiu (2001, 83–87).

<sup>33</sup> deducing from the betterment-tax all other taxes eventually weighting on such a property value’s increase

in the USA “special assessments” were used by various cities (Boston for example between 1866 and 1870) to finance their urban infrastructure expansion. In Prussia too in 1875 and 1893 two laws<sup>34</sup> made provision for the infrastructures burden to be covered by side-residents.

In Italy the principle that “those who had some earnings from an infrastructure should give a contribution to the betterment costs” had been included in the June 25<sup>th</sup> 1865 law on expropriation for public utility (Marongiu 2001, 86). Other laws approved in those years for specific urban transformation were based on such principle. However the 1865 law required very specific conditions to be applied. Conversely to the English, Prussian and American cases, in Italy a law allowing to systematically capture a share of property value increase did not exist and was not approved in the 19<sup>th</sup> century.

In 1904 however a tax on building land areas is approved in Italy<sup>35</sup>. According to that law 1 % of the land value increase was to be paid by the owner. In order to encourage truth declaring in 1907<sup>36</sup> it was established that, if an expropriation was needed, the expropriation amount to be paid by the municipality to the land owner would be the same property value amount declared by the owner (Marongiu 2001, 161–165). The 1904 law was designed however to incentivize building rather than capturing a share of property value increase<sup>37</sup>. Indeed the idea of allowing local authorities to control land rent was still not present (Dorigati and Molon 1982, 184). Obviously the approval of the tax on building areas and its application met a strong opposition by land owners and the tax was more effective in creating a harsh political debate than in giving more funding to municipalities (Marongiu 2001, 165). Indeed in Milan it was estimated that the tax could collect a total amount of only 341 709 lira (1% of a tax base of 34 M lira) which

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<sup>34</sup> Law July 2nd 1875 and Lax July 14th 1893. According to the 1893 law betterment taxes were included among the ordinary municipal fiscal revenues.

<sup>35</sup> *Tassa comunale sulle aree fabbricabili*, approved by the July 8th 1904 Law n°320

<sup>36</sup> *Legge 11 luglio 1907 n°52*

<sup>37</sup> Such a tax was initially conceived for the Rome municipality but then extended to all municipalities who needed to incentivize to build houses. It was to be paid until a building had been completed on the area. “...imporre una tassa sulle aree fabbricabili, la quale anzichè avere uno scopo fiscal, tendesse essenzialmente a stimolare i proprietari di aree fabbricabili a costruire sulle medesime nell'interesse di quell maggior sviluppo edilizio, che era vivamente reclamato dalle condizioni della città.”(Municipio di Milano 1907a).



appears not relevant at all if compared with the total fiscal revenue of the Milan municipality at that time<sup>38</sup>.

Indeed in 1914, Milan's municipal administration was still asking for a legislative act allowing to capture a part of property value increase caused by municipal infrastructure since the tax on building areas was not judged sufficient (Sai et al. 1970, 229–230).

Not only did Italy not manage to design a proper tax to collect a share of property value increase but also the property tax<sup>39</sup> provided for by the 1865 law was collected not rigorously since the tax base (property values) was not kept up to date (Dorigati and Molon 1982, 263). Indeed a general property value review was realized only in 1870 and 1890 while partial property value reviews implemented after 1910 (according to the 1865 law) were not sufficient to modify the tax base (Sai et al. 1970, 229–230).

As a matter of fact, Italy was not able to implement effectively a tax system allowing to capture land value neither through betterment levies neither through a general tax on property values increase.

Land value capture tools were implemented in Paris under Haussmann's ruling as we show in the papers in Part II. However, in France, the case of "Haussmann's *caisse des travaux* and *bonds de delegations* remained exception. Indeed, Morizet suggests that Haussmann was fired because *petits bourgeois* opposed government taking part in land speculation (Morizet 1932).

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<sup>38</sup> 1905 rough values : 23.8 M Lira of total fiscal revenues composed mainly of 13.4 M Lira from the excise duty, 5.8 M Lira from the additional tax on property and 1.2 M Lira from the Tassa di esercizio e rivendita dei generi non riservati al monopolio dello Stato and 1.2 M Lira from the imposta sul valore locativo delle abitazioni (Atti del Municipio di Milano 1906-1907)

<sup>39</sup> Including the additional tax (*sovraimposta comunale*) on property.



### 3 Infrastructure and repayable finance

This section focuses on infrastructure and investments undertaken by production units within Musgrave's Allocation branch. Capital expenditures require an upfront payment in front of benefits released along the whole life span of the infrastructure. Infrastructure implies a temporal mismatch between its implementation and payment and its benefits production. That's where *repayable finance* is concerned. By "repayable finance" we refer to all the financing tools (loans, bonds...) which allow a production unit to borrow and get money upfront in order to finance its investments. Such a debt shall be then paid back according to the loan or bond amortization schedule.

Using repayable finance to fund infrastructure needs raises more than one question both from the theoretical and practical point of view.

The use of public debt is a widely debated issue in public finance and it is far behind our research scope to make a fully comprehensive review on the topic. Nevertheless repayable finance plays such a major role in infrastructure and in the water and sanitation sector that some recalls from public finance theory are useful.

This section focuses on what public finance theory tells us on the use of public debt to finance infrastructure needs.

#### 3.1 Generations and the burden of the debt

To discuss repayable finance, one needs the concept of generations. Two different definitions of a generation have been used in public finance.

On one hand there is the Lerner's position where a generation is composed of everyone who is alive at about the same time. This definition has been largely used in the 1950's and 1960's to argue that in macroeconomics terms the burden of the debt does not always shift to future generations. Lerner's view distinguishes in particular internal debt from external debt. Internal debt is not seen as a burden since it consists only of an internal transfer of income among members of the same generation: in the future, bondholders will receive money from taxpayers. However the consumption level of the future generation is preserved (Lerner 1948).

Another way of defining a generation is "everyone who was born at about the same time" (Rosen and Gayer 2010, 467). This definition of a generation is at the root of

overlapping generations' models where various generations are alive in the same time and partially overlap. This kind of model has been used recently in the establishing of a "generational accounting" framework (Auerbach, Kotlikoff, and Leibfritz 1999) used to analyze intergenerational transfers among generations.

Lerner's view on internal debt and on its burden had been already severely criticized by Buchanan (1958) without using the overlapping generation concept. While Lerner's position was based on an organic conception of society as a group (macro-economic definition of the "burden" concept), Buchanan relies on the individual perceptions (micro-economic burden concept) to show that "the taxpayer in future time periods, that is the future generation, bears the full primary real burden of the public debt" (Buchanan 1958, 32). Moreover, Buchanan shows that the debt's burden is by definition shifted to future taxpayers and that the distinction between internal and external debt is not relevant. Using an overlapping generation model also allows to demonstrate that a debt (internal or external) creates a burden for the future generations (Rosen and Gayer 2010, 468).

For the purpose of our research, macro-economics reasoning does not makes great sense and Buchanan's micro-economics burden concept is more appropriate. Furthermore, Lerner's distinction between internal and external debt is not very relevant to us since we mainly deal with local authorities or sub-national production units. Local public finance by definition relies exclusively on external debt (Musgrave 1959, 575). We used the concept of overlapping generations to explore intergenerational transfers implied by water infrastructure in our paper on the financing history of Milan's water and sanitation service (§6.5 in Crespi Reghizzi forthcoming b in Part II).

### **3.2 Pay-as-you-use finance Vs run-of-river-finance**

Infrastructure expenditures and investments usually have a long life time even if they are realized and paid upfront during the construction phase. Infrastructure (and in general all investment decisions) implies a temporal mismatch between those who make the decision and pay for it and those that will receive the benefit from it.

According to the benefit and fiscal equivalence principles (§2.2.1 and §2.10 respectively) one wishes that those who receive some benefits cover also the costs implied. "If the period-one investments of a government level were entirely paid for by

the current generation of taxpayers, the following generations would benefit from the ensuing goods without paying a penny for them. This is unfair” (Rossi and Dafflon 2002, 19).

Such a point of view is the one of *pay-as-you-use* finance which recommends to loan-finance the initial expenditures so that “future fiscal generations are made to pay for the benefits they obtain from these investments as far as their tax-burden covers the corresponding debt service inclusive of debt amortization”(Rossi and Dafflon 2002, 20). Next paragraph (§ 3.3) shall go in more detail on pay-as-you-use finance.

Pay-as-you-use finance (and the implied loan-finance) is criticized by those economists who think that investments are recurrent and continuous. This is what we call the *run-of-river-finance*<sup>40</sup> view (tax-finance in Musgrave’s terms). According to that view each generation pays for some investments through tax-finance. The assumption of continuous investment implies that there is roughly a match between the benefits obtained by the current generation from the investments undertaken by the previous generations and the investments costs which shall yield benefits to future generations. According to this view there is no need for loan-finance as intergenerational equity is already obtained through continuous investments (Buchanan 1997, 133). Such a point had been also made by Musgrave: “Matters are simple enough if we assume that there is a continuous stream of capital outlays. In such a case tax-finance [run-of-river finance] of new projects becomes equivalent to pay as you use finance of old projects”(Musgrave 1959, 558).

However, Rossi and Dafflon point out that “this line of reasoning applies only to relatively large sub-national jurisdictions. For smaller local authorities [or smaller production units], as those of several European countries, the constant investment hypothesis seems far less realistic.”(Rossi and Dafflon 2002, 20). Our research concerns mainly local authorities and sub-national production units. To this purpose the concept of pay-as-you-use finance fits well as we shall see in the next paragraphs.

### 3.3 Pay-as-you-use finance

To start with, we refer to the allocation branch within Musgrave’s trilogy (§2.1).

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<sup>40</sup>The term is chosen in analogy with hydropower where one distinguishes run-of-river production which does not require to stock water and production based on water storage.

”The budget of the allocation branch should be balanced since the opportunity cost of resource withdrawal must be allocated to the individuals whose wants are satisfied; [however] annual balance is not necessary, since the cost of durable goods or of lasting services should be allocated over their useful life”(Musgrave 1959, 16).

Following Musgrave’s line of thought, suppose a production unit requiring some initial investments<sup>41</sup> to deliver a good or a service through the time.

“In these cases present expenditures will provide for future benefits. Where the initial outlay is large, taxpayers may not wish [or may not be able] to assume the entire cost at once and may prefer to pay over the years as the services of the new facility are enjoyed. This reflects the same motivation underlying the purchase of a house on a mortgage [...]. The option of pay-as-you-use finance increases the flexibility of consumer budgeting and adds to the efficiency of private finance. Precisely the same results occur in public finance. The question is how the principle can be implemented at the public level”(Musgrave 1959, 558).

From a macroeconomic perspective the classic Ricardian<sup>42</sup> model assumes that in a perfect system with rationale taxpayer behavior and a pure credit market, tax-finance and loan-finance are equivalent. Indeed if a one-shot tax-finance solution is chosen the rational tax-payers may subscribe a loan to pay the tax. Thus “the outcome will be similar to that of public loan finance, the only difference being that private rather than public debt is issued”(Musgrave 1959, 559).

The assumptions of the Ricardian model are far from being met in reality since the individual taxpayer is much less rational and is not farsighted as supposed in the model. Moreover, “credit facilities are not available in equal terms to all taxpayers. Public loan finance may then be thought as a means of enabling tax-payers to secure tax-credit at equal terms”(Musgrave 1959, 559).

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<sup>41</sup>In Musgrave’s perception investments may include not only infrastructure but also “productivity-increasing services such as investment in education” (Musgrave 1959, 558).

<sup>42</sup> Buchanan (1958, xviii) reminds us that the Ricardian point of view had been deeply studied and defended by Italian public finance scholars such as Pantaleoni, de Viti de Marco and Einaudi.

To understand Musgrave's argument, let us imagine a club requiring some significant investment. Either the club shares the investment cost as a *una tantum* fee to be charged to the members (which can eventually subscribe individual loans) or it subscribes a loan and shares year by year the annuities among the members. Loan-finance is a way of making only one collective loan in place of various individual loans.

Relying on pay-as-you-use finance (repayable finance) to fund capital expenditures is a way of implementing the benefit approach (§2.2.1) and the fiscal equivalence principle (§2.10) in an intergenerational framework. To respect the pay-as-you-use principle public debt should be entirely paid back when "the benefits from the initial expenditure are being exhausted" (Musgrave 1959, 559).

We think that pay-as-you-use finance as discussed by Musgrave is a useful concept for our research. Ex-post, it is interesting to observe that on one hand Musgrave's discussion was still based on the macroeconomic distinction between internal and external debt (which we shall not retain) while on the other hand it was already based on an overlapping generation model (Musgrave 1959, 563–564). Moreover the whole "pay-as-you-use" concept considers that loan-finance allows to shift the investment cost (burden) on the future generations to solve the mismatch between costs and benefits.

From a practical point of view relying on pay-as-you-use finance justifies to "draw up a budget statement that divides the budget accounts into a current and capital part" (Musgrave 1959, 559). And indeed this kind of distinct accounting rule was made increasingly compulsory in public accounting.

Pay-as-you-use finance (repayable-finance) can also be justified on the grounds that it allows to minimize fluctuations "in the level of tax rates due to fluctuations in the level of public expenditures" (Musgrave 1959, 567). The argument was initially developed in the general case of public debt serviced by tax-revenues : debt was thought as a way of reducing "tax friction". The same argument however applies to the case of repayable finance serviced by endogenous revenues (club-finance § 2.6) since repayable-finance may allow to smooth club-fees fluctuations.

### 3.4 Repayable finance serviced by endogenous revenues

A particular case is the one of collective consumption units where all costs including debt-service are covered by endogenous revenues (also defined as “club-finance”§ 2.6). This case is defined by Musgrave as the case of “self-liquidating” projects”.

“Self-liquidating projects may be defined narrowly as investments in public enterprises that provide a fee or sales income sufficient to service the debt incurred in their financing ; or they may defined broadly as expenditure projects that increase future income and the tax base. Such projects permit servicing (interest and amortization) of the debt incurred in their financing without requiring an increase in the future level of tax rates”(Musgrave 1959, 569).

In this case, public finance works in a very similar to market finance. The initial investment cannot be financed by the collection in advance of club fees. As in private investment, the required capital is obtained through debt which must be serviced by future revenues of the collective consumption units

There is nearly no-debate on the use of repayable finance for “self-liquidating” projects. Buchanan agrees too:

“If a project is self-liquidating, then sufficient revenues are automatically earmarked for debt service from the start. For public projects of this sort, which must be of a quasi-private nature such that services may be marketed to individuals directly, debt financing is certainly appropriate. Many examples come to mind here. Perhaps the most familiar are municipal electric power facilities, municipal water and sewage systems, toll highways, and other projects of like nature”(Buchanan 1958, 128).

### 3.5 Repayable finance serviced by exogenous revenues

Let us consider the broader case of a collective consumption unit where endogenous revenues (club-finance revenues§ 2.6) are not high enough to fully cover operational costs or where they cover operational costs only at break even. In this general case club-revenues are not high enough to finance investments.



In this case it is very common that the investments might be undertaken by a governmental entity external to the collective consumption unit or by an upper level of government. This can be done in various ways :

- Investments are undertaken by the external entity and transferred as a in-kind grant to the collective consumption unit. In this case investments might be financed by the external entity through repayable finance or through tax-finance.
- Investments are undertaken by the collective consumption unit through repayable finance serviced by exogenous revenues (general taxation money coming from the external entity or by an upper level of government)

We shall discuss further this issue in §4.7.2 since it is very linked to the issue of Intergovernmental Relations and local public finance (Section 4).

### **3.6 Off-balance repayable finance**

Until now we have always made reference to repayable finance which is accounted for on-balance : loans and bonds issued by a municipality or by the central government for example.

A local government unit or the central government may choose to externalize out to a private partner both the construction of an infrastructure and the production of the associated public service. This is the concession model also referred-to in terms of Public Private Partnerships (PPP).

“Through conventional public procurement, the public sector accounts infrastructure investments as capital expenditures. Alternatively, the public sector can contract out the infrastructure provision to a private contractor and is committed to remunerate the private partner for such a provision.

Public-Private Partnerships (PPPs) exemplify the latter case since they are a model for procuring infrastructures and related services through a long-term regulated contract between the public sector (i.e. buyer) and private sector (i.e. seller). The contract bundles the infrastructure building and subsequent service provision so as to secure the private sector’s return on investment.” (Santandrea, Bailey, and Giorgino forthcoming, § 1)

PPPs and concessions are frequently used by the central government or by a LGU as a way of not increasing its debt level. Various authors argue however that most of the time a PPP agreement is not a way of avoiding debt but a only an artificial way of replacing on-balance-debt by less politically visible off-balance debt:

“As such, PPPs allow the public sector to avoid the on-balance sheet treatment of borrowing and debt (Quiggin 2004). In so doing, the public sector substitutes today’s capital expenditures by tomorrow’s current spending which does not show up in the public sector’s balance sheet.”(Santandrea, Bailey, and Giorgino forthcoming, § 1)

An example of a PPP scheme is given by the case of Paris canals (Crespi Reghizzi forthcoming a, § 2). Indeed in that case the concession scheme implied an implicit off-balance debt as a yearly grant was guaranteed to the private partner by the local authorities as a compensation for the upfront capital expenditures he had covered.

In the present European context, national governments and local government units are subjected to borrowing constraints. In such a context privatization policies and PPP’s are often seen as the *panacea*. We agree with Santandrea et al. and argue that from a public finance perspective the implicit off-balance debt associated to the PPP needs to be cautiously considered when evaluating the pros and cons of externalizing out an infrastructure. Such a position has been also underlined by Dafflon et al.

“[...] public private partnerships, and even purely and simply renouncing local public responsibility through privatization are idealized – often mistakenly – as much better alternatives. Dafflon and Beer-Toth (2009), however defend the thesis that these arguments are excuses and that the countries concerned should (and could) take on real responsibility in the investment=loan duo”(Dafflon and Madiès 2011, 57)

### 3.7 Inflation

Inflation is another key factor when dealing with long term repayable finance. Indeed “when the government is a debtor and the price level changes, changes in the real value of the debt may be an important source of revenues” (Rosen and Gayer 2010, 463).

In presence of borrowings with fixed interest rate, changes in the price level may affect significantly the borrower-lender relationship. That was the case for example with the great inflation rate of the 1910-1930 years in France and Italy which had the effect of

absorbing a significant part of the debt's residual burden, transferring it, from a long run point of view, away from the borrower on the lenders. In the three papers in Part II we shall show the key role played by inflation in absorbing a part of the costs of Milan and Paris water and sanitation capital expenditures.

### **3.8 Intergenerational clubs**

In Section 2 we have referred to club literature with an intra-generational focus. In fact very often collective consumption units deliver a good or service which is shared among overlapping generations of members.

“For such intergenerational clubs, the life span of the shared goods exceeds the membership span of the founding members, so that the good is shared among generations until the time span of the good is exhausted”(Cornes and Sandler 1996, 461).

Public services based on a long lasting infrastructure (such as the water and sanitation one) may be looked at as intergenerational clubs. In this kind of clubs one of the possible problems is the “myopia” of the members in defining maintenance and investment policies. Indeed, by definition the forthcoming generations are not members of the club. Thus the club manager faces incentives to satisfy only the present generation members and adopt myopic policies consisting in postponing investments or implementing only the minimum level of maintenance.



## 4 Local Public Finance

The development of water and sanitation systems in Europe (and particularly in France and Italy) has been mainly a municipal one. That's why it is relevant to focus this section on what public finance theory can tell us on intergovernmental relations and fiscal federalism. This is the field of "Local Public Finance" to quote an expression from Bernard Dafflon<sup>43</sup>.

Before starting our discussion it is useful to define the concept of Local Government Unit (LGU) to which we shall make frequent references : by "Local Government Unit" we refer to a sub-national level of government. For example it could be a municipality, a county or a region: we shall refer indistinctly to all of them as a LGU<sup>44</sup>.

### 4.1 Federalism, decentralization and subsidiarity

It is worthwhile to remember here the distinction between the concepts of "federalism" and "decentralization". The distinction is based on two different disciplinary point of view of law and economics.

"From the standpoint of constitutional law there are three possible distributions of state sovereignty [...] : unitary, federal and confederate government units."(Dafflon and Madiès 2011, 5)

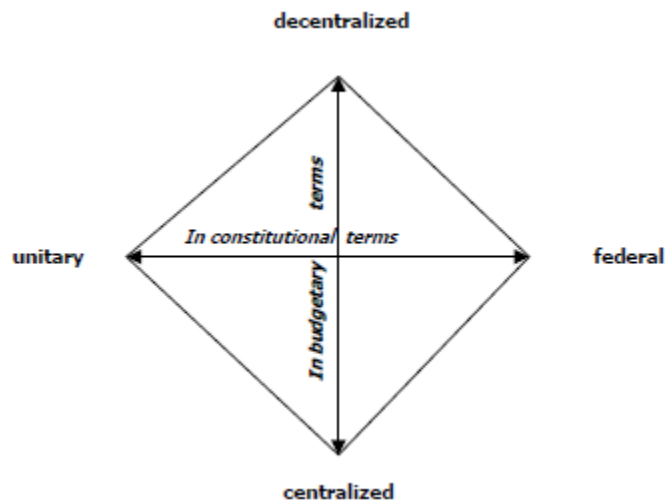
On the contrary from an economics point of view the question is not whether a government system is decentralized or not but to what extent is the system centralised in budgetary terms. As Wallace E. Oates claims : "In economic terms most if not all systems are federal"(Oates 1972, 18; quoted by Dafflon and Madiès 2011, 5)

Dafflon and Madiès (2011, 6) cross the constitutional law and the economics standpoints to obtain a two-dimensional map of systems of Government which might be useful to perform comparative analysis.

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<sup>43</sup> The expression is inspired from the title of a book edited by Bernard Dafflon : "Local Public Finance in Europe"(Dafflon 2002)

<sup>44</sup> However implicitly we shall often have in mind the municipal level which has been the most relevant for the development of water and sanitation infrastructure in France and Italy.

**Figure 3: Two-dimensional Map of Systems of Government**

Source : Dafflon(2011, 6)

The concept of subsidiarity guides us into a third way of considering intergovernmental relations based on the idea that a specific public policy must be addressed at the most local level as long as local authorities are able to cope with it (Barraqué forthcoming, 2; Barraqué 1997, 3).

The principle of subsidiarity takes its origin as far as in the 16<sup>th</sup> and 17<sup>th</sup> century<sup>45</sup>. The concept of subsidiarity was also used at the end of the 19<sup>th</sup> century by the bishop von Ketteler in Germany (Barraqué forthcoming, 2). It was also inserted in the Catholic social doctrine in the 1931 “*Enciclica Quadragesimo anno*” by Pope Pius XI (Breton, Cassone, and Frascini 1998). The subsidiarity principle found a new success in European institutions, first in the single European act of 1986 and later in the article 3 of the Maastricht Treaty of 1993 :

In areas which do not fall within its exclusive competence, the Community shall take action, in accordance with the principle of subsidiarity, only if and in so far as the objectives of the proposed action cannot be sufficiently achieved by the Member States and can therefore, by reason of the scale or effects of the proposed action, be better achieved by the Community.

<sup>45</sup>Eberlin in 1521 and Althusius in 1603 (Breton, Cassone, and Frascini 1998, n. 2)

As stated in the Maastricht treaty, the principle of subsidiarity “relates to the question of the assignment of powers to governing bodies located at different jurisdictional tiers in governmental systems though the Treaty itself does not assign any powers” (Breton, Cassone, and Frascini 1998, 2). In other term the subsidiarity principle raises the question of where to assign powers without giving a sharp answer. Some clues might be found in the theory of decentralization which was developed by public finance scholars.

## 4.2 What should be decentralized?

We might refer once again to Musgrave’s trilogy of government functions (§2.1). There is quite a large consensus on the fact that the stabilization branch should be under the central government responsibility. Interpersonal redistribution policies should also be centralized to avoid people “voting with their feet” (Tiebout 1956).

To the purpose of our research the most relevant issue is the question of assigning the Allocation Branch to the proper level of government. Two different principles may guide the policy-maker in such a choice:

- on one hand, the various local government units “differ greatly in their ability to render public services”. According to a vision somewhat derived from the ability-to-pay approach (§2.2.2) the central government may wish to deliver a uniform level of service among communities and to “equalize fiscal positions”(Musgrave 1973, 612). We shall refer to this vision as the “**unitary principle**”. That principle suggests to adopt some kind of territorial equalization mechanism on which we shall give some more detail in §4.4.
- On the other hand a vision based on the benefit approach (§2.2.1) suggests that “the policies of the allocation branch should be permitted to differ between states [Local Government Unit] depending on the preferences of their citizens”(Musgrave 1959, 181). We shall refer to this vision as the “**decentralization principle**”. Indeed, “devolution best makes it possible to match local public services to citizens’ preferences [...if it is] accompanied by a solid democratic process with a solid institutional foundation.” (Dafflon and Madiès 2011, 13). This paragraph shall focus on the content and implementation of such principle.

Fiscal federalism theory tells us that decentralized provision of public services which satisfies a 3-P trilogy (preference, participation and proximity) allows to improve the allocative and productive efficiency of Local Public Goods (LPGs) (Dafflon and Madiès 2011, 13). Exceptions to this principle are the case of economies of scale in production and the case of spillover.

In absence of economies of scale and of spillover, **Oates decentralization theorem** states that “each public service should be provided by the jurisdiction having control over the minimum geographic area that would internalize benefits and costs of such provision”(Oates 1972 quoted by; Dafflon and Madiès 2011, 13). Oates’ theorem is another way of expressing the benefit approach (§2.2.1) and has very common views with Olson’s fiscal equivalence principle (§2.10)(Olson 1969).

In presence of technical **economies of scale** for producing a particular good or service, these are *ipso facto* a justification for moving to a new functional scale (Dafflon and Madiès 2011, 19). For example in the case of a municipal collective consumption unit, this can imply relying on an inter-municipal production unit. Taking into account economies of scale gives an additional decentralization criterion suggesting “to assign the allocation function to the government tier which can provide a particular level of a public good or service at the lowest unit cost” (Rossi and Dafflon 2002, 25)

When **spillover** occurs it raises another issue to be addressed. The literature distinguishes production and consumption spillover.

“**Production spillover** happens when the LPG produced in a local government unit (LGU) has effects in other adjacent LGUs without the latter taking part in the decision or sharing the cost of the LPG.

**Consumption Spillover** happens when the LPG produced by a LGU A can be consumed by residents of adjacent LGUs who move to A to take advantage of the service without paying when it is not possible to exclude them (Dafflon and Madiès 2011, 19)”.

Policy response to spillover might be to enlarge the collective consumption units scale in order to make the circles of payers, beneficiaries and decision-makers coincide.



Although the already mentioned Tiebout hypothesis is more relevant for redistribution policies it may also be extended to allocation policies since “agents are mobile and can vote to choose the jurisdiction offering the combination of local public goods and tax system closer to their preference”(Rossi and Dafflon 2002, 25).

### 4.3 Autonomy of Local Government Units

The autonomy of Local Government Units is twofold: “financial autonomy” which concerns LGUs revenues and “budget autonomy” which concerns their spending. Obviously the two autonomies<sup>46</sup> are not independent: the accountability principle suggests that LGUs should bear the financial cost of their spending decision; *vice versa* they might be able to make expenditures only if they have the corresponding financial resources available. In presence of an imbalance between the local revenues and expenditures, transfers from an upper level of government might take place (Dafflon and Madiès 2011, 40).

#### 4.3.1 Financial autonomy

The “financial autonomy” of a local government unit might be defined as the ratio of autonomous revenues over its total revenues or as the ratio of autonomous revenues over its total spending. “Fiscal autonomy” of a local government is defined instead as the ratio between LGU own tax revenues to their total revenues. Fiscal autonomy is then a “sub-set of financial autonomy”.(Dafflon and Madiès 2011, 42). “Fiscal sovereignty” is a more restrictive concept : a government has fiscal sovereignty if it can define all the tax criteria (tax base, tax rate , exemptions...). Very often a local government unit has only a “partial tax sovereignty” limited to a part of the taxation criteria. A local government unit has “tax flexibility” only if his autonomy of choice is limited to the tax rate (Dafflon and Madiès 2011, 28).

Local Government Unit Revenues include a variety of sources:

- a) user charges and other endogenous revenues (club-finance) related to a particular local public good or service (§2.6)

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<sup>46</sup> Another important concept is the one of “borrowing autonomy”. It shall be treated separately in §4.5

- b) exclusive taxes :“a tax for which only one level of government can exploit the tax base and collect all of the revenue from the tax” (Dafflon and Madiès 2011, 28)
- c) shared tax : several levels of government have access to the same tax base but each level of government may apply a specific tax rate (Dafflon and Madiès 2011, 28). Included in this category are the piggyback taxes or *centimes additionnels*.
- d) revenue sharing : here the tax revenues are collected by the central government who defines all technical aspects too (tax base, tax rate...) but a set rate of the tax revenues collected in a LGU is allocated to the LGU(Dafflon and Madiès 2011, 28; Giarda 2004, § 4.2).

There is no doubt that the first two categories should be considered as autonomous revenues. It is trickier to determine whether the categories (c) and (d) should be considered as autonomous revenues at least partly. This depends on the implemented set of rules and institutional setting. “The degree of autonomy depends, in this case, on how much latitude local governments have to negotiate when defining the formula that shall be used to distribute tax revenues between levels of government.”(Dafflon and Madiès 2011, 43)

In fact the distinction between autonomous and non autonomous revenues is not a black or white one. On the contrary a LGU might be classified according to a decreasing sovereignty spectrum which goes from full local sovereignty in setting the tax rate and/or the tax base, to full central sovereignty. An intermediate category is the shared tax revenues one where the distribution key might be under the control of the central government or of the LGU<sup>47</sup>.

### 4.3.2 Budget autonomy

Budget autonomy is defined as “the capacity of a local government unit to decide alone, fully independently, the categories, quantity and quality of services that it intends to offer to its residents”(Dafflon and Madiès 2011, 45).

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<sup>47</sup> The classification of Tax Sharing suggested by the OECD is summarized by Dafflon and Madiès (Dafflon and Madiès 2011, 44)

In fact, the activities of a local government unit might be classified in three categories (Dafflon and Madiès 2011, 45):

- *Deconcentrated functions* where LGUs provide public services on behalf of central government with no or little freedom. “Central government dictates supply, and the local governments manage production according to criteria determined by the central ministries concerned”
- *Delegated functions* where LGUs have only a part of the responsibility. The central government keeps a relevant control on these functions through setting standards or other supervisory norms. A typical example in many countries is primary education.
- *Devolved functions* where LGUs “have strong controlling powers and full responsibility for services and their quality”.

#### 4.3.3 Decentralized taxation in practice

The principle of horizontal equity (equal fiscal treatment of citizen) is in contrast with a full local fiscal sovereignty where LGUs are free to determine the tax base and the tax rate. Dafflon and Giarda agree that in practice the sovereignty and management of the major modern fiscal sources (income tax, value added tax, business tax...) should be at least partially kept under the central government responsibility (tax base definition, control and arbitration). Some degree of autonomy could be left to the LGU concerning the tax rate of the income and value added tax. The degree of fiscal sovereignty left to LGUs is however highly dependent on the eventual presence and characteristics of the transfers and equalization mechanisms (Giarda 2004, § 4) (§4.4).

A part from user charges and other endogenous revenues related to a particular public good or service, exclusive local taxation is generally composed of the property tax which is local by definition. “Land value capture” tools (§ 2.11) are another possible fiscal source of income for the LGUs.

Depending on the entity of the LGUs functions and expenses, user-charges and exclusive taxes are eventually not sufficient to cover costs. That’s where shared taxes, revenue sharing, transfers or equalization mechanisms intervene. We shall refer to them globally speaking as “transfers”

For sure if all the revenues of a LGU come from transfers, its autonomy is very limited (Giarda 2004, § 4.2). Shared tax and revenue sharing should be considered as a supplement to exclusive taxes of the LGU when these do not produce enough revenues to cover the functions to be fulfilled. On the contrary shared tax and revenue sharing should not be the only revenue of LGUs if one wishes the LGUs to be able to adapt both the fiscal pressure and the provision of goods and services to their citizen preferences (Giarda 2004, § 4.3)

#### **4.4 Equalization and transfers**

We mentioned in §4.2 the trade off between the two principles of decentralisation and the unitary principle suggesting the uniformity of treatment of citizens in different LGUs. This paragraph focuses on the latter principle.

Musgrave's redistribution branch should be kept at central government level. A redistribution policy in favour of inequality reduction is generally implemented using two policy tools : i) progressive taxation (including negative income tax) and ii) expenditures and provision of public services in favour of low-income people (Giarda 2004, § 5).

In many countries there are significant differences in the average income between the various geographical areas. In presence of full fiscal sovereignty and autonomy, LGUs would be able to cover very different levels of public expenditures and to provide very different levels of public goods and services. On one hand this might be considered as an expression of local preferences according to the decentralization theorem. On the other hand if a great lot of the Allocation Branch has been decentralised, significant differences in the level of public services provision could be judged unacceptable (Giarda 2004, § 5).

A great spatial variability of income within a country might have consequences in terms of ability of LGU's to provide public services. Policy-makers might judge such a situation unacceptable and wish to mitigate spatial inequalities through some kind of transfer and equalization mechanism.

From the institutional point of view the literature distinguishes two families of equalization mechanisms : vertical equalization where the transfers flow from the

central government to the poorer LGUs and horizontal equalization where the transfer flow straight from the richer LGUs to the poorer LGUs (Giarda 2004, § 5).

Equalization mechanisms might also be distinguished according to their target. On one hand there are *fiscal equalization mechanisms* where the central government transfers money from its budget to LGUs with low tax base. On the other hand there are *transfer mechanisms based on the satisfaction of public needs* where the central government “may wish to assure a minimum level of state services independent of self-finance by the states”(Musgrave 1961, 97; Giarda 2004, § 5.1).

When a policy of fiscal equalization is adopted one has to set the maximum level of the tax base below which a LGU is qualified for receiving a transfer. Do all LGU's below the LGU with the higher tax base receive a transfer ? or only those below the average ? Moreover the transfers should be done in the form of *general* and *non-matching* grants. This means respectively that the LGU has no constraints on the use of the grant amount and that the LGU receives a set amount to spend irrespective of its own contribution (Dafflon and Madiès 2011, 51; Giarda 2004, § 5)

On the contrary when an equalization mechanism is based on the provision of a minimum level of public services the policymakers have to set : i) what are the public needs indicators to adopt and ii) shall the transfer cover only a minimal level of public service provision or a merit level to be defined by the central government ? In this case the transfers should be done in the form of specific grants where the funds are allocated to a specific function (Dafflon and Madiès 2011, 51; Giarda 2004, § 5).

Another key choice to be made is the one between open-ended or close-ended transfers. “Grants are closed-ended if the total budgetary means made available by the government issuing the grant for a subsidizing function are limited” and their awarding based on selection criteria. Open-ended grants are just the opposite (Dafflon and Madiès 2011, 52).

Central government may adopt a tailor-made equalization policy according to their normative judgment. In general such a policy is in contrast with the autonomy principle as expressed through the decentralization's theorem. The more the equalization transfer mechanism is constraining (sector-specific, close-ended, matching) the more it is an expression of the central power interference on the local autonomy (Giarda 2004, § 5).

The trade-off between the unitary and the decentralization principle is more a political and normative one rather than an economic one and local public finance theory leaves it with no clear answer.

## **4.5 Borrowing autonomy**

Local Governing Units (LGU) might also borrow to finance their expenditures. We already discussed the use of repayable finance for infrastructure (§3.4 and §3.5). This paragraph focuses on local debt finance in the context of intergovernmental relations.

### **4.5.1 Constraints on local borrowing and the bailout issue**

The first issue to consider is whether LGU should be totally free to borrow or not. According to the “financial market discipline” no legal borrowing constraints on LGUs are required since the “modern financial market would suffice to exert effective discipline on LGUs [...] in particular higher interest rates” which “would impose effective sanctions and penalties on those jurisdictions living beyond their means”(Rossi and Dafflon 2002, 33 quoting other authors’ positions).

Another key issue is whether the central government will grant financial support in case of financial distress of LGUs. Although LGUs are autonomous legal entities, in general it is not credible that the central government will not bail them out in case of risk of failure. Since the central government commitment not to bail out is not credible, financial markets will *de facto* not play their regulatory role as they might assimilate sub-sovereign borrowing by a LGU to sovereign borrowing. This is the classical moral hazard problem in presence of *soft budget constraint* (no or weak budget rules).

That is why some central government control on LGUs borrowing is required and performed in most countries.

### **4.5.2 For what purpose should LGUs borrow ?**

The question here is for which purpose LGUs should rely on repayable finance? We already discussed that only the Allocation Branch should be decentralized while the Distribution and Stabilization branch should be kept under the central government responsibility (§4.2). The question is less general and should then be restated as : for which purpose LGUs should rely on debt-finance *within the Allocation Branch* ? From a

normative point of view, public finance theory answers that the pay-as-you-use principle justifies the use of debt-finance for capital spending only (Section 3).

In practice, if they have total borrowing autonomy, LGU might not limit the use of debt-finance to capital spending only. That is why in many countries there are constraints on the borrowing autonomy of LGUs based on the accounting separation between current and capital spending. On such a setting, the so called “golden rule” imposes:

“a balanced current account combined with a capital account in which government borrowing for investment expenditures is tolerated or even promoted for inter-generational equity reasons. This distinction has been pushed ahead by arguing that a balanced current account must include debt service, which is defined as interest payment, and debt amortization according to a pay-as-you-use rule”(Rossi and Dafflon 2002, 28)

Not only the golden rule is the expression of the pay-as-you-use principle but it is also a way to impose a *hard budget constraint*, enhance the LGU *budget accountability* and limit the risk of financial distress of LGUs and need of bailout from the central government (Dafflon and Madiès 2011, 59).

### 4.5.3 Borrowing autonomy Vs Borrowing constraints

Once the golden rule is adopted, should the LGUs have an extended borrowing autonomy or should they be submitted to some borrowing constraints ? From a normative point of view there is no sharp answer to such a question. In practice, there is a great variety of institutional solutions and rules which might be characterized by the following questions<sup>48</sup>.

- Does the LGU need to ask for a *a priori* authorization before borrowing or is the LGU only submitted to *a posteriori* control and sanctions ? Which level of government and which institution is in charge of the authorization process
- Is there a borrowing cap to be respected by a LGU ? How is it defined ?
- Can the LGU freely choose the lender or not ? Is market-borrowing authorized or not ? are there some special state-owned lending institutions having the exclusive right of lending to LGUs ?

<sup>48</sup>These questions are partly inspired from the list of questions made by Dafflon (2002, 12)

- What are the sort of loans authorized ? Which interest rate?

Depending on the country and possibly on the specific sector, each of these questions has multiple answers. That leaves us with a great number of combinations which call for useful comparative analysis (Dafflon 2002; Brugnoli 2009)

One should take note that the tighter the constraint set on LGUs' borrowing, the more LGUs are incentivized to avoid borrowing and to adopt eventually other solutions where debt is more implicit and externalized out (Dafflon and Beer-Tóth 2009) (§3.6).

#### **4.5.4 Borrowing cap in EU countries**

According to the Maastricht treaty Member states have committed to respect two ratios :i) a ratio of government deficit to GDP below 3% and a ratio of government debt to GDP below 60%. In EU definition the "government" label includes all levels of government from the central to the LGUs with exclusion of commercial activities<sup>49</sup> (where Tariffs cover at least 50% of the total costs) (Dafflon 2002, 2).

The subsequent question is then how this commitment should be shared among the various levels of government. In some European countries (such as in Italy) an internal stability pact has been approved to make the LGUs to contribute to the goals of the European Stability and Growth pact (SGP) in terms of percentage of consolidated sovereign debt / GDP (Fraschini 2002, 177). Other countries (such as France) chose to rely only on a strict application of the golden rule to discourage LGUs from excessive borrowing. A very deep comparative analysis on the implementation of EU constraints on subnational units of government is made in the collective book edited by Dafflon (2002)

#### **4.5.5 Liquidity management**

One should also consider that the borrowing issue is not independent on the rules applying to liquidity and savings of LGUs (Adam, Ferrand, and Rioux 2010). In some countries (such as in France) LGUs' liquidity is managed by the central Treasury. From

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<sup>49</sup>The European legislation (Council Regulation n°2223/96 – SEC95) established that "market" public enterprises with Tariff covering at least 50% of the total costs should not be included in national public accounting" used for yearly reports to EU institutions in the framework of the European growth and stability pact (SGP).



the national government perspective such a policy has the great advantage of reducing short term liquidity needs of the central government.

On the contrary, from the local perspective, the LGU is not free to manage its cash and is not encouraged to accrue funds for future investment spending. The constraints on the liquidity management are an implicit incentive to LGUs for loan-financing investments having future revenues as collateral rather than financing them through savings from past revenues. This was particularly attractive in the historical phases of high inflation.

#### **4.6 Autonomous and external collective consumption units**

In §2.5, we used the concepts of collective consumption unit (CCU) and production unit to understand the twofold nature of public services. In some cases the collective consumption unit and the production unit may coincide while in others the production unit might be operated by a private entity (§2.8) or by another level of government. The degree of private sector participation is not our issue. In this paragraph we focus instead on the institutional nature of the collective consumption unit.

Indeed, when a LGU is responsible for the provision of a public good or service various choices are possible in terms of institutional nature of the related “collective consumption unit”. The CCU can be fully part of the LGU, it can be a public law entity autonomous from the LGU or it can even be a company fully or partially owned by the LGU (cat. A, cat.B or cat.C in Table 2 below). What we label “LGU” could be indifferently a municipality, a county or a region. In the case of a municipality:

- In the first category (Cat A) the CCU is a municipal department with no legal autonomy, ruled by administrative law and public accounting rules
- In the second category (Cat B) the CCU is an autonomous legal entity ruled by public law and public accounting)
- In the third category (Cat C) the CCU is a company ruled by private law and private accounting rules, fully or partially owned by the municipality

**Table 2 : institutional status of collective consumption units**

	<b>Cat. A</b>	<b>Cat. B</b>	<b>Cat. C</b>
	<b>Provision fully internal to the LGU</b>	<b>Provision autonomous from the LGU</b>	<b>Corporatized provision</b>
Comment	The CCU is fully part of the LGU.	The CCU is an external entity	The CCU is a corporate entity (joint stock company or plc...) owned by the LGU
Law	Administrative law	Administrative law	Private law
Borrowing autonomy	Integrated in the LGU	Yes	Yes
Accounting rules	Public accounting rules	Public accounting rules	Private accounting rules

Source : author's elaboration

The CCU in the first category (Cat. A) are part of the LGU and in general the rules on intergovernmental relations (budget and financial autonomy, public accounting rules, borrowing rules) apply to them. On the contrary these rules do not apply to Corporatized CCU (cat. C) since they are external to the LGU. Autonomous CCUs (Cat. B) are somewhere in-between the two other categories.

#### **4.7 Decentralization and infrastructure**

We already discussed in Section 3 the peculiarity of infrastructure provision within the Allocation Branch. Additionally, in the previous paragraphs we analyzed the theories of fiscal federalism. In this paragraph we shall discuss how the public finance decentralization theory interacts with the infrastructure issue.

We showed that a public service function might be provided by a LGU according to three different decentralization paradigms: de-concentration, delegation or devolution (§4.3.2). As discussed by Frank and Martinez-Vazquez (2014, 5) these labels do not fit easily to infrastructure provision. Indeed one needs to consider both the specific public service function and the underlying infrastructure required to provide it and distinguish the *service provider* (“who is responsible for the end-service to citizens”) and the *infrastructure planner* (who is “responsible over the project and investment cycle”). Indeed, the two concepts are necessary because even when a public-service is fully devolved to a LGU, the infrastructure investment cycle might be more or less under the central government authority in the various phases: planning, defining the technical standards, procurement, and financing.

Some literature classifies the infrastructure both according to its technical nature and to its business model. On the technical side the distinction is made between *point-*

*infrastructure* (hospital, school...) and *network-infrastructure* (roads, bridges, water, sanitation). The latter category (on which we focus) often delivers a public service mission *per se* (e.g. a bridge or a road) without requiring as many operational expenditures as in the point-infrastructure (e.g. teacher in a school)(Frank and Martinez-Vazquez 2014, 3). Indeed, public services based on network infrastructure (such as water and sanitation services) have a high ratio of fixed capital costs over total costs compared to other kinds of public services.

Concerning the business model, some literature (Martinez-Vazquez and Timofeev 2013, 47) classifies the infrastructure in three categories : i) *fee-recoverable* infrastructure where the user charges cover the full cost including the investment amortization, ii) *non-fee-recoverable* infrastructure with sizeable operations and maintenance costs (public parks, non toll roads) and iii) *non-fee-recoverable* infrastructure with very large operations and maintenance costs (mainly point-infrastructure). Martinez-Vazquez and Timofeev include water and sanitation in the fee-recoverable infrastructure. This might be true in many country specific cases but we already discussed that choosing the share of costs covered by revenues to the service is a normative trade-off which is the expression of the wished level of exclusion (case of CCUs with voluntary membership) or of the wished level of compulsory membership to the CCU (§2.9.2and §2.10).

For sure the provision of infrastructure in a decentralized context is a complex issue which raises many questions. From a normative perspective the first question is whether the central government should intervene in the provision and financing of decentralized infrastructure (§4.7.1). A second question concerns the technicalities of such a central government intervention (§4.7.2).

#### **4.7.1 Should the central government intervene?**

Assume a multi-level state where LGUs are responsible for the provision of some public services which requires some capital investments in infrastructure. Should the central government (or an upper level of government in the general case) intervene in the infrastructure provision and financing or should it let the issue to the LGUs alone ?

On one hand, applying the decentralization theorem (§4.2) to infrastructure would recommend to leave its provision to the local level in order to increase the allocative

efficiency and the satisfaction of citizen's preferences. On the other hand, the unitary principle (§4.4) would suggest to equalize infrastructure provision over the country.

### **The pros**

At least three arguments are given in the literature to justify some level of central government intervention in subnational infrastructure : *coordination*, *efficiency*, and *equity* (Frank and Martinez-Vazquez 2014, 2).

The coordination argument makes reference to the need of coordinated capital spending in a multilevel government to achieve the goal of regional and national growth in the context of a Keynesian stimulus through public investment policy. The efficiency argument opens the door to central government intervention to solve the cases where full decentralization is inefficient (spillover effects, economies of scale).

We focus on the latter argument. The equity argument consists in pointing out that “disparities in the availability of and need for capital infrastructure matters very significantly for fiscal equity”(Martinez-Vazquez and Timofeev 2013, 46). This is a straight-forward extension of the unitary principle previously discussed (§4.4). One underlying question is “whether intergovernmental policies should address disparities in the accumulated stock of physical capital (sometimes referred to as “capital backlog” or “capital infrastructure gap”) relative to some target level” or not (Martinez-Vazquez and Timofeev 2013, 19).

Assume that there are large inequalities between the various LGUs in the infrastructure endowment, policy-makers might judge such a situation unacceptable and wish to mitigate spatial inequalities in infrastructure. In that case the infrastructure gaps issue is very much interrelated with the whole intergovernmental relations framework (§4.4).

Another argument in favour of central government intervention frequently mentioned in the literature<sup>50</sup> is the fact that when they are under tight financial constraints LGUs may prefer to allocate the scarce financial resources available to operational expenditures rather than to investments. In other terms in presence of scarce financial resources LGUs tend to cut capital expenditures in favour of operational ones. This may call for some kind of ear-marked infrastructure equalization fund as we shall see next (§4.7.2).

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<sup>50</sup>Ahmad and Brosio (2006), Moak and Hillhouse 1975 quoted by Martinez-Vazquez and Timofeev (2013, 6)

### The cons

On the other hand, in a decentralized setting, the stock of infrastructure of each LGU (the infrastructure endowment) could be considered as the expression of the local preferences. Such a line of thought would suggest avoiding any central government intervention in equalizing disparities among LGUs in infrastructure stock (Martinez-Vazquez and Timofeev 2013, 19).

Another argument against government intervention in interfering in decentralized infrastructure provision derives from the fact that investments in infrastructure can be considered as a way of saving and that infrastructure stock equalization grants could encourage moral hazard phenomena. Following this line of thought, government intervention in favour of LGUs with smaller infrastructure stock “could be interpreted to represent essentially a bailout to a municipality that has failed to save in the past”(Martinez-Vazquez and Timofeev 2013, 5)

#### 4.7.2 How should the central government intervene?

In general terms, the action of the central government concerning subnational infrastructure provision can take one of the following forms: a) planning and management of the investment cycle directly under the central government responsibility, b) definition of a general equalization mechanism which includes infrastructure needs too, c) ear-marked transfer specifically focused on capital spending and d) no infrastructure equalization policy.

- a) Central planning and management of the investment cycle. In this case the central government is the *investment planner* (full responsibility over planning, management, procurement and financing of the investment cycle) and the LGU has only the role of *service provider*. In this model the LGU receives infrastructure from the central government as an in-kind grant. On the one hand, such a centralized model has the advantage of having a coherent and well technically optimized infrastructure (assuming that in general the central government has stronger technical capabilities than the LGUs).

On the other hand, such a model creates a strong and risky dichotomy between the investment and the operations and maintenance phases. Indeed, the LGUs might perceive infrastructure as a free gift on which they have no

responsibilities. The LGUs might tend to free ride and spend as little as possible in maintenance of the local assets waiting for central government *ex post* intervention. Furthermore, the central government might underestimate the burden of operational expenditures associated to the infrastructure project. Sadly there are many cases of infrastructure implemented or financed by a central government (or even by external development aid in developing countries) turning to be a “white elephant” where the LGU is unable to afford operations and maintenance in a sustainable way. This sometimes leads even to the infrastructure being abandoned (Martinez-Vazquez and Timofeev 2013, 5).

In Italy after WWII local authorities had the formal responsibility of water and sanitation services. However the investments were mostly managed, planned and financed by the central government (Crespi Reghizzi forthcoming d, § 3.3). In France too, until the 1980’s, central government influence on LGUs investments was quite tight as we shall discuss in § 6.3.5.

- b) Integrated equalization mechanism which includes infrastructure needs. The infrastructure needs can be integrated either in the estimation of the fiscal capacity (in the case of a *fiscal equalization mechanism*) or as an input for the indicators related to public service provision (*equalization based on public needs satisfaction*)(Prud’homme 2007, 456) (§4.4).

In countries where subnational infrastructure is debt-financed against future revenues “this equalization should allow local governments to generate the necessary surpluses to cover amortization and interest on their debt in addition to maintenance of the associated capital assets”(Martinez-Vazquez and Timofeev 2013, 16). In this case a credible commitment of the central government to the stability of the equalization mechanism is essential to ensure the creditworthiness of the LGU.

In countries (such as Denmark<sup>51</sup>) where it is compulsory to finance subnational infrastructure through past savings the equalization model should generate enough surplus to allow savings for infrastructure spending in the future.

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<sup>51</sup>(Martinez-Vazquez and Timofeev 2013, 5)

In presence of significant inequalities among the various LGUs in the infrastructure stock at the time when the equalization mechanism is designed, the mechanism should take into account the disparities in the infrastructure stock and whether these are generating profit or deficit (Martinez-Vazquez and Timofeev 2013, 20).

- c) Ear-marked transfer. In this model the infrastructure equalization issue is distinct from the general equalization mechanism. Ear-marked grants are allocated to the LGUs depending on the infrastructure needs. The grants could be more or less ear-marked, meaning that their use could be allowed for all capital expenditures, or restricted to a specific sector or even restricted to a specific project. The more the conditionalities are tight the less the LGU's autonomy is respected and the more such a model gets similar to the first model (a – central planning and management of the project cycle).

In most sectors there is a clear dependence between maintenance and investments in new assets. In general, a higher level of maintenance extends the infrastructure life time and makes possible to postpone new investments. Therefore in presence of an ear-marked mechanism, this should include both investments and maintenance expenditures in order not to bias the LGU's behaviour<sup>52</sup>. This argument suggests to adopt sector-broad ear-marked grants rather project-specific ear-marking (Martinez-Vazquez and Timofeev 2013, 19).

Another solution to make the LGU more aware of its responsibilities on the infrastructure assets could consist in shaping the ear-marked transfer mechanism as an intergovernmental loan system.

A intergovernmental loan system could also be appropriately designed by the central government to keep an eye and be able interfere on the management and service provision based on the financed infrastructure : the loan non-reimbursement could be conditional on the LGU respecting various

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<sup>52</sup>This point of view is in contrast with the most common paradigm according to which even when the initial endowment in infrastructure is financed by an upper level of government (or by an external donor in developing countries), the maintenance and renewal cost in the future should be covered by the LGU. Depending on the accounting system future renewal costs are accounted for through different depreciation systems.

conditionalities imposed by the central government (Martinez-Vazquez and Timofeev 2013, 25).

- d) No infrastructure equalization policy. This model is based on the idea that no specific equalization mechanism is needed for infrastructure. Independently from this choice the central government might have implemented a general equalization mechanism or not. Infrastructure provision is fully seen as an expression of local citizen preferences. If a general equalization mechanism exists, it is judged powerful enough to equalize LGU's with no need to address in a specific way the infrastructure issue.

In this model, infrastructure is debt-financed by CCUs within the LGUs with the debt service and amortization flows being covered by endogenous revenues (§3.4) or by exogenous revenues (§3.5) depending on the specific infrastructure being -fee-recoverable or not fee-recoverable (in the classification by Martinez-Vazquez and Timosheev(2013)).

One of the caveats of such a model is that relying only on market-based repayable finance “is likely to benefit primarily the richer sub-national government – those that are already better endowed than the average and that at the same time can more easily obtain the trust of lenders. An improved borrowing system (the well functioning bond market dreamt by many) can therefore increase, rather than reduce, existing disparities.”(Prud'homme 2007, 456).

In practice, the four policy solutions detailed above are not exclusive or rival. There are many possible in-betweens among them. For example a central government could adopt central planning (model a) for a specific infrastructure sector only and on the contrary not adopt an infrastructure equalization policy (model b) in all the other sectors. Or alternatively a central government could rely on ear-marked transfers for a specific sector where infrastructure gaps are particularly big and adopt an integrated equalization mechanism for all other sectors. The combination of policy options is vast. No matter which combination is chosen, it will be heavily dependent on the general framework of intergovernmental relations in place in that specific country with respect to its federalist



or unitary nature, its degree of decentralization (§4.1) and to the choices made in the full autonomy Vs full equalization trade-off (§4.4).

Infrastructure should be considered as part of the broader governmental policy and “infrastructure projects alone should not be assigned any type of priority that is independent of the programs and public services that utilize these capital assets as inputs”(Martinez-Vazquez and Timofeev 2013, 47). All the same, the reverse is also true and the intergovernmental relations should not be designed without taking into account somehow the infrastructure issue and particularly the disparities in infrastructure endowments (Martinez-Vazquez and Timofeev 2013, 56)

The issue is complex and the literature suggests the policy-solution to be both sector and country-specific (Frank and Martinez-Vazquez 2014). Nevertheless, the same literature gives some policies suggestion depending on the infrastructure classification in § 4.7 : i) fee-recoverable, ii) non fee-recoverable with sizeable O&M costs and iii) non fee recoverable with very large infrastructure costs.

- Equalization for the latter category should take place through general purpose equalization grant which integrates the infrastructure issue to avoid the dichotomy between investment and O&M costs..
- The second category should be equalized instead through sector specific earmarked conditional grant for investments and maintenance. (Martinez-Vazquez and Timofeev 2013, 47; Frank and Martinez-Vazquez 2014, 24).
- According to the same literature no equalization policy should be implemented for fee-recoverable infrastructure (infrastructure covered by endogenous revenues in our own terminology §2.6) which “would call for using credit markets and borrowing to facilitate those investments and fully abstain from any form of transfers. This is because the stream of future use fee receipts can be more easily pledged as a collateral for debt financing than general tax revenues vulnerable to the uncertainties of the political climate”(Martinez-Vazquez and Timofeev 2013, 48).

We do not fully agree with the authors on the latter recommendation at least for the three following reasons.

- Our first argument is that fee-level is at least as much vulnerable to the policy climate as general tax revenues. Moreover, there could be some kind of institutional commitment to the stability of the equalization transfers which would guarantee creditworthiness<sup>53</sup>.
- As we have discussed in Section 2 (§ 2.9 and § 2.9.2), the choice of the share of the costs covered by endogenous revenues and those covered by exogenous revenues is a key normative trade off to be made by policy-makers and not an intrinsic value of a kind of infrastructure.
- When the choice is made to have a collective consumption unit with all costs covered by fees (club-finance), by definition its perimeter is financially isolated from the general budget of the LGU. In network infrastructure sectors where the capital expenditures costs are very relevant some specific kinds of financing equalization mechanisms needs to be designed to smooth, through time and space the infrastructure burden. We shall see that this kind of mechanism is largely present in the water sector through various institutional solutions (§5.2).

In practice, infrastructure grants are more common than what public finance theory would suggest.

“The normative base [...] would seem to justify a rather sparse use of capital transfers within the desired architecture of intergovernmental fiscal relations. [...]However, in reality many countries regularly implement capital transfer programs, in many cases quite considerable in size by comparison to other transfers, which do not always conform to the normative prescriptions”(Martinez-Vazquez and Timofeev 2013, 53)

For example such a mismatch between theory and practice is confirmed by the kind of intergovernmental relations between the European Union and the member countries : one observes that “grants from the (small) EU budget to countries and regions most frequently take the form of infrastructure grants” (Prud’homme 2007, 456).

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<sup>53</sup> Curious enough this had been argued by the same authors (Martinez-Vazquez and Timofeev 2013, 16)

## 5 Public finance & water and sanitation services

In the previous sections we have presented a discussion on public finance theory which is not sector-specific. In this section we take a dip instead into the water sector.

We start by giving some recalls on the European legal framework and on full cost recovery (§5.1) and the reasons behind it (§5.1.2). We review literature that shows that FCR is not necessary to achieve sustainability (§5.1.3). Indeed, gradually international institutions made a shift from full cost recovery to sustainable cost recovery and the 3 T's paradigm (§5.1.4). In § 5.2 we analyze some institutional choices which allow equalization and financial economies of scale in the water sector.

The last paragraph (§ 5.3) proposes an original matrix which summarizes all the trade-offs on which water and sanitation services policy-makers needs to take position. Such a trade-off matrix might also be used by researchers to perform comparative or historical analysis (as we shall do in Part IV).

### 5.1 From full cost recovery to endogenous / exogenous revenues

#### 5.1.1 European water framework directive and full cost recovery

The full cost recovery (FCR) principle became increasingly popular through the 1990's and was *in fine* adopted by EU legislation within the Water Framework Directive (WFD) – 2000/60/DCE which is the key water policy act in Europe (UE 2000).

Specifically, article 9, “Recovery of costs for water services”, states that “Member States shall take account of the principle of recovery of the costs of water services including environmental and resource costs [...] and in accordance with the polluter pays principle”..

According to the WFD by 2010 « Member States shall ensure by 2010 :

- that water-pricing policies provide adequate incentives for users to use water resources efficiently and thereby contribute to the environmental objectives of this Directive,
- an adequate contribution of the different water uses, disaggregated into at least industry, households and agriculture, to the recovery of the costs of water services, [...] according to the polluter pays principle.

Member States may in so doing have regard to the social, environmental and economic effects of the recovery as well as the geographic and climatic conditions of the region or regions affected.”(UE 2000)

### **5.1.2 The reasons in favor of full cost recovery**

*De facto* through the full cost recovery concept the European legislation takes position, in the normative trade off between cost recovery based on exogenous revenues or endogenous ones (§2.6) in favour of endogenous revenues cost recovery.

What were the reasons behind the adoption of the full cost recovery principle within European legislation? According to Massarutto (2002; 2004; 2007) the European legislation adopted the full cost recovery principle for four major reasons :

- a) The implementation of a more equitable cost allocation based both on the polluter pays principle and on the internalization of externalities.
- b) The adoption of tariff formulas which would encourage a more sustainable use of water resources. On these grounds, subsidies and rebates were forbidden and it was established that the total costs of services was to be covered by the users.
- c) To guarantee the financial equilibrium of water and sanitation utilities through autonomous and stable endogenous revenues. Endogenous revenues were seen as more stable and predictable than exogenous ones. Through this vision endogenous revenues were to be preferred as collateral for repayable finance.
- d) To make compulsory for the water and sanitation services to adopt accounting rules based on a correct depreciation and provision for long life time infrastructure assets.

Officially full cost recovery was mainly justified at the European level on the environmental grounds (reasons (a) and (b)) rather than on the financial sustainability ones. Massarutto argues that in reality the latter objectives are very relevant arguments too (Massarutto 2002; 2004; 2007).

### **5.1.3 From full cost recovery to sustainability**

In reality, applying the full cost recovery is not an easy task : on the one hand, identifying the costs (and particularly the environmental costs) is not trivial (Massarutto

2004); on the other hand, applying Long Run Marginal Cost Pricing is not appropriate for natural monopolies (§2.9.1). Massarutto points out that “once the pricing rule deviates from the orthodox LRMC, the choice of the pricing structure is by far a political decision whose pros and contras originate from other reasons than allocative efficiency”(Massarutto 2002, 3). As we already argued (Section 2) the trade-off between cost recovery based on endogenous and exogenous revenues is a normative one.

FCR might be a too rigid and ambiguous concept since by definition costs are recovered. Massarutto suggests “that instead of asking for FCR, the legislation should require that externalities should be avoided” (Massarutto 2002, 3). These could be both intra-generational<sup>54</sup> and inter-generational<sup>55</sup> externalities. In other terms, sustainability might be achieved as long as the natural and infrastructure capital are not damaged from a single generation at the expenses of the forthcoming ones. Such a vision does not require to impose full cost recovery and to ban *a priori* any exogenous revenue. (Massarutto 2004; 2007).

In fact even within the European institutions the report of the WATECO working group<sup>56</sup> (UE 2003) clarifies that full cost recovery is not an objective *per se* to be achieved everywhere. Member States should take action in order to obtain a situation where the polluter pays principle is sufficiently implemented and perceived. That leaves to the Member states the latitude of taking into account in their decision the social, environmental and economic impacts of full cost recovery (UE 2003, 130).

Indeed, through the 2000 decade imposing the full cost recovery and forbidding all sorts of contribution from endogenous revenues (tax-finance) on environmental grounds appeared excessive and too rigid to many international institutions which progressively softened their position as we shall see next.

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<sup>54</sup> Think of the classic example of an untreated waste water discharge into an un-spoilt River system which generates an externality on the downstream water users.

<sup>55</sup> Think of a water utility which does not invest in network renewal and transfer the renewal burden on the next generations.

<sup>56</sup>Such a report clarifies what is the correct interpretation of the WFD

#### 5.1.4 Sustainable cost recovery and the 3T's

In the last ten years great attention has been given by international institutions and donors to the issue of sustainable financing for the water sector through various working panels<sup>57</sup> which progressively softened their position from *full cost recovery* to the more realistic and pragmatic concept of *sustainable cost recovery* (OECD 2009a).

This process led around the Istanbul 2009 World Water forum to the OECD publications (OECD 2009b; OECD 2009a; OECD 2010) clarifying concepts and defining a harmonized terminology on costs and financing sources well known as the “3T's” (Tariffs, Taxes and Transfers). The issue was also picked up again in 2012 at the World Water Forum in Marseille where the whole “Condition for Success 2 -Financing water for all” was focused on the concepts of the 3T's and of “Sustainable Cost Recovery” (Tremolet 2012a; Tremolet 2012b).

According to the OECD 3T's paradigm (Figure 4), the costs of a water and sanitation service may be covered *in fine* by three source of revenues : Tariffs (direct charges paid by the user), Taxes (general taxation paid by taxpayers) and Transfers (subsidies from an upper level of government or from foreign donors). Repayable finance tools might be used to finance in the short terms some investment and paid back on future revenues from the 3T's.

The trade off between the 3Ts is still a source of debate. According to the OECD the Tax source of revenue is more appropriate for sanitation rather than for water (OECD 2009b, 56). Also, the OECD suggests that urban services should be able to apply FCR (rely on Tariff revenues only) while rural ones may have more need to rely also on Tax revenues in particular for investment and renewal of infrastructure.

According to the Camdessus panel and to the 3Ts paradigm a sustainable cost recovery includes three aspects:

- An appropriate mix of the 3Ts which allows both to cover recurrent costs including investments costs and debt amortization

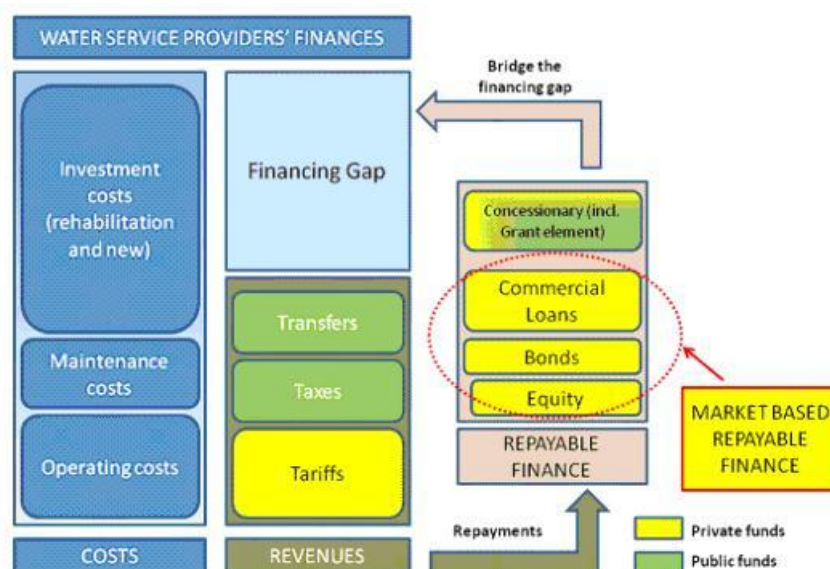
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<sup>57</sup>Such as the ones chaired by Mr Camdessus and Mr Gurria which produced various reports (Van Hofwegen 2006; Winpenny 2003).

- When the system relies also on Tax revenues these should be previsible and secured well in advance

The water tariff should be designed in order to be affordable for all on one hand and to ensure the financial sustainability of the operator on the other hand.

**Figure 4 : the 3T's paradigm**



Source : OECD

### 5.1.5 Endogenous & exogenous revenues

According to the OECD 3T's paradigm (OECD 2009) the costs of a water and sanitation service may be covered *in fine* by three source of revenues : Tariffs (direct charges paid by the user), Taxes (general taxation paid by taxpayers) and Transfers (subsidies from an upper level of government or from foreign donors).

In fact the 3T's paradigm is another way of expressing the normative trade off to be made between club-finance and tax-finance or between endogenous and exogenous revenues (§2.6)

The terms endogenous and exogenous revenues have been proposed by Massarutto(2002; 2004; 2007) who points out that "it becomes very difficult to distinguish prices from taxes"(Massarutto 2002, 13) and that "it is often a pure terminological convention that of considering revenues either as direct charges or

taxation. What really matters is who pays, for what purpose and how much”(Massarutto 2002, 25).

We follow Massarutto and we distinguish revenues endogenous to the WSS (Tariff according to the OECD) and ordinary fiscal revenues exogenous to the service (Taxes). According to this line of thought, sanitation levies which have a fiscal nature are considered revenues endogenous to the service contributing to the “Tariff” element of the 3T’s. By definition costs left uncovered by endogenous revenues are covered by exogenous revenues (general taxation at the local or national level). Local Exogenous revenues may be labelled as “Taxes” in the OECD 3T’s while National exogenous revenues should be considered as “Transfers”.

Apart from the endogenous and exogenous source of revenues, land value capture tools can play a financing role too in the infrastructure expansion phase. The idea is to make the property-holders to contribute too to the infrastructure development costs (see also §2.11). In Part II we discuss the role of land-value capture tools in the financing of Paris and Milan water infrastructure.

**Box 2 : Water and sanitation cost recovery in Fribourg canton, Switzerland**

Switzerland is not submitted to the full cost recovery principle as set by EU Water Framework Directive. In a recent paper Bernard Dafflon (Dafflon 2013) discusses how cost recovery for water and sanitation is organized in the Fribourg canton in Switzerland.

Water supply costs are accounted for in distinct accounting chapters :

- [II]Initial investment (*Premier investissement*)
- [IR]Investment for Renewal (*Investissement de renouvellement*)
- [PI] Investments for fire protection and other public functions
- [F\_Opex] Fixed Operational Expenditures (*coûts fixes d’exploitation*)
- [V\_Opex] Variable Operational Expenditures (*coûts variables d’exploitation*).

This is roughly the marginal production cost

Three categories of payers are distinguished in Fribourg canton :

- [A] Owners of building connected to the water supply system



- [B] Owners of properties (buildings and buildable lands) unconnected to the water supply system but located in areas served by the water supply system
- -[C] Users of the water service (connected to the water supply service)
- -[D] Tax Payers

The cost sharing solutions are the following ones :

- Initial investments costs [II] are covered both by categories [A] and [B]. Owners of properties unconnected to the water supply system but located in areas served by the water supply system are asked to contribute too as the undertaken initial investment increase their properties values: they will be free to connect to the service if they wish to do so. Costs are shared among economic agents according to the maximum potential demand of each economic agent. Category A pays a *una tantum* connection levy (*taxe de raccordement*). Unconnected properties owners [category B] pay only a fraction of the contribution of category A (roughly 60-70 %) through a preference levy (*charge de preference*). When a property owner wishes to connect, it will have to pay the difference between the connection levy and the preference levy he already paid.
- Investment for Renewal costs [IR] are covered by an yearly infrastructure renewal charge which is paid both by category A and B.
- Fixed Operational Expenditures [F\_Opex] are shared among the users of the water service independently of their consumption
- Investments for fire protection and other public functions [PI] are covered by the general municipal budget paid by tax payers
- Variable Operational Expenditures [V\_Opex] are shared among the users of the water service according to their water consumption.

Bernard Dafflon also gives a full description of how sanitation costs are shared in Fribourg canton. The cost sharing scheme follows the same principles. One of the specific aspect is that rain water collection and drainage costs have are covered by the general municipal budget and not by water users.

It seems to us that one of the caveats of the cost recovery approach implemented in Fribourg canton is its accounting complexity. On the other hand it is a very interesting way to capture land value gains and make property owners to contribute to the investment costs.

## 5.2 Equalization and financial economies of scale

Water and sanitation are local public services. Very often their provision is under the responsibility of the local governing unit. Moreover the water and sanitation sector is highly capital intensive. Some system of equalization between the CCU are required to smooth through time and space inequalities and infrastructure financing needs.

According to Barraqué (2011a) there are four kinds of equalization : a - spatial equalization, b- temporal equalization, c-inter-sector equalization<sup>58</sup> and d- social equalization. We already talked of temporal equalization when we discussed of infrastructure and repayable finance (Section 3). We shall focus here on spatial equalization mechanisms in the water sector.

We distinguish two categories of spatial equalization mechanisms :

- Implicit equalization, i.e. the equalization is only based on the collective consumption unit size.
- Explicit equalization, i.e. there is a *ad hoc* institution or mechanism to smooth inequalities among collective consumption units.

Examples of implicit equalization are UK water services which are run on a large geographical basis (there are only 30 water services utilities in England). In Italy the attempt was made to follow the English example: the 1994 reform asked to provide WSSs at the Optimal Provision Area (*Ambiti Territoriali Ottimali – ATO*) scale. However the reform had to face a strong resistance and was implemented with great inertia. Implicit equalization was not really obtained since many ATOs are much too small (little area and/or population deserved) (Linares, Massarutto, and Anwandter 2012, 7–8).

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<sup>58</sup> The inter-sector equalization approach is typical of the German model where a single municipally owned company provides various public services (water, gas, urban transport). Inter-sector cross subsidies may take place.

In some countries there are explicit equalization funds which help local water and sanitation services to finance their infrastructure. Various choices have to be made in designing this kind of fund:

- a) Geographical size of the fund : river basin scale, state / regional scale or federal scale
- b) Source of the revenues of the fund : is the fund fuelled by water user levies or is it composed of subsidies coming from the government budget (general taxation) ?
- c) Kind of financing tools allowed : grants and/or loans ?
- d) An additional issue which goes beyond the equalization purpose is whether the fund is designed also to obtain financial economies of scale. Does the fund also borrows on the financial market on behalf of the collective consumption units ?

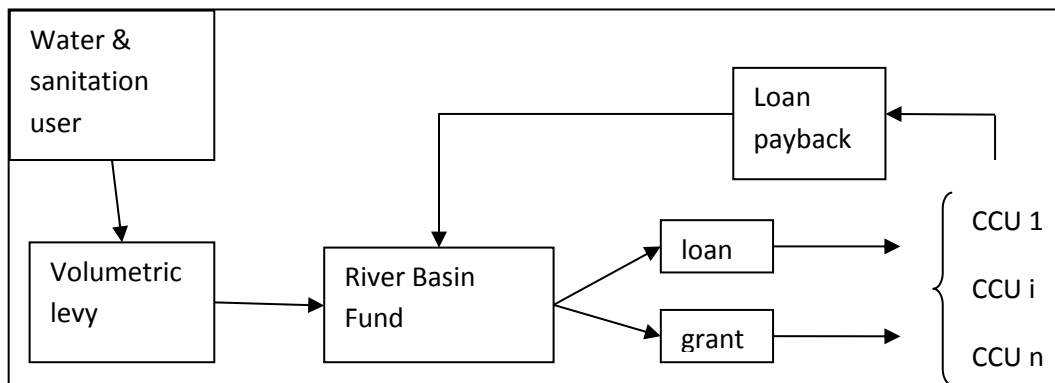
Two examples of water sector equalization fund are the River basin agencies<sup>59</sup> in France (*Agences de l'eau*) and the USA revolving funds system (Figure 5 and Figure 6 respectively). One of the key differences between the two systems is the fact that funds of the French River Basin agencies are fuelled by the water and sanitation levies paid by the users through their water bills while the money of the US revolving funds comes from the federal government subsidies. This implies that in France users pay a total water price which includes water and sanitation levies set by the River Basin agencies and thus feel the “real cost” of water and sanitation services. On the contrary, in the US system the users are kept in the low water tariff illusion since a part of the cost are subsidized by federal Transfers.

In fact, it has often been argued that the French River basin agencies are essentially a temporal equalization tool rather than a spatial one since the amounts received by each CCU are roughly equal to the amounts paid by the CCU users through levies.

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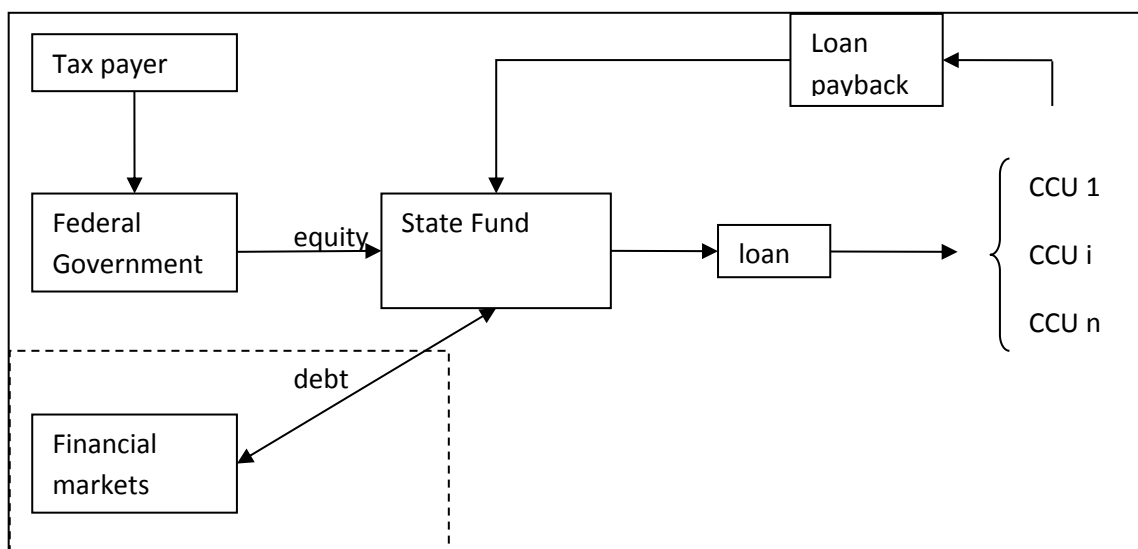
<sup>59</sup> See also Barraqué (Barraqué forthcoming; Barraqué 1997)

**Figure 5 : The French river basin equalization scheme**



Source : author’s elaboration

**Figure 6 : The USA revolving fund system**



Source : author’s elaboration

An additional feature of the US revolving fund system is the fact that the State Fund can also borrow on the financial markets through bonds or loans in order to leverage more funds (dotted box in Figure 6). In such a way the fund not only has an equalization function but also helps the collective consumption units to pool together to get an easier and cheaper access to debt financing (Linares, Massarutto, and Anwandter 2012; Bougelot and Loury 2003). This is what Linares et al. define as “financial economies of scale i.e. benefits from centralizing and standardizing the financing functions and financial documentation through a dedicated institution” (Linares, Massarutto, and

Tesi di dottorato "A long run perspective on urban water and sanitation infrastructure financing: essays in public finance" di CRESPI REGHIZZI OLIVIER discussa presso Università Commerciale Luigi Bocconi-Milano nell'anno 2014 La tesi è tutelata dalla normativa sul diritto d'autore(Legge 22 aprile 1941, n.633 e successive integrazioni e modifiche). Sono comunque fatti salvi i diritti dell'università Commerciale Luigi Bocconi di riproduzione per scopi di ricerca e didattici, con citazione della fonte.

Anwandter 2012, 5) . The same authors also show that institutional mechanisms allowing financial economies of scale are essential to lower the costs of water and sanitation services which are both local and highly capital intensive.

Linares et al. make a comprehensive comparative analysis of various institutional agreements which allow a financial economy of scale mission to be fulfilled in various countries. Among the various cases at least two cases are worth mentioning here :

- The Netherlands water institutions & the NWB Bank (Nederlandse Waterschapsbank N.V.)
- The *Aguas de Portugal* (AdP) holding system

In the Netherlands the water sector is characterized by a multi-level governance which is composed of many institutions among which there are 24 regional water boards in charge of water quantity and quality management (including sewage treatment) and 10 drinking water limited liability companies owned by municipalities and provincial governments (OECD 2014; Linares, Massarutto, and Anwandter 2012, 70). In 1954 the NWB was created originally with the purpose of financing investments in the sea defences. It plays the role of the “house banker and treasurer for the water boards”. NWB also “finances municipal and provincial authorities, drinking water supply companies, environmental organizations and housing, healthcare and educational institutions” (Linares, Massarutto, and Anwandter 2012, 70).

In Portugal, since the reform of the 1990’s, there are many multi-municipal companies responsible for the planning, financing and management of bulk water supply and waste water treatment plants. Each multi-municipal company is partially owned by the served municipalities and by *Aguas de Portugal*. AdP is a private law company owned and controlled by the central government (also through state owned financial institutions). The AdP holding plays a major role in the Portuguese water sector since it “provides funding, project consultancy, technical personnel and advisory services to its subsidiaries”. The holding AdP is the unique borrower for the Portuguese water sector. Often the Portuguese government gives a sovereign guarantee for the borrowings (Linares, Massarutto, and Anwandter 2012, 58). Through such an institutional design loans awarded by lenders such as the European Investment Bank are obtained at better financial conditions.

### 5.3 Key trade-offs for Water and Sanitation Services

In the previous paragraphs we discussed the concepts how the concept of full cost recovery, sustainable cost recovery and the 3T's can be expressed in terms of endogenous Vs exogenous revenues (§5.1). We also analyzed the institutional tools available to allow equalization and financial economies of scale in the water sector (§ 5.2).

Water and sanitation services are natural monopolies and club goods as Elinor and Vincent Ostrom show:

“Once appropriated from a natural supply, water can be dealt with as a toll good to be supplied to those who have access to a distribution system; similarly, once taken from the ocean, fish can be dealt with as a private good. Water management problems, typifying common pool resources, are likely to be subject to market failure while water distribution problems typifying toll goods are likely to manifest market weaknesses associated with monopoly supply”(Ostrom and Ostrom 1999, 78)

Such a point of view is shared by Bernard Barraqué (2009, 4): “Water services, as a set of infrastructures, are club goods, even though the club ideally encompasses the full territory of a city and its suburbia (there are economies of scale and of scope, up to a certain point, and frequent club effects)”.

In the earlier sections we have discussed many aspects of public finance without focusing specifically on water and sanitation services. Choosing to cover costs through endogenous or exogenous revenues is one of the various trade-offs which have to be made by policy makers but we pointed out in the previous sections a great lot more of issues which have to be set and which have an impact in terms of water and sanitation infrastructure financing. Table 3 below summarizes some of the key trade offs to be made by policy makers. The last column gives the references of the paragraph in which the issue has been discussed.

**Table 3 : Key trade-off for WSSs**

Trade off		Options		Paragraph
1	<b>CCU-Membership</b>	1a	Voluntary	§2.6
		1b	Compulsory	
2	<b>Revenues</b>	2a	Endogenous	§2.6, §2.9.2, §2.10 and § 5.1
		2b	Exogenous	
		2c	Both	
3	<b>Institutional nature of the CCU</b>	3a	Internal to the LGU	§4.6
		3b	Autonomous from the LGU	
		3c	Corporatized	
4	<b>Legal nature of the endogenous revenues</b>	4a	Tariff	
		4b	Fiscal	
5	<b>Technical nature of the endogenous revenues</b>	5a	Volume	
		5b	Flat	
		5c	Two part	
6	<b>Source of the exogenous revenues</b>	6a	Local	Section 4 and §4.7
		6b	National	
		6c	Both	
7	<b>Infrastructure project planning &amp; management</b>	7a	By the central gvt	Section 4 and §4.7
		7b	By the LGU	
		7c	By the CCU	
8	<b>Who borrows ?</b>	8a	The central Gvt	Section 4 and Section 3
		8b	The LGU	
		8c	The CCU	
8	<b>Infrastructure end-payer</b>	9a	By the central government	Section 4 and Section 3
		9b	By the LGU	
		9c	By the CCU	
10	<b>Spatial equalization &amp; financial economies of scale</b>	10a	Implicit (Based on the CCU size)	§ 4.4 and § 5.2
		10b	Explicit (revolving funds, financial mutualization)	

Source : author's elaboration

In fact not only the policy-makers should consider and take position on the trade-offs listed in the above table but the same list of issues might be used by the researcher to analyze past and present policies. Indeed this is the approach we undertook. In Part IV (Section 6) we shall analyze the long run path of the French and Italian water sector using such a matrix.

- 1) Is the membership to the water and sanitation CCU voluntary (presence of exclusion) or compulsory (§2.6)?
- 2) What is the level of exclusion signal / compulsory membership fee implemented? Is cost recovery based on endogenous or exogenous revenues (§2.6, §2.9.2, §2.10 and § 5.1) ?
- 3) What is the legal and institutional nature of the collective consumption unit (CCU) (§4.6) ?
- 4) What is the legal nature of the endogenous revenues? Do they have a tariff or a fiscal nature? Are they based on a tariff or on a tax system ?
- 5) What is the technical design of the endogenous revenues, are they metered and billed according to volume? Or is it a flat fee rate? or a two part tariff based both on a flat rate and a volumetric part ?
- 6) Where do the exogenous revenues come from? Do they come from the Local Governing Unit (LGU) or from the Central Government? Through this question it is all the topic of Local Public Finance which is concerned (Section 4)
- 7) What entity and level of government is in charge of the planning and management of investments (Section 4 and §4.7)?
- 8) Who borrows to finance investments in the short run (Section 3, Section 4 and §4.7) ?
- 9) What entity and level of government is the end-payer of the investments costs (Section 4 and §4.7)?
- 10) Is there a spatial equalization mechanism in place? What kind is it? (§ 4.4 and § 5.2)



## **Part II. Network expansion phase within urban development : two case studies**

**a) The Finance of Paris Water: Local Public Goods at the Onset of Industrialization**, in *Infrastructure Finance in Europe. Insights into the History of Water, Transport and Telecommunication*, edited by Massimo Florio, Giuseppe de Luca and Youssef Cassis [submitted to **Oxford University Press**]

**b) Providing and financing a municipal infrastructure : a long run analysis of water and sanitation investments in Milan (1888-1924)**, in *The Economics of Infrastructure Provisioning - The (Changing) Role of the State*, edited by Arnold Picot, Massimo Florio, Nico Grove and Johann Krantz [submitted to **MIT Press**]

**c) Providing a municipal infrastructure: how did Paris and Milan finance their water and sanitation infrastructure (1853-1925) ?**[to be published in *FLUX - Cahiers scientifiques internationaux Réseaux et territoires*]



## The Finance of Paris Water: Local Public Goods at the Onset of Industrialization (1807-1925)<sup>60</sup>

Olivier Crespi Reghizzi<sup>61,62</sup>

### Abstract

Sustainable financing is a major challenge for the water sector both in many developing countries where water and sanitation services are still in the expansion phase and in Europe where the water industry also faces major investments needs too. To give more depth to the present policy debate a historical perspective on water services financing is needed. This paper focuses on how the completion of the Paris water system (Ourcq canal, water supply network and sewers, long distance aqueducts) was financed during the 1807-1925 time frame. The Paris municipal finance framework is analyzed. A variety of financing schemes and institutional solutions (municipal budget - fiscal resources, concession, municipal bond and land added value capture schemes) are identified and described. The financial flows of Paris' water, sanitation and canals service over the 1865-1930 time frame are analyzed in depth. The OECD 3T's framework is adopted to analyze the long run cost allocation. Tariff's revenues were insufficient to cover full costs which were partially covered by Tax sources too. Long term debt, inflation and land added value capture mechanisms played key roles in absorbing part of the investments' costs.

### Keywords:

Financing history, Infrastructure, Water supply and sewerage, Paris, Municipalization, 3T's, cost sharing, bonds, inflation, land value capture

**JEL:** H54 - H72 - H74 - L95 - N73 - N74 - N83 - N84 - N93 - N94

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<sup>61</sup> Centre International de Recherche sur l'Environnement et le Développement (CIRED), AgroParisTech – Paris, [crespireghizzi@agroparistech.fr](mailto:crespireghizzi@agroparistech.fr)

<sup>62</sup> Centro di Economia Regionale, dei Trasporti e del Turismo (CERTET), Università Commerciale Luigi Bocconi – Milano

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## 1 Introduction

In the last ten years great attention has been given by international institutions and donors to the issue of sustainable financing for the water sector through various working panels, e.g. panel Camdessus and panel Gurria (Van Hofwegen 2006; Winpenny 2003). This process led around the Istanbul 2009 World Water forum to the OECD publications (OECD 2009a) clarifying concepts and defining a harmonized terminology on costs and financing sources well known as the “3T’s” (Tariffs, Taxes and Transfers).

The water industry is very capital intensive and requires huge lump sum investments particularly in the early phase of infrastructure expansion in which many developing countries are. Historically how to finance these investments has constantly been a major concern. This paper focuses on the financing history of urban water and sanitation infrastructure in Paris during its expansion phase. By providing a historical context and outlining past solutions to financing challenges this paper aims to contribute to the present policy debate.

Our historical analysis starts in 1807 with the construction of the Ourcq canal and ends in 1925 with the completion of the *Voulzie* operation, the last long distance aqueduct built in Paris. This paper is a revised version of an earlier, more detailed Working Paper available online on REPEC (Crespi Reghizzi 2012).

Throughout the 19<sup>th</sup> century Paris faced a demographic revolution driven by a massive influx of immigrants (D. H. Pinkney 1953; Marchand 1993, 35). Indeed, Paris population progressed from 546,856 inhabitants in 1801 to 1,053,262 in 1851, 2,714,068 in 1901 and 2,871,429 in 1926. Such a fast and wild demographic growth created strong negative externalities in terms of sanitary conditions. At first life expectancy in Paris was even lower than in French rural areas (Kesztenbaum and Rosenthal 2012b). Severe epidemics (cholera, typhoid fever) were very common and represented a very significant cause of mortality. In 1831 the cholera “attacked 39,000 persons in the city and killed 18,000 of them, including the prime minister himself. It struck again in 1849 and this time 19,000 Parisians died.” (D. H. Pinkney 1955, 129). Progressively, the scientific community and policymakers came to understand the link between the lack of access to clean water and sanitation, the epidemics and life expectancy in cities (Jaquemet 1979).

To grasp the significance of the improvement in access to water and sanitation during the 19<sup>th</sup> century one has to consider that in 1807, only 8000 m<sup>3</sup>/day of drinking water (mainly pumped

from the Seine) was distributed by the Paris municipal water service. At that time household water connections were very rare and water was home-delivered by water-carriers (the *porteurs d'eau*). The sewer system extended for only 24 km. By 1926, Paris water infrastructure delivered roughly 1,323,960 m<sup>3</sup>/day of water, the majority of buildings had household water connections and roughly 1300 km of sewers were in operation.

While the technical history of Paris water and sanitation service (WSS) has been largely studied (Cebren de Lisle 1991; Bellanger, Pineau, and SIAAP 2010; Beaumont-Maillet 1991; Bocquet, Chatzis, and Sander 2008; Chatzis 2006; Graber 2009) this is not the case for the financing history on which this paper focuses. How was such an impressive infrastructure financed in the short run ? Who paid for it in the long run ?

Starting in 1802 a first investment phase focused on the construction of Paris canal system (Section 2). Apart from the canals, only minor investments were made in the first half of the 19<sup>th</sup> century in the water network and sewer system infrastructure (§2.4).

To answer the above questions it is important to understand the financial constraints faced by French municipalities at that time (Section 3), and to identify the financing tools that were available including the land value capture schemes implemented under Haussmann (§3.5).

The great expansion phase of these systems took place after 1853 and lasted symbolically until 1925. The financing tools adopted during this second phase are analysed in Section 4, including a detailed study of the financial flows of Paris WSS (§4.5). Section 0 concludes and draws some policy lessons.

## **2 Paris canals : from public provision to concession and back again public**

### **2.1 Canal de l'Ourcq – phase 1 – Wine for water according to the Emperor's will**

In the beginning of the 19th century the first priority was to bring large quantities of clean water to the city according to “the paradigm of water quantity and water systems” (Barraqué 2003). Indeed, that was the main purpose of the Ourcq canal project although it would also allow navigation and transport of goods.

The Ourcq canal project was approved by *Napoléon I<sup>er</sup>* and authorized by law in 1802 (29 *Floréal an X*). A few months later (25<sup>th</sup> *Thermidor An X*), a decree added a piggyback levy of

1.25 franc per hectolitre on all wine entering the city of Paris (*droit d'octroi*) for the next ten years to finance the Ourcq canal project (Beaumont-Maillet 1991, 142). Construction started in 1803 but was initially carried out very slowly due to a conflict over various technicalities of the project (Girard 1804; Cebron de Lisle 1991, 134; Graber 2009).

Most of the works were executed by private *entrepreneurs* chosen through selective procurement, however “charity workers” and war prisoners were also involved in the construction in order to make the water flow through the canal and reach the *Bassin de la Villette* in time for the celebration party in the Emperor’s honour on December 2<sup>nd</sup> 1808. However, to satisfy the Emperor’s will, works had been undertaken in a hurry and with such low quality standards that a few month later the *Bassin de la Villette* was again without water. Additional works had to be undertaken (Beaumont-Maillet 1991, 143).

Money coming from the additional *droit d'octroi* on wine was not sufficient to cover all the expenses, therefore on the 21<sup>st</sup> March 1808 a decree authorized the sale of various navigation canals through France and allocated 3 million of francs from this sale to the Ourcq project (Beaumont-Maillet 1991, 143). Even with this additional funding, the city struggled to cover the expenses, particularly the expropriation compensation fees which were increasing due to a windfall effect. Additional funding was still needed. In 1810, the city was authorised to contract a 7 million francs loan (decree of February 21<sup>st</sup> 1810) to buy the plots of land needed for both the canal and the water distribution networks. However this loan was never actually made (Massa-Gille 1973). Construction stopped in 1814 due to the Battle of Paris (Cebron de Lisle 1991, 135). By 1816, the project had already cost 22 million francs (Conseil Général des Ponts et Chaussées 1816).

This first phase of the Ourcq project was essentially run by the Emperor who fully controlled the city institutions. The funding came mainly from the additional *droit d'octroi* combined with other sources within the public budget. The precise funding breakdown between the *droit d'octroi* and the other sources of funding is not clear on the basis of available sources.

## **2.2 Canal de l’Ourcq – phase 2 – concession and borrowing : an in-between**

### **2.2.1 The concession approach**

The second phase of the Ourcq canal project took place after Napoleon’s fall during the Borbonian *Restauration*, in years when the city of Paris faced severe financial constraints.

The prefect of Paris *Gaspard de Chabrol* decided to slow down the speed of construction to stay within the constraints of the available financial resources and to use public private partnerships for the larger investments (i.e. the *Ourcq* canal).

Parisians decision-makers started to follow the English example of involving private companies in bridging the financial gap for large investments (see also **Box 3**). As much as 38 million francs and 10 years were still required to complete the construction even without considering the sensitive issue of the overrun in expropriation compensation-costs. As a result, the 1816 *Ponts et Chaussées* commission strongly recommended that the city adopt a concession approach and select a private company to be involved in the funding and execution of the next phase. (Conseil Général des Ponts et Chaussées 1816).

In fact the approach was mainly financial as the works were to be executed under control of the *Ponts et Chaussées* engineers: the city borrowed some capital from a private financial company which got the money through the sale of shares. Revenues coming from the canal were flowing into the company. They were paying off the capital while the interest was covered by annual payments from the city (Gille 1965, 203 quoted in; Massa-Gille 1973, 135). The 19<sup>th</sup> century canals in France were more frequently contracted on a “*Soumission*” agreement basis rather than a full “*concession*” (Nieradzic 2007). However, the Paris canal case is somewhere in between the “*concession*” model and the “*Soumission*” one. Nevertheless, in this paper we will refer to the Paris case as a “concession”.

### 2.2.2 The awarding of the first concession in 1818 - Ourcq and Saint Denis canal

Two companies answered the call for tenders for the completion of the Ourcq and Saint Denis canals and for the execution of the canal Saint Martin. However, one of them was excluded since its offer based on the use of English cast iron was unacceptable under government protectionist policy.

#### **Box 3 : The case of the Compagnie des Eaux de Paris (1778-1788)**

Concession schemes had already been used in the past in France but for much smaller investments. The case of the *Compagnie des Eaux de Paris* created in 1778 by the *Périer* brothers is a well known example of such a scheme. At that time the “private service” consisting in bringing water “à l'étage” (upstairs) was considered a luxury by French authorities whose main concern was to deliver water nearly for free at public fountains. Thus the *Compagnie des Eaux de Paris* was given a 15 years concession to supply 3000 m<sup>3</sup> of



water per day and distribute it both at public fountains and upstairs in apartment buildings. To achieve its objective the company had to invest in steam engines to elevate and deliver the *Seine* water. The company did not last very long: it went bankrupt in 1788 and its assets became property of the royal treasury. Why did this company fail? One possible reason is that the company was required to sell and deliver water to public fountains and it was not compulsory for small users to subscribe to the upstairs service, which was the only source of profit for the company (Cebron de Lisle 1991, 85; Bezançon 1999, 87; Dardenne 2005).

A contract was signed and approved (24<sup>th</sup> April 1818) with the *compagnie Vassal et Saint Didier*. The company had to finance the completion of the Ourcq and Saint Denis canals and received in turn the revenues from the navigation traffic through a 99 years concession plus a 7.5 million francs initial grant to be paid by the government. Only 0.5 million francs was to be paid in cash to the company while the other 7 million francs was to be paid through *bons d'échéances* (time drafts) with the revenues coming from the additional *droit d'octroi*.

### 2.2.3 The awarding of the second concession in 1821 - Canal Saint-Martin

A rather striking peculiarity of the concession awarding in 1818 was that the company agreed both to finish the construction and to lend money to the city by accepting a postponed payment of the 7 million francs grant. An 1821 act (5<sup>th</sup> of August) modified the awarding mechanism for canals concessions in France. The awarding procedure had to be split in two separate tenders: a first one for the selection of a company for the concession including the execution of the works which were technically specified by the public authorities (selection criterion was the smallest grant asked) and a second one for the selection of a financial partner who would lend money to the city. The purpose of this two-fold approach was to enlarge competition to obtain better terms for the city. For the first tender, the *Compagnie des Canaux de Paris* (former *Compagnie Vassal and Saint Didier*) was awarded the concession for the Saint Martin canal on the basis of a city grant of 5,470,000 francs. A second competition took place to obtain a 8 million francs nominal loan which had been authorized by the government (400,000 francs of annuity at 5% interest rate). The tender was held at very similar conditions as the issuance of state bonds. Twenty one companies answered the bid based on the lowest discount over the nominal value. The city obtained 7,924,000 francs against a nominal capital value of 8 million francs (the bid was won by *G. Odier* at 99.05 comparable to the national bond emission in the same years – 89.55). The funds had to be paid to the city in 8 payments

between July 1822 and April 1824. The payback time was 27.5 years. The effective interest rate was 5.5 % (Gallais-Hamonne 2007, 267). These funds were supposed to cover both the payment of the grant to the *Compagnie des Canaux de Paris* and the land purchase and expropriation compensation costs (which quickly exceeded the estimated amounts).

### **2.3 Canal de l'Ourcq and canal Saint Martin : from concession to public ownership**

An intense debate took place in the parliament in 1818 on the pros and cons of the concession approach. A similar debate took place once again in the 1860's when the city decided to cover the Saint Martin Canal in order to stop splitting this area of the city into two parts. The company argued that covering the canal was detrimental to its interests. The city ended up buying back the concession from the Saint Martin Canal from the company in 1861 (Humblot 1885).

A similar conflict took place during the important drought period of 1875. According to the 1818 agreement, the company had to deliver 80 000 m<sup>3</sup> of water per day to the city. Due to the drought, the city wanted to allow people to draw additional water from the canal, but the company had rented the canal bank to private workshops and small factories needing the hydraulic force of the flow. Once more, the city decided to reclaim ownership of the Ourcq and Saint Denis canals in order to protect the "public interest".

These two early terminations of the contract required the city to pay an annual installment to the company until 1922 as compensation for lost revenues (Humblot 1885).

Was the concession approach a good policy choice for the city? The literature offers conflicting evidence. In his 1885 report, Mr Humblot, which was the *Ponts et Chaussées* chief engineer in charge of the sanitation and canal service, is very critical of the choice of the concession. He cited some figures to demonstrate the excessive-profit which in his opinion had been made by the *Compagnie des Canaux de Paris* and argued that surely the city of Paris could have contracted a loan in 1823 with a much better interest rate and thus avoided the conflicts and the high transaction costs of the 1861 and 1876 episodes which had been very high. On the contrary G. Massa-Gille (1973) points out that the city of Paris had almost "no credit" in financial circles in 1818 and 1821 when the agreements were made. And if the estimation of 300,000 francs of expected revenues from the Saint Denis canal was correct, the

profitability that the company would receive on its net expenses would hardly have exceeded 5%.

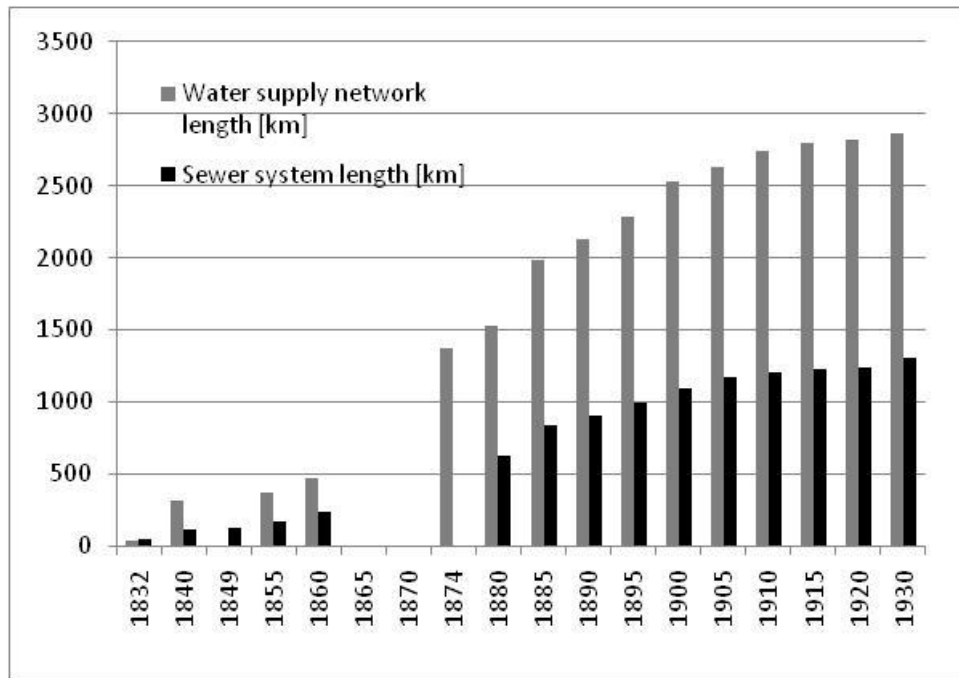
## **2.4 Water distribution network for the city: the temptation of the concession approach 1806-1853**

In 1807 (4<sup>th</sup> September decree) the ownership and management of all the water supply in Paris was transferred from the state to the municipal administration (*Prefet de la Seine*). However the state administration continued to closely supervise the water through the *Ponts et Chaussées* and the Ministry of the interior administration.

The Ourcq canal system had certainly been built in part to allow navigation but his main objective was to bring additional water for the needs of the city. Although the Ourcq's water already reached the *fontaine des Innocents* on August 15<sup>th</sup> 1809, the city still lacked a proper water distribution network (see also Figure 7).

Three ambitious projects (*Projet Girard, Projet Mallet, Projet Genieys*) were drafted for the Ourcq water distribution network. Quite soon however suspicions arose on the real quality of the Ourcq water in parallel with the concept of realizing two separate distribution networks : one for the residential drinking water delivered *à l'étage* (Seine water) and one for the public fountains and other needs (Ourcq water) (Cebren de Lisle 1991).

In the three various projects the financial needs ranged between 31 million francs (*Projet Mallet*) and 18.7 million francs (*Projet Genieys*). Due to the huge amounts of money needed, the city considered awarding a water distribution concession to a private company which supposedly would obtain the necessary financial resources more easily. On the other hand, there was strong opposition to the concession due to the still fresh memory of the failure of the *Compagnie des Eaux de Paris* in 1788 (refer to **Box 3**). It was not easy to guarantee both the city's desire to have free water delivery at public fountains and the company's profitability which was tightly linked to having a sufficient number of private subscriptions.

**Figure 7 : Water and sewer system lengths (1832-1930)**

Source : Authors elaboration, inspired from various sources (Cebron de Lisle 1991, 247, 424, 559; Lemarchand 1914, 164; Lemarchand 1923, 274) and from *Annuaire Statistique de la Ville de Paris*, various years

The city started negotiations with the English brothers *Lees* company in 1814 and was finalizing the agreement in 1817 when the government rejected the principle of a settlement through a simple mutual agreement *intuitu personae* and instead required a transparent and competitive bid (Mallet 1830). In order to gain ideas on how to draft the technical specifications of such a tender, Mr Mallet led a mission in 1824 to London where private companies already had concessions on water distribution (Chatzis 2010). The city of Paris launched a competitive bid in 1829, but no offers were received as it mandated that the company extend and maintain the unprofitable Ourcq water network to supply the public fountains on which no revenues could be expected (Cebron de Lisle 1991).

With the new Paris administration, led by prefect Rambuteau, further attempts were made to award a concession to a private company. Indeed, new specifications were drafted and approved by the municipal council in 1834. Learning from the failure 1830 tender, the city wanted to limit the concession to the distribution of Seine water from which a private company could expect to generate some revenues, leaving the city responsible for completing the Ourcq public fountains network. However the *Conseil Général des Ponts et Chaussées* never approved these specifications and suggested in 1836 to concede the water distribution service to the *Lees* company through a simple mutual agreement. When asked to pay a 2

million francs guarantee deposit, the Lees withdrew their offer (Beaumont-Maillet 1991). Once more, the attempt to award a concession had failed.

The financial constraints of the city, the hesitation between the various projects and the debate around the opportunity of a concession approach slowed down the extension of the water network in the first half of the 19<sup>th</sup> century : until 1830, infrastructure works were undertaken only with minor ordinary funds taken from the annual city budget surplus. The great expansion of the water and sanitation services (WSSs) would take place a few decades later (§4.1).

### 3 Municipal finance in Paris

#### 3.1 The French and Paris fiscal context in the 19<sup>th</sup> century

Through the 19<sup>th</sup> century, French municipalities were subjected to a formal yearly budget balance obligation. Furthermore, there were no significant financial transfers from the central government to the municipalities (less than 10% of local authorities spending until 1938) (Delorme and André 1983, 72–73 & 90–91). Most of these transfers were not recurrent and often were approved to partially subsidize an investment: In the case of Paris, various subsidies were approved through the 19<sup>th</sup> century to fund urban investments. However obtaining the parliament's approval for these transfers was not an easy task as MPs representing rural areas were reluctant to allocate funds to the Capital city.

Municipal revenues of urban municipalities came mainly from indirect taxes and in particular from excise duties (the *droit d'octroi*) on goods entering the city which might be considered as an *ante litteram* local Value Added Tax (VAT). This fiscal system which was mainly based on indirect taxes was regressive and had a strong redistributive effect in favour of capital owners and the upper revenue classes (Ardant 1972; 1976). In Paris, the *droit d'octroi* had been eliminated after the Revolution in 1791 but was re-established in 1798 since no other replacement revenue could be found. It was then finally abolished only in 1897 (Cadoux 1900).

Other fiscal sources consisted in piggyback taxes (additional levies - *centimes additionnels*) on the 4 national taxes established after the French revolution (*les quatre vieilles* : *contribution foncière sur le bâti et le non bâti*, *contribution personnelle mobilière*, *contribution sur la patente*, *contribution sur les portes et fenestres*). These direct piggyback

taxes played a minor role in Paris as excise duties represented more than two thirds of the total municipal revenues (Cadoux 1900).

Cashing-in the excise-duties was a challenge for Paris until the 1860 annexation (*Loi 16 juin 1859*) because the administrative or “institutional area” was much smaller than the “functional area” with a significant spillover effect taking place (Dafflon and Madiès 2011, 19). Prior to 1860 Paris faced a fiscal dumping : new industries and productive activities started to develop in the suburban municipalities with lower or no excise duties (Cadoux 1900, 57). With the 1860 annexation, industries located in the former suburban municipalities were granted the right to apply the former excise-duty regime in place in those outer municipalities for 7 years (Cadoux 1900, 58).

### **3.2 A cautious borrowing attitude**

After 1818, French municipalities (including Paris) were required to obtain approval from the national parliament before borrowing money. During the *Empire* and the *Restauration*, Paris was generally reluctant to borrow as only 5 loans were contracted in the first half of the 19<sup>th</sup> century. Paris adopted a cautious approach, financing investments either using the yearly budget surplus or through the concession approach by giving up future revenues to the concessionaire (refer to Section 2).

As early as the 1820's a debate took place between the city decision makers : the “cautious approach”, called for slowing down the works and finding a surplus in the city budget to fund them. The “gambling approach” implied borrowing in order to accelerate the construction rhythm which would in turn increase the city's revenues and allow loan repayment. As a matter of fact, the borrowed amounts represented only 10% of the city's total revenues during the *Restauration* and only 7.5% between 1821 and 1830 showing a cautious borrowing policy (Massa-Gille 1973).

### **3.3 The turning point in the city's borrowing policy**

The approach changed with the new *régime* led by Napoleon III who wished to quickly undertake urban renovation, expand the infrastructure and build a new Paris in order to consolidate his power. A tension arose between prefect Jean-Jacques Berger who wanted to proceed cautiously and minister Persigny who was in favour of borrowing large amounts of money in order to accelerate the construction rhythm.

Despite being reluctant to borrow, Berger was forced to accept several large urban renovation projects (new streets next to the Louvre, creation of the *Boulevard de Strasbourg*) financed through a 50 million francs loan (contracted in 1852 by the city). The loan's repayment was covered by the additional *droit d'octroi* on wine which had been extended until 1870 (D. Pinkney 1958, 54). Persigny, however, wanted to borrow even more to buy land which would be sold later at a higher price with a capital gain for the city. Such a "land acquisition and resale policy" (Peterson 2009) would allow payback of the loan and invest in another similar operation (§3.5). That was too much for Berger who "could not accept bankrupting the city and burdening future generation with debt" (quoted by Cebron de Lisle 1991). Berger resigned and was replaced by prefect Haussmann with the clear mandate of modernizing the city of Paris from a "congested medieval city into a dynamic metropolis" (Gandy 1999, 27).

### **3.4 Haussmann : reshaping the city by all means (1852 -1869)**

An enormous body of literature exists on Haussmann's transformation of Paris (D. H. Pinkney 1955; D. Pinkney 1958; D. H. Pinkney 1957; Marchand 1993; Marchand 2011; Gandy 1999). Thus, we will only give a few figures to summarize the extent of the changes which took place in that historical phase. Between 1852 and 1868, more than half of Paris buildings were demolished (18,000 buildings demolished on a total of 30,770 buildings in Paris at that time). 60 % of Paris surface was altered in 17 years (Marchand 2011). The investments cost 2.5 billion francs which represented roughly the total annual budget of the French state at that time (2 billion francs) (Marchand 2011) and "about forty-four times" the municipal budget of 1956-1957 (D. Pinkney 1958, 5)

The huge investments undertaken by Haussmann between 1852 and 1869 aimed to shape a brand new city with large *boulevards* and new modern buildings by following a "centrally directed public investment" strategy (Gandy 1999, 28) based on the Saint-Simonian ideas of "productive expenses" (Marchand 2011; Gandy 1999). To comply with Napoleon III's will, Haussmann pursued urban renovation at a frantic pace and did not hesitate to borrow more and more in a sort of self-powered vicious circle. In all the administrative documents of that time, the urban renovation operations undertaken by Haussmann are classified in 3 groups ("*les trois réseaux*") according to the percentage of funding coming from the government. The first group of projects, *le premier réseau* launched at the beginning of the *Second Empire*, were strongly subsidized by the government since the parliament did not dare oppose the

emperor. Later, MP's from rural areas progressively curbed all attempts to subsidize the capital city (Morizet 1932, 202). As a consequence, the second phase of works was less subsidized, and the third one, *le troisième réseau*, was not subsidized at all by the government. As the construction went on, subsidies not only decreased but opposition to municipal borrowing grew. Indeed while the 1855 and 1860 loans were easily passed at the Parliament, the approval for the 1865 loan was narrowly obtained (Moncan and Heurteux 2002; quoted by Marchand 2011). For the 1869 consolidation loan with the *Crédit Foncier*, opposition to its approval was so fierce that it led to Haussman's fall (Morizet 1932, 299).

Between 1855 and 1869 five municipal bonds were issued by the city of Paris totaling more than 770 million francs (Table 6 in Crespi Reghizzi (2012)). Despite these large borrowing amounts, funds remained insufficient to cover all the works at the pace planned by Haussmann : other financing techniques (§3.5) had to be found to collect more funds and to bypass the borrowing cap imposed by the parliament.

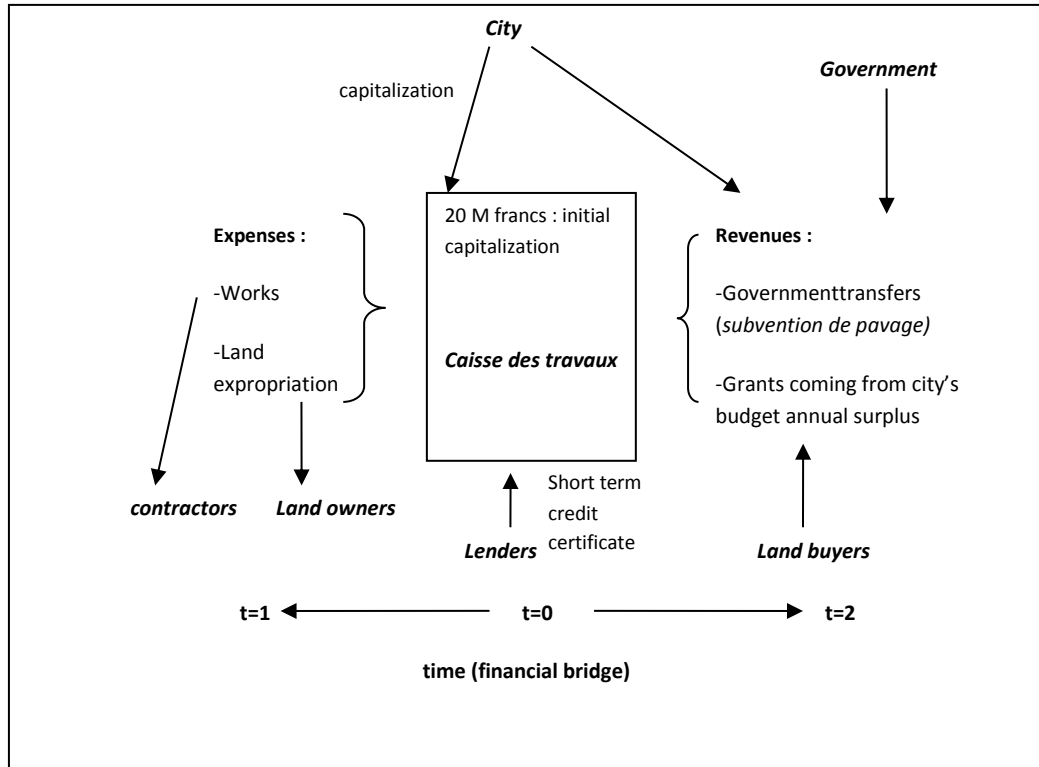
### 3.5 Land Value Capture schemes under Haussmann's ruling

According to land value capture theory, urban infrastructure can be financed endogenously if the local authorities are able to design proper legal mechanisms to capture the added value created by urban growth (Peterson 2009). In other words through a value capture financing scheme, a public administration can monetize a part of the positive externalities of an infrastructure project (Brugnoli 2010, 15). A great variety of land value capture tools exists including "a land acquisition and resale policy" which consists in owning or "acquiring lands near by an infrastructure project and then selling it upon completion of the project" at a higher value (Peterson 2009, 41). One issue with this policy which Haussmann used to finance Paris' urban renovation was that substantial funding was required upfront (expropriation and construction costs), while the revenues were to be collected only much later. To cover upfront costs, the *Caisse des travaux* was created (decree of November 14<sup>th</sup> 1858): this was a short term revolving fund, subject to a borrowing cap imposed by Parliament. Initially the cap was set at only 30 million francs but under political pressure it was later increased to 100 million francs (Massa-Gille 1973, 252). The idea of the *caisse* (see Figure 8) was to bridge the expenses to be paid at the beginning of an urban renovation operation (land purchase and expropriation, works) and the funding to be obtained later through government transfers (*subvention de pavage*), fiscal resources from the city budget surplus and revenues from land



sales. The resources of the *Caisse des travaux* came from the initial capitalization made by the city (20 million francs) and through the sale of short term credit certificates (*bons de caisse*).

**Figure 8 : The *Caisse des travaux* institutional scheme**

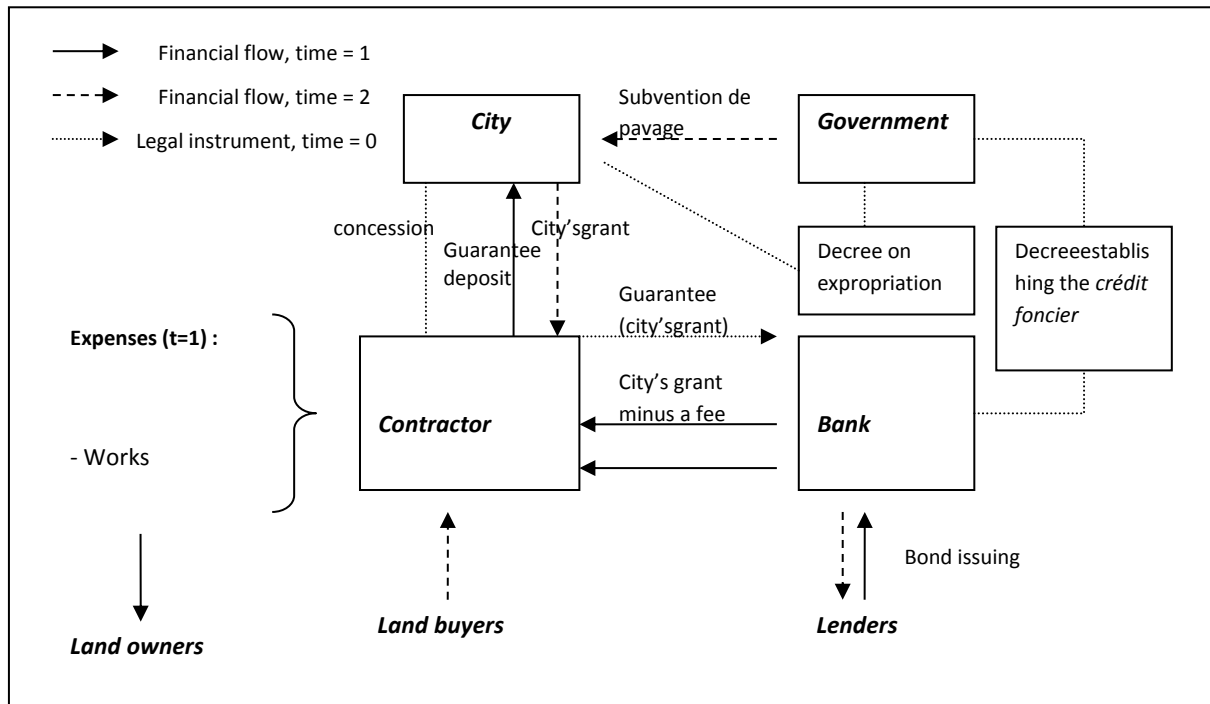


Source : author's elaboration

As this proved insufficient, another financing scheme was launched, the *Bons de delegation*, in that scheme the city gave rights to a contractor for expropriating and acquiring some areas, demolishing the old buildings and streets, building the new *Boulevard*, returning land ownership of the *boulevard* to the city and finally selling either the land or the new buildings (refer to the Figure 9). The city would pay a grant (partially covered by the government through the *subvention de pavage*) to the contractor linked with the value of the renovated street. In fact the grant would be paid cash to the contractor by a bank (for a fee) on the basis of the city's guarantee. The contractor would advance the funds both for the land purchase expropriation and for the construction costs while his profits would come from the property value capital gain at the end of the whole operation. The city was implicitly borrowing both from the contractor (the land purchase/expropriation and works costs) and from the bank (the credit given in advance on the grant to be paid). The contractor's funds could come from his equity but were very often borrowed from banks which would be the major lenders. In fact very often the banks would invest through equity in the contractor's company in order to get a

share of the expected capital gain. The banks themselves, and particularly the *Crédit Foncier* which had been established by the government in 1852, were collecting money through their own bond sales.

**Figure 9 : the *Bons de délégations* institutional scheme**



Source :author's elaboration

### 3.5.1 Expropriation rules

A key legal instrument allowing the implementation of a land acquisition and resale policy was the 1852 decree on expropriation rules (*decret loi du 26 mars 1852*) which had been issued by the government. The previous law of 1841 already authorized the expropriation of buildings and land on the layout of the new streets. Nevertheless the 1852 decree was much more powerful since, on the grounds of avoiding insalubrity, it authorized the expropriation on all of the properties impacted even marginally by the planned works<sup>63</sup>. The city could now expropriate a much larger area and capture a greater part of the capital gain on land value when selling it at the end of the renovation. However, after 1858, land owners consistently appealed the expropriation acts and prevailed most of the time in the rulings of the *Conseil d'Etat*. After 1858, properties could be expropriated less easily and had instead to be bought

<sup>63</sup> *Decret Loi du 26 mars 1852* : "Dans tout projet d'expropriation pour l'élargissement, le redressement ou la formation des rues de Paris, l'Administration aura la faculté de comprendre la totalité des immeubles atteints, lorsqu'elle jugera que les parties restantes ne sont pas d'une étendue ou d'une forme qui permette d'y élever des constructions salubres", quoted by Faure (2004, 12)

at increasingly high market value. Even when the expropriation went on, according to the *Conseil d'Etat* jurisprudence, the city had to give back any part of the properties un-impacted by the works to the previous owners (Harvey 2003, 132–134; Marchand 2011; Morizet 1932, 287). As a consequence, a larger part of the added property value escaped from the city's control. Furthermore, according to an 1858 decree (December 27<sup>th</sup> 1858), for an expropriation, the city had to pay an indemnity not only to the owners but to the tenants too. Obtaining land for urban renovation became increasingly costly.

### 3.5.2 The slippery grounds of borrowing

The land value capture schemes adopted by Haussmann, especially the *Bons de délégation*, were very controversial since in many opponents' view they consisted in hidden loans adopted to bypass the borrowing cap imposed by the parliament. Suspicions about the legality of these schemes progressively grew in the 1860's (Morizet 1932, 288) but Haussmann was at first protected by Napoleon III. Meanwhile, financial needs to cover urban operation costs were constantly increasing. Furthermore, as most of the *Bons de délégation* were in the hands of the *Crédit Foncier*, its financial soundness was in precarious equilibrium. A debt consolidation agreement between the city and the *Credit Foncier* was needed to extend the debt's maturity and it required official approval. The debate was intense as shown in the famous pamphlet "*Les Comptes fantastiques d'Haussmann*" by Jules Ferry (1868) accusing Haussmann of throwing abusively the city into massive debt which would affect the future generations. Although the consolidation loan was approved in 1869, Haussmann lost most of his power and *prestige* and fell from power a few months later on January the 5<sup>th</sup> 1870.

## 4 The great expansion of water and sanitation (1853-1925)

### 4.1 An innovative public-private partnership

In 1852-1853, under the *Second Empire*, the municipality launched another call for tenders for a concession of the water service (see also §2.4 and **Box 3** for previous concession attempts). Five offers were received including one from the *Compagnie Générale des Eaux* (CGE) whose creation had been led by the very influential Comte Siméon (Stefanovitch 2005, chap. III). Napoleon III almost chose to award the concession to the CGE when the new prefect of Paris, Baron Haussmann managed to convince the Emperor to stop that process in order to maintain the city's control of its water supply.

Assisted by Eugène Belgrand, the chief engineer he had appointed, Haussmann had the intuition, later confirmed by Koch and Pasteur's scientific discoveries, that all the water containing organic matter (such as in the Seine and Ourcq) should not be considered drinkable. Haussmann and Belgrand wanted to bring distant and clean water to the city from distant clean sources and they therefore opposed the mainstream idea of pumping more water from the Seine as the CGE or another private company would have done, had the concession been awarded.

In the meantime in the suburbs, outside the administrative boundaries of Paris, various concessions had been awarded since the 1820's to various private companies delivering Seine water elevated through steam pumps. By 1859, the CGE had bought all the previous existing companies and was responsible for the water service in 26 nearby municipalities through concession contracts (Defeuilley 2013a). When the annexation of many suburban municipalities to the capital city took place (June 1859), a solution had to be found concerning CGE's rights in the formerly independent areas of the new Paris. The 50 year legal agreement signed in 1860 between the city of Paris and CGE consisted both in a "municipalization and a (partial) privatization" (Bocquet, Chatzis, and Sander 2008) : a) the Paris municipal service acquired the entire water infrastructure of the formerly autonomous municipalities from CGE by agreeing in turn to pay a 50 year long annual royalty of 1,600,000 F to CGE until 1910 (Morizet 1932, 329) ; b) within the new Paris administrative boundaries, CGE was not awarded a full concession but only a *régie intéressée* contract according to which the company was responsible for selling water, handling relations with clients, and billing and collecting payments on behalf of the city. Furthermore, the municipality kept control (*régie directe*) over the commercial relationship with water users within the public administration.

CGE kept however the full management of various water services outside Paris new administrative boundaries (Cebron de Lisle 1991, 387). The CGE activities in the suburbs expanded even more after the 1867 amendment to the 1860 contract. Under this amendment the City of Paris withdrew from all the water supply contracts with neighbouring suburbs and left CGE totally free to expand its activity as a *cessionnaire* in these neighborhoods (Bocquet, Chatzis, and Sander 2008).

Through the 1860 agreement, water service revenues were secured and the commercial risk taken by CGE. The municipality could thus focus its attention on operations and especially on investments and construction projects. Indeed, water infrastructure was considered to be a potential source of revenues for the city. It made sense for the municipality to capitalize these revenues through a loan which they would payback. Haussmann and his municipal administration had already an industrial and commercial vision of the water service. Their vision is quite similar to the “municipal capitalism” described by Millward (2000, 324) as the main driver in favour of public ownership.

## 4.2 Investments in water and sanitation (1853 -1925)

### 4.2.1 The Belgrand phase (1853-1878)

A very significant part of Paris water infrastructure has been constructed between 1853 and 1925. The first phase covers the period of Paris urban transformation from 1853 to 1880. That phase was initiated by Haussmann and implemented by the chief engineer Eugène Belgrand who stayed in charge until his death in 1878.

Haussmann was very concerned with the water supply issue and presented, with Belgrand, three *Mémoires* to the City Council on that topic in 1854, in 1858 and in 1860 (Haussmann et al. 2000). Planned investments in water were already huge but they became even larger after the 1860 annexation of the new *arrondissements* making it necessary to extend water and sewerage to the new areas. With the annexation, the population of Paris increased from 1,174,346 inhabitants in 1856 to 1,696,141 in 1861 (Bocquet, Chatzis, and Sander 2008) and the surface area of Paris more than doubled (Morizet 1932, 278).

Total investment in water and sanitation during Haussmann’s mandate (1853-1869) adds up to 150 million francs and consisted mainly of :

- a) the strategic water supply elements aimed at bringing clean water to the city (*Dhuis* and *Vanne* aqueducts) and storing it in various reservoirs (roughly 75 million francs, table 11 in Crespi Reghizzi (2012)),
- b) water pumping stations withdrawing surface water from rivers - *Austerlitz*, *Saint-Maur*, *Trilbardou* and *Isles* as well as others pumping stations obtained through the 1860 agreement with CGE,

c) and water distribution and sewers which were extended massively as the new streets and *Boulevards* were completed (eg. 1527 km and 619 km of water supply and sewer systems respectively in 1880 compared to the 364 and 163 km respectively in 1855 – see Figure 7).

#### 4.2.2 The second phase (1879-1925)

After Belgrand's death in 1880, a second phase opens and lasted until 1925 with the completion of the *Voulzie* which is the last long-distance aqueduct built for Paris.

In 1878, theoretical daily production capacity was somewhere between 300,000 and 370,000 m<sup>3</sup> while the planned needs were estimated at 480,000 m<sup>3</sup> (Cebon de Lisle 1991, 468). The additional daily water need was around 180,000 m<sup>3</sup>. It was urgent to increase daily water production and to complete the two water distribution systems (domestic water and public water network).

By 1879, three major sewers (*collecteur général d'Asnières, collecteur de Bièvre, collecteur du Nord*) had been completed on the left and right banks of the river to collect waste water in the various areas and discharge it further downstream (Cebon de Lisle 1991, 424). These sewers only displaced the pollution problem further downstream from Paris without solving it. However after 1865, a first small-scale experiment of waste water disposal through land farming was launched by the city in the outskirts of Paris (*Clichy* and *Genevilliers*). By 1878 it had showed some initial results but needed to be extended on a larger scale.

The major infrastructure projects that were completed in the 1879-1925 phase included:

##### A) Water supply

- a) new spring water aqueducts: *Vigne* and *Avre* ; *Loing* and *Lunain* ; and finally the *Voulzie* in 1924,
- b) new investments in surface water production units totalizing 17 million francs between 1876 and 1889,
- c) the extension of the water distribution networks from 1527 to 2867 km that cost more than 20 million francs,
- d) the progressive use of disinfection and water treatment to purify drinking water (after 1911),

## B) Sanitation

- e) the extension of the sewer system from 619 to 1303 km (in 1913) for a total cost of more than 70 million francs,
- f) new land farming waste water disposal units downstream from Paris that were able to “treat” a fraction of daily Parisian water consumption, for a total cost of more than 50 million francs.

How was such an ambitious investment plan financed? This is the central question we will analyze in the next paragraph.

### 4.3 Financing tools for water and sanitation infrastructure (1853 – 1925)

In the first phase (1853-1880's), within Paris urban transformation, three techniques were used to finance water and sanitation infrastructure: funds taken from the city's ordinary budget surplus, land value capture mechanisms and municipal loans. Lump-sum investments such as long-distance aqueducts were financed through long-term municipal loans. On the contrary time-spread investments such as water and sanitation networks were largely made during Paris urban transformation and financed through land value capture schemes (§3.5). These schemes lightened the investment burden weighing on the municipal budget.

After the completion of Paris urban transformation in 1890, land value capture mechanisms played a minor role in water and sanitation investments and the majority of water and sanitation infrastructure were financed through municipal bonds.

In both phases, municipal debt was the key economic instrument used to channel savings into economic growth as a by-product of infrastructure expansion. Indeed, in the second half of the 19<sup>th</sup> century savings were high in France and still largely unproductive (Marchand 2011; Gandy 1999). Both Paris municipal bonds and the *Crédit Foncier* bonds (used to finance the “*Bons de délégation*”) were attractive investments.

Indeed, in a century of monetary stability, bonds issued by public authorities (including Paris municipal bonds) were safe assets and used as saving and pension tools (Delorme and André 1983, 610). In most cases the city publicly issued its own municipal bonds, however, there were also some cases of loans with bank intermediation, mostly with the *Crédit Foncier*. Through the 19<sup>th</sup> century, public debt was progressively bought not only by a booming *bourgeoisie* but also by the middle class (Delorme and André 1983, 610).

Municipal loans were mainly multipurpose ones allocated to various sectors of the city government. Allocation decisions were made by the City council and approved by the Government. Most of the time, water and sanitation allocations were lowered in order to give more funding to other sectors which were given higher priority. Only a few loans were specifically issued to finance water infrastructure (in 1872 for the Vanne aqueduct and 1908 for water and sanitation) and then they were justified by the high degree of “urgency” of the investments.

The City’s fiscal revenues were given as loan collateral in most of the loans; indeed the loan’s approval by the Parliament was conditional on the principle of using piggyback tax revenue as collateral. Since the WSSs often did not receive sufficient funding under the City council’s funds allocation decisions, various attempts were made in the 1880’s to convince the council to approve a specific loan dedicated to water investment where estimated future revenues of the WSSs were used as collateral. However these attempts all failed to obtain the City’s council approval (Cebron de Lisle 1991, 480). It was only after the 1894 *tout-à-l’égout law* that a 117.5 million francs loan which used the new sanitation levy as a collateral was approved by the City Council and by the Parliament. The sanitation levy, based on the property value, was still considered to be more similar to a fiscal revenue than to a rate. A further step was made in 1908 when water revenues were partially used as collateral to contract a loan<sup>64</sup>.

#### **4.4 Tariffs, policy and rhythm of connection**

In 1854 only one out of five buildings in Paris had a domestic water connection. Twenty years later one half of the buildings were connected. The number of domestic water connections increased from 6229 to 39 104 (Chatzis 2006). At first, two kinds of contracts were available: the *robinet libre* and the *à la jauge* subscription. The first gave an unlimited quantity of water but was offered only with Ourcq water. The latter consisted in installing a pipe gauged that only allowed a calibrated flow and it also required a water storage capacity within the building. It was used for higher quality water connections (*Seine* water at first and spring water later), with the goal of better controlling consumption (Cebron de Lisle 1991, 191). It was only after 1880 that subscriptions with collective water meters (one meter per building)

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<sup>64</sup> A special fund was created to collect up to 3 million francs coming from water revenues and allowing to cover the loan’s amortization. That special fund was supposed to be the collateral for the three first years while the general budget would be used as a collateral afterwards. (République Française 1912, 278)



started to be set up in order both to disincentivize excessive water consumption and to increase water revenues through more accurate metering and billing (Chatzis 2006). After 1894 only meter subscriptions were allowed for spring water which was sold at 0.35 F/m<sup>3</sup> with a discounted social rate for low income buildings. Surface water (Ourcq and Seine) was sold cheaper, roughly around 0.20 F/m<sup>3</sup> (Lemarchand 1923, 874). While the number of subscriptions to the domestic water supply increased, the number of public fountains and water extraction points decreased with severe effects on access to water for low income people (Barraqué 2013). Furthermore there were still strident inequalities in water quality and quantity delivered between the wealthy city centre and the working-class outlying districts. During the 1870's, the mortality rate in the low-income districts was twice or three times the average one in Paris (Jaquemet 1979, 522)

In the first half of the 19<sup>th</sup> century, landlords were not keen on subscribing domestic water connections contracts due to the implied costs both in the initial investment (nearly three times the annual subscription fee (Cebon de Lisle 1991, 190)) and in the daily operations. Indeed, a water connection implied emptying the cesspools (*fosses d'aisance*) more frequently in the building's basement.

Things changed after 1851, with the installation of the sanitary tubes (*tinettes filtrantes*) as the level of water consumption had no longer an impact on their emptying frequency. Landlords resistance to domestic water connection dwindled in the face of tenants demand for flats with water connections and the city's economic incentives. At the end of the 1870's lower water tariffs were approved and free installation of standpipes to bring water to all floors was proposed by the city to all un-connected building owners who signed up for a minimal annual water subscription (Bocquet, Chatzis, and Sander 2008, 8).

As soon as the landlords' opposition to water connection had been overcome, a new controversy arose around the *tout-à-l'égout* innovation which consisted in collecting feces through the drainage system while in Paris the feces were still collected through cesspools (*fosses d'aisance*) and sanitary tubes (*tinettes filtrantes*). Landlords opposed such a change since it would mean the payment of a sanitation levy (*taxe sur les tuyaux de chute*) based on the property value which they considered to be an "unequal" progressive tax since it would increase sanitation charges from 0.75 to 1.75 % of the gross property revenue (Jaquemet 1979, 536). Despite the opposition to it, the 1894 *tout-à-l'égout* act was approved : a

sanitation levy (*Taxe municipale sur les tuyaux de raccordement à l'égout*) had to be paid by all owners of buildings near a sewer (Décision of the City council January 27th 1892, Bellanger, Pineau, and SIAAP 2010, 85). The tax amount was based on the post tax net revenue of the building (Cebron de Lisle 1991, 648) and was higher for low revenue buildings than for high revenue ones (respectively 2% and 1.5% of the after tax net building revenues).

The *tout-à-l'égout* was progressively extended to all buildings but the speed of expansion was quite slow. By 1913 24,000 out of 71,000 buildings in Paris still did not have the *tout-à-l'égout* system. Furthermore, the expansion was spread inequally throughout Paris with the rich districts receiving the *tout-à-l'égout* system faster than the poor ones. Indeed, in 1901 the 5 richest (high rent) districts “had a connection rate of at least 54% (and 62% on average) while the 12 poorest districts had at most 39% of their buildings hooked up to the sewers (and 27% on average)” (Kesztenbaum and Rosenthal 2012a, 16).

Thanks to the 1894 law, not only did the sanitation service start to produce some revenues but also the water service's revenues were increasing since subscription to the water service was also made compulsory through the decree of the 8<sup>th</sup> August 1894. Officially such an obligation was made to ensure a sufficient fluidity in the sewer system but an implicit objective was also to improve the financial equilibrium of the water service (Tréhu 1905; quoted by Bellanger, Pineau, and SIAAP 2010, 84).

Incredibly, the 1894 water tariff (0.35 F/m<sup>3</sup>) was kept constant until 1920 when a new tariff of 0.65 F/m<sup>3</sup> was approved (Lemarchand 1923, 874). Due to the huge inflation of those years, in 1925 and 1926 new administrative acts decreed that water price should be indexed-link to coal price and salaries. Indeed, water rate increased significantly from 1.05 F/m<sup>3</sup> in the first half of 1925 to 1.46 F/m<sup>3</sup> in 1928<sup>65</sup>.

#### 4.5 Who did pay in the long-run ?

Having analysed how the investment were financed, as done in the previous sections, we now turn to a discussion of the long run cost allocation which was different from the short run one. If we adopt the OECD 3T's (Tariff, Tax, Transfer) methodology (OECD 2009a), which one of the 3T's actually paid back the investment *in fine* ? To answer that question, we analyze in detail the yearly financial report of the Paris municipality since the water, sanitation and canals (WSC) departments were included in the municipal budget.

<sup>65</sup> Archives Departementales de Paris, archival reference 2709W 24, « *liasse 8* »

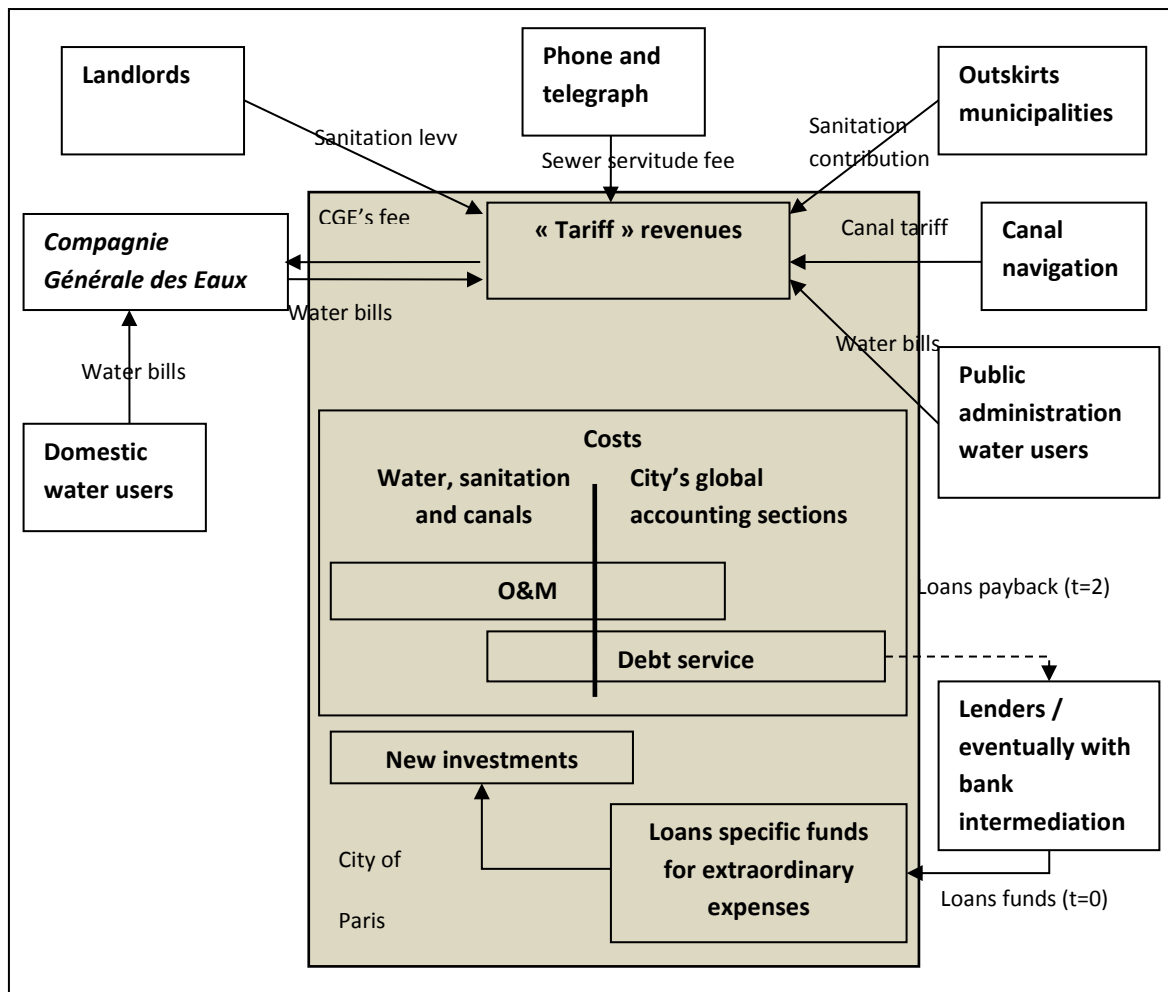
#### 4.5.1 Data from the municipal budget

The institutional scheme and the associated financial flows (1865-1925) are displayed in Figure 10. The city annual financial report (*Compte administratif de l'année...*) included distinct chapters for water, sanitation and canals.

Massarutto (2002; 2007) points out that often “it becomes very difficult to distinguish prices from taxes” (Massarutto 2002, 13). The main distinction we focus on is the one between revenues endogenous to the WSSs (Tariff according to the OECD) and ordinary fiscal revenues exogenous to the WSSs (Taxes). We consider the Paris sanitation levy to be an endogenous revenue contributing to the “Tariff” element of the 3T’s rather than to the “Tax” one (§4.4).

To sum up, revenues coming from “Tariffs” in those years were coming from domestic water users through water billing, from the canal navigation users and from landlords who were paying a sanitation levy. Additional minor revenues were also coming from the phone and telegraph right-of-way fees.

Figure 10 : Institutional scheme and financial flows of Paris's WSS (1865 1925)



Source : author's elaboration

On the costs side, three main categories should be distinguished: operational expenditures (OPEX), the debt service, and new investments expenditures. In the two first categories, only a fraction of the costs was accounted for in the water, sanitation and canals (WSC) chapter of the city financial report. On the contrary a part of the costs (most of the debt service and a significant part of the energy and of the human resources costs) was mixed up in the various chapters of the city budget (“external costs”).

#### 4.5.2 Investments and debt-service model

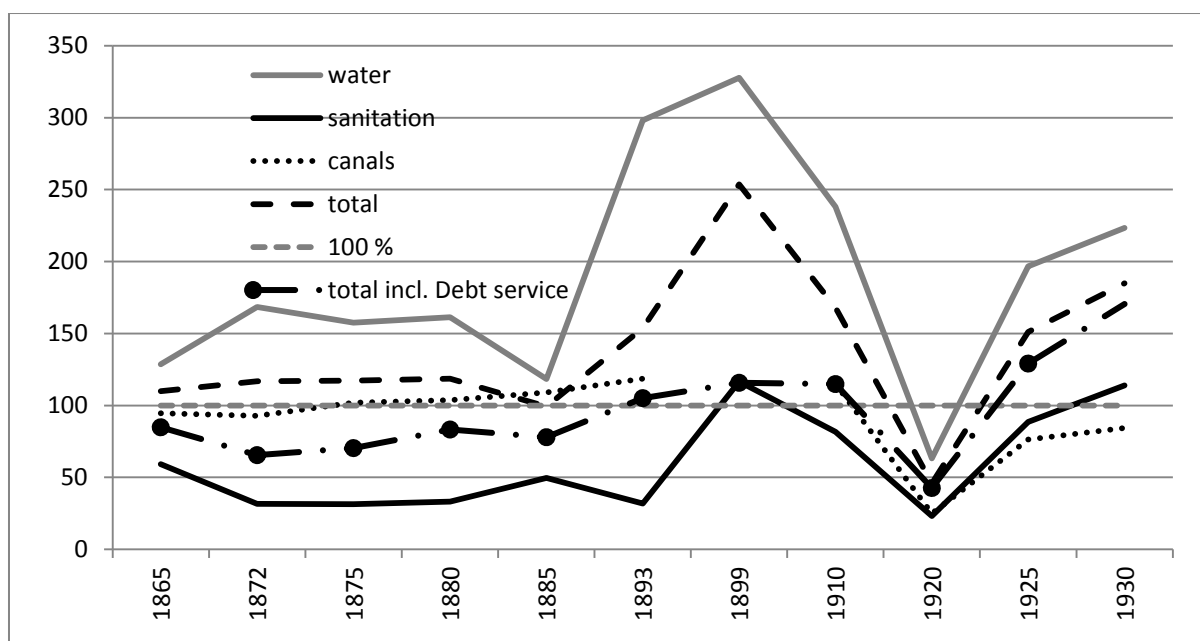
Investments were accounted for in a separate section (*Dépenses extraordinaires affectées sur fonds d'emprunt*). No accounting depreciation was in use. We used a simplified model based on the loans contracted by the city to estimate the total debt service amount. Only the capital fractions of the loan that financed water and sanitation investments are considered. Effective

interest rates and maturities from the real bonds are adopted. Debt's redemption is considered linear and with no grace period. Such a model is too simple to fully represent the complexity of the city's debt service but it is valuable in estimating the order of magnitude and trends of the variables. More details on the model are given in Crespi Reghizzi (2012).

#### 4.5.3 Results on Tariff coverage of the costs

The graph in the figure below shows the percentage of the yearly costs covered by Tariff revenues. By definition, costs uncovered by "Tariff" revenues are covered by the City's general budget, meaning "Tax" revenues according to the OECD definition. The graph does not take into account OPEX "external costs". If those "hidden subsidies" were considered, they would lower the percentages shown in the graph.

**Figure 11 : Share of the yearly costs of the Water, Sanitation and Canals services (1865-1930) covered by Tariff revenues [%]**



Source : author's elaboration - financial model based on Paris's city yearly financial report. Only the "total incl. Debt service" line refers to total costs including debt service while all other lines refer to OPEX costs only. "OPEX external costs" are not considered.

When considering OPEX only (all lines except "total incl. Debt service"), it appears that until 1925 "Tariff" revenues were not even sufficient to cover the Canals and Sanitation costs. On the contrary the water service had larger "Tariff" revenues which entirely covered internalized OPEX costs. Observing the overall picture of the Water, Sanitation and Canals (WSC)

chapters, total “Tariff” revenues were covering OPEX costs meaning that a cross subsidy between the three services was taking place.

When considering total costs, including the debt service estimated by our model, it appears that Tariff revenues (for WSC service as a whole) covered at least 70% of the total costs (65% in 1872) and more than 100 % after 1893. However, these percentages are over-estimated since they do not take into account “external OPEX costs” (in particular energy costs and engineers’ salaries) which were absorbed by the city overall budget in what would be considered as “Tax” subsidy in the OECD 3T’s methodology.

#### 4.5.4 The key role played by inflation

“France was paid for by currency distortions” (Sédillot 1953, 56) : this is the case also for Paris water and sanitation infrastructure. Inflation lightened Hausmann’s debt burden (Marchand 1993, 97; Sauvy 1965). Between 1899 and 1930, the debt service’s amount, while staying almost constant, represented progressively a lower percentage of the water, sanitation and canals budget. With time, Gross Profits (Tariff revenues minus OPEX) were high enough to cover the debt’s service cost meaning that “Tariff” revenue covered the full financial cost of the service with no more contributions from “Tax” revenues.

As a matter of fact, all the loans contracted by the city of Paris in those years had a fixed interest rate and most of them had long payback durations between 60 and 75 years. The great inflation rate of the 1910-1930 years in France absorbed a significant part of the debt’s residual burden. The graph in Figure 12 compares the real debt service with no inflation indexation and a “virtual” debt service increased by an inflation index<sup>66</sup> as if the loan repayments were indexed-link to inflation. Until 1912 the two curves are very close since inflation was low, after 1912 French annual inflation rates increased significantly and the debt service with inflation indexation curve diverts from the curve with no inflation indexation.

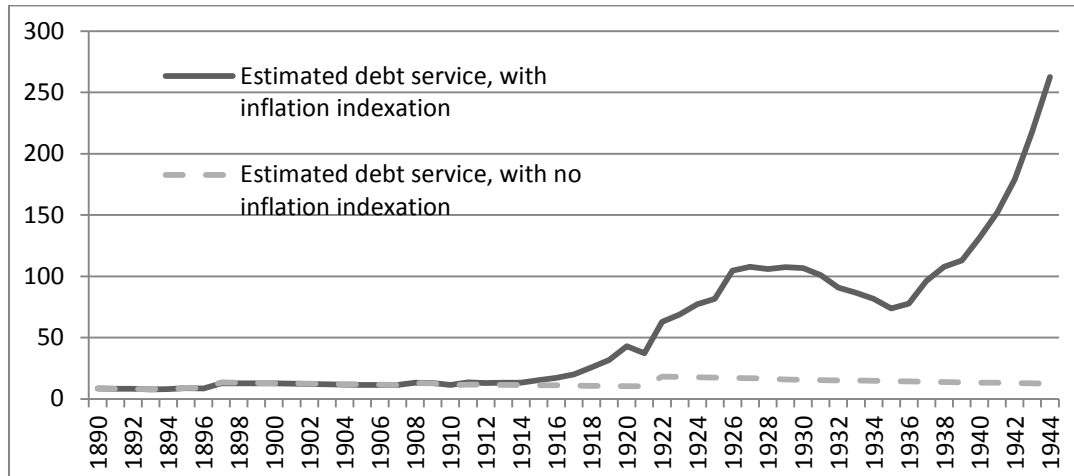
The increasing area between the two curves is a good proxy of the lenders progressive absorption of a significant part of the debt service in real terms. Total inflated debt service represents roughly 120 million francs over the 1900-1909 decade while it represents more

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<sup>66</sup> The inflation index is on an 1890 base (equal to 1 in 1890) and comes from Piketty (2001 annex F), inspired from INSEE, *Bulletin Mensuel de Statistique*, février 1999, pp.144-145 (“coefficient de transformation du franc d’une année ancienne en franc”)

than 800 million francs over the 1920-1929 decade, meaning that in real terms, a significant part of the debt's burden was absorbed by the lenders who happened to have made a very poor investment. In terms of long run cost-sharing equilibrium, inflation has played a key role since part of the capital costs have been removed from the water, sanitation and canals budget.

**Figure 12 : Estimated debt service in MF (1890-1944), comparison with or without inflation**



Source : author's elaboration, results from the model

## 5 Conclusion

Most of Paris water infrastructure was completed by 1925. Most of its elements including the gravity aqueducts, the storage units and the integrated sewer-supply networks are still in operation today to deliver and collect water. The canals are no longer a source of drinking water but are still in use for leisure and constitute a key element in the urban geography of Paris.

How was such a vast infrastructure financed? To answer such a question, the municipal finance context, the borrowing policy, and the land value capture tools have been described (Section 3). Through a review of the major investments in the water infrastructure, we analyzed a great variety of financing solutions: from fiscal resources to private concession, from bond issuing to land acquisition and resale policies (Sections 2 and 4).

To examine the long run cost allocation issue, we undertook a detailed analysis of the financial flows of the water, sanitation and canals (WSC) service from 1865 to 1930 using annual city financial report as the main primary source of data. Total costs (OPEX and debt service) were only partially accounted for within the water, sanitation and canals accounting chapter. Such a tight accounting link between the WSC services and the municipality general

budget is a sign *per se* that those services were managed as ordinary municipal departments even though they were labelled “*services industriels et commerciaux*”. However such an industrial and commercial nature is partially visible in the water service at the beginning of the 20<sup>th</sup> century since the water “Tariff” revenues were high enough to cover total OPEX costs. At the same time however the canals and sanitation “Tariff” revenues did not cover total OPEX costs.

In addition we also showed through our debt service model that WSC total “Tariff” revenues were only partially sufficient to cover full costs (including debt service) implying that “Tax” revenues were also contributing to servicing the debt service coverage until at least 1912. Millward (2000, 329) describes a similar situation for water services in Great Britain which “made large operating surpluses but were usually not enough to meet loan charges.”

After 1912, the situation changed in Paris since the debt service stayed roughly constant while the revenues and other costs increased due to high inflation in these years. The joint effect of high inflation and long term fixed interest rate loans significantly reduced the municipal debt service in real terms. In 1910, the debt service represented the same order of magnitude of the WSS total gross profit, but by 1930, it represented only one tenth of WSS total gross profit.

Another striking finding from our case study is the essential difference in the chosen financing policy between lump-sum investments such as aqueducts or water treatment plants and networks. Not only can network investments be easily spread over time and at least partially absorbed by ordinary budget surpluses but they also appear to be intimately linked with the urban transformation of the city.

It is common for urbanists to characterize the fluid networks as the blood vessels which bring life to the city. Victor Hugo referring to Paris’ urban transformation wrote that “*Every time that the city opens a street, the sewer stretches out an arm*”.<sup>67</sup> Our study shows that on the financial side too the water and sanitation networks’ expansion was closely tied to the city’s urban transformation since a significant part was financed through land value capture schemes. Financing municipal investment through the mechanisms of urban development and real-estate added value capture is a very popular public policy choice recommended by international donors (Peterson 2009; Paulais 2012a; Paulais 2012b). According to this view a

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<sup>67</sup> « *Chaque fois que la ville perce une rue, l’égout allonge un bras* », Victor Hugo, *Les Misérables*, quoted by (Cebron de Lisle 1991, 678)



city can capture a part of the added value created by urban development and use this money to finance further urban development projects or municipal investments including water and sanitation infrastructure.

In terms of cost-sharing in the long run, it appears that both inflation and the use of land value capture financing tools allowed to “externalize” out of the water and sanitation budget a considerable part of the investment costs and helped the water service reach financial equilibrium.

In the early 20<sup>th</sup> century in Paris both “Tax” and “Tariff” revenues were used to cover water infrastructure investment costs. In the 1960’s, the “water pays water” (“*L’eau paie l’eau*”) paradigm was implemented in France and a few decades later, full cost recovery was also recommended at the European scale through the year 2000 water framework directive. Although international institutions have softened their position on the issue of full cost recovery (according to the 3T’s paradigm), revenues coming from Tariffs are still considered more legitimate than the others two T’s (Gurria 2012).

Today, the financial equilibrium of water and sanitation services in France is severely challenged. A rich policy debate is taking place: should the French water sector move to a different mix of the 3 T’s to generate revenues (CNE 2013)? For example various policy makers want the “Tax revenues” to cover the costs of rain water collection and treatment. A trend in favour of a different mix of water Tariff and Tax revenues is noticeable in the French water policy debate. Will the financial flows of the water sector in France in a few years have similarities with the early 20<sup>th</sup> century picture ?



## Providing and financing a municipal infrastructure: water and sanitation investments in Milan (1888-1924)

Olivier Crespi Reghizzi<sup>68,69</sup>

### Abstract

Sustainable financing is a major challenge for the water sector both in many developing countries where water and sanitation services are still in the expansion phase and in Europe where the water industry is facing major investments needs too. To give more depth to the present policy debate a historical perspective on water services financing is needed.

Water and sanitation services (WSS) have been mostly provided in Italy (and in Europe) at the municipal level. WSS are highly capital intensive. How water and sanitation infrastructure has been financed by Italian municipalities? What were the financing tools implemented to cover the huge investments' costs in the short run? Who were the final end-payers in the long run?

In Italy intergovernmental financial relations between municipalities and the central state changed significantly from 1861 till now : fiscal autonomy or dependence from central state transfers, balanced budget obligation or not, degree of borrowing autonomy. This is a useful background element to our work.

Our paper focuses on a detailed analysis of the rolling-up phase of Milan modern water and sanitation service (1888-1924). A variety of implemented financing schemes and institutional solutions (municipal budget - fiscal resources, municipal bond and land added value capture schemes) are identified and described.

More over the financial equilibrium of Milan's WSS is analysed. A discussion on on the long run cost allocation of the chosen financing schemes is made using the OECD 3T's scheme. Furthermore a basic overlapping generation model is used to explore how the infrastructure costs have been allocated between the various generations. It appears that long term debt and inflation played key roles in absorbing part of the investments' costs.

### Keywords:

Financing history, Municipal Infrastructures, Water supply and sewerage, Milan, intergovernmental relations, 3T's, cost sharing, deficit financing, Italy

JEL: H54 – H71 - H72 - H74 - L95 - N73 - N74 - N83 - N84 - N93 - N94

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<sup>68</sup> Centre International de Recherche sur l'Environnement et le Développement (CIRED), AgroParisTech – Paris, [crespireghizzi@agroparistech.fr](mailto:crespireghizzi@agroparistech.fr)

<sup>69</sup> Centro di Economia Regionale, dei Trasporti e del Turismo (CERTET), Università Commerciale Luigi Bocconi – Milano

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## 1 Introduction

In many developing countries water and sanitation services (WSS) are still in a phase of development and network expansion. The water industry is very capital intensive and requires huge lump sum investments particularly in the early phase of expanding the infrastructure. In a historical perspective how to finance these investments has constantly been a major concern, not always easy to solve. Adopting a “long run” historical perspective on WSS financing as we do in the present paper can be highly beneficial to give more depth to the present policy debate and enlighten present and future challenges both in developing countries and in Europe.

WSS have been mostly provided in Italy (and in Europe) at municipal level. They are highly capital intensive particularly in the networks’ expansion phase. How water and sanitation infrastructure rolling-up and provision has been undertaken and financed by Italian municipalities ?

This paper focuses on the case study of Milan’s water and sanitation service from its genesis as a “modern” service in 1888 to the year 1924<sup>70</sup>, using the municipality’s yearly financial report<sup>71</sup> as the main data source.

Through the second half of the 19<sup>th</sup> century Milan was facing a demographic revolution driven by massive flows of immigrants. Indeed, at Italy’s unification in 1861, Milan had only 196 109 inhabitants. With the birth of large industries<sup>72</sup>, Milan’s population grew massively also thanks to immigration from rural areas. In 1911 there were more inhabitants in Milan (590 000) than in Turin (427 106) and Rome (511 076) and the population gap with Naples (678 091) was much smaller than in 1861. By 1931 Milan had a greater population (992 036) than all other Italian cities except Rome (1 008 083).

Such a huge demographic growth implied a massive urban expansion which first took place in a spontaneous and unruled way in the outer area of expansion of the city. Things changed only in 1889 when a city development master plan (*Piano regolatore*) designed by Engineer

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<sup>70</sup> After 1924 the fascist regime abolished the autonomy of Italian municipalities (*ordinamento podestarile*). In those years Milan municipal budget and reports are not available anymore.

<sup>71</sup> *Conto consuntivo dell’anno*

<sup>72</sup> Such as Riva in 1889, Carlo Erba in 1892, Tecnomasio Brown Boveri and Breda in 1903, Marelli in 1905, Pirelli, Falck and Alfa Romeo in 1906 (Borioni 1982, 60)

Beruto was approved by the Italian parliament<sup>73</sup> after having been adopted by the City Council in 1886. Due to such a fast demographic growth and urban development, a modern water and sanitation infrastructure was seriously required and could no longer be postponed.

Water and sanitation in Milan (and in Italy) is very much a municipal story. How did the municipality manage to finance such a costly infrastructure ? To tackle such a question the Italian municipal fiscal *regime* is described (section 2) with a detailed focus on Milan's municipality financial constraints. Land value capture tools are given a specific attention too to understand why they failed to play a major role in Milan's urban infrastructure financing conversely to the Paris case (§2.2 and §2.3).

Section 3 focuses on the water and sanitation infrastructure brought to completion and estimates the total invested amounts in water and sanitation in Milan to more than 300 Million 1924 Italian Lira. This is the order of magnitude of the whole 1921 municipal budget. What were the financing tools implemented to cover the huge investments' costs in the short run? Repayable finance played a major role as we show in Section 4. What was the borrowing regime of Italian Municipalities like (§4.1 and §4.2) ? What were the deficit financing tools implemented in Milan (§4.3 and §4.4)?

Who were the final end-payers in the long run? Referring to the OECD 3T's methodology, were they the users or the tax payers ? To tackle this question Section 5 focuses on how the WSS were charged to the users while Section 6 analyses in details the financial flows of the water and sanitation service using figures from the yearly municipal financial report and determines whether tariff revenues were covering the full service cost or not. The key role played by long term debt and inflation is analysed too (§6.4). To discuss who were the end-payers and to estimate the intergenerational transfers a basic overlapping generation model is implemented (§6.5) to explore how the infrastructure costs are allocated between the various generations.

## 2 Municipal finance (1861-1930)

### 2.1 Intergovernmental financial relations in Italy (1861-1930)

The financial organization of the newly born Italian state was progressively set between 1861 and 1876. The imposta di ricchezza mobile (income tax on all revenues except property ones)

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<sup>73</sup> The public utility declaration decrees were approved by the parliament the 29<sup>th</sup> April 1888 and the 11<sup>th</sup> July 1889.

which was previously in place in the Regno di Sardegna was extended to all of Italy (legge 1840 del 14 luglio 1864). It was a non-progressive income tax on all incomes except those deriving from landownership which were taxed through the imposta sui terreni (land property tax) and imposta sui fabbricati (buildings property tax) (legge n°2136 del 26 gennaio 1865).

The Italian state was heavily centralized and municipalities (comuni) were under the tight control of the prefetto<sup>74</sup> (prefect) who was both the government's representative and the head of the provincia's (county) administration (Cassar and Creaco 2007, 713–715). Intergovernmental relations were designed in a centralized way through various acts, particularly the 1859 Rattazzi decree (Regio Decreto 23 Ottobre 1859 n°3702) and the 1865 act (Legge n° 2248 20 Marzo 1865). According to those acts, municipal expenses were classified in compulsory (spese obbligatorie) and optional ones (spese facoltative). The municipalities could undertake optional expenses only once they had covered all the compulsory ones. However the distinction between the two categories was quite arbitrary and among the compulsory expenses<sup>75</sup> there were some expenses which by definition should have been under the central government's responsibility: primary education, national defense, elections costs, prisons<sup>76</sup>. Furthermore, the fact that the optional expenses (such as public works and infrastructure) were disincentivized was by itself a problem.

Municipal revenues were authorized to come from various sources: i) non fiscal sources (such as tariff revenues from municipal services including water and sanitation), ii) autonomous taxes and iii) additional levy on national taxes (the so called sovraimposta). No recurrent transfers from the central government were in place (except minor ones).

The dazio di consumo (excise duty) was the major municipal fiscal revenue. However a ceiling on the dazio di consumo was fixed by the 1865 act in order to avoid excessive taxation on low income people (Cassar and Creaco 2007, 716). In Italy, the excise duty was both a central and local tax. Municipalities were authorized to tax additional duties on goods already taxed by the central state excise duty and were authorized to create autonomous excise duties only on goods with a minor fiscal yield (Volpi 1959, 16). Progressively the municipalities'

<sup>74</sup> The mayor were formally appointed by the king. The prefect had the power to revoke the mayors.

<sup>75</sup> Maintenance of water supply systems and of streets were among the compulsory expenses while all new investments (capital expenditures) were considered as optional expenses.

<sup>76</sup> "*istruzione elementare per i due sessi, guardia nazionale, registri dello stato civile, elezioni, sala d'arresto presso la giudicatura del mandamento e per la custodia del mandamento*". Art 116 legge 20 marzo 1865 n° 2248 quoted by (Volpi 1959).

share on the excise duties revenues increased as the other fiscal incomes were reduced<sup>77</sup>. However excise duty revenues were fully given to municipalities only in 1923 (Volpi 1959, 20)

If total revenues coming both from non fiscal sources and autonomous fiscal revenues were not sufficient to cover the compulsory expenses, municipalities could ask to be authorized to impose additional levies on national taxes (income tax, land property tax and building property tax). The additional levies had to weigh similarly on the three taxes (Cassar and Creaco 2007, 716).

The fiscal regime of municipalities had some weak points which put the municipalities in an uneasy financial situation. A first weakness came from the fact that the central state and the municipalities were sharing the same fiscal revenues. Thus, a significant fiscal competition took place between the two levels of the state. On one hand even if the legislator had thought of the *sovraimposta* as last resort source of revenue, municipalities considered *sovraimposta* as an ordinary fiscal source (Fraschini 1991, 26). Indeed, they always preferred to increase *sovraimposta* rather than setting autonomous taxes since *sovraimposta* were less visible and more easily hidden behind the central state mask (Locatelli 2010, 13; Cassar and Creaco 2007, 717). On the other hand the central state, which was facing a tight financial situation too, progressively limited the municipalities' fiscal autonomy (Marongiu 2001, 19) while extending the list of compulsory expenses of the municipalities as stated by Luigi Einaudi : "The central state kept confiscating municipal revenues while it transferred new expenses to municipalities"<sup>78</sup>.

Only minor modifications to the municipalities' fiscal regime were approved in 1898, 1908 and 1915. When comparing intergovernmental relations in Italy over the 80 years between 1861 and 1941 with more recent decades a major feature of those early years appears: at that time transfers between the central state and the municipalities were not taking place and own tax revenues to total spending ratio was very high (including both autonomous and non-

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<sup>77</sup> Furthermore a municipality could chose to collect not only its own share of the excise duty but also the central government share on its behalf. In that case the municipality would guarantee a fixed revenue (*canone daziario*) to the central government. The amount of such *canone daziario* was judged too high by many municipalities and special acts were passed to delay its payment in various instalments (Volpi 1959, 20). At the end of the 19<sup>th</sup> century the *canone daziario* amount was frozen and stayed untouched for many years meaning that the central government share on the excise duties was falling down steadily leaving most of it to the municipalities

<sup>78</sup> *Lo Stato di fronte ai comuni non ha Saputo far altro che togliere entrate da una parte e rovesciare su di esse nuove spese generali e non locali* ; L. Einaudi, *Pronunciamento dei comuni in Cronache*, 1905, II volume, p 203, quoted by Cassar and Creaco (2007)



autonomous tax revenues). Indeed, according to Marongiu “before WWI fiscal decentralization was much more significant than in all the rest of the 20th century”<sup>79</sup>. Surprisingly, no equalizing mechanism was in place in a newly born country which had major geographical variability between the North and the South (Giarda 2005) implying that low revenues municipalities were not always able to deliver public services (Fraschini 1991, 27).

As progressively the responsibility of more public services was given to the municipalities (thus increasing compulsory expenses) while their fiscal autonomy was reduced, the average income to expenses ratio progressively fell down from more than 100 % in 1866-1868 to 94 % in 1899, 89% in 1907 and 79,81 % in 1912 (Cassar and Creaco 2007, 721). Nevertheless, municipal budgets had to be balanced (including the debt service) in order to be approved and the solution often came from repayable finance as we shall see in section 4.

## **2.2 Taxing (or not taxing) land added value**

During the 40 years under study, massive urban expansion took place in Milan. In the framework of various city development master plans, large investments were undertaken by the municipality to build basic infrastructure including water and sanitation. Those investments had the effect of significantly increasing the value of the properties near by.

According to value capture theory, urban infrastructure can be financed endogenously if the local authorities are able to design proper institutional mechanisms to capture the added value created by urban growth. In other terms through a value capture financing scheme a public administration can monetize a part of the positive externalities of an infrastructure project (Brugnoli 2010, 15). There is a large variety of tools which can allow doing this as the table below shows. This paragraph focuses on the mandatory fiscal tools in Italy while paragraph 2.3 focuses on other tools and policies implemented (or not implemented) in Milan.

In Italy the principle that “those who retrieved some earnings from an infrastructure should give a contribution to the betterment costs” had been included in the June 25th 1865 act on expropriation for public utility (Marongiu 2001, 86). Other acts approved in those years for specific urban transformation were based on such principles. However the 1865 act required very specific conditions to be applied. Conversely to what was enforced at that time in other

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<sup>79</sup> « *Prima della prima guerra si ebbe un decentramento delle entrate quale dopo non si ebbe per tutto il resto del '900* » (Marongiu 1999, 9–15; quoted by Locatelli 2010, 18)

countries (England, Prussia and USA), an act allowing to systematically capture a share of property value increase did not exist in Italy in the 19th century.

**Table 4 : Value capture financing tools**

Capture from (Who is the payer?)	Voluntary tools	Mandatory tools	Comments
Developers	Joint development	-Development exaction and impact fees - Public land acquisitions and resale	Expansion areas / integrated urban renovation operation
The community <sup>80</sup>	No	-Betterment levies -General infrastructure tax on land value gains	Built up areas
Within	Internalization (integrated urban developer)	No	

Source : author's elaboration based on concepts from various sources (ReUrba 2006; Peterson 2009; Brugnoli 2010)

In 1904 a tax on buildable land areas is approved in Italy<sup>81</sup>. The 1904 act was designed however to incentivize building rather than capturing a share of property value increase<sup>82</sup>. Indeed the idea of allowing local authorities to control land rent was still not present (Dorigati and Molon 1982, 184). As a matter of facts in 1914, Milan's municipal administration was still asking for a legislative act allowing to capture property value increase caused by municipal infrastructure, since the tax on building areas was not judged sufficient to capture the land value increase (Sai et al. 1970, 229–230).

Not only did Italy not manage to design a proper tax to collect a share of property value increase but also the property tax<sup>83</sup> provided for by the 1865 act was collected not rigorously since the tax base (property values) was not kept up to date (Dorigati and Molon 1982, 263). Indeed a general property value review was made only in 1870 and 1890 while partial property value reviews implemented after 1910 (according to the 1865 act) were not sufficient to modify the tax base (Sai et al. 1970, 229–230).

Italy was unable to implement effectively a tax system allowing to capture land value, neither through betterment levies nor through a general tax on property values increase.

<sup>80</sup> "The community consists of all property owners in the direct vicinity of the infrastructure (direct beneficiaries)"(ReUrba 2006)

<sup>81</sup> *Tassa comunale sulle aree fabbricabili*, approved by the Legge n°320 8 Luglio 1904

<sup>82</sup> Such a tax was initially conceived for the Rome municipality but then extended to all municipalities who needed to incentivize to build houses. It was to be paid until a building had been completed on the area. "...imporre una tassa sulle aree fabbricabili, la quale anzichè avere uno scopo fiscal, tendesse essenzialmente a stimolare i proprietari di aree fabbricabili a costruire sulle medesime nell'interesse di quell maggior sviluppo edilizio, che era vivamente reclamato dalle condizioni della città."(Municipio di Milano 1907a).

<sup>83</sup> Including the additional tax (*sovraimposta comunale*) on property.

### 2.3 Land acquisitions and resale policy in Milan

In the previous paragraph we have showed that tax tools were unable in Italy to capture a share of the property value increase created by the built infrastructure. We also mentioned that many other value capture tools exist. One of them which has been ambitiously implemented in the those decades in Paris under Haussmann's ruling, consists in a municipal policy of land acquisitions and resale (Crespi Reghizzi 2012). To what extent such a value capture tool was implemented in Milan ? This paragraph focuses on such a question.

Prior and in parallel with the Beruto masterplan a large urban transformation operation was undertaken in areas next to the castle (Foro Buonaparte – Castello - Arena – Arco della Pace) when the decision of moving the Piazza d'Armi<sup>84</sup> (military area) was taken. Through such an operation the municipality obtained the castle and the former military area from the central state, in turn it had to give the new Piazza d'armi area to the State plus a 3 million lira grant to contribute to the barracks' construction. At first land market prices in the two areas were very different : 8 lira /m<sup>2</sup> in the castle area Vs 2.70 Lira/m<sup>2</sup> in the new Piazza d'armi area. In addition to the area given by the state, the municipality also obtained from the Società Fondiaria some land to build new streets and urban services. The 182 000 m<sup>2</sup> available for building were entirely sold to the banker Marsaglia in 1886 for 11 million lira (60 lira/m<sup>2</sup>) (de Finetti, 352). The whole operation was profitable and gave a significant additional extraordinary revenue to the municipal budget. Unfortunately such an operation was quite an exception. Indeed, the city could have invested profits made in such an operation to buy land at low prices in the periphery which could have been sold afterwards at higher market prices fueling a revolving mechanism (de Finetti, 352). On the contrary the Beruto city development masterplan did not adopt such a policy.

A municipal policy of land acquisitions and resale policy consists in owning or “acquiring lands near by an infrastructure project and then sell it on completion of the project” (Peterson 2009, 41). A key issue in implementing such a policy is the expropriation power held by the municipal authorities. Expropriation policies can be classified in three categories: i) expropriations are limited to the new streets, ii) expropriations are undertaken not only for street areas but also to build collective facilities (such as schools, public gardens...) and iii)

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<sup>84</sup> This is the same area on which a corruption scandal with mayor Bellinzaghi arose in 1884. The urban operation was implemented in the end after Bellinzaghi quitted. We do not know whether bribery took place on the final deal or not.

expropriations are authorized to a very large extent in order to finance urbanization costs through the selling of land or buildings at higher market value once the urban infrastructure are constructed.

According to Campos Venuti (1986, 12) the first version of the Beruto masterplan was clearly fitting in the second policy category. It planned a street network widely meshed with large size blocks, while its second version planned a much more dense mesh with smaller size blocks much more favourable to real estate speculation. However the first Beruto masterplan was never approved. A second version was enforced instead : with much smaller blocks was then clearly less constraining for the land-owner bourgeoisie as Beruto himself states : “small blocks are due to the real estate speculation’s interests<sup>85</sup>”. Through the implementation of the second version of the Beruto masterplan Milan’s municipality accepted to absorb all the infrastructure costs without managing to involve the private operators in the financing process (Boriani 1982, 59).

Until the first years of the 20th century value capture policies were not largely implemented in Italy also due to the weak available legislative tools on expropriation (1865 Pisanelli act on expropriations and 15 gennaio 1885 act on Naples urban renewal). In 1907<sup>86</sup> the city of Rome was given the right to expropriate land owners more easily in order to capture land value. In Milan’s City Council the opposition asked the majority to obtain a similar expropriation power in order to make the landowners contributing to the financing of the city’s infrastructure (Dorigati and Molon 1982, 185). However more powerful expropriation tools (allowing for example to expropriate to build social housing) were given to the City of Milan only with the approval of the Piano di ampliamento in 1912.

Without waiting 1912, a timid value capture policy based on land acquisition of larger areas surrounding the new streets was undertaken in 8 districts developed between 1905 and 1912 in the framework of “integrated urban operation of housing and collective services”(Boriani 1982, 83). The policy proposed by engineer Cesare Saldini and adopted by mayor Cesare Ponti consisted in buying large expansion areas of the city (de Finetti, 343) which could be sold back by the municipality at much higher value<sup>87</sup>.

<sup>85</sup> « *gli isolati piccoli sono il prodotto della speculazione* » (Beruto 1885, 6)

<sup>86</sup> Legge 11 luglio 1907 n°502

<sup>87</sup> “*Già a quest’ora sono assicurati al comune 1360 000 mq di aree che costarono, tutte insieme circa 4 milioni e mezzo ; vi si dovranno sistemare a strade circa 400 000 mq; vi si dovranno attivare i pubblici servizi di*

Such a land acquisition policy was judged insufficient by the opposition as shown by the discussion of the 1907 70 million lira loan with the Cassa Depositi e Prestiti. Mr Bottini (representing the opposition) argues that “the city government (Giunta) is planning too little land acquisitions to obtain significant added value<sup>88</sup>”. The council member Morpurgo replies that a more ambitious land acquisition policy allowing to capture land added value more extensively would imply to contract a much larger loan which is not possible since the revenues from the additional tax (sovrimposta) are not high enough.

Such a debate points out that in addition to the availability of powerful expropriation legislative tools, the capacity of mobilizing quickly large amounts of money is another key condition needed to implement ambitious land value capture policies. Under Haussmann’s ruling in Paris appropriate expropriation tools were given to the municipality which in turn issued massive debt to finance an urban transformation based on very large land expropriation (Crespi Reghizzi 2012). Conversely in Milan’s both these two essential conditions were not met : available expropriation tools were weak and the borrowing policy was very cautious and constrained. Indeed, as a matter of facts only two major urban value capture operations were undertaken in 1885 (Foro Buonaparte area) and in 1905 (Saldini – Ponti policy). With the exception of these two urban operations value capture mechanisms did not play a significant role in financing Milan’s urban infrastructure including the water and sanitation one.

## 2.4 Milan’s municipality : financial constraints

In the second half of the 19th century Milan’s municipality was facing tight financial constraints for various reasons. Firstly it was affected by the general framework of Italian municipal finance (§2.1) : on one hand its fiscal autonomy was progressively reduced by national acts, on the other hand the list of municipal compulsory expenses was growing. A second reason of concern was the fast urban and demographic growth which required huge municipal investments to roll up a modern infrastructure.

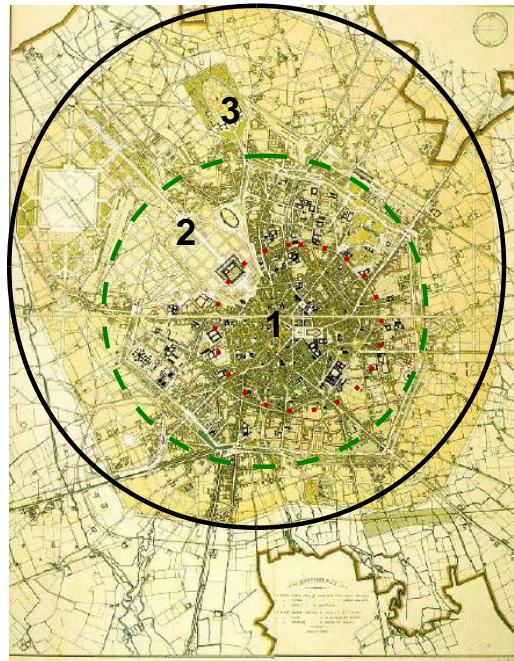
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*fognatura, illuminazione, acqua potabile; si dovrà dar loro vita con un pronto allacciamento alla rete tranviaria e tutto ciò richiederà una spesa che si preventive in circa 3 milioni; sono quindi 7,5 milioni all'incirca che si dovranno spendere nel quinquennio, ricorrendo a fondi straordinari, per assicurare al Comune una superficie netta fabbricabile di circa un milione di mq. Non v'ha dubbio che, a sistemazione fatta, il valore di quell'area supererà di gran lunga le spese che il Comune avrà anticipato ».*(Municipio di Milano 1905, 32)

<sup>88</sup> « Così la Giunta propone l'acquisto di aree ma in misura troppo limitata per fornire largamente del plus valore e senza un concetto direttivo » (Atti del Municipio di Milano 1906-1907, seduta ordinaria del 19 luglio 1907, p 572)

After Italy's unification, as usual for Italian municipalities at that time, the excise duties were the municipality's main source of revenues (Sai et al. 1970, 26). At that time Milan's municipality administrative area was quite small (area 1 + area 2 in Figure 13) and limited by the "Spanish walls" (le mura spagnole or bastioni) schematized by the green circle on the map below. The mainly rural area outside the Spanish walls was under the administrative authority of the rural municipality of I Corpi Santi (just outside of the green circle in the map). Looking further away from the I Corpi Santi the administrative fragmentation was even larger. In 1861 a total of 30 municipalities existed within the present day surface of Milan's municipality (Buzzi Donato 1969, 5).

**Figure 13 : The Beruto city development master plan**



Source : author's elaboration, original map from Beruto (1885)

This was a major problem since due to fiscal opportunism, manufacturing activities were settling in the I Corpi Santi area in order not to be subjected to the excise duty<sup>89</sup>. Although the city's administrative area grew significantly in 1873 with the annexation<sup>90</sup> of I Corpi Santi, at first things did not change very much from a fiscal point of view since the annexated

<sup>89</sup> *“si tratta di un dazio che bandisce dalla città nostra le industrie, spingendole oltre le mura, vessatorio su mille modi, immorale nelle conseguenze del contrabbando”* Mussi at the City Council in 1872. quoted by (Sai et al. 1970, 32).

<sup>90</sup> Two annexations took place in Milan : in 1873 and in 1923. In the last one 11 other municipalities were annexated giving to Milan roughly the same size it has nowadays (18 176 ha while it had a surface of 7600 ha prior to 1923) and increasing significantly its population too.

areas were exonerated from the excise-duty. I Corpi Santi were subjected only to the Imposta sulla minuta vendita and as a fact each inhabitant was subjected to less than a third of tax compared to an inhabitant of the inner area (Volpi 1959, 23).

Things changed only in 1898 with the abolition of the physical excise-duty barrier which was separating the inner and outer part of the city. Excise-duties started being collected in the whole city only on some large consumptions goods (beverages, meat, forage and building material) through a “virtual barrier”(Volpi 1959, 24).

Thanks to the 1898 fiscal reform Milan’s municipal budget managed to balance or to have only a minor imbalance from 1900 to 1905. Between 1904 and 1908 Milan was faced with a major phase of demographic and urban growth (built area increased from 10.2 to 15.5 thousands of square meters). Public services and public networks required massive investments to follow such a fast urban transformation. In 1906 and even more in 1908 (also due to the international exhibition costs) the municipal budget closed again with a significant imbalance (Volpi 1959, 27). During WWI municipal expenses (particularly investment ones) dropped significantly and increased steeply after the war (Volpi 1959, 28).

**Table 5 : Milan’s municipal budget balance / imbalance**

	Fiscal revenues	Non fiscal revenues <sup>91</sup>	Total ordinary revenue <sup>92</sup>	Ordinary expenses	Ordinary budget balance	Extraordinary expenses	Total budget balance
	I	II	III	IV	V=III-IV	VI	VII=III-IV-VI
1888			18.4	16.9	1.5	24.56	-23.06
1898	15.3	2.9	19.5	17.9	1.6	10.6	-9
1903	20.8	4.8	27.2	22.2	5	5.4	-0.4
1908	27.6	8.9	38.8	34	4.8	14.6	-9.8
1913	35.4	12.1	53.3	43.2	10.1	13.58	-3.48
1918	44.2	14.47	66.1	62.7	3.4	20	-16.6
1921	155.9	32.3	200.8	185.6	15.2	102.2	-87

Source : author’s elaboration from Sai et al (1970, 232) and municipal yearly financial reports, all figures in Million Italian Lira.

<sup>91</sup> Non fiscal revenues are composed of tariff revenues from the following municipal services: tramways, electricity, water and sanitation.

<sup>92</sup> Total ordinary revenues (column III) are not only the addition of fiscal and non fiscal revenues (columns I and II), there is a third addend, not given in the table, which is represented by the “*rendite patrimoniali*”. Under such a label are included : revenues from municipal buildings, revenues from government bonds, revenues from concessions to private companies (tramways to the Edison company). We have omitted them from the table since they always represented minor amounts.

The other part of the equation is given by deficit financing which allowed to cover not only the capital expenditures but also the eventual imbalances on ordinary expenses as we will detail in section 4.

### **3 Investing in a modern water and sanitation service**

#### **3.1 Far away water versus water from below the city ?**

Milan is located in the middle of the Pianura Padana lowlands with no river flowing through the city. A system of canals (the so called navigli) had been built through the centuries for navigation purposes. It also allowed to channel water to the city.

In the second half of the 19th century there was still no modern water supply system in Milan. Water from the navigli was used for all non-drinking usages while drinking water came from private shallow wells (Bigatti 1997, 29) since the city lies on an abundant aquifer. Most of the wells were excavated down to 6-7 m depth although there were also a few bore-holes drilled down to 10-12 m depth (ATO Città di Milano 2007, 78). Water was available in large quantities and some buildings had pumps installed which made water available upstairs (Colombo 1984, 119).

Through the 1870's however groundwater quality started to deteriorate and many scientific studies showed the link between its pollution and the quantity of waste water discharged in the ground which was significantly increasing due to the extraordinary urban growth (Colombo 1984, 119).

Through the years the scientific and decision making circles became progressively aware that the vicious spiral of waste water polluting the aquifer from which water was withdrawn had to be broken up<sup>93</sup>. According to the water quantity paradigm (Barraqué 2003b), which was mainstream at that time in Western Europe, clean water was brought to the city from far away sources. Following that line of thought, a call for water supply projects was launched in 1881 by Milan's municipality. The scope was not only to find the best way to deliver far

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<sup>93</sup> *“Tutto all’aves! Si potrebbe dire il sistema di fognatura della città, volendo darne una succinta definizione quantunque esagerata...E l’acqua da bere? Tutta dall’aves! Ecco il ciclo che devesi assolutamente interrompere”* Felice Poggi, quoted by Colombo (1984, 119)



away water to the city but also to “allow the European monetary markets to provide capital to build such an infrastructure” 94.

Among the 12 projects in competition the municipal commission ranked first a project by the Società Italiana condotte d’acqua (linked to the Banco di Roma) and a contract was signed. The project planned to channel spring water nearby the Brembo River and to reach Milan through a 45 km gravity aqueduct plus a 25 km pressure pipeline. A public utility declaration from the Ministry of public works was needed to allow the land expropriation and start the project. The inhabitants of the Brembo valley fiercely opposed<sup>95</sup> the project. Various people and institutions took part in the debate as Colombo (1984, 120) reports. In 1885 the ministry ended up not awarding the public utility declaration for the project<sup>96</sup>.

Milan’s municipality terminated the contract with the Società Italiana condotte d’acqua and launched in 1887 a new call for projects, much more detailed than the first one. Mainstream thinking had changed through the time and spring water was not anymore a priori preferred to groundwater. 22 projects were in competition and evaluated by the municipal commission which however was unable to make a choice.

### 3.2 Rolling-up the water service

In July 1888 the City Council chose to experiment a water supply pilot project which had been designed by the engineer Felice Poggi within the municipal technical department (ufficio tecnico comunale). According to such a project a few deep bore holes were to be drilled, a pumping station installed and a one km pipeline was to be laid down (Comune di Milano 1888).

In the second half of 1888 two pilot boreholes were made close to the Arena (reaching respectively 146,43 and 81.75 m of depth) and in 1889 a steam engine pumping station was installed (140 l/s of discharge). Roughly 1200 m of pipelines were laid down in order to supply water to the Piazza Castello - Foro Buonaparte - Via Dante residential area recently built. Such a pilot project met success and an investment plan concerning water supply was

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<sup>94</sup> “*Permettendo i mercati monetari europei di associare capitali per l’esecuzione di tal genere di intraprese*” (Municipio di Milano 1881; quoted by Colombo 1984)

<sup>95</sup> The Brembo valley is located in the Bergamo region. It is well known that Bergamo and Milan have historically been in rivalry

<sup>96</sup> *Lettera del maggio 1885 in cui il Consiglio Superiore dei Lavori Pubblici rifiuta la dichiaraz di pubblica utilità per la condotta d’acqua verso Milano delle sorgenti della Val Brembo*, reported in (Motta 1989b).

approved by the City Council in 1890 going further in the choice of using underground water which was not anymore seen as a temporary solution.

Thanks to its location on the top of an abundant aquifer the city of Milan was able to make the sound decision of building only basic water infrastructure (wells, pumps and pipelines). In such a way, Milan's municipality was able to be free from the central government's authorization which would have been compulsory in case a distant water source had been chosen. Additionally, the chosen technical solution had also the great advantage of being very flexible and gradual in its implementation. Investments in water infrastructure could be implemented step by step as the number of subscriptions to the water service increased (Bigatti 2000, 222) .

Various wells and pumping stations were built progressively totalizing 331 wells and 17 pumping stations in 1927, totalizing a nominal discharge capacity of 5.830 l/s. There was little need for storage units since the abundant aquifer is by itself a massive natural water storage just below the city. Only two relatively small reservoirs (1200 cubic meters each) were placed in 1889 and in 1896 inside two of the towers of the Milan's castle (Castello Sforzesco) near by the first pumping station (Municipio di Milano 1907a, 28).

### **3.3 Rolling up the sanitation service**

Although various canals and sewers<sup>97</sup> existed already in 1868 in Milan, they had been built randomly street by street with no systemic vision. The first sewer master plan for the city of Milan was approved that year and implemented very slowly over ten years with only 3.5 km constructed by 1878.

The 1868 master plan designed a well thought sewer network within Milan historical centre. In those years however Milan's size was constantly increasing. In order to rule the urban expansion, in January 1886 a town development masterplan (Piano regolatore Beruto) was approved by the City Council. A sanitation masterplan was needed too and in 1888 a specific sanitation office was created within the municipal technical department with the mission of designing a new sewer master plan for the city (Municipio di Milano 1890a).

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<sup>97</sup> There were 123 canals/sewers totalizing 153 km in 1868 (Gentile, Brown, and Spadoni 1990, 29)

Such a masterplan was approved by the City Council in 1890. It was designed to serve a 2830 hectares area with a combined sewer network. The project was based on the 963 265 inhabitants hypothesis made by the Beruto masterplan and on a household water consumption of 100 l/person/day. The city was divided in 4 water collection areas. Three areas would discharge waste water respectively through three major sewers (Gentilino, Vigentino, Nosedo), all reaching the Roggia Vettabbia river while a fourth area would discharge water in the Lambro Meridionale river. Milan's ground is naturally sloping from the North to the South. This was a key condition which allowed to build only free flow gravity sewers with no need of pumping stations for waste water. For various centuries waste water collected by the Milan's canals (navigli) had been channelled through the Roggia Vettabbia and had irrigated large farming areas downstream of Milan (the so called marcite<sup>98</sup>). The 1890 sanitation project obviously planned to go ahead in the waste water disposal through farming practice. The sewer masterplan included 355 km of small section sewers (called canali), 30 km of major sewer and 42 km of secondary sewers to be built or renovated.

Minor modifications to the 1890 Poggi sanitation master plan were designed through an alternative plan in 1897. A new sanitation masterplan designed by Mr Poggi was approved then by the City Council in 1911 (Poggi 1911). It focused on extending the sewer in the new areas where the city was expanding (Zona di ampliamento). The various sanitation master plans were not limited to the administrative area of Milan's municipality and the sewer system was designed to collect waste water on a larger area. Such a design did not imply however that the City of Milan would pay the sewer investments also for the outskirts municipalities. Mr Poggi suggested that some agreements on the sewer's usage could be signed with these municipalities if they were not absorbed by Milan's municipality (Poggi 1911, 690). Mr Poggi proved to be right and predictive since in 1923 the annexation to Milan's municipality of eleven municipalities<sup>99</sup>, previously independent took place. A new sanitation masterplan was then drafted by Mr Codara<sup>100</sup> in 1924.

One could wonder why so many plans were necessary at such a high frequency. The reason is given by Mr Poggi himself (Poggi 1911, 7) : "the sewer infrastructure in the old part of a city can be organized and designed at once through a definitive masterplan. The question is

<sup>98</sup> There is a historical document (28 September 1583) giving the technical description of 15 irrigation intakes from the *Roggia Vettabbia*. A copy of the document is available in Gentile et al. (1990, 12)

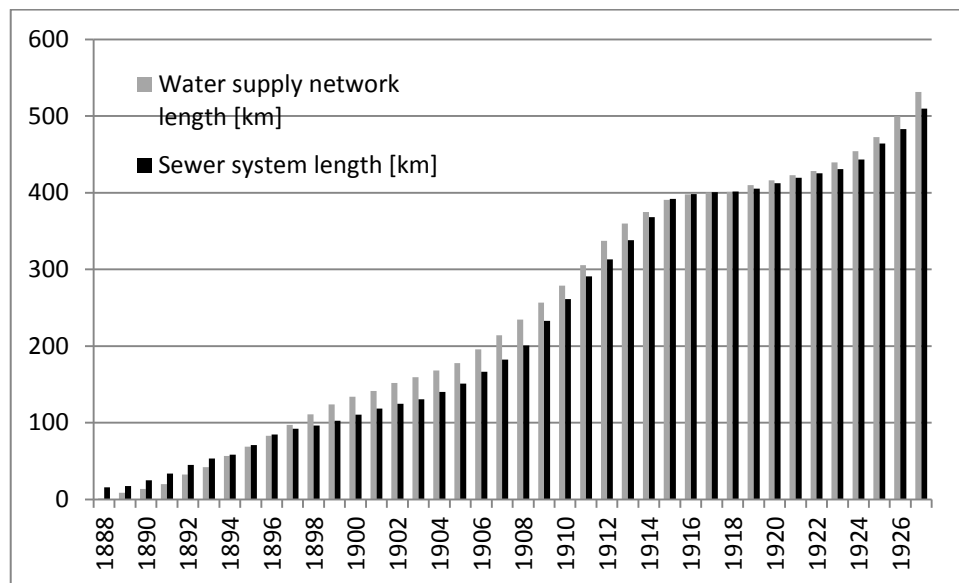
<sup>99</sup> Baggio, Trenno, Musocco, Affori, Niguarda, Greco, Gorla, Crescenzago, Lambrate, Chiaravalle, Vigentino

<sup>100</sup> Such a new masterplan was implemented out of the timeframe of our study.

different for our city which does not fit anymore within the 1889 city development plan. Furthermore, since in our city people did not comply that much to the 1889 development plan, as a fact sewer realization had to adapt to the city's builders needs and trespassings". Indeed it was not easy to develop and adapt the sewer system as fast as the urban transformation which was taking place (Gentile, Brown, and Spadoni 1990, 102).

By the end of 1905 only 151 km of sewers had been completed and only 3950 building were connected to the sewers. Between 1888 and 1905 an average of 7,4 km of sewers per year had been built. Such a slow rhythm of work calls for various reasons. On one hand works were complexified by the fact that it was necessary to lower the water table before digging the sewers (Municipio di Milano 1907a). On the other hand there were still some doubts on some technicalities of the project and in 1898 a study commission was asked to study and give an advice.

Last but not least the slow implementation was also due to the difficulty to find an agreement with the farmers irrigation consortium downstream of Milan (Consorzio Vettabbia) where Milan's waste water was supposed to be discharged and used for irrigation. It was only in 1905 and 1906 that agreements were signed respectively with the Consorzio Vettabbia and the Consorzio Redefosso. Indeed by 1906 the total discharge capacity of the major sewers (Gentilino; Vigentino, Nosedo and a few smaller ones) was still not large enough to channel all the water in case of large rains. The acquisition and planned improvements of the Redefosso canal (thanks to the 1906 agreement with the Consorzio Redefosso) were supposed to help increasing the maximum discharge capacity of the whole sewer system (Municipio di Milano 1907a).

**Figure 14 : Milan's water supply and sewer networks length (1888-1927)**

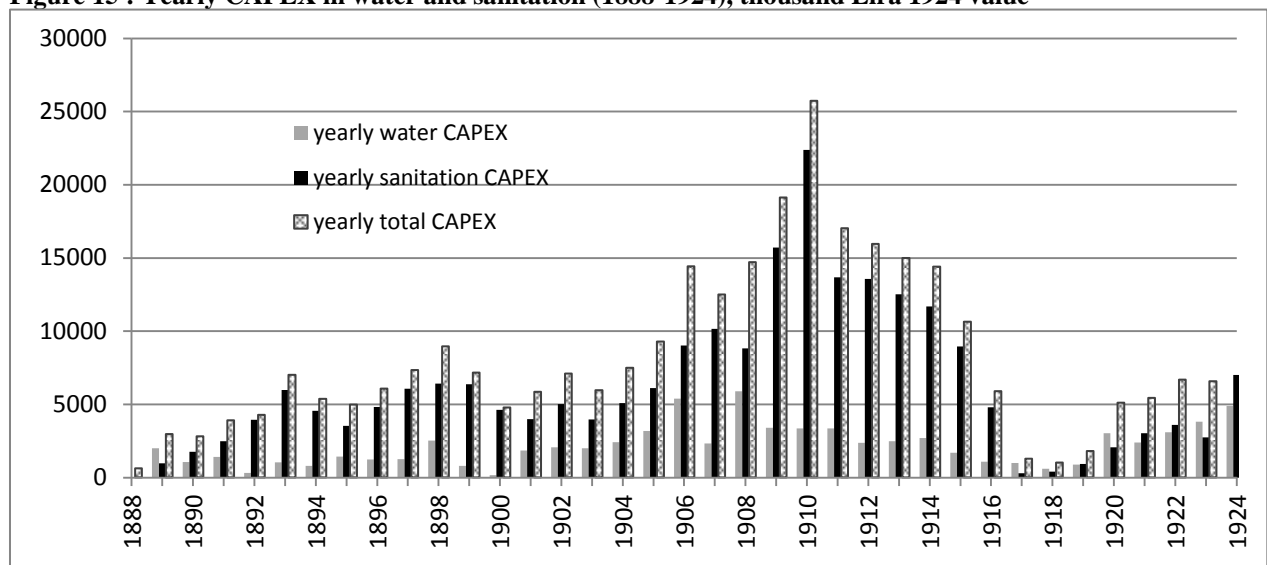
Source : author's elaboration, various data sources

After 1906 works sped up significantly as some figures at the end of 1910 show : 261 km of sewer and 6500 buildings connected. With Mr Poggi's 1911 new masterplan, the sewers were extended even more in the city's outskirts reaching the impressive length of 509 km in 1927 with 13 760 buildings connected, representing roughly 77 % of Milan's houses according to Bigatti (1997, 223).

### Investments amounts

Within nearly 40 years between 1888 and 1926, major water and sanitation infrastructure was built in Milan. Indeed, by 1926 the water supply and sewer networks respectively reached a length respectively of 531 and 509 km (Figure 13). Roughly 13 km of water supply and sewer network were laid down each year in those 40 years.

According to the annual city financial report (*conto consuntivo*) capital expenditure in water and sanitation infrastructure add up to a total amount of respectively 79.9 and 227.2 million Italian lira (expressed in 1924 value). It appears indeed that sanitation infrastructure implied costs nearly three times greater than water supply ones. As a fact the average annual capital expenditure in water and sanitation in those years was respectively 2.1 and 6.1 million Italian lira (expressed in 1924 value). The total invested amount of more than 300 million Lira (1924 value) represents the same order of magnitude as the whole 1921 Milan's ordinary and extraordinary municipal budget.

**Figure 15 : Yearly CAPEX in water and sanitation (1888-1924), thousand Lira 1924 value**

Source : author's elaboration based on *Conto consuntivo dell'anno...*

When observing total yearly capex on the above graph a major investment peak phase appears from 1905 to WWI. In those years significant investments in the sewer network were undertaken not only for hygiene reasons but also to fight underemployment (Sai et al. 1970, 261). During the war investments nearly stopped. Public works started up again after the war in 1919 and 1920 (Sai et al. 1970, 227).

#### Water and sanitation infrastructure in the context of urban transformation

It is key to underline that the expansion of water supply and sewer networks took place in Milan in a phase of massive urban expansion and transformation ruled, at least partially, by the various city development masterplans. The city's urban expansion not only imposed the networks' topology but also their expansion rhythm.

Indeed a municipal report of April 1890<sup>101</sup> argues that a 2,7 million lira amount is urgently needed for water and sanitation investments since "they are essential to the street works already approved and under implementation in 1890-1891"<sup>102</sup>.

One year later another report (Municipio di Milano 1891a, 26) is even more explicit and states that "the realization of the sewers cannot be postponed since it was started and should

<sup>101</sup> That document was written to justify a 8 million lira *mutuo ipotecario* with the *Cassa di Risparmio delle Province Lombarde*

<sup>102</sup> « Sono richiesti dalle opere di viabilità già deliberate ed iniziate pel biennio 1890-1891" (Municipio di Milano 1890b, 9)

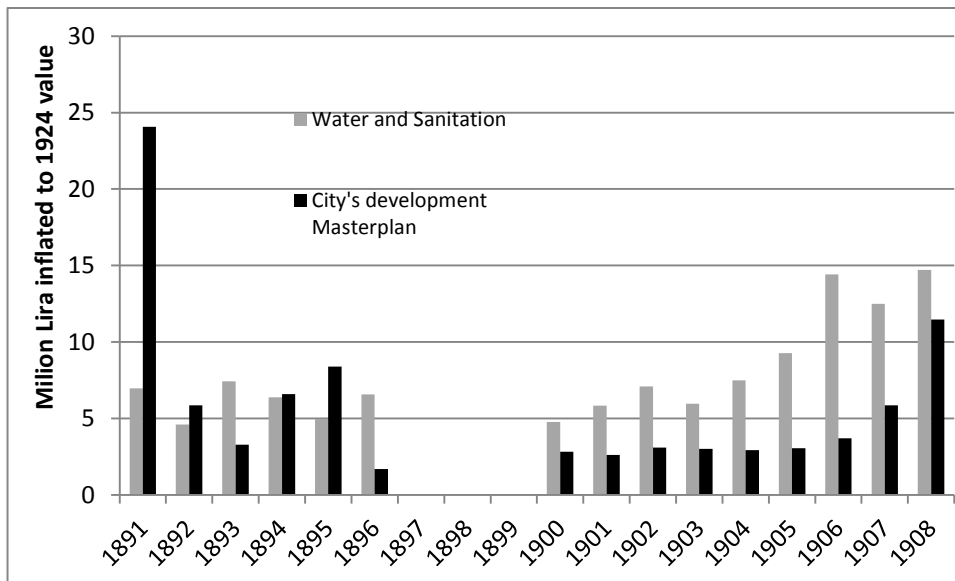
be implemented jointly with the city development masterplan. Indeed sewers are part of the masterplan since drainage is essential for both the new streets and buildings<sup>103</sup>.” It also adds that “the priority in extending the water supply network is given to the streets having a sewer or to those where a sewer is planned shortly. However extending the water network in every street where a sewer exists would be too much. Thus, the priority is given to the streets where at least a single subscription to the water service can be forecast in the first year.”<sup>104</sup>

Not only has water and sanitation infrastructure a tight relation with the city masterplan’s development on a technical base but it might also be worthwhile to compare their relative investment amounts. At first, expenses dedicated to refurbish streets and areas according to the *piano regolatore* were much higher than water and sanitation capital expenditures but after 1893-1894 this not true anymore and water and sanitation expenditures (particularly the latter) get higher than the *piano regolatore* ones as the two graphs below show. Indeed total sanitation capital expenditures over the 15 years of available data (1897, 1898 and 1899 data are missing) inflated to 1924 Italian Lira (112 million Lira) are by themselves nearly as high as the ones due to the Piano Regolatore (138 million). If we add up water capital expenditures (43 million Lira) to sanitation ones, their total amount (156 million Lira) is greater than what has been spent on the Piano regolatore’s implementation. Even if we cannot be sure that expenses were always accounted for correctly and hidden cross-subsidies between the two accounting sections might have taken place to some extent, we assume that the order of magnitude should be correct. Water and sanitation infrastructure represented an essential part of the undertaken urban transformation weighing financially roughly the same amount as the urban transformation itself.

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<sup>103</sup> “L’opera stessa è stata iniziata ed è destinata a svolgersi parallelamente al piano regolatore, del quale è necessario e connesso organismo, dovendosi alle nuove costruzioni e alle nuove vie designare i convenienti provvedimenti di scolo.”

<sup>104</sup> « Si prediligono le vie dove c’è la fognatura o dove ha da essere eseguita. Però estendere acqua ovunque ci sia la fognatura sarebbe eccessivo, allora si prediligono le vie dove ci dovrebbe essere una richiesta nell’anno. »

**Figure 16 : Water & sanitation Vs urban transformation capital expenditures**

Source : author's elaboration, Million Lira, inflated to 1924 value<sup>105</sup>

## 4 Municipal repayable finance

In section 2 we gave an overview on the investments in water and sanitation infrastructure undertaken in Milan in the 1888-1924 time frame. Our figures give a total invested amount of 96,5 million lira (nominal values) or 307 million lira (inflated to 1924 italian lira value). In this section we analyse the financing tools implemented to mobilize such a massive amount of money.

### 4.1 Italian municipalities borrowing constraints

With the 1859 and 1865 acts (§2.1), the municipal budget had to be balanced. Debt could be part of the solution not only to finance capital expenditures (investments) but also to cover ordinary budget imbalances. In fact debt issued by Italian municipalities in those years can be classified in three categories : i) "budget imbalance loans" in municipalities with a very low income population and minor economic development (thus with very low fiscal revenues), ii) debt issued to solve temporary imbalance due to external factors (economic crisis, war...) and iii) debt issued to finance major capital expenditures needed in municipalities facing a fast economic development (Dorigati and Molon 1982, 187).

<sup>105</sup> using ISTAT serie storiche – Tavola 21.6.1



According to the 1865 act (Legge comunale e provinciale – articolo 137) approval by the county administration (Provincia) was required for a municipality to contract any debt. No approval by the national parliament was needed. A municipality could borrow if the two following limitations were abided by : i) the fifth of the ordinary revenues of the municipality had to be greater than the interest costs<sup>106</sup> on the first year of amortization and ii) the revenue from the additional tax on properties was to be high enough to cover the debt service over the payback duration years. In the following years, progressively more constraints were set by law : the 1870 act<sup>107</sup> limited the bonus - lots amounts on municipal bond<sup>108</sup> while with the 1874 act<sup>109</sup>, some limits on the obligatory expenses were established. With the 1880 Depretis reform project (which was not approved in the end) municipal loans representing more than one tenth of the ordinary municipal revenues or larger than 100 000 lira would have to be authorised by a specific act made by the national parliament (Bufalini and Cavagna Sangiuliani di Gualdana 1881, 29).

## 4.2 Municipal lending institutions in Italy

The municipalities could choose between directly issuing municipal bonds or using bank loans. Various kinds of financial institutions were operating in the latter category as lenders : the Cassa Depositi e Prestiti, the various Casse di Risparmio, the various Banche Popolari and the standard commercial banks.

The Cassa Depositi e Prestiti (CDP) had been created already in 1850 in the Regno di Sardegna inspiring from the French Caisse des depots et consignations. Later (in 1863, after the unification) it extended its activity to all of Italy. Municipalities and other local authorities could contract loans with CDP both for capital expenditures and for debt consolidation (debt previously contracted). Debt consolidation loans surpassed CAPEX ones between 1875 and 1923 except during the 1883 to 1895 years (Della Torre 2001, 20). Loans offered by CDP to municipalities had very interesting features such as low interest rates and no commission fees. Payback durations were initially quite short (10 years allowed in 1863) but longer payback duration were authorized afterwards (25 years allowed in 1875 and even more afterwards). At first the CDP was asking no collaterals except the enrolment within the municipal budget.

<sup>106</sup> Including interests costs due to previously contracted loans.

<sup>107</sup> Legge 19 luglio 1970 n° 5704

<sup>108</sup> *Somma riservata a premi non superi 1/5 degli interessi annuali* (Bufalini and Cavagna Sangiuliani di Gualdana 1881, 205)

<sup>109</sup> Legge 14 giugno 1874 n°1961

However various municipalities were not paying back their debt, particularly in the South of Italy. As a solution to that problem after 1875 additional municipal taxes on properties were asked as a collateral for CDP loans<sup>110</sup>. Furthermore it was also asked that interest amount should not be higher than the fifth of the municipal revenues<sup>111</sup>. These two conditions limited the municipalities borrowing power and partially excluded some municipalities from accessing to CDP loans but protected effectively the CDP from insolvencies (Conte 2001, 121).

In 1875 a major reform allowed the CDP to collect savings using the post office network throughout the country. As a consequence the CDP started to have much more funds available for municipalities than prior to 1875. Indeed, after 1880, total loans from CDP to municipalities represented greater figures than those from all other banks (Della Torre 2001, 20). Such a trend was even higher after 1896<sup>112</sup> when a special financial vehicle (Sezione autonoma di credito comunale e provinciale – SACCP) was created within CDP to channel additional money from the market to local authorities (Conte 2001, 141–142).

Other major lenders to local authorities were the various Casse di Risparmio created in Italy through the 19th century. Among them, the Cassa di Risparmio di Milano which had been created in 1823 played a major role in channelling private savings to municipal budgets. The Cassa di Risparmio di Milano opened local branches all over the Lombardy region and was later rebaptized Cassa di Risparmio delle Provincie Lombarde – (CARIPLLO). We shall see in next paragraph that it was a major lender to Milan's municipality asking as a collateral municipal properties through mortgage loans (credito fondiario).

After the 1875 CDP reform, the Casse di Risparmio were in competition with the CDP and the postal offices network. CDP had a fiscal advantage since its loans were not subjected to the imposta di ricchezza mobile<sup>113</sup>. Collected savings figures show however that total savings collected by postal offices were much lower than those collected by the Casse di

<sup>110</sup> The municipality would give delegations to the tax collector to payback and amortize the loan as a collateral ("*delegazioni sull'esattore delle imposte dirette*") (Municipio di Milano 1907a).

<sup>111</sup> The Milan City Council documents show indeed that these two conditions had to be met to obtain the loan from CDP. This was not straightforward for Milan's municipality since it had already touched the ceiling on the additional tax on properties. A waiver had to be obtained (Municipio di Milano 1907a).

<sup>112</sup> Legge 551/1896 and Legge 227/1897

<sup>113</sup> Indeed municipal bonds were subjected to the tax while state bonds were not. This fact was criticized by local authorities (Municipio di Milano 1916). The municipality guaranteed a net interest to the lenders (bond subscribers). Thus the *imposta di ricchezza mobile* was an additional cost to be paid by the municipality when due.

Risparmio network<sup>114</sup>. This was particularly true in Lombardy where the CARIPLO was very well established (Della Torre 2001, 30,31).

Until the end of the 19th century total municipal bond emission<sup>115</sup> still represented the principal borrowing tool of Italian municipalities (2/3 of total municipal debt in 1877, 1/2 in 1896 and 1/6 in 1911). The new century was the turning point in the choice of borrowing tools by municipalities which contracted loans either with the CDP (including the special vehicle SACCP) or with other financial institutions instead of issuing bonds. Furthermore some data seem to show that loans from SACCP-CDP were frequently issued to consolidate previous debts and thus convert municipal bonds in CDP loans (della Torre 2003, 23,33).

### **4.3 Milan's municipal debt**

In this paragraph, we describe in more detail how Milan's municipal debt was generated and what were the principal financial institutions operating as mediators. All bonds and loans used by Milan's municipality are summarized in Table 6.

Debt was centrally managed to fund municipal needs and imbalances as a whole. Only in a few cases was debt contracted to cover sector-specific needs: for example the 1899 CARIPLO loan for the Simplon railway tunnel or the loans for the hydroelectric power plants.

#### **Long run and short run debt**

Debt was contracted both with long run and short run payback durations. Long run debt was contracted at fixed interest rates with very long payback durations (from 35-50 years for the CDP loans up to 75 years for the 1886 bond emission - Table 6).

From time to time, Milan's municipality was forced to revert to short term debt as a temporary solution. In issuing long term debt, the municipality had to comply to borrowing limits (§4.1) and short term debt was occasionally used to bypass these limits. After the 1897 bond emission, Milan's municipality could not contract more debt anymore until 1902 since the yearly budget surplus did not allow to cover additional debt service. Meanwhile, in 1901, a total amount of 1 million Lira of 6 months municipal debt certificates were issued at a 4.5% interest rate and discounted by the Banca Popolare di Milano, the Banca Commerciale Italiana or another bank. Such a short term debt urgently needed to undertake some sanitation

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<sup>114</sup> Things changed only after 1925 when new savings products were commercialized by CDP through the postal network (*Buoni Postali Fruttiferi*).

<sup>115</sup> In smaller size municipalities Municipal bonds were directly subscribed by local gentry while in larger cities banks were subscribing significant parts of the bonds too (della Torre 2003, 29).

investments would be converted in longer term debt when possible after 1902 (Atti del Municipio di Milano 1900-01,341).

Another reason for short term debt was CDP's lengthy administrative process to approve long term loans. The municipality used short term debts in 1909-1910 and 1917 to fund hydropower plants in Valtellina. The 1909-1910 promissory notes (vaglia cambiari) were issued while waiting for the long term loan from CDP which was finally approved in 1914. However the funds from the 1914 CDP loan were still not available in 1917 (credit restriction due to the war period). The Milan municipality had to open a short term "negative" checking account (conto corrente) with the Banca Popolare di Milano.

### **Loans or bonds**

We have already mentioned that from the early 20th century Italian municipalities subscribing loans preferred financial intermediation rather than issuing municipal bonds (§4.1). Milan's municipality too in the new century chose to borrow mainly through loans with financial institutions (mainly with the CDP) rather than issuing more municipal bonds as in 1886 and 1897. Indeed, the conditions offered by CDP were more attractive especially for financing public works that required time spread disbursements due to various conditions : i) better fiscal conditions<sup>116</sup>, ii) better interest rates, iii) time-spread drawing according to the works rhythm, iv) long duration (50 years), v) possibility to get a lower interest rate on postponed disbursements in the case that a decrease in the reference interest rate takes place (Municipio di Milano 1907a, VIII).

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<sup>116</sup> CDP was exempted from the *imposta di ricchezza mobile*. In the previous bond emissions the municipality guaranteed a net interest to the lenders (bond subscribers). Thus the *imposta di ricchezza mobile* was an additional cost to be paid by the municipality when due.

**Table 6 : Milan's municipality loans and bonds (1854 – 1922)**

<i>Issuing Year</i>	<i>Nominal amount Million Italian Lira</i>	<i>nominal interest rate (%)</i>	<i>Expiry date</i>	<i>Lender</i>	<i>Main scope</i>	<i>comment</i>
1854	5840000 svanziche	5	1899			
1861	10		1916			Draw emission
1866	5		1921			Draw emission
1886	80	4	1960	bond emission		
1890	8			CARIPL0		2 bank accounts of 4 million Lira each
1897	15		1960	bond emission		
1899		4.75	1933	CARIPL0	Simplon railway tunnel	
1901	1		1902		sanitation	Short term
1905	16		1908			Bank account
1907	10					10 millions (3 in <i>buoni fruttiferi</i> and 7 with CARIPL0 for the 1907 budget deficit)
1906-1907	70				buildings, electricity, tramways, sanitation, water	
		4 - 3.9	1963	CDP		17 million al 4% ; 53 million al 3,9 %
1910	8	4	1960	CARIPL0	Power plants	
1909-1910	4.676			various banks	hydropower in Valtellina	Short term promissory note
1912			1961-1966		Pensions of the former municipal employees	
				CNP		CNP = <i>Cassa Nazionale Previdenza</i>
1914	4.6	4	1963	CDP	hydropower in Valtellina	To convert the 1909 short term promissory notes
1914	3.5	4	1963	CDP	istituti alta coltura	
1915	1.65	2	1950	CDP	River Olona	
		5	1921		ordinary budget imbalance	
1916	20			bond emission		
1917	1.5			BPM		checking account –allowing to wait for the disbursement of the 1914 power plant loan
1919	50	4	1960	bond emission		
1920	40	3%	1955	CDP		Sez autonoma per credito comunale e provinciale,
1920	36	3%	1956	CDP		Sez autonoma per credito comunale e provinciale,
1921	25	5%	1956	CDP		first draft of a total 120 million loan
1921	8			CARIPL0		
1922	8				Power plants	

Source : author's elaboration based on the *Atti del Municipio di Milano* [various years...], in grey loans and bonds on which water infrastructure has been financed at least partially

### Financial institutions

Among the financial institutions the CDP became the first borrowing option for Milan's municipality through the early 20th century as it offered better conditions. The second best choice for the municipality was represented by CARIPO which asked municipal properties as a collateral<sup>117</sup>. Indeed such a second best option was practiced mainly when no additional taxes on properties could be used as collateral for a CDP loan. The availability of CARIPO funds was limited too and Milan's municipality could not use all the funds and leave nothing available for other municipalities of the region (Atti del Municipio di Milano 1918-1919; 361,457). As a last option the municipality would borrow through the Banca Popolare di Milano (BPM) or through standard commercial banks<sup>118</sup>.

### Financial engineering

The few municipal bonds emissions were often used to convert previously contracted debts<sup>119</sup> to longer durations. Most of the issued bonds and loans had a very long maturity. According to some authors savers in those years were trusting long term investments of that kind thanks to the gold standard comforting effect. In retrospect however, those savers lost most of their money as the great inflation of the 1910-1930 years curbed down severely in real terms the profitability of their investments. Indeed, we shall further analyse the key effect of inflation in paragraph 6.4 while section 6 will sketch what were the cost-sharing effects of these mechanisms in the long run. Who was the end-payer in fine in those schemes?

Municipal bonds were issued with lots and premiums (emissione a premi). The draw calendar was defined at the emission and generally capital payback was not at all linear. For example according to the 1886 bond emission conditions, 157 bonds (cartelle) were to be paid back the first year and 4419 on the last year meaning 126 500 lira to reimburse the first year and 3 683 000 to pay back in the last year (Atti del Municipio di Milano – 1889-1890). Interests were to be paid each term. In the 1897 emission the nominal value of the bonds had a large range (5000 lira, 1000 lira, 500 lira, 100 lira) adapted to various kinds of subscribers. Bonds were written in Italian, in French and in German and purchasable on various foreign financial markets (Paris, Geneva, Bern, Lyon and Bruxelles) showing that Milan's municipality had the

<sup>117</sup> in the framework of a *conto corrente* or a *mutuo ipotecario*

<sup>118</sup> The name of the Banca Commerciale Italiana is quoted as an option too while some money was borrowed in the short term with the BPM

<sup>119</sup> Holders of the 1882 loan could choose either to be paid back at the nominal value or to subscribe to the 1897 municipal bond emission at a 4% interest rate (Atti del municipio di Milano 1895-1896) which payback would last until 1960.

ambitions of collecting capitals abroad also thanks to the Union Latine which had been created in 1865.

#### **4.4 Financing tools for water and sanitation infrastructure**

In the previous paragraph we gave an overview of the financing tools (bonds, loans, credit lines...) used by Milan's municipality in the 40 years of our time frame. Unfortunately it is not possible to give full details and figures on the financing tools specifically used to finance water and sanitation infrastructure since loans and bonds were financing Milan's municipal budget as a whole and only in a few cases the detailed reports written to justify the loan's approval by the City Council are available.

However, after 1911 the water and sanitation accounting chapters (Allegato B) within the city financial report include the re-invoicing of the debt service (interests on the capital invested in the water and sanitation service). Three source of funding are mentioned : i) the municipal bonds (Prestito Unificato issued in 1886, 1897 and 1919), ii) the 1906-1907 loan with the Cassa Depositi e Prestiti and iii) "extraordinary credits on the municipal budget".

As we have discussed in §2.3, only two major urban value capture operations were undertaken in 1885 (Foro Buonaparte area) and in 1905 (Saldini – Ponti policy). With the exception of these two urban operations value capture mechanisms did not play a significant role in financing Milan's urban infrastructure including the water and sanitation one.

### **5 Water tariffs, sanitation levies and connection policy**

As in most European cities, in Milan too the water and sanitation service was considered as an industrial and commercial service from which revenues could be collected. While water was billed according to volumetric price (§5.1) through collective meters (one meter per block of flats), on the contrary users were not charged a sanitation bill but a sanitation levy (§5.2).

Massarutto (2002; 2007) points out that "it is often a pure terminologic convention that of considering revenues either as direct charges or taxation. What really matters is who pays, for what purpose and how much"(Massarutto 2002, 25). We adopt the classical 3T's approach (OECD 2009a). Following Massarutto (2002), the main distinction we focus on is the one between revenues endogenous to WSS (Tariff according to the OECD) and ordinary fiscal revenues exogenous to the service (Taxes). We considered then Milan's sanitation levy as an

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<sup>120</sup> An amount of 15 million lira on the 1886 80 million municipal bond emission was allocated to public works including water and sanitation investments.

endogenous revenue contributing to the “Tariff” element of the 3T’s rather than to the “Tax” one (section 6).

The connection policy is a key issue in the initial phase of a network industry. How can the service increase fast the number of new users ? This is usually particularly tricky for the sanitation service for which users have a very limited willingness to pay since its positive externalities are not individually perceived. Is the connection made compulsory? Or is it encouraged using economic incentives ? Paragraph §5.3 analyses the connection policy applied in Milan (compulsory connection fees or not) and the subscriptions’ rhythm obtained.

## 5.1 Water

The first set of rules for the water supply service was approved in 1894 (Municipio di Milano 1907b). Water tariffs were slightly volume regressive in order to encourage consumption (

Table 8). An annual fee had to be payed too depending on the diameter of the installed meter (Table 7). Milan water tariff were in 1903 lower than in many other big Italian cities : 0.25 lira/m<sup>3</sup> in Naples, 0.23 lira/m<sup>3</sup> in Torino, 0.30 lira/m<sup>3</sup> in Verona, 0.25-0.30 lira/m<sup>3</sup> in Bologna, 0.27 lira/m<sup>3</sup> in Bergamo, 0.40 lira/m<sup>3</sup> in Firenze (Bigatti 1997, 113)

In 1907 new water service regulations (Municipio di Milano 1907c) were approved with a simpler pricing system (two consumption blocks instead of the six previously applied). The discounted social tariff (previously reserved to houses inhabited by the working class and hydraulic force usage) was extended to social housing and charities. The new tariff was supposed to give slightly lower revenues to the municipality. However the billing of a minimum consumption per term was made compulsory in order to guarantee a minimum “floor” revenue.



**Table 7: Meter rental fees**

Diameter (mm)	1884 rules	1907 rules	1912 rules	1920 rules	1929 rules <sup>121</sup>
	(Lira/year)	(Lira/quarter)			
7-13	6	nd	5	7	nd
15	7,20	1,80	10	15	nd
20	9,60	2,40	15	22.50	64
25	10,80	2,70	20	30	160
30	12	5	25	37	180
40	15	3,65	30	45	200
50	18	4,5	35	60	300
80	30	12 + 25 (intake fee)	40	75	400
100	36	15 + 50 (intake fee)	50	100	600
150	nd	18 + 75 (intake fee)	75	150	800

Source : author's elaboration, 1884 and 1907 data from Municipio di Milano (1907b); 1912 and 1920 data from Atti del Municipio di Milano 1919-1920, p736 ; 1929 data from (Comune di Milano 1935)

**Table 8: Milan's water tariff evolution**

	1894	1907 and 1920	1912	1929
<b>Minimum unitary price (high consumption block)</b>	0.15	0.15	0.08	0.15
<b>Maximum unitary price (low consumption block)</b>	0.20	0.18	0.10	0.35
<b>Discounted social price</b>	No	0.10	0.06	0.25 – 0.20

Source : author's elaboration, more details in Crespi Reghizzi (forthcoming b), all values in lira/ m<sup>3</sup>

In 1912 a new and very degressive 4 blocks tariff was approved in order to discourage the growing trend of private borehole drilling. Those private initiatives were source of concern due to the uncontrolled hygienic conditions of the water delivered. On the contrary the threat on municipal water revenues was not an issue (Atti del Municipio di Milano 1919-1920, p736).

After WWI, in 1919 a tariff increase was needed since operational costs had increased due to the growth of energy's price and to the reduction of the working hours from 12 to 8 hours a day. At first it was thought of a 4 blocks tariff but then it was chosen to go back to the 1907 two-blocks tariff which could be more easily explained and accepted by the users while it would guarantee larger revenues to the municipality (Atti del Municipio di Milano 1919-1920, p736). The fixed part of the tariff to be paid every three months was significantly increased. In 1929 a new tariff was approved with a very new increase on the 1920 tariff. We lack information on the 1929 tariff increase but we can easily guess that such a massive increase was unavoidable due to the great inflation of the 1920's.

<sup>121</sup> The 1929 rules refer to an "intake fee" (*canone di presa*) rather than a meter rental fee.

## 5.2 Sanitation

The first rules concerning the sanitation service were approved by Milan's City Council on June 5th 1888<sup>122</sup> and concerned initially only the houses of the Foro Buonaparte and Via Dante area which were the first to be connected. Through the following years however those rules were applied to all buildings connected to the sewer system. According to the 1888 act a *una tantum* connection fee of 35 lira per meter of length of the front of the building was due. Its payment could be divided into various instalments over 5 years, meaning a yearly amount of 8.08 lira/year. Furthermore a yearly amount of 0.07 lira per m<sup>2</sup> of total surface of the building was due in order to contribute to the operational costs. It is explicitly written that those contributions were far below the operational and capital expenditures (Atti del Municipio di Milano 1893-1894, p 355).

Strictly speaking the first set of rules for the sanitation service were approved by the City Council in 1894 (Atti del Municipio di Milano 1893-1894, p 355). Both the connection fee and the yearly contributions were modified in order to encourage hygienic improvements in the houses where they were more needed. To such a purpose "sanitation fees should be designed so that a high income house should pay a greater fee than a middle income one which should pay more than a house inhabited by the working class. Specific mechanisms were designed to lower working class houses contributions"<sup>123</sup>.

In 1907 new sanitation regulations were approved in order to collect higher revenues from the sanitation service. In 1920 the sanitation regulations were modified once more and the fees significantly increased since "although the sanitation system was put in place mainly for hygienic reasons, the building owners are getting so many benefits from the sewer system that it makes sense to ask them a larger contribution" (Atti del Municipio di Milano 1919-1920, p 920). Indeed after the war, the financial constraints of the municipality were so tight that all sources of revenues were carefully reviewed in order to increase their contribution to the municipal budget. It was necessary for the sanitation yearly revenues to increase from the

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<sup>122</sup> *Regolamento provvisorio per la fognatura del nuovo corso dal Cordusio al Foro Buonaparte ed addiacenze*, a copy is reported in Gentile et al. (1990, 90). It made compulsory for the landowners to connect to the sewer system and gave precise technical guidelines on how to connect properly the private building with the sewer system.

<sup>123</sup> « ...coll'intento pero' di facilitare l'attuazione del risanamento domestico, nelle case che maggiormente ne hanno bisogno, proporzionando quindi la misura del corrispettivo per modo che una casa signorile sia chiamata ad un contributo maggiore di quella d'affitto del medio ceto e questa più di una casa d'operai. Per queste ultime si è inoltre creduto opportuno di stabilire norme speciali e facilitazioni a vantaggio dell'igiene". 1894 (Atti del Municipio di Milano 1893-1894, p 355)

previous 1 million lira to 4 millions lira in order to roughly balance the operational expenditures (1 million lira) and the debt service on the invested capital (4 millions) (Atti del Municipio di Milano 1919-1920, p 921).

### 5.3 Connection policy

Both in the 1891 and 1907 water service regulations, the user was not charged any *una tantum* water connection fee as long as the water meter could be installed right at the entrance of the private property. Conversely full installations costs of any pipeline within the private property (upstream or downstream of the water meter) were to be charged to the user.

Connections could be asked either by the owner or by the tenant. Tenant had however to ask a waiver to their owner. A deposit of 25 lira was due if the connection had not been asked by the building owner. In 1919 water connection fees were approved in order to increase the water service revenues (ref Table 9).

**Table 9 : 1919 water connection fees**

Diameter	Connection fee (Lira)
Up to 15 mm	50
20-40 mm	100
50 mm	200
Over 50 mm	To be discussed on a case by case basis

Source : author's elaboration based on on Atti del Municipio di Milano (1919-1920, p 919)

While users were not asked any fees to connect to the water service until 1919, a sanitation connection fee was considered already by the 1888 fees setting. Furthermore, the 1894 sanitation regulation forbade to build cesspools in all new houses built in streets with an existing sewer and made compulsory for them to be connected to the sewer system. Meanwhile, previously existing houses were given a six years deadline to connect to the sewer system. In case they connected before the deadline, they were anyway exonerated from paying the yearly sanitation fee for the first six years. The new 1907 regulations shortened the exonerated period from six to two years since “now the connection to the sewer system is not anymore seen as a constraint and is instead asked by the building owners themselves<sup>124</sup>”. Such an exonerated period was shortened again to one year in 1920.

At first the connections were quite timid. Indeed in 1897 there were roughly 8000 houses in Milan. Only 21 % of them were connected to the water supply and only 15 % to the sewer

<sup>124</sup> “...ora che l'impianto di fognatura non è più considerato come un aggravio, ma insistentemente invocato dagli stessi proprietari di case ( che possono così ridurre i loro stabili in migliori condizioni di affittanza, eliminando in pari tempo le difficoltà e gli inconvenienti dello spurgo dei pozzi neri)” (Municipio di Milano 1907d, 3)

system. In 15 years the connections had significantly increased as just before WWI 81% of the houses were connected to the water network and 77% to the sewer system (Bigatti 2000, 223). In 1926 however percentages had slightly decreased as only 72.6 % of the houses were connected to the drinking water network. Furthermore, such a overall average hides the fact that access to the water service was not equally widespread on all social classes. Indeed only 43.7% of the working class houses were connected to the water network versus 75.25 among the other houses ( Table 10).

Such a variability among social classes in the access to hygienic conditions confirms that Milan's urban "fast and furious" urban development implied sharp inequality in the living conditions.

**Table 10 : percentage of houses without drinking water, latrine or bathroom in Milan in 1926**

	<b>working class</b>	<b>others</b>	<b>total</b>
	%	%	%
<b>flat without drinking water</b>	56.7	24.65	37.42
<b>flat without latrine and water</b>	68.54	34.37	48
<b>flat without bathroom</b>	94.1	64.84	76.5

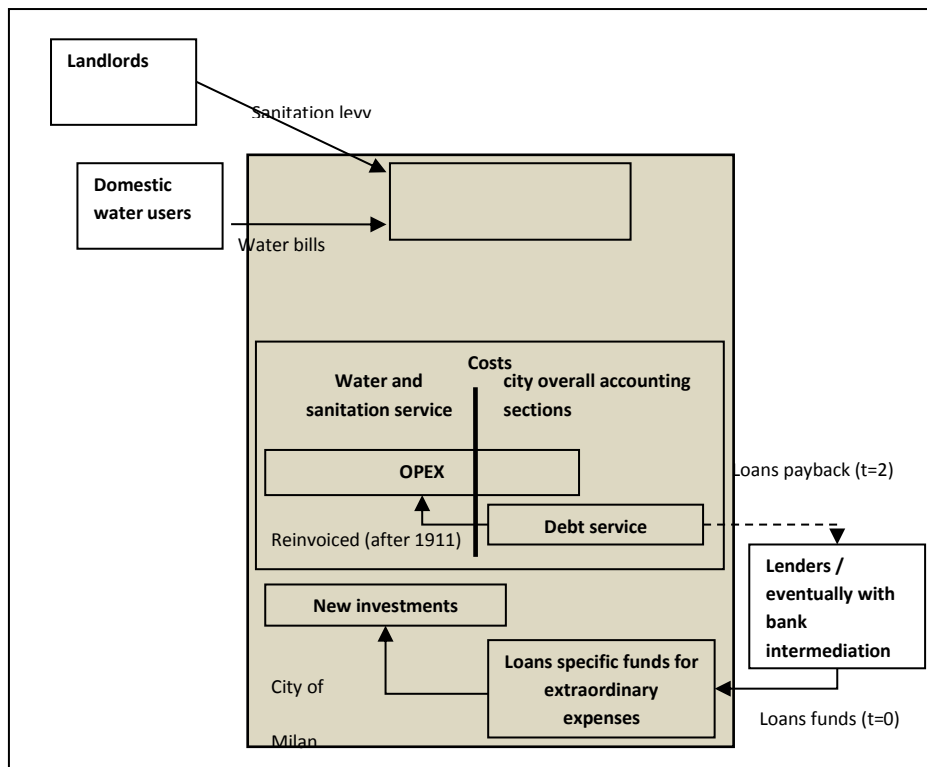
Source : author's translation based on Buzzi Donato (1969, 22), the percentage are expressed in terms of the total number of houses inhabited by each category (working class and others respectively).

## **6 Financial flows of the water and sanitation services**

In the previous section we have discussed how water and sanitation revenues were collected. In this paragraph we analyse the overall picture of Milan WSS's financial flows. Water and sanitation were municipally managed and their budget was part of the city general budget (the grey shaded area in the figure below). We analysed various years of the city annual financial report. We adopted the classical 3 T's OECD approach (OECD 2009) and built a simple model to analyse the cost sharing between the Tariff revenues and the Tax revenues. Since no "Transfers" were in place from the central government, by definition the costs uncovered by Tariff revenues are covered by the municipal general budget (Tax revenues). Figure 16 and Table 11 summarize our approach and model.

The first two paragraphs (§6.1 and §6.2) describe the available data. Paragraphs §6.3 and §6.4 focus respectively on the results of our estimations concerning the OPEX and CAPEX cost sharing. The role of inflation is analysed in §6.4. The last paragraph (§6.5) concerns intergenerational issues.

Figure 17 : Institutional scheme and financial flows of Milan’s WSS (1888-1924)



Source : author’s elaboration

Table 11 : Water, sanitation accounting scheme and model (1888-1924)

Cost classification	Accounting entries in use	Content’s description	Approach in our model
<b>OPEX</b>	<b>Internal OPEX :</b> Data in the Water and Sanitation ordinary expenses chapters	-energy, -most salaries of the technical staff -ordinary maintenance expenses	Summarized from the existing data in the Water and Sanitation ordinary expenses chapters
	<b>External OPEX :</b> Within other chapters of the city financial report, unknown for the 1888 - 1910 years, mentioned distinctly and reinvoiced after 1911	- management and office clerk salaries - paper, office lighting and heating, -cars	Unknown for the 1888 - 1910 years, mentioned distinctly and reinvoiced after 1911
<b>Debt service</b>	In the city overall debt service chapter, partially reinvoiced to the water and sanitation chapters after 1911		Estimated through our debt amortization model
<b>New investments</b>	In the water, sanitation and canals extraordinary expenses chapters - each loan has its own extraordinary expenses accounting fund		New investments are paid by extraordinary expenses funds coming from the contracted loans. They are taken into account only through the debt service model.

Source : author’s elaboration

## 6.1 Data from the municipal budget

The city annual financial report (*Conto consuntivo dell'anno*) included distinct accounting chapters for water and sanitation.

The city annual financial report in those years adopted a very classical accounting scheme: *Entrata* (revenues) and *Uscita* (expenses) which were subdivided into *ordinarie* (ordinary) and *extraordinarie* (extraordinary) ones. The ordinary expenses represent Operational expenditures (OPEX) while the extraordinary ones represent Capital expenditures (CAPEX).

Revenues coming from “Tariffs” in those years were coming from the household water users through water billing and from the landlords who were paying a sanitation levy. As we discussed in Section 5, such a levy might be considered to our purpose as a revenues endogenous to the WSS contributing to the “Tariff” part of the revenues. Additional revenues were also coming from the *una tantum* connection fees due mainly for the sanitation service but also for the water service after 1920 (§5.3). Although the WSS had distinct accounting sections, it did not have distinct budget and accounts. All these revenues were flowing into the water and sanitation general municipal budget and not directly channeled towards the WSS. Data available include distinct Tariff revenues for both the water and sanitation service. We have excluded from the water Tariff the internal billing for water consumption by municipal buildings.

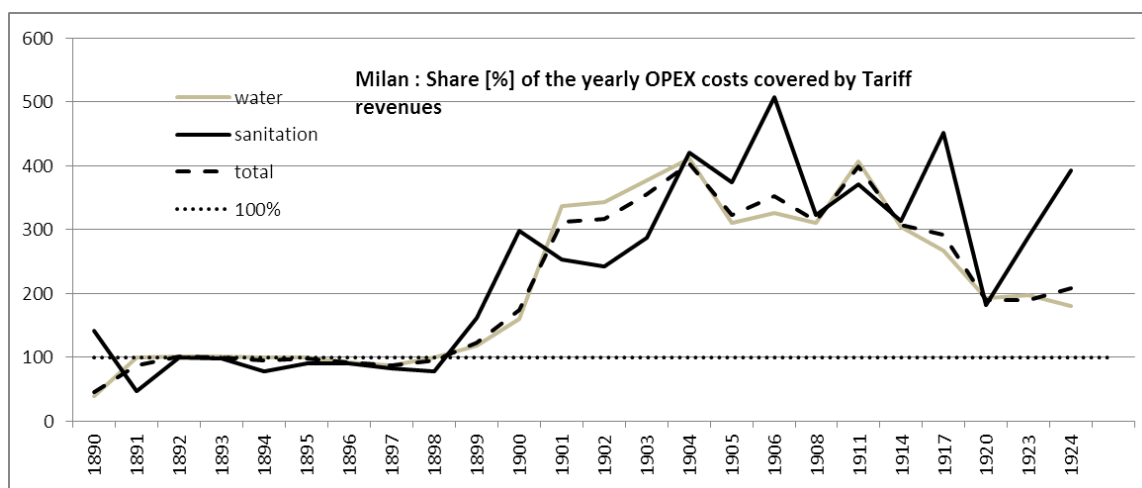
On the costs side three main categories should be distinguished: Operational expenditures (OPEX), the debt service and new investments expenditures (Capital expenditures – CAPEX). At first only a fraction of operational expenditures was accounted for in the water and sanitation chapter of the city financial report (energy, most salaries of the technical staff and ordinary maintenance expenses). On the contrary a part of the expenses (management and office clerk salaries, paper, office lighting and heating, cars) was mixed up in the various overall chapters of the city budget (we will refer to these as OPEX external costs). Only after 1911 (Atti del Municipio 1912-1913) operational expenses include a re-invoicing of those expenses previously mixed up in other accounting chapters.

The debt service expenditures were accounted for in a general expenses chapter. Before 1911 no reference was made to debt service in the water and sanitation accounting chapters. After 1911 debt service expenses are partially re-invoiced in the water and sanitation accounting

chapters (data on the debt service figures re-invoiced to Water and sanitation accounts in 1911, 1914, 1917, 1920, 1922 and 1924 are available in Crespi Reghizzi (forthcoming b).

## 6.2 Evidence on OPEX costs recovery

Revenues, OPEX and Gross Profit (expressed as the difference between revenues and OPEX) are reported in Figure 18 : Milan's WSS - share [%] of the yearly OPEX costs covered by Tariff revenues



Source : author's elaboration

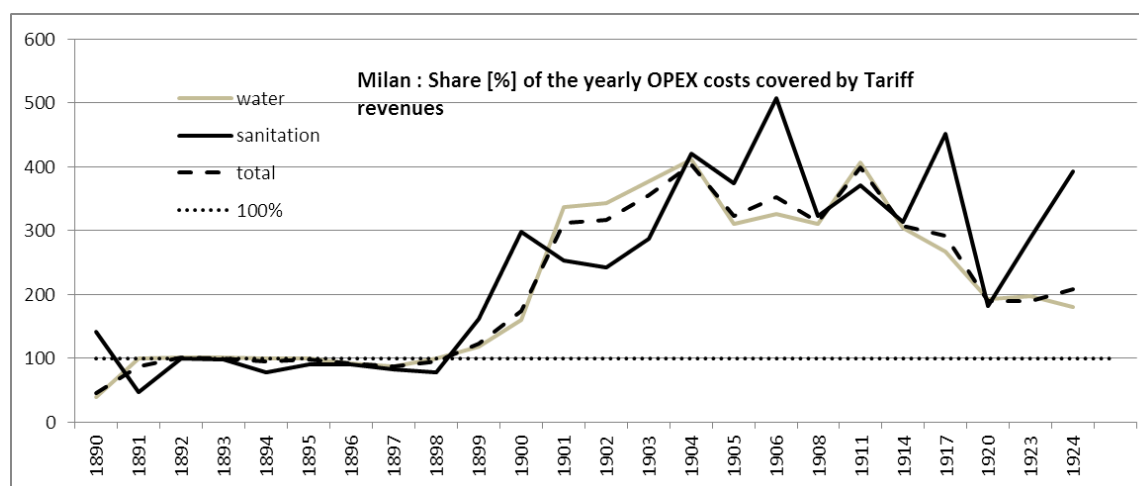
Table 12. Moreover Figure 18 shows the percentage of the yearly OPEX costs covered by Tariff revenues.

It appears clearly that until 1899 “Tariff” revenues were not even sufficient to cover the OPEX costs both for water and sanitation even without considering “hidden subsidies” (Water and sanitation OPEX external costs). By definition, costs uncovered by “Tariff” revenues are covered by the city general budget, meaning “Tax” revenues according to the OECD definition. After 1899 “Tariff” revenues were covering OPEX costs both for water and sanitation (which did not include OPEX external costs at that time).

We make the hypothesis that such a threshold was reached in 1899 when some economies of scale were obtained with a greater number of users (meaning larger revenues) in front of nearly constant or decreasing operational expenditures. Indeed tariff revenues were increasing since : i) the quantity of water metered and billed doubled from 1.17 to 2.42million m<sup>3</sup>, ii) the number of private water meters reached 2538 and iii) the number of buildings

connected to sanitation and paying the sanitation levy was getting higher<sup>125</sup> (142 connected in 1893, 227 connected in 1894 and 464 connected in 1895).

**Figure 18 : Milan's WSS - share [%] of the yearly OPEX costs covered by Tariff revenues**



Source : author's elaboration

**Table 12 : Revenues, OPEX and gross profit of Milan's WSS (1890-1924), all values in Lira**

years	Water			Sanitation			Total		
	Revenues	OPEX	Gross profit	Revenues	OPEX	Gross profit	Revenues	OPEX	Gross profit
1890	12 497	31 631	-19 134	2 748	1 939	809	15 245	33 570	-18 325
1891	34 122	34 518	-396	4 524	9 825	-5 301	38 646	44 343	-5 697
1892	57 860	57 446	414	14 626	14 625	1	72 486	72 071	415
1893	78 581	78 485	96	16 927	17 406	-479	95 508	95 891	-383
1894	114 460	115 767	-1 307	22 000	28 413	-6 413	136 460	144 180	-7 720
1895	144 004	144 086	-82	28 272	31 264	-2 992	172 276	175 350	-3 074
1896	181 980	197 496	-15 516	55 392	61 298	-5 906	237 372	258 794	-21 422
1897	252 618	288 143	-35 525	59 334	72 425	-13 091	311 952	360 568	-48 616
1898	330 156	334 414	-4 258	76 166	97 717	-21 551	406 322	432 131	-25 809
1899	445 379	378 423	66 956	87 694	54 317	33 377	533 073	432 740	100 333
1900	525 637	329 848	195 789	139 630	46 805	92 825	655 251	376 653	288 614
1901	586 443	174 193	412 250	149 743	59 221	90 522	729 586	233 414	502 772
1902	722 846	210 884	511 962	173 102	71 696	101 406	895 948	282 580	613 368
1903	839 869	222 653	617 216	205 275	71 311	133 964	1 045 144	293 964	751 180
1904	1 042 030	253 373	788 657	294 598	69 995	224 603	1 302 694	323 368	1 013 260
1905	1 132 347	364 402	767 945	328 035	87 683	240 352	1 460 382	452 085	1 008 297
1906	1 476 819	452 031	1 024 788	390 594	77 034	313 560	1 867 413	529 065	1 338 348
1908	1 948 968	627 934	1 321 034	489 603	151 599	338 004	2 438 571	779 533	1 659 038
1911	2 779 809	683 808	2 096 001	756 006	204 000	552 006	3 535 815	887 808	3 535 815
1914	2 721 329	893 361	1 827 968	821 386	261 861	559 525	3 542 715	1 155 222	2 387 493
1917	3 588 139	1 341 658	2 246 481	951 254	210 614	740 640	4 539 394	1 552 272	2 987 121

<sup>125</sup>According to the 1894 sanitation rules building connecting to the sewer system were exonerated from paying the sanitation levy for 6 years (refer to §5.3). Building connected in 1893 / 1894 were starting to pay the levy in 1899.



1920	6 350 218	3 308 380	3 041 838	2 039 236	1 127 133	912 103	8 389 454	4 435 513	3 953 941
1923	9 618 500	4 869 846	4 748 654	3 105 251	1 074 720	2 030 531	11 258 501	5 944 566	6 779 185
1924	9 553 103	5 324 441	4 228 662	5 533 857	1 411 629	4 122 228	14 038 096	6 736 070	8 350 890

Source : author's elaboration based on *Conto Consuntivo dell'anno...* [various years]

Revenues from the sanitation service were always lower than those of the water service which is not surprising. In parallel sanitation operational expenditures very low (much lower than water OPEX) since the sewer system was gravity based and no waste water treatment was in place.

### 6.3 Capital expenditures and estimated debt service

As in many infrastructure sectors water and sanitation are industries where capital expenditures are predominant over operational expenditures. Capital expenditures were financed mainly through debt as we showed in the previous sections. What was the return on invested capital given by the available gross profits? Were gross profit high enough to fully cover debt service (capital payback and interests)?

Water, sanitation and total data are summarized in Table 13, Table 14, Table 15.

A first evaluation is given by a rate of return on invested capital index computed as the percentage ratio between gross profit and invested capital up to that year. Such an index is negative before 1899 since gross profit is negative too. Concerning water only, after 1901 the rate of return is greater than 10% which might be considered an acceptable figure. The rate of return given by sanitation's gross profits is instead extremely low (always below 5 % except the 1924 value) meaning that undertaken investments were really huge compared to the profits given by that service. As a consequence the total rate of return of the investments is quite low too (never above 10 % and above 5% only after 1904).

**Table 13 : Water service financial flows (1889-1924)**

Water	(a)	(b)	(c)	(d)	(e) = 100*c/d	(f)	(g) = c-f
years	Revenues	OPEX	Gross profit	Invested capital	Return on capital %	Debt service	Net profit
1889	2 960	0	0	547 081	0.00	34 955	-34 955
1890	12 497	31 631	-19 134	777 607	-2.46	49 240	-68 374
1891	34 122	34 518	-396	1 085 458	-0.04	68 273	-68 669
1892	57 860	57 446	414	1 155 010	0.04	71 755	-71 340
1893	78 581	78 485	96	1 372 981	0.01	84 687	-84 591
1894	114 460	115 767	-1 307	1 542 981	-0.08	94 348	-95 655
1895	144 004	144 086	-82	1 843 138	0.00	112 200	-112 282
1896	181 980	197 496	-15 516	2 101 730	-0.74	127 117	-142 633
1897	252 618	288 143	-35 525	2 364 558	-1.50	142 072	-177 597

1898	330 156	334 414	-4 258	2 891 144	-0.15	173 698	-177 956
1899	445 379	378 423	66 956	3 053 581	2.19	181 509	-114 553
1900	525 637	329 848	195 789	3 086 801	6.34	180 890	14 899
1901	586 443	174 193	412 250	3 468 554	11.89	202 582	209 668
1902	722 846	210 884	511 962	3 893 542	13.15	226 702	285 260
1903	839 869	222 653	617 216	4 318 496	14.29	250 437	366 779
1904	1 042 030	253 373	788 657	4 835 560	16.31	279 694	508 963
1905	1 132 347	364 402	767 945	5 516 297	13.92	318 978	448 967
1906	1 476 819	452 031	1 024 788	6 696 881	15.30	389 688	635 100
1908	1 948 968	627 934	1 321 034	8 565 922	15.42	496 960	824 074
1911	2 779 809	683 808	2 096 001	10 850 069	19.32	618 214	1 477 787
1914	2 721 329	893 361	1 827 968	12 621 096	14.48	700 919	1 127 049
1917	3 588 139	1 341 658	2 246 481	13 826 663	16.25	743 051	1 503 430
1920	6 350 218	3 308 380	3 041 838	17 265 508	17.62	924 973	2 116 865
1923	9 618 500	4 869 846	4 748 654	26 307 132	18.05	1 450 995	3 297 659
1924	9 553 103	5 324 441	4 228 662	31 189 847	13.56	1 740 301	2 488 361

Source : author's elaboration, all data in Italian Lira

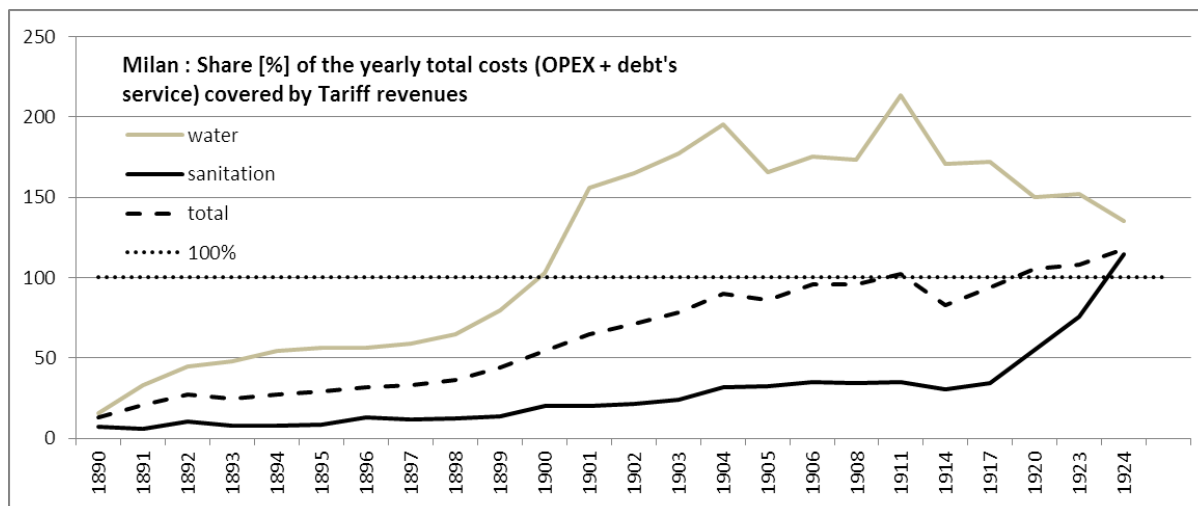
We also built a debt model in order to simulate a virtual debt service. Our debt service model (fully described in Crespi Reghizzi (forthcoming b)) which estimates a debt service value (capital payback and interests) is based on the following basic assumptions : 4.5 % interest rate, 50 years payback duration with no grace period, linear amortization, disbursement calendar following the capital expenditures calendar. Such a model is very basic and might only be able to give an order of magnitude indication<sup>126</sup>.

Figure 19 shows the share of the yearly total costs (including the debt service) covered by Tariff revenues. Water Tariff revenues were high enough to cover operational expenditures (OPEX) and the debt service (after 1899). On the contrary sanitation levy revenues (considered as Tariff) were not even sufficient at first to cover OPEX, meaning that sanitation infrastructure was mainly financed by Tax revenues.

The water and sanitation infrastructure as a whole was financed by a mix of Tax and Tariff revenues as the share of the yearly total costs covered by Tariff revenues is below 50 % until 1899, above 70 % after 1901 and close to 100% after 1906. This is also due to the effect of inflation which in the 1920's absorbed a significant part of the debt service in real terms as we show in §6.4.

**Figure 19 : Milan's WSS - share [%] of the yearly total costs (OPEX + debt service) covered by Tariff revenues**

<sup>126</sup> We have also tested the sensitivity of our model to the payback duration with two other hypothesis (35 years and 70 years). The results confirm a negative net profit for the water and sanitation service in all years except in the last years.



Source : author's elaboration

**Table 14 : Sanitation service financial flows (1889-1924)**

Water	(a)	(b)	(c)	(d)	(e) = 100*c/d	(f)	(g) = c-f
years	Revenues	OPEX	Gross profit	Invested capital	Return on capital %	Debt service	Net profit
1889	-	-	-	209 200	-	13 404	- 13 404
1890	2 748	1 939	809	592 419	0.14	37 781	- 36 972
1891	4 524	9 825	- 5 301	1 134 189	- 0.47	71 975	- 77 276
1892	14 626	14 625	1	1 989 114	0.00	125 755	- 125 754
1893	16 927	17 406	- 479	3 253 927	- 0.01	205 039	- 205 518
1894	22 000	28 413	- 6 413	4 211 279	- 0.15	263 477	- 269 890
1895	28 272	31 264	- 2 992	4 951 245	- 0.06	307 118	- 310 110
1896	55 392	61 298	- 5 906	5 957 116	- 0.10	367 139	- 373 045
1897	59 334	72 425	- 13 091	7 217 014	- 0.18	442 537	- 455 628
1898	76 166	97 717	- 21 551	8 562 184	- 0.25	522 267	- 543 818
1899	87 694	54 317	33 377	9 874 093	0.34	598 654	- 565 277
1900	139 630	46 805	92 825	10 830 780	0.86	651 091	- 558 266
1901	149 743	59 221	90 522	11 659 016	0.78	694 433	- 603 911
1902	173 102	71 696	101 406	12 691 995	0.80	750 154	- 648 748
1903	205 275	71 311	133 964	13 530 630	0.99	792 488	- 658 524
1904	294 598	69 995	224 603	14 621 523	1.54	850 237	- 625 634
1905	328 035	87 683	240 352	15 932 958	1.51	921 140	- 680 788
1906	390 594	77 034	313 560	17 906 392	1.75	1 033 298	- 719 738
1908	489 603	151 599	338 004	22 231 532	1.52	1 276 213	- 938 209
1911	756 006	204 000	552 006	33 931 109	1.63	1 955 344	- 1 403 338
1914	821 386	261 861	559 525	42 787 900	1.31	2 423 090	- 1 863 565
1917	951 254	210 614	740 640	46 673 265	1.59	2 551 211	- 1 810 571
1920	2 039 236	1 127 133	912 103	49 217 013	1.85	2 587 265	- 1 675 162
1923	3 105 251	1 074 720	2 030 531	58 343 904	3.48	3 030 920	- 1 000 389
1924	5 533 857	1 411 629	4 122 228	65 364 758	6.31	3 428 447	693 781

Source : author's elaboration, all data in Italian Lira

**Table 15 : Water and sanitation services financial flows (1889-1924)**

Water	(a)	(b)	(c)	(d)	(e) = 100*c/d	(f)	(g) = c-f
years	Revenues	OPEX	Gross profit	Invested capital	Return on capital %	Debt service	Net profit
1889	2 960	-	-	756 281	-	48 360	-48 360
1890	15 245	33 570	-18 325	1 370 026	-1.34	87 020	-105 345
1891	38 646	44 343	-5 697	2 219 648	-0.26	140 248	-145 945
1892	72 486	72 071	415	3 144 124	0.01	197 509	-197 094
1893	95 508	95 891	-383	4 626 908	-0.01	289 726	-290 109
1894	136 460	144 180	-7 720	5 754 260	-0.13	357 825	-365 545
1895	172 276	175 350	-3 074	6 794 383	-0.05	419 318	-422 392
1896	237 372	258 794	-21 422	8 058 846	-0.27	494 255	-515 677
1897	311 952	360 568	-48 616	9 581 572	-0.51	584 609	-633 225
1898	406 322	432 131	-25 809	11 453 328	-0.23	695 965	-721 774
1899	533 073	432 740	100 333	12 927 674	0.78	780 163	-679 830
1900	655 251	376 653	288 614	13 917 581	2.07	831 981	-543 367
1901	729 586	233 414	502 772	15 127 569	3.32	897 015	-394 243
1902	895 948	282 580	613 368	16 585 537	3.70	976 856	-363 488
1903	1 045 144	293 964	751 180	17 849 126	4.21	1 042 925	-291 745
1904	1 302 694	323 368	1 013 260	19 457 083	5.21	1 129 931	-116 671
1905	1 460 382	452 085	1 008 297	21 449 254	4.70	1 240 118	-231 821
1906	1 867 413	529 065	1 338 348	24 603 273	5.44	1 422 986	-84 638
1908	2 438 571	779 533	1 659 038	30 797 454	5.39	1 773 173	-114 135
1911	3 535 815	887 808	3 535 815	44 781 179	7.90	2 573 559	962 256
1914	3 542 715	1 155 222	2 387 493	55 408 997	4.31	3 124 008	-736 515
1917	4 539 394	1 552 272	2 987 121	60 499 928	4.94	3 294 262	-307 141
1920	8 389 454	4 435 513	3 953 941	66 482 521	5.95	3 512 238	441 703
1923	11 258 501	5 944 566	6 779 185	84 651 035	8.01	4 481 915	2 297 270
1924	14 038 096	6 736 070	8 350 890	96 554 604	8.65	5 168 748	3 182 142

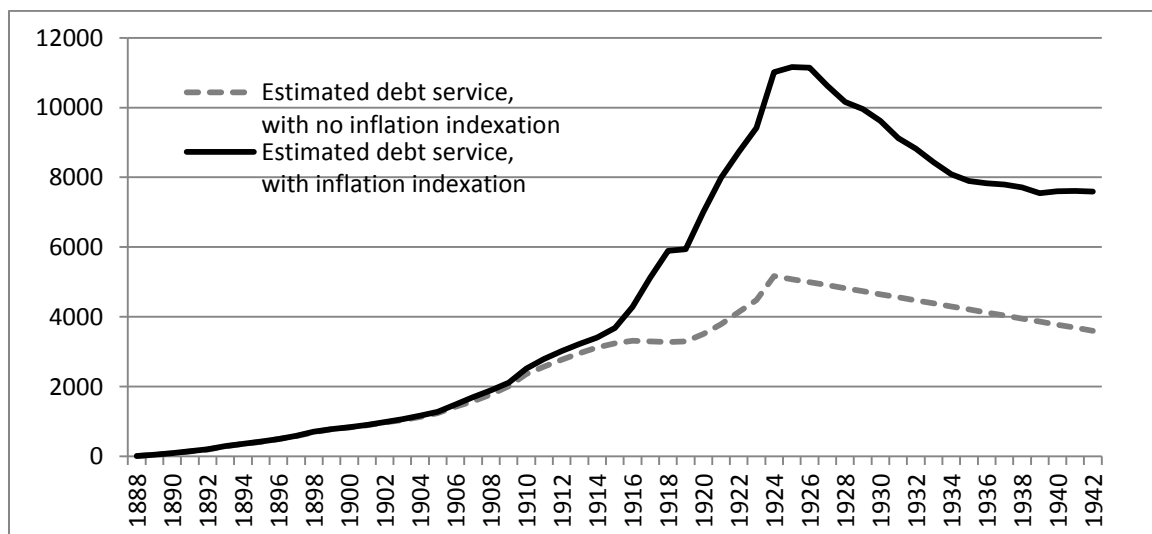
Source : author's elaboration, all data in Italian Lira

## 6.4 Inflation

We saw in the previous paragraph that the debt service's amount, while staying almost constant, progressively represented a lower percentage of the water and sanitation budget. Indeed Tariff revenues and OPEX expenses increased significantly in those years while debt service stayed nearly constant. Inflation played a key role in the borrowing-lending relationship in determining *in fine* the cost-sharing equilibrium between the lender and the borrower. Indeed, all the loans contracted by the city of Milan in those years had a fixed rate and most of them had long payback durations between 35 and 75 years. The great inflation rate of the 1910-1940 years in Italy had the effect of absorbing a significant part of the debt's residual burden, transferring it, from a long run point of view, away from the borrower on the "lenders". The graph below compares the real debt service with no indexation to inflation and

a “virtual” debt service increased by an inflation index<sup>127</sup> as if the interest rate was indexed-link to inflation. While until 1915 inflation has a minor role (the two curves are very close), after 1916 Italian annual inflation rates increased significantly and debt service indexed to inflation diverts from the curve with no indexation to inflation. The area between the two curves which goes increasing is a good proxy of the lenders progressive absorption of significant part of the debt service in real terms.

**Figure 20 : Estimated debt service in thousand Lira (1888-1944), comparison with or without inflation**



Source : author’s elaboration, all values in thousand Italian Lira

Indeed, as the last column in Table 16 shows, after 1916 a significant part of the debt’s burden has been absorbed by the lenders (bond subscribers or institutional lenders) in real terms. Indeed inflation has played a key role in terms of long-run cost-recovery since part of the capital costs have been taken away from the water, sanitation budget.

We have seen in section 4 (Table 6), that a significant part of the investments were financed through fixed-interest loans with CDP. CDP at that time was a state-owned institutions channelling savings<sup>128</sup> to the Municipalities. What was the impact of inflation on long term loans between CDP and Municipalities ? For sure CDP absorbed a part of the investment’s costs since it was being paid back in real terms less than thought. Since CDP was state owned, we make the assumption that from the municipality point of view this could be seen as a

<sup>127</sup> We have computed “virtual inflated debt service” as the sum of two elements : i) capital payback (no inflation on this) and interests which have been inflated using an inflation index. The inflation index is equal to 1 in 1888 and comes from ISTAT, serie storica, tavola 21.7

<sup>128</sup> Collected either through the postal offices networks or on the market through bond emissions in the case of the *Sezione Autonoma per il Credito Comunale e Provinciale - SACCP*

Transfer in real terms. Going further in that direction, what was the impact of inflation on the financial relations between CDP and the postal savers (or the CDP bond subscribers in the case of SACCP) ? Did the CDP absorb the inflation impact since it had to pay higher interest rates to the postal savers ? Or was the inflation's burden transferred to the savers (no major change in the interest rate paid to the savers) ? These are all key questions to address in further research.

**Table 16 : Total debt service over periods of 9 years, comparison with or without inflation**

		debt service		difference	
		a	b	c = b-a	d=100*c/b
from	to	no inflation	with inflation		%
1889	1897	2627.3	2677.2	49.9	1.9
1898	1906	9017.9	9213.9	195.9	2.1
1907	1915	22 399.4	24365.3	1965.9	8.1
1916	1924	29 116.9	54 377.7	25 260.8	46.5
1925	1933	43 390.4	91 626.0	48 235.6	52.6
1934	1942	36 351.5	70 519.6	34 168.1	48.5

Source : author's elaboration; all values in thousands of Italian Lira

## 6.5 Intergenerational transfers

Water and sanitation infrastructure has a very long lifetime. Indeed, a part of the sewers and water network built in the 1888-1924 years are still in use today in Milan. Infrastructure can be analysed as a capital stock which has been progressively built up and passed down to the next generation as a legacy. What are the intergenerational transfers implied ? How is the investment's burden shared between the generations ?

Nearly half of the investments appear to have been undertaken between 1907 to 1915 and significant fraction between 1898 and 1906 (CAPEX column in Table 17). A first level of analysis tells us that the 1898-1915 generations paid most of the capital stock.

However the infrastructure was financed through debt which by definition has the function of spreading the investments' costs over various generations. We used the same debt service model previously described and computed total debt service paid in six 9-years long time phases (4 investments phases from 1889 to 1924 and 2 debt payback only time phases from

1925 to 1942)<sup>129</sup>.. The debt service results (last column in the table above) show effectively that through deficit financing the investment's burden is better spread over various time phases unloading the 1907-1915's generation and charging more the 1916 – 1942 generations.

**Table 17 : CAPEX and debt service's burden on 9 years time periods (1889-1942)**

years		CAPEX		Debt service
from	to	1924 value	1942 value	1942 value
1889	1897	38 001	75 309	20 749
1898	1906	63 905	117 967	70 947
1907	1915	148 872	241 031	159 666
1916	1924	56 352	75 946	84 247
1925	1933	0	0	70 092
1934	1942	0	0	58 122
total		307 131	510 253	463 824

Source : author's elaboration, all values in thousand Italian Lira (1924 or 1942 value)

This issue is further explored using a basic overlapping generation model in which each generation is composed of everyone who is born at the same time instead of “everyone who is alive at a given time (Rosen and Gayer 2010, 466). Our model is conceived as schematized in Table 18 below and based on the following assumptions:

- Our model cover 6 time phases of 9 years each.
- Investments are made only in the first 4 time phases. Only debt payback takes place in the last two time phases.
- Each generation is alive along 4 time phases, labelled “young”, “adult1”, “adult2” and “old”
- We consider 7 generations crossing our time frame labelled gen0, gen1,..., gen6
- In each time phase there are four generations alive in the same time. The burden weighing on each generation is a quarter of the total burden of that time phase (as computed in the above paragraph)

The model has takes the debt service<sup>130</sup> amounts (last column in Table 17) as input. The results are given in Table 19 and show that the investment effort is quite well spread among

<sup>129</sup> The reader should be aware that the debt service model is very basic and cannot fully represent the complexity of loans effectively contracted by the municipality to finance its water and sanitation infrastructure. Nevertheless such a model is useful to appreciate the order of magnitude of each generation's contribution

<sup>130</sup> Debt service amounts are computed using CAPEX amounts.



generations (particularly among 5 generations from gen 2 to gen 6) with only the first two generations which contribute far less due to the “border effect” of the model

**Table 18 : overlapping generation model –schematic view**

	1889-1897	1898-1906	1907-1915	1916-1924	1925-1933	1934-1942
<b>young</b>	gen 3	gen 4	gen 5	gen 6		
<b>adult 1</b>	gen 2	gen 3	gen 4	gen 5	gen 6	
<b>adult 2</b>	gen 1	gen 2	gen 3	gen 4	gen 5	gen 6
<b>old</b>	gen0	gen 1	gen 2	gen 3	gen 4	gen 5

Source : author’s elaboration

**Table 19 : results from the overlapping generation model based on debt service**

	1889-1897	1898-1906	1907-1915	1916-1924	1925-1933	1934-1942	Total
gen 0	5 187	0	0	0	0	0	5 187
gen 1	5 187	17 737	0	0	0	0	22 924
gen 2	5 187	17 737	39 917	0	0	0	62 841
gen 3	5 187	17 737	39 917	21 062	0	0	83 902
gen 4	0	17 737	39 917	21 062	17 523	0	96 238
gen 5	0	0	39 917	21 062	17 523	14 531	93 032
gen 6	0	0	0	21 062	17 523	14 531	53 115

Source : author’s elaboration, all data in thousand Italian Lira (1942 value)

## 7 Conclusion

At the end of the 19th century and in the early decades of the 20th century, Milan was facing a massive economic development which implied a huge demographic pressure driven by the process of migration from the rural areas to the city. As a consequence, the municipality had to rule a fast urban expansion and to find a solution to provide at least the basic infrastructure and services. In particular the rolling-up of modern water and sanitation infrastructure could not be postponed anymore without risking major epidemics and other negative impacts on health.

At first the solution of bringing spring water from the mountains to the city was chosen but it required the support of the central government to bypass the resistance from the Brembo River inhabitants. Such a support did not come. Thus, Milan chose local groundwater resources instead of distant springs. Furthermore, doing so, Milan’s municipality chose a fully

autonomous solution which required little approval or support from the upper level of government.

Water and sanitation in Italy is mainly a municipal story and the Milan's case is the perfect example of such a paradigm. To analyse how such an infrastructure has been financed one has first to understand what the financial intergovernmental relations between the municipalities and the central government were like. The newly born Italian State was facing an uneasy financial situation and in consequence it imposed a tight financial discipline to the municipalities (ordinary budget balance, no transfers from the central government, borrowing constraints). Furthermore, as municipal fiscal revenues relied mainly on non autonomous fiscal sources shared with the central government, a growing fiscal competition took place together with a progressive reduction of the fiscal revenues left to municipalities. In the same time the compulsory expenses to be made by municipalities were increasing.

In such a tight financial situation how did Milan's municipality manage to finance a such a costly water and sanitation infrastructure ? A first idea could have been to capture the land added value created by such an infrastructure. We showed however that this kind of tools played only a minor role in the financing of Milan's urban infrastructure since both the legislative (expropriation) and fiscal tools available in Italy were not powerful enough. Milan's municipality was then facing the classical debate of defining an investment policy having schematically to choose between three options : i) to postpone the investment, ii) to increase the burden on the present generation or iii) to borrow and thus to spread the investment's cost on the forthcoming generations. However, postponing the provision of a modern water and sanitation service was not truly an option due to the public health externalities it would have implied. In turn, the classical public finance dilemma on deficit financing : option i) or option ii)) was lively.

Indeed, in 1891 Milan's policy makers were already pointing out the implicit intergenerational transfers caused by deficit financing: " To justify a loan, it is not sufficient to tell that public infrastructure will benefit mostly our grandchildren. Since we are confiscating future revenues, we also have to demonstrate that no other infrastructure needs will appear in the future and that we are providing today to all the future needs, including the

unpredictable ones<sup>131</sup>” Nevertheless, infrastructure deficit financing was not avoidable as “it would not be possible to increase taxes to cover each year those expenses. Neither to spread those extraordinary and urgent public works through the years in order to finance them on the yearly budget’s surplus would be a sound decision since those works cannot be postponed<sup>132</sup>”. Indeed, we have shown that deficit financing (both through bond and loans) was a major financing tool used to cover the investments’ costs in the short run.

In the long run debt was paid back both by users (Tariff) and by local tax payers (Tax) as our detailed analysis of the water and sanitation service financial flows showed. The combined effect of high inflation and long term deficit financing tools at fixed interest rate played a key role in absorbing a part of the investment costs

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<sup>131</sup> Such a position was taken within a report which argued in favour of a fiscal reform of Milan’s excise duty system (§2.4). *« a giustificarli [i prestiti] non basta affermare che i vantaggi delle grandi opere pubbliche ridondano in gran parte sui nipoti ; occorre dimostrare che a tempi nuovi non corrispondano nuove aspirazioni, e che noi provvediamo oggi a tutte le aspirazioni anche le non prevedibili di quell’avvenire di cui andiamo man mano confiscando i redditi. »*(Municipio di Milano 1891b, 42).

<sup>132</sup> *“Già venne altra volta accennato come non sarebbe praticamente possibile il richiedere ad inasprimenti di tasse o a tasse nuove i mezzi necessari per far fronte annualmente a simili spese. Non si riuscirebbe a nulla di pronto ed efficace. Per l’esecuzione di opere straordinarie ed urgenti ad un tempo come quelle sottoposte al vostro esame, il sistema di provvedervi ripartitamente in una lunghissima serie di anni, si da potervi far fronte con le risorse ordinarie di bilancio, non risponde ai bisogni che le dette opere reclamano, né al loro coordinamento, nè a quell’incremento della vita cittadina che non soffre soverchi ritardi nei miglioramenti di pubblici servizi e nello sviluppo edilizio”* (Municipio di Milano 1907a, v)



## Providing a municipal infrastructure: how did Paris and Milan finance their water and sanitation infrastructure (1853-1925) ?<sup>133</sup>

Olivier Crespi Reghizzi<sup>134,135</sup>

### Abstract

Water and sanitation services (WSS) are highly capital intensive, particularly in the networks' expansion phase. How was water and sanitation infrastructure financed in European cities in the early phase of 'modern' WSS' creation? What were the financing tools implemented to cover the huge investment costs in the short run? Who were the final end-payers in the long run? This paper analyzes the financing history of WSS in Paris and Milan from their creation as 'modern' services (mid-19<sup>th</sup> century in Paris, 1888 in Milan) until 1925. A comparative approach is adopted. The analysis is based both on existing literature and on primary sources (particularly the municipalities' annual financial report).

In both cities WSS were developed by the municipality. In Paris clean water was not easily available on site and complex infrastructure was built: canals, long-distance aqueducts, water supply network and sewers, water treatment plants, sewage farms. Conversely Milan lies on an abundant alluvial aquifer and only basic water infrastructure was built.

A variety of implemented financing schemes and institutional solutions (fiscal resources from the municipal budget, municipal bonds and land added value capture schemes) are identified and described. The financial equilibrium of the WSS is analyzed. A discussion on the long run cost allocation is made. It appears that long-term debt, inflation and land added value capture mechanisms played key roles in absorbing part of the investment costs.

### Keywords:

Financing history, Infrastructure, Water supply and sanitation, Paris, Milan, Municipalization, 3T's, cost sharing, bonds, inflation

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<sup>134</sup> Centre International de Recherche sur l'Environnement et le Développement (CIRED), AgroParisTech – Paris, [crespireghizzi@agroparistech.fr](mailto:crespireghizzi@agroparistech.fr)

<sup>135</sup> Centro di Economia Regionale, dei Trasporti e del Turismo (CERTET), Università Commerciale Luigi Bocconi – Milano

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## 1 Introduction

Throughout the 19<sup>th</sup> century Paris faced a demographic revolution driven by massive flows of immigrants (Marchand 1993, 35). Indeed, Paris's population progressed from 546,856 inhabitants in 1801 to 1,053,262 in 1851 and 2,714,068 in 1901 (2,871,429 in 1926).

A few decades later, the same phenomenon took place in Milan. At the time of Italy's unification in 1861, Milan had only 196 109 inhabitants. With the birth of large industries, Milan's population grew massively also due to immigration from rural areas. It reached 590 000 inhabitants in 1913. By 1931 Milan had a larger population (992 036 inhabitants) than all other Italian cities except Rome (1 008 083 inhabitants).

Such a fast and wild demographic growth implied strong negative externalities in terms of poor sanitary conditions. At first, life expectancy in Paris was even lower than in French rural areas (Kesztenbaum and Rosenthal 2012b). Severe epidemics (cholera, typhoid fever) were very common and represented a significant cause of mortality. Progressively the link between the lack of access to clean water and sanitation, the epidemics and life expectancy in the urban environment was made explicit within the scientific community and among decision-makers (Jaquemet 1979).

In 1807, no more than 8000 m<sup>3</sup>/day of drinking water (mainly pumped from the Seine) were distributed by Paris municipal water service. At that time domestic water connections were very rare and water was home-delivered by water-carriers (the *porteurs d'eau*). The sewer system had an extension of only 24 km. By 1926, Paris water infrastructure allowed to deliver roughly 1,323,960<sup>136</sup> m<sup>3</sup>/day, the great majority of the buildings had domestic water connections and roughly 1300 km of sewers were in operations.

In the second half of the 19<sup>th</sup> century there was still no modern water supply system in Milan. Water from the *navigli* (canals) was used for all non-drinking usages while drinking water came from private shallow wells (Bigatti 1997, 29) since the city lies on an abundant aquifer. Water was available in large quantities and some buildings had pumps installed which made water available upstairs (Colombo 1984, 119). Through the 1870's however ground water quality started to worsen and many scientific studies showed the link between its pollution and the quantity of waste water discharged in the ground which was significantly increasing

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<sup>136</sup> Including Ourcq water. The daily average amount without considering Ourcq water was of 1 087 852m<sup>3</sup>/day or 379 l/hab/day.

due to the extraordinary urban growth (Colombo 1984, 119). Starting in 1888 a major water and sanitation infrastructure was built in Milan. Indeed, by 1926 the water supply and sewer networks reached a length respectively of 531 and 509 km while 17 pumping stations and 331 wells had been completed totalizing a nominal discharge capacity of 5,830 l/s (503,712 m<sup>3</sup>/day).

While the technical history of Paris water and sanitation infrastructure has been largely treated in the previous literature (Cebon de Lisle 1991; Bellanger, Pineau, and SIAAP 2010; Beaumont-Maillet 1991; Bocquet, Chatzis, and Sander 2008; Chatzis 2006; Graber 2009) this is not the case for the financing history on which this paper is focused. This is even more the case for the history of Milan's water service on which the literature is limited (Bigatti 1997; Bigatti 2000; Colombo 1984; Motta 1989a; Gentile, Brown, and Spadoni 1990).

From the mid 19<sup>th</sup> century in Paris (a few decades later in Milan), due to the relentless urban growth, the implementation of a water and sanitation infrastructure could not be postponed anymore. In both cities a very significant part of the water and sanitation infrastructure which is still in operation today has been built during the second half of the 19th century and early 20<sup>th</sup> century. How was such an impressive infrastructure development financed in the two cities ?

We have made the choice of defining a time frame which lasts from 1853 (arrival of Haussmann as a prefect) to 1925 (completion of the last long distance aqueduct – *The Voulzie*) in Paris and from 1888 (creation of the municipal WSS) to 1925<sup>137</sup> (fascist abolition of the municipal autonomy) in Milan.

In both cases it was a municipal finance story. This is why we first analyse the constrained context of the municipal finance of that time (Section 2) before comparing the chosen water and sanitation infrastructure (Section 3). Different financing tools (repayable finance, land value capture tools...) were implemented in the two cities to finance the infrastructure in the short run (Section 4). Last but not least a detailed analysis of the financial flows of both WSSs has been undertaken to find out who did pay for the infrastructure in the long run (Sections 5 and 6). The users or the tax payers ? The then current generation or future ones ? We show

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<sup>137</sup>After 1924 the fascist regime abolished the autonomy of Italian municipalities (*ordinamento podestarile*) and Milan municipal budget and reports have not been found.



that the high inflation in the early 20<sup>th</sup> century played a key role in absorbing part of the debt service cost (Section 7).

## 2 Municipal finance in Italy and France

In the second half of the 19<sup>th</sup> century French and Italian municipalities were subjected to a formal yearly budget balance obligation. Furthermore, there were no major recurrent financial transfers from the central government to the municipalities (Delorme and André 1983, 90–91; Fraschini 1991; Marongiu 2001; Giarda 2005).

The municipal revenues of urban municipalities were coming mainly from indirect taxes and in particular from excise duties (the *droit d'octroi* in France and the *dazio di consumo* in Italy) on goods entering the city which might be considered as an *ante litteram* local Value Added Tax (VAT). Such a fiscal system mainly based on indirect taxes was regressive and had a strong redistributive effect in favor of capital owners and upper revenue classes (Ardant 1972; 1976).

Other fiscal sources consisted in additional levies on national taxes. In France the piggyback taxes (*centimes additionnels*) on the four national taxes<sup>138</sup> established after the Revolution were kept as municipal taxes for a significant part of the 20<sup>th</sup> century even if they were not used anymore as a fiscal source for the central state after 1917 when the national income tax system (*impôt national sur le revenu*) was established (Lainville 1930, 82). In Italy, municipalities could ask to be authorized by the central government to impose additional levies on national taxes (income tax, land property tax and building property tax) (Cassar and Creaco 2007, 716).

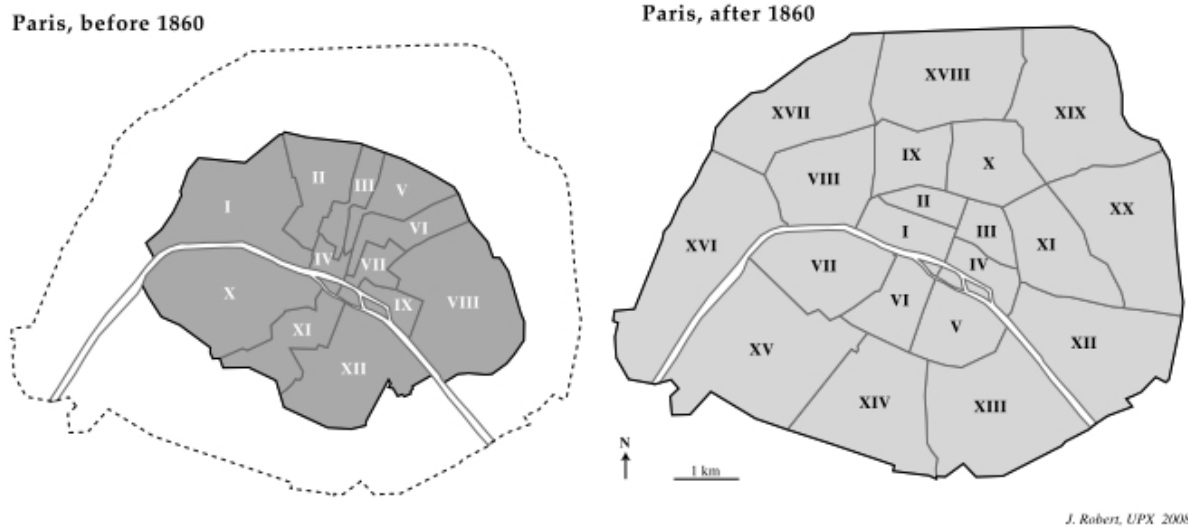
These direct taxes played a “minor” but very significant role both in Paris and Milan as the excise duties represented respectively more than two thirds and more than half of the total municipal revenues of the two cities (Volpi 1959, 25; Cadoux 1900). Cashing-in the excise-duties was a challenge for these fastly growing cities whose administrative borders were at first much smaller than their nowadays area (refer to Figure 21 and Figure 22). Milan and Paris were then facing fiscal dumping : new industries and productive activities started to develop in the suburban municipalities where no or lower excise duties were due (Campos Venuti et al. 1986; Cadoux 1900, 57).

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<sup>138</sup> *les quatre vieilles : contribution foncière sur le bâti et le non bâti, contribution personnelle mobilière, contribution sur la patente, contribution sur les portes et fenêtres*

In Paris the administrative area was enlarged on January 1<sup>st</sup> 1860 (*Loi 16 juin 1859*) while in Milan this took place in 1873. At first industries located out of the former boundary of the cities were granted the right to keep the former excise-duty regime in place in those outer municipalities for a transitional period of time of 7 years in Paris and until the 1898 fiscal reform in Milan (Cadoux 1900, 58; Volpi 1959, 24).

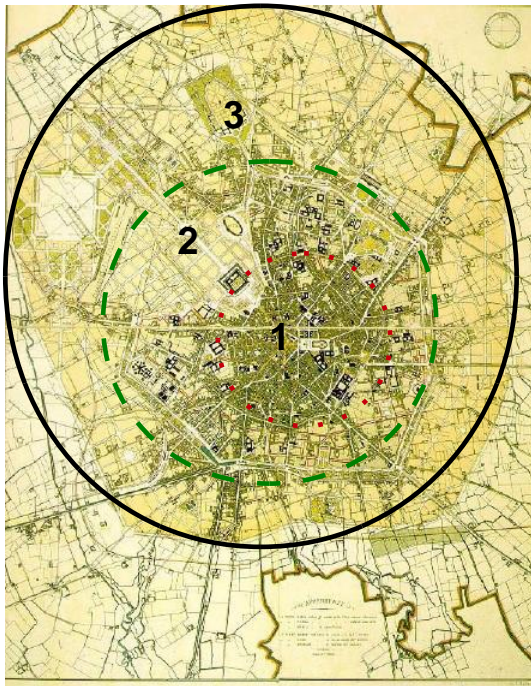
**Figure 21 : Administrative boundaries of Paris before / after 1860**



*J. Robert, UPX 2008.*

Source : Bocquet, Chatzis and Sander (2008)

**Figure 22 : The Beruto city's development master plan**



Source : author's elaboration, original map from Beruto (1885). Milan's administrative area consisted roughly in areas 1 and 2 prior to 1873 while it included area 3 afterwards.

On the other hand, in those years of fast urban development the number of services to be provided by municipalities was steadily increasing as these included schools, social services and last but not least the water and sanitation service. This implied a significant growth of the municipal expenses both concerning ordinary expenditures and the provision of the new infrastructure. While the ordinary municipal budgets were balanced most of the time, an imbalance appears if extraordinary expenses are considered too as shown for Milan case in the following table. Extraordinary expenses were needed for investments in urban infrastructure which could not be postponed anymore. In particular a modern water and sanitation system was harshly needed to improve the city's sanitary condition. The only variable which could allow matching the growing municipal expenses with the tight financial constraints was debt as we shall discuss in §4.

**Table 20 : Milan's municipal budget balance / imbalance**

	Fiscal revenues	Non fiscal revenues <sup>139</sup>	Total ordinary revenue <sup>140</sup>	Ordinary expenses	Ordinary budget balance	Extraordinary expenses	Total budget balance
	I	II	III	IV	V=III-IV	VI	VII=III-IV-VI
1888			18.4	16.9	1.5	24.56	-23.06
1898	15.3	2.9	19.5	17.9	1.6	10.6	-9
1903	20.8	4.8	27.2	22.2	5	5.4	-0.4
1908	27.6	8.9	38.8	34	4.8	14.6	-9.8
1913	35.4	12.1	53.3	43.2	10.1	13.58	-3.48
1918	44.2	14.47	66.1	62.7	3.4	20	-16.6
1921	155.9	32.3	200.8	185.6	15.2	102.2	-87

Source : author's elaboration from Sai et al (1970, 232) and municipal yearly financial reports, all figures in Million Italian Lira, nominal value

### 3 Water and sanitation infrastructure

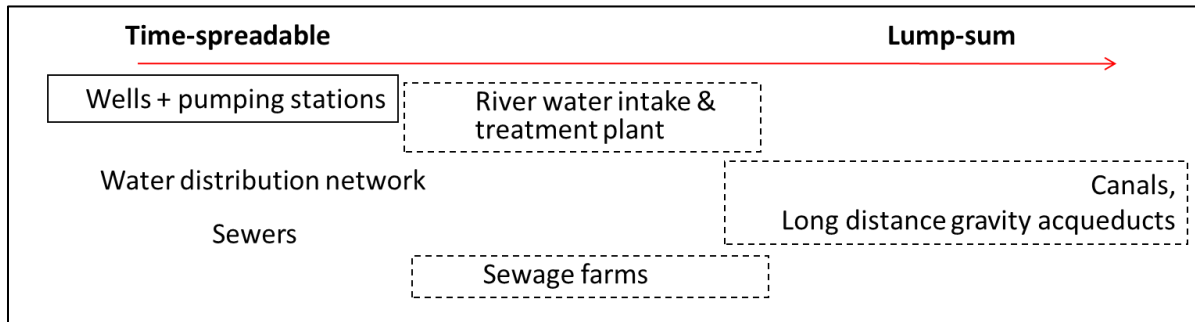
The built infrastructure might be classified according to whether it consists in a *time-spreadable* or in a *lump-sum* investment (refer to Figure 23). Investments in the water networks and sewer systems built in both cities were spread over long periods of time, as this

<sup>139</sup><sup>139</sup>Non fiscal revenues are composed of tariff revenues from the following municipal services: tramways, electricity, water and sanitation.

<sup>140</sup>Total ordinary revenues (column III) are not only the addition of fiscal and non fiscal revenues (columns I and II), there is a third addend, not given in the table, which is represented by the "*rendite patrimoniali*". Under such a label are included : revenues from municipal buildings, revenues from government bonds, revenues from concessions to private companies (tramways to the Edison company). We have omitted them from the table since they always represented minor amounts.

infrastructure expanded. On the contrary the water production infrastructure built at first in Paris (canals, long distance aqueducts and reservoirs) required huge lump-sum investments. In Milan only a very basic water production infrastructure (wells, pumping stations) was built since the city lies over an abundant aquifer which obviously fills the water storage function.

**Figure 23 : a classification of water and sanitation infrastructure in Paris and Milan**



Source : author's elaboration ; Paris in dotted lines, Milan in full lines and infrastructure built in both cities with no lines

### 3.1 Paris

A very significant part of Paris's water infrastructure was built between 1853 and 1925. A first phase goes from 1853 to 1880 in the years of Paris urban transformation years initiated by Haussmann (who ruled Paris as a prefect from 1852 to 1869) and implemented thanks to its chief engineer Belgrand. After 1880 (Belgrand's death) a second phase opens and ends symbolically in 1925 with the realization of the *Voulzie* which is the last long-distance aqueduct built in Paris.

The main investments concerned:

- a) aqueducts and reservoirs aimed at bringing clean water to the city and storing it (clear example of lump-sum investments),
- b) water stations pumping surface water from the river system,
- c) waste water disposal plant through sewage farms (*champs d'épandage*), including a pumping station
- d) water distribution networks and sewers (example of time-spreadable investments, see also Figure 23).

An estimation of the total invested amounts in those years is given in Table 21 and Table 22 respectively in nominal (current) value and in 1925 francs (constant) value<sup>141</sup>. Total water investments represent more than twice the sanitation investments. Indeed, the water adduction infrastructure was costly as detailed in

Table 23. Let us keep in mind that Paris' municipality had an annual budget of 264 M Francs in 1891 (1.2 Billions francs in 1925<sup>142</sup> value), of 320 M Francs in 1900 (1.5 Billions francs in 1925 value) and of 2.1 Billions Francs in 1925 (Cadoux 1900, 538; Ville de Paris 1926). The total investment amounts in water and sanitation infrastructure over 75 years represent the same order of magnitude of the city annual budget in 1925.

**Table 21 : Total investments in water and sanitation infrastructure in Paris, millions francs nominal value**

		1853-1877	1878-1900	1901-1925
water	networks	105.10	16.65	5.61
	long distance water supply devices including reservoirs	76.34	53.00	123.00
	surface water	0.00	17.00	0.00
	total	181.44	86.65	128.61
sanitation	sewer	45.52	39.58	32.11
	Sewage farms	0.00	52.27	0.00
	total	45.52	91.85	32.11
<b>total</b>		<b>226.96</b>	<b>178.50</b>	<b>160.72</b>

Source : author's elaboration based on Crespi Reghizzi (2012), all values in thousands francs

<sup>141</sup>Inflation index from Piketty (2001), annex F has been used. The index starts in 1890 only. The 1890 index value has been used both for the 1853-1877 and for the 1878-1900 investments. This is justified by the fact that inflation has been very low during the second half of the 19<sup>th</sup> century. The 1913 value has been used for the 1901-1925 investments.

<sup>142</sup>Inflation factors from Piketty (2001), annex F

**Table 22 : Total investments in water and sanitation infrastructure in Paris, inflated to 1925 millions francs values**

		1853-1877	1878-1900	1901-1925	total
reference year		1890	1890	1913	
inflation factor		4.71	4.71	4.05	
water	networks	495.15	78.45	22.75	<b>596.35</b>
	long distance water supply devices including reservoirs	359.68	249.70	498.36	<b>1107.74</b>
	surface water	0.00	80.09	0.00	<b>80.09</b>
	total	854.83	408.24	521.11	<b>1784.18</b>
sanitation	sewer	214.46	186.50	130.09	<b>531.05</b>
	Sewage farms	0.00	246.25	0.00	<b>246.25</b>
	total	214.46	432.75	130.09	<b>777.30</b>
<b>total</b>		<b>1069.29</b>	<b>841.00</b>	<b>651.20</b>	<b>2561.48</b>

Source : author's elaboration, inflation factors from Piketty (2001), annex F

**Table 23 : Main investments in water supply devices (1862-1900),**

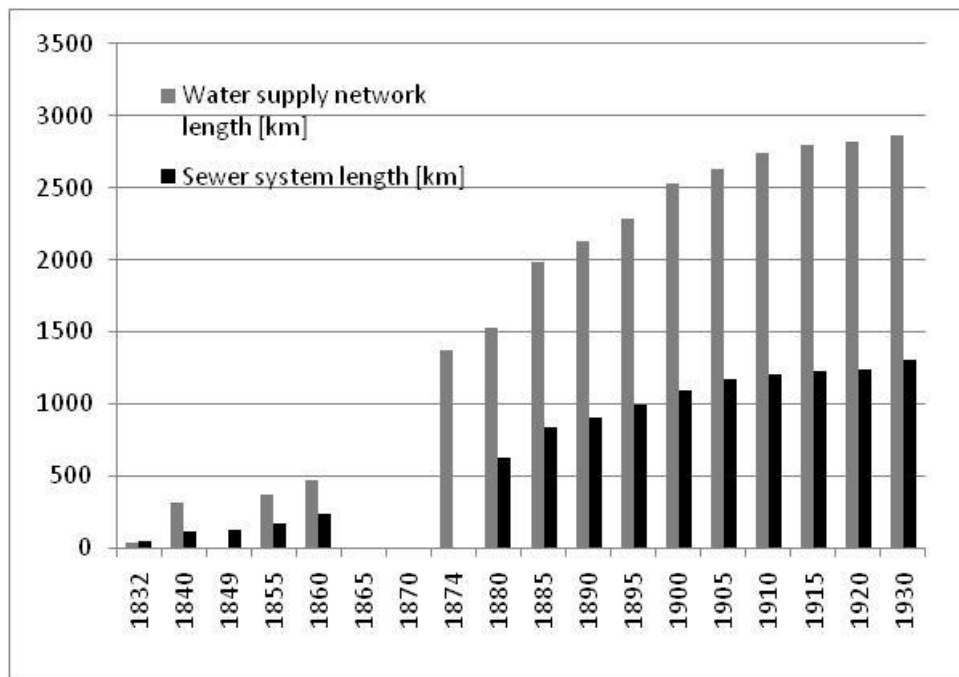
Operation name	Included infrastructures	Costs (Francs)	Loan	Comments
<b>Dhuis adduction</b> 1862-1865	Total	27 560 000		
	Dhuis aqueduct	18 000 000		131 km
	Storage unit Menilmontant et Belleville	4 560 000		123000 m <sup>3</sup>
	Main water distribution network	5 000 000		
<b>Vanne adduction</b> 1867-1876	total	48 782 000	Partially on the 1865 loan + 18 M on the 1872 special loan	
	Vanne aqueduct	37 230 000		173 km
	Storage unit Montrouge	6 000 000		204000 m <sup>3</sup>
	Main water distribution network	2 200 000		
	Additional expenses	3 352 000 <sup>143</sup>		
<b>Vigne and Avre adductions</b> 1891-1893	Vigne and Avre aqueducts	35 000 000	35 M 1886 loan <sup>144</sup>	102 km
	Storage unit Saint Cloud			286 000 m <sup>3</sup>
<b>Loing and Lunain adductions</b> 1897-1900 + 1911 - 1922		28 000 000 (Cebron de L'isle) 70 000 000 <sup>145</sup>	23 M on the 1894 loan	73 km Pumping station at Sorques
<b>Voulzie</b> 1922 -1925		53 000 000	53 MF on 1921 loan	45 km

Source : author's elaboration, data coming from (Cebron de Lisle 1991; Beaumont-Maillet 1991)

<sup>143</sup>Lemarchand (1923, 205)

<sup>144</sup>Lemarchand (1923, 161)

<sup>145</sup>Lemarchand(1923, 179), including the second phase of works 1911 - 1922

**Figure 24 : Paris : water network and sewer system lengths (1832-1930)**

Source : Authors elaboration, inspired from various sources (Cebon de Lisle 1991, 247, 424, 559; Lemarchand 1914, 164; Lemarchand 1923, 274) and from *Annuaire Statistique de la Ville de Paris*, various years

### 3.2 Milan

In 1881 a call for tender for the supply of water was launched by Milan's municipality. The scope was not only to find the best way to deliver far away water to the city but also to "allow the European monetary markets to furnish capitals to build such an infrastructure<sup>146</sup>".

Among the 12 bids in competition the municipal commission ranked first a project by the Società Italiana condotte d'acqua (linked to the Banco di Roma) and a contract was signed. The project planned to channel spring water nearby the Brembo River and to reach Milan through a 45 km gravity aqueduct plus a 25 km pressure pipeline. A public utility declaration from the Ministry of public works was needed to allow the land expropriation and start the project. The inhabitants of the Brembo valley fiercely opposed<sup>147</sup> to the project. (Colombo 1984, 120). In 1885 the ministry ended up abolishing the project.

Milan's municipality terminated the contract with the Società Italiana condotte d'acqua and launched in 1887 a new more detailed call for tenders. Spring water was not anymore a priori preferred to ground water. Indeed, in 1888 the City's council chose to experiment a water

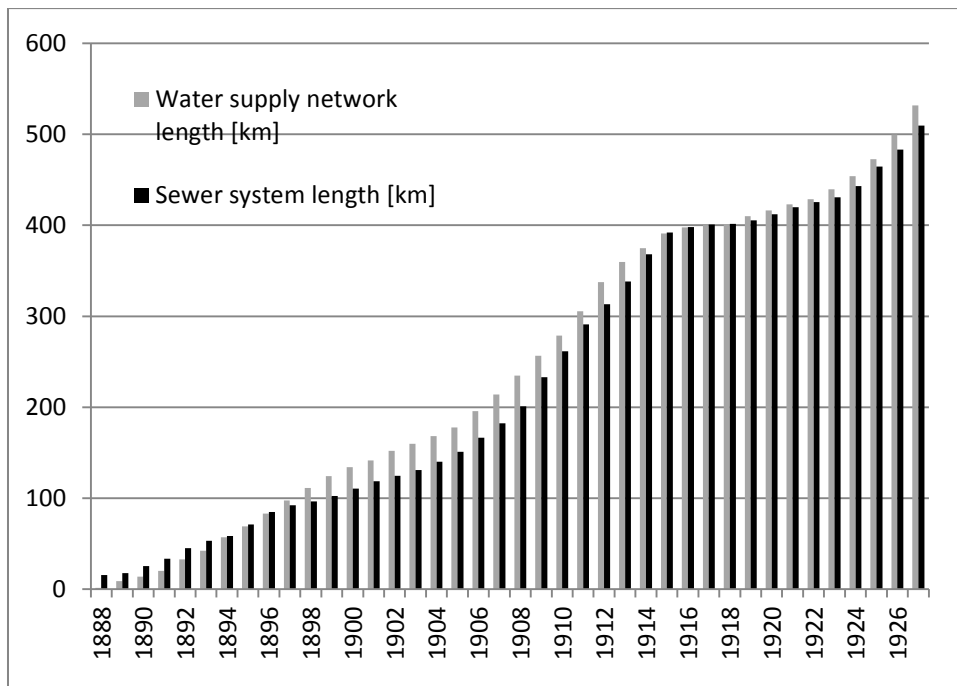
<sup>146</sup> "Permettendo i mercati monetari europei di associare capitali per l'esecuzione di tal genere di imprese" (Municipio di Milano 1881; quoted by Colombo 1984)

<sup>147</sup> The Brembo valley is located in the Bergamo region. It is well known that Bergamo and Milan have historically been in rivalry

supply pilot project based on groundwater resources. This can be considered as an example of the switch from the “water quantity” to the “water quality” paradigm defined by Barraqué (2003b).

In the same year the municipal sanitation service was created too. In the following years the water network and sewer system were expanded progressively (refer to Figure 25) as a time-spreadable infrastructure. with the switch from the “water quantity” to the “water quality” paradigm defined by (Barraqué 2003b)

**Figure 25 : Milan’s water supply and sewer networks length (1888-1927)**



Source : author’s elaboration, various data sources

The choice of relying on local groundwater resources was also a way for Milan’s municipality to be free from central government’s authorization which would have been needed in case far away water source had been chosen.

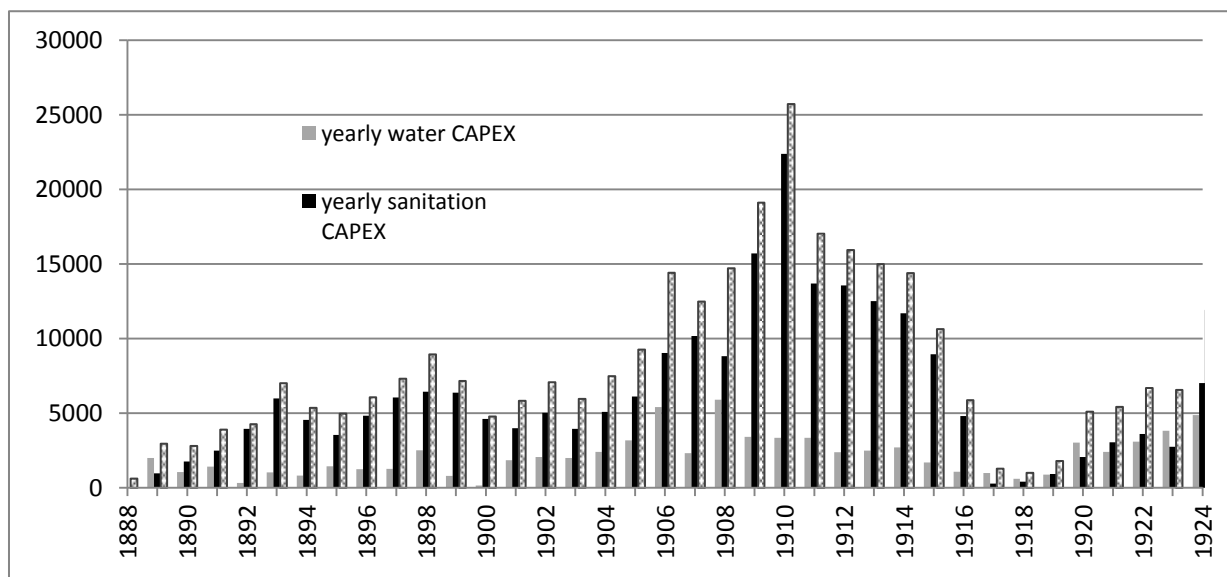
According to the annual city financial report (*conto consuntivo*) capital expenditure in water and sanitation infrastructure adds up to a total amount of respectively 79.9 and 227.2 million Italian lira (expressed in 1924 value). Thus in strong contrast with what was observed in Paris, sanitation infrastructure implied costs nearly three times greater than water supply ones. This was due to the fact that water infrastructure built in Milan was very basic (only time-



spreadable infrastructure). The average annual capital expenditure in water and sanitation in those years was respectively of 2.1 and 6.1 million Italian lira (expressed in 1924 value).

This might be compared to the size of the total ordinary revenue of the city : 90.6 million 1924 Lira in 1888, 171.3 million 1924 Lira in 1908 and 205.41million 1924 Lira in 1921. The total investment amounts in water and sanitation infrastructure over 36 years (more than 300 million lira) represent the same order of magnitude of the city annual budget in 1921.

**Figure 26 : Yearly CAPEX in water and sanitation (1888-1924), thousand Lira 1924 value**



Source : author's elaboration based on *Conto consuntivo dell'anno...*

## 4 Short run financing tools

How was the costly infrastructure described in the previous paragraphs financed in both cities? In that historical phase the water and sanitation fell within the overall municipal budget and we have already pointed out that the municipalities were facing tight financial constraints: indeed the surplus from ordinary municipal budget was not sufficient and investments were financed using two other financing tools: i) land value capture tools and ii) long term municipal debt (repayable finance).

### 4.1 Repayable finance

In the second half of the 19<sup>th</sup> century both municipalities borrowed massive amounts of money to finance the infrastructure required by their urban development. Respectively 29 and 25 borrowing operations were undertaken by the Paris and Milan municipalities between 1849

(1854 in Milan) and 1925<sup>148</sup>. Debt was issued either through bonds (in the case of Paris) or through loans<sup>149</sup> (subscribed mainly from a state-owned lending institution the *Cassa Depositi e Prestiti* in the case of Milan).

Debt was managed and issued globally at municipal level through multipurpose loans or bonds aimed at financing various municipal sectors (eg. Schools and Public works in the 1892-94 and 1894-96 bonds in Paris). There are only few cases of bonds/loans dedicated to the water and sanitation infrastructure only. That happened only when the two municipalities had no other choice to bring the infrastructure to completion (e.g. in Paris : 1872 bond dedicated to the *Vanne* aqueduct and 1908 loan dedicated to water and sanitation).

Most of the time the fiscal revenues (a part of the excise duties or a part of the additional levies on the national taxes<sup>150</sup>) of the municipality were used as collaterals for the loans. Very seldom were revenues from water tariff or sanitation levies used as collaterals: this happened in Paris only in 1894<sup>151</sup> (sanitation levy used as a collateral) and in 1908<sup>152</sup>.

Most of the issued loans/bonds had a very long maturity (30-80 years) and a fixed interest rate. According to Marchand (2011) savers in those years were trusting long term investments of that kind thanks to the gold standard comforting effect. In retrospect, however, those savers lost most of their money as the great inflation of the period from the 1910's to the 1930's severely curbed down in real terms the profitability of their investments (refer to §2.6).

Both municipalities were subjected to a borrowing authorization and capping fixed by an upper level of government (the *Provincia* – county, in Italy and the national parliament in France) which constrained the pace of investment. Other sources of funding thus had to be found and land value capture tools offered part of the solution (Section 4.2).

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<sup>148</sup> A detailed analysis of the borrowing operations undertaken by the two municipalities is available in (Crespi Reghizzi 2012; Crespi Reghizzi 2013; Gallais-Hamonno 2007, Electronic Annex II; Massa-Gille 1973)

<sup>149</sup> *Loans* are bilateral financial instruments between a borrower and a lender, through which the borrower borrows a fixed amount of money commensurate with the cost of a specific project... *Bonds* are multilateral financial instruments structured between an issuer and multiple investors, through which the issuer receives a lump sum of money at the time of issuance.” (Tremolet, Mansour, and Gorelick forth)

<sup>150</sup> The 1921 act (June 10<sup>th</sup>) authorised for example the city to raise 50 additional centimes on the tax base : “50 centimes additionnels) additionnels au principal des 4 contributions directes”

<sup>151</sup> 1894 *tout à l'égout* act

<sup>152</sup> A special fund was created to collect up to 3MF coming from water revenues and allowing to cover the loan's amortization. That special fund was supposed to be the collateral for the three first years while the general budget would be used as a collateral afterwards. (République Française 1912, 278)

## 4.2 Land Value Capture tools

According to nowadays value capture theory, urban infrastructure can be financed endogenously if the local authorities are able to design proper legal mechanisms to capture part of the added value created by urban growth (Peterson 2009). In other terms through a value capture financing scheme a public administration can monetize a part of the positive externalities of an infrastructure project (Brugnoli 2010, 15). A great variety of land value capture tools exists among which “a land acquisition and resale policy” which consists in owning or “acquiring lands near by an infrastructure project and then sell it on completion of the project” (Peterson 2009, 41).

In Paris a massive urban renovation took place between 1853 and 1869 under prefect Haussmann’s mandate. Between 1852 and 1868 more than half of Paris buildings were demolished (18 000 buildings demolished on a total of 30 770 buildings in Paris at that time). 60 % of Paris’s surface was transformed for a total investment amount over 17 years of 2.5 billion francs which represented more than the total annual budget of the French state at that time (2 billion francs) (Marchand 2011). New streets, boulevards and entire areas were built anew, lined with water pipes and sewers. The costs of the water and sewerage networks were partially absorbed in the global cost of these urban regeneration operations, which were financed through a public land acquisition and resale policy.

The profitability of the urban regeneration operations was ensured by a major expropriation decree adopted in 1852. On the grounds of the fight against insalubrity, it authorized the expropriation of all properties impacted by the planned urban works, including those only marginally impacted. By doing so, a greater part of the capital gain on land values could be captured by the municipality. Land owners appealed against the expropriation act and, after 1855, properties could be expropriated less easily and at higher cost for the municipality (Harvey 2003, 209–210; Marchand 2011; Morizet 1932, 287).

One issue with that scheme was that substantial funding was required to pre-finance all of the costs (expropriation and works), whilst the revenues were to be collected only much later. To that end, the *Caisse des travaux* was created: this was a short term revolving fund, subject to a borrowing cap imposed by Parliament. Given that this proved to be insufficient, another scheme was launched, the *Bons de délégation*, in which a general contractor was involved in the up-front financing of the operation. Such a financing mechanism was harshly criticized for

being a hidden form of borrowing to bypass the Parliament's borrowing cap. The harsh debate on the level of municipal debt was one of the main reasons for Haussmann's fall<sup>153</sup>.

Another key issue with this system, however, is that these massive urban regeneration operations had a very large social impact, given that relatively poor people who had been expropriated could not afford to live in the area once it had been renovated. Indeed, the negative social impacts of Haussmann's policy have been underlined by many authors (Marchand 1993, 99–101; Harvey 2003; 2012).

### **4.3 Two different financing strategies for water and sanitation infrastructure**

To sum up, what were the financing tools implemented by both cities to finance water and sanitation infrastructure?

In Paris between 1853 and 1880 one should distinguish between the lump-sum strategic water supply infrastructure (aqueducts and reservoirs) on one hand and the time-spreadable infrastructure (water distribution and sewer system) on the other. The former were financed through various municipal multipurpose bonds, while on the contrary the latter were only partly financed through ordinary public funds coming from the municipal yearly budget (surplus). Indeed, network development was only a single element of more complex and large operations through which entire buildings, streets and areas were renovated. Network costs were then absorbed in the global cost of these operations through land value capture schemes we have described in the previous section.

From our perspective, two key public policy choices made it possible for Paris to undertake a massive land acquisition and resale: a) powerful expropriation tools and b) a capacity to mobilize quickly large amounts of money through innovative borrowing schemes. An attempt was made in Milan too to implement a similar land acquisition and resale policy but the same two essential conditions were not met: available expropriation tools were weak and the borrowing policy was very cautious and constrained. As a matter of fact only two significant urban value capture operations were undertaken in 1885 (Foro Buonaparte area) and in 1905 (Saldini – Ponti policy). With the exception of these two urban operations, value capture mechanisms did not play a significant role in financing Milan's urban infrastructure including

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<sup>153</sup> The debate was harsh as shown in the famous *pamphlet* “*Les Comptes fantastiques d’Haussmann*” by Jules Ferry (1868) accusing Haussmann to put abusively the city into a massive debt which shall weight on the next generations. See also I “[*Rac*]conti fantastici” del barone Haussmann (Barraqué 1987)

the water and sanitation one which was mostly financed on multipurpose municipal loans (Crespi Reghizzi 2013).

In Paris too, after the 1880's the water and sanitation infrastructure was financed through multipurpose municipal bonds and land value capture tools stopped being relevant since most urban renovation operations initiated by Haussmann had been brought to completion.

## 5 Water tariff and sanitation levies

In Paris, under Haussmann's mandate; water infrastructure was seen as a potential source of revenues for the city. It made sense then to capitalize these revenues through a loan which they would payback. Haussmann and his municipal administration had already an industrial and commercial vision of the water service. That vision is quite similar to the "municipal capitalism" described by Millward (2000, 324) as the main driver in favour of public ownership<sup>154</sup>. According to such a vision, the *Compagnie Générale des Eaux* (CGE) was entrusted through the 1860 agreement<sup>155</sup> of *régie intéressée* with the task of collecting the water bills<sup>156</sup>. Through such an agreement water service revenues were secured and the commercial risk taken by CGE. The municipality could focus its attention on operations and especially on investments and works. Both a "municipalization and a (partial) privatization" had taken place (Bocquet, Chatzis, and Sander 2008).

At first in Paris, two kinds of subscriptions were available: the *robinet libre* and the *à la jauge* subscription. The first implied an unlimited quantity of water and was offered only for lower quality water (*Ourcq*). The latter consisted in a gauged pipe allowing only a limited discharge. It implied having a water storage capacity within the building. It was used for the *Seine* water connections (and also later for the spring water connections) with the purpose of better controlling consumption (Cebon de Lisle 1991, 191). It is only after 1880 that subscriptions with collective water meters started to be set up in order both to disincentivize excessive water consumption and to increase water revenues through a more faithful metering and billing system (Chatzis 2006). After 1894 only meter subscriptions were allowed for spring

<sup>154</sup>According to Millward (2000), municipal enterprise in England in the second half of the 19<sup>th</sup> century is much more driven by the will to increase municipal revenues through municipal enterprise's rates rather than a municipal socialism ideology which in fact appeared later in the early decades of the 20<sup>th</sup> century.

<sup>155</sup>An amendment to the 1860 agreement was signed in 1869. A new agreement was signed on February 11<sup>th</sup> 1911 at the expiry of the first one. A third agreement was signed on February 1930.

<sup>156</sup>The municipality kept under its own responsibility (*régie directe*) the commercial relationship with water users within the public administration.

water which was sold at  $0.35 \text{ F/m}^3$  with a concessional tariff for low income buildings. Surface water was sold cheaper, roughly around  $0.20 \text{ F/m}^3$  (Lemarchand 1923, 874)

In Milan water collective meters were installed from the early phase of municipal water service. The first set of rules for the water supply service was approved in 1894 (Municipio di Milano 1907b). Water tariffs included moderate volume discounts in order to encourage consumption. An annual fee had to be paid too depending on the diameter of the installed meter. In 1912 a new four blocks tariff with major volume discounts was approved in order to discourage the growing trend of private borehole drilling (Atti del Municipio di Milano 1919-1920, p736).

In both cities a sanitation levy was established (in 1888 in Milan and in 1894 in Paris) and in 1894 in both cities it was made compulsory for landlords with a sewer nearby to connect and pay the levy. Connection to the water service was also made compulsory, officially to ensure sufficient fluidity to the sewer system (Bellanger, Pineau, and SIAAP 2010, 84).

A variety of connection policies were applied through the decades in the two cities. For example a six years temporary exoneration from the sanitation levy was applied in Milan in order to encourage connections (Crespi Reghizzi 2013). In turn, in Paris at the end of the 1870s free installation of standpipes to bring water to all floors was proposed by the city to all un-connected building owners engaging themselves in a minimal annual water subscription (Bocquet, Chatzis, and Sander 2008, 8).

## 6 Long run perspective

We have analysed in the previous sections how investments have been financed. A key issue is then to discuss the long run (final) cost allocation which might be very different from the short run one. In other words it is essential to distinguish the (short run) financial solution from the (long run) economic equilibrium. To do so we adopt the classical OECD 3Ts (Tariff, Transfer, Taxes) methodology (OECD 2009a). Which one of the 3Ts did pay the investment *in fine* ?

### 6.1 Data and methodology

In this paragraph we describe the data and the methodology we adopted to analyse the WSSs financial flows in Paris and Milan. We analysed the water and sanitation accounting sections

within the yearly financial reports of the two cities and schematized the financial flows going on (refer to the Figure 27 below which shows Milan's WSS model).

The primary data source used is the municipal yearly financial report : *Compte administrative de l'année* in Paris and *conto consuntivo dell'anno* in Milan. These documents reported the yearly revenues and operational expenditures of the WSSs.

**Revenues** from "Tariffs" in those years were coming from the domestic water users through water billing<sup>157</sup> and from the landlords who were paying a sanitation levy. Although such a levy was very similar to a property tax, we argue that to our purpose it can be considered as a contribution to the "Tariff" part of the revenues. Doing so, we agree with Massarutto<sup>158</sup> (2002; 2007) and our analysis is inspired from the accounting scheme he proposes.

A part of the yearly operational expenditures (OPEX) was accounted for in the water and sanitation accounting sections of the yearly financial report while others were invoiced from general accounting sections ("OPEX external costs").

Investments were accounted for in a separate section (*Dépenses extraordinaires affectées sur fonds d'emprunt*) and no accounting depreciation was in use. Based on evidence from the municipal financial report, the assumption is made that capital expenditures (CAPEX) were entirely financed by debt. The debt service is computed through a model based on the bonds and loans characteristics (Box 4). Details on the inflation index used are given in Box 5.

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<sup>157</sup> Also from the canal navigation users in Paris

<sup>158</sup> "It is often a pure terminologic convention that of considering revenues either as direct charges or taxation. What really matters is who pays, for what purpose and how much, and what is the customer actually obtaining in exchange of what is paid." (Massarutto 2002, 25)

**Box 4 :Debt-service model**

In both cities. We used a simplified model based on the loans contracted by the cities to estimate the total debt service amount (capital payback and interests) due to the water and sanitation service. Our models are too simple to represent the complexity of the city's debt service but it is valuable in estimating the order of magnitude and trends of the variables.

**Paris :** The model is based on the real loans contracted by the city. Only the capital fractions of the loan that financed water and sanitation investments are considered. Effective interest rates (from 3.45 to 5.75 %) and maturities from the real bonds (from 20 to 80 years) are adopted. Debt's redemption is considered linear and with no grace period.

**Milan :** The model is based on the following basic assumptions : 4.5 % interest rate, 50 years maturity with no grace period, linear debt's redemption, disbursement calendar following the real capital expenditures calendar.

More details on the collected data and on the adopted methodology are given in our working papers (Crespi Reghizzi 2012; Crespi Reghizzi 2013).

Since no "Transfer" from an upper level of government was taking place, by definition, costs uncovered by "Tariff" revenues were covered by the City's general budget, meaning local "Tax" revenues according to the OECD 3T's definition.

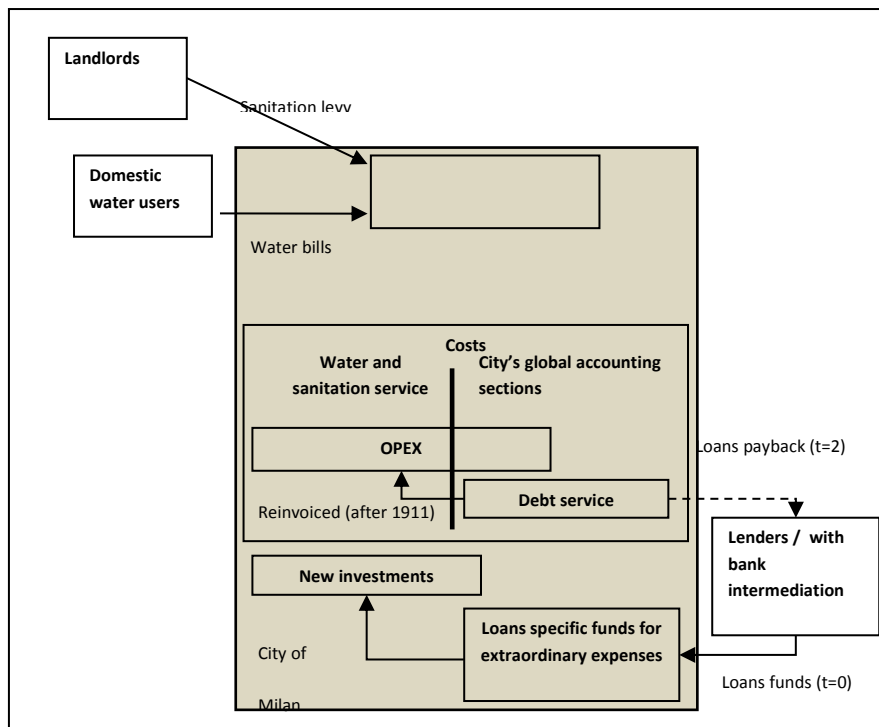
**Box 5 : Inflation index**

**France :** inflation index from Piketty (2001 Annex F), inspired from INSEE, Bulletin Mensuel de Statistique, février 1999, pp.144-145 ("coefficient de transformation du franc d'une année ancienne en franc")

**Italy :** ISTAT, serie storiche, tavola 21.7

More details are given in our working papers (Crespi Reghizzi 2012; Crespi Reghizzi 2013).



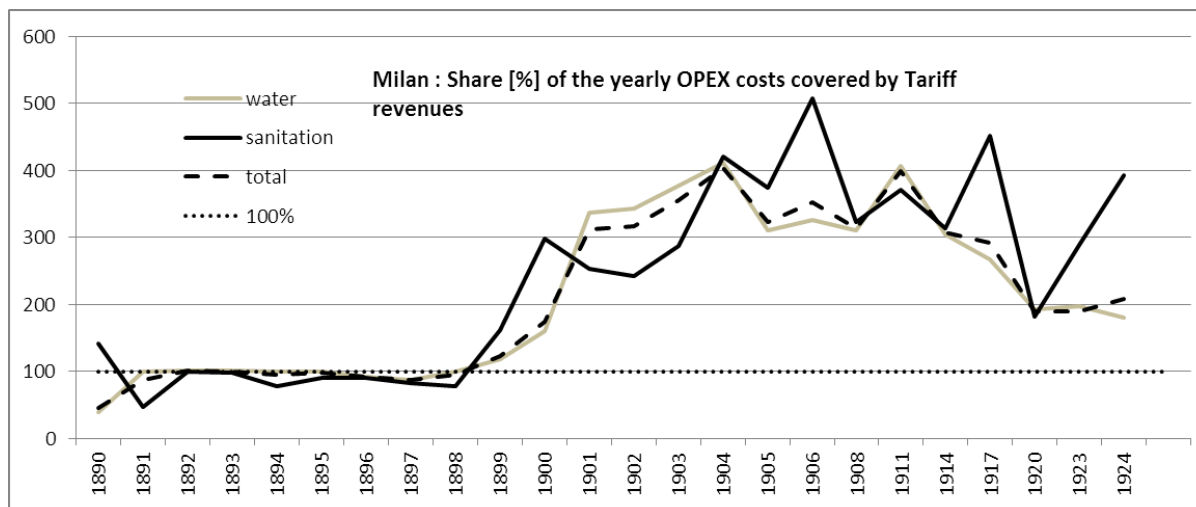
**Figure 27 : Institutional scheme and financial flows of Milan's WSS (1888-1924)**

Source : author's elaboration

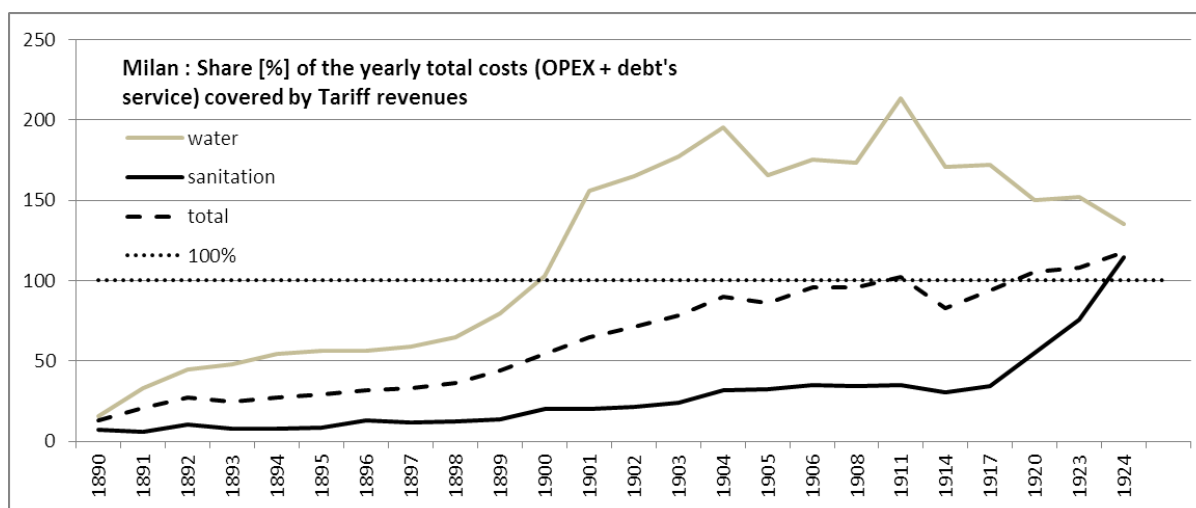
## 6.2 Evidence from the WSSs financial flows

In this paragraph we sum up the results of the undertaken analysis of the WSS Financial Flows in Paris and Milan.

In Milan, water Tariff revenues were high enough to cover operational expenditures (OPEX) and the debt service (after 1899). On the contrary sanitation levy revenues (considered as Tariff) were not even sufficient to cover OPEX, meaning that sanitation infrastructure was mainly financed by Tax revenues. The water and sanitation infrastructure as a whole was financed by a mix of Tax and Tariff revenues : the share of the yearly total costs covered by Tariff revenues is below 50 % until 1899, above 70 % after 1901 and of roughly 100% after 1906 (refer to Figure 28 and Figure 29).

**Figure 28: Milan - share [%] of the yearly OPEX costs covered by Tariff revenues**

Source : author's elaboration

**Figure 29 : Milan - share [%] of the yearly total costs (OPEX + debt's service) covered by Tariff revenues**

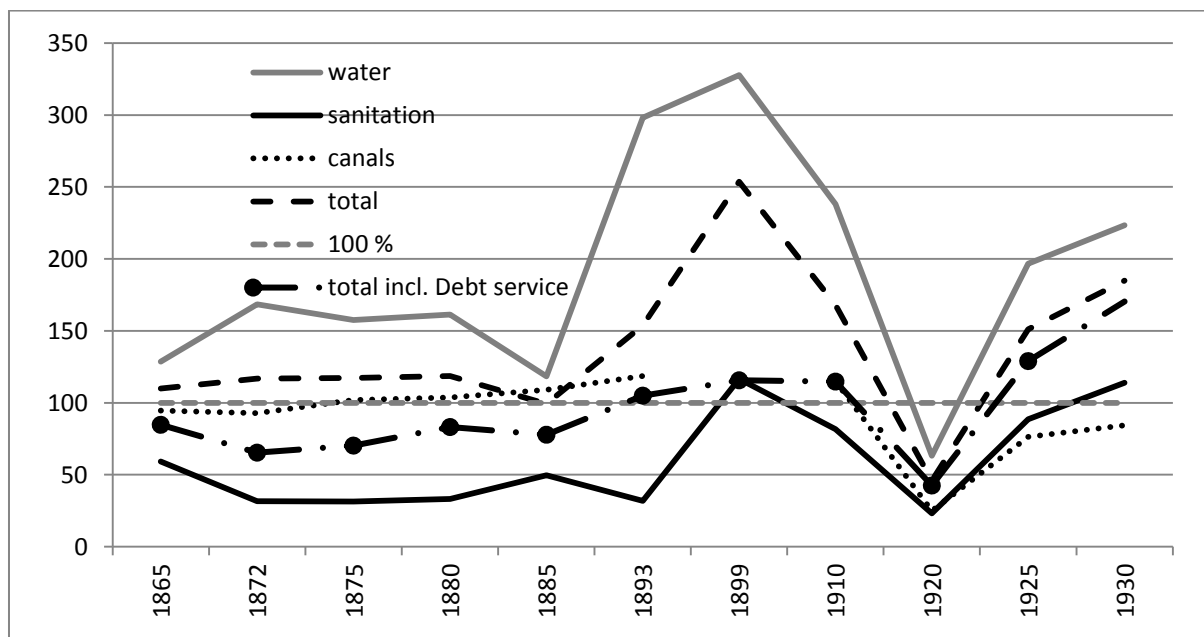
Source : author's elaboration

In Paris (Figure 30) the water service (grey line) OPEX was fully covered by Tariff revenues while this was not the case for sanitation (black line) until 1925. When considering the water, sanitation and canals service as a whole (black dotted line), total “Tariff” revenues were fully covering OPEX costs meaning that a cross subsidy between the three services was taking place. The financial equilibrium was guaranteed by some OPEX costs (engineers’ salaries and energy) being absorbed by the city’s global budget in what would be considered as “Tax” subsidy in the OECD 3Ts methodology<sup>159</sup>.

<sup>159</sup> A detailed analysis of this issue is made in Crespi Reghizzi (2012, 50)

When considering the total costs (OPEX and debt service) it appears that in the late decades of the 19th century Tariff revenues covered more than 70% of the costs. Between 1893 and 1930, Gross Profits increased significantly while the debt service's order of magnitude was quite constant. Progressively Gross Profits became high enough to cover the debt service cost meaning that "Tariff" revenue was covering the full financial cost of the service with no more contributions from "Tax" revenues.

**Figure 30 : Paris - share of the yearly costs of the Water, Sanitation and Canals services (1865-1930) covered by Tariff revenues [%]**



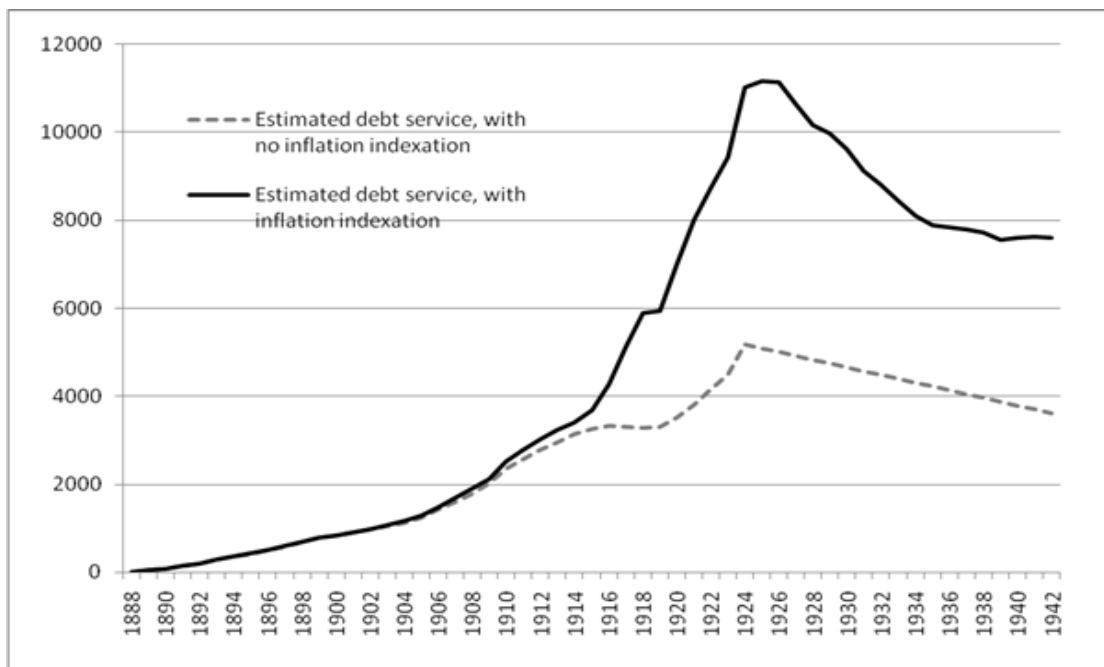
Source : author's elaboration - financial model based on Paris's city yearly financial report. Only the "total incl. Debt service" line refers to total costs including debt service while all other lines refer to OPEX costs only. "OPEX external costs" are not considered. If those "hidden subsidies were considered, they would lower the percentages shown in the graph.

## 7 Inflation

We saw in the previous paragraph that in both cities, the debt service's amount, progressively represented a lower share of the water and sanitation budget. Indeed Tariff revenues and OPEX expenses increased significantly in those years while debt service stayed nearly constant. Inflation has played a key role in the borrowing-lending relationship by determining *in fine* the cost-sharing equilibrium between the lender and the borrower. Indeed, all the loans/bonds issued by the two cities in those years had a fixed rate and most of them had long payback durations between 30 and 80 years. The great inflation rate of the 1910-1940 years in France and Italy had the effect of absorbing a significant part of the debt's residual burden,

transferring it, from a long run point of view, away from the borrower to the lenders<sup>160</sup>. The graph below compares estimations of the real debt service with no inflation indexation and of a “virtual” debt service increased by an inflation index<sup>161</sup> as if the interest rate was indexed-link to inflation. While until 1912/1915 inflation has a minor role (the two functions are very close), afterwards the annual inflation rates increases significantly and debt service with inflation indexation diverts from the curve with no inflation indexation. The growing gap between the two curves is a good proxy of the lenders progressive absorption of significant part of the debt’s service in real terms.

**Figure 31 : Estimated debt service in Milan in thousand Lira (1888-1944), comparison with or without inflation indexation**

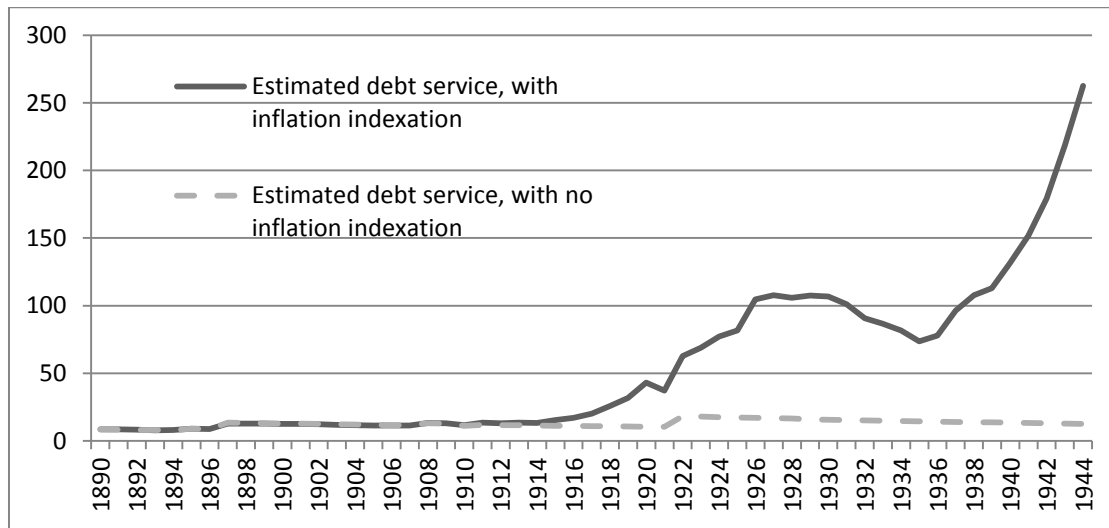


Source : author’s elaboration, see also Box 5

<sup>160</sup> In the case of the bond exchanged on the market this is a schematic view as “the lender” is a virtual entity.

<sup>161</sup> We have computed “virtual inflated debt service” as the sum of two elements : i) capital payback (no inflation on this) and interests which have been inflated using an inflation index. The inflation index is equal to 1 in 1888 and comes from ISTAT, serie storica, tavola 21.7

**Figure 32 : Estimated debt service in Paris in MF (1890-1944), comparison with or without inflation indexation**



Source : author's elaboration, see also Box 5

Indeed, after 1916, the difference between the debt service with inflation and without inflation represents roughly 50 % of the inflated debt service in Milan and peaks to more than 80 % of it in Paris after 1920. That means that in real terms a significant part of the debt's burden has been absorbed by the lenders (bond subscribers or institutional lenders). In terms of long run cost-sharing equilibrium, inflation has played a key role since part of the capital costs have been taken away from the water and sanitation budget.

## 8 Conclusion

In this paper we studied how Paris and Milan municipalities managed to finance their water and sanitation infrastructure which was created and massively expanded in the second half of the 19<sup>th</sup> and early 20<sup>th</sup> centuries.

The two stories have many similarities as in both cities the infrastructure was provided by the municipality and financed through debt at fixed interest rate with long payback duration. Due to the high inflation from the 1910s to the 1930s, the debt's service was lowered in real terms and a significant part of the debt's burden ended up being absorbed by the lenders.

The debt was globally issued and managed at the municipal level. In both cities the Tariff revenues were insufficient at first to cover the total costs (operational expenditures OPEX and debt's service). Moreover the sanitation levy revenues were below the OPEX and a cross-

subsidy was taking place between the water and sanitation service. The debt's service was hence covered by a mix of Tax and Tariff at first, then by Tariff alone once it had already been lowered in real terms.

A difference between the two stories is the very large implementation in Paris of land acquisition and resale policies in the framework of the massive urban renovation which was undertaken under Haussmann's mandate and until the 1880s. The Paris policy is still often quoted by international donors as an example which could be implemented in the fastly growing cities of the developing world (Peterson 2009; Paulais 2012a). On the contrary land value capture mechanisms did not play a significant role in financing Milan's urban infrastructure as neither of the two essential conditions for such a policy were met: available expropriation tools were weak and the municipal borrowing policy was very cautious and constrained.

In most developing countries water services are in a phase of network development and expansion. The water industry is very capital intensive and requires huge lump sum investments particularly in the early phase of expanding the infrastructure. A historical perspective reveals how financing these investments has constantly been a major concern, not always easy to solve.

It should be pointed out however that sufficient and sustainable financing for water infrastructure is a crucial factor not only in developing countries where modern water services are still in an expansion phase but also in Europe where they are now a "mature industry"<sup>162</sup> with an increasing need to reproduce the (huge) infrastructure capital which was set up over decades"(Barraqué 2009).

We showed that both "Tax" and "Tariff" revenues were used to cover water infrastructure investments costs in the late 19<sup>th</sup> century in Paris and Milan. In the 1990's the "water pays water" ("*L'eau paie l'eau*") paradigm was implemented in France and Italy), and a few years later full cost recovery was set at the European scale too through the 2000 water framework directive. Although international institutions softened their position on the issue of full cost recovery (admitting Tax revenues contributions too within the 3Ts paradigm), revenues

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<sup>162</sup> Mr Gurria, General Secretary of OECD, also pointed out during his Marseille opening speech that " huge costs are now to be faced to replace and modernise ageing water infrastructure, and to upgrade systems to meet stricter quality standards" (Gurria 2012).

coming from Tariff are still often considered more legitimate than that from Taxes and Transfer<sup>163</sup> in the international debate on sustainable financing for the water sector.

The present policy debate on the water sector is challenging. We believe that adopting a long run historical perspective on water infrastructure financing as we do in the present paper can be highly beneficial to give more depth to the debate and enlighten present and future challenges both in developing countries and in Europe.

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<sup>163</sup>During the opening speech at the Marseille 2012 World Water Forum it has been declared by Angel Gurría, General Secretary of OECD, that there is “the need to take a strategic approach to financial planning, to encourage greater use of water pricing and to enhance the use of water tariffs as a central part of what we call the 3Ts – Tariffs, Taxes and Transfers”(Gurría 2012).





### **Part III. Water and sanitation services from WWII up to the present**

**d) Water, sanitation and intergovernmental relations in Italy after WWII : a case study on Milan’s water and sanitation service—**  
[accepted with minor revisions by the Journal of Competition and Regulation in Network Industries]

**e) *Institutions, comptabilité et financement des services d’eau et d’assainissement en Italie et en France*** – [revised version of a paper published in « Le service public d'eau potable et la fabrique des territoires », L’Harmattan 2013]

**f) Milan’s water and sanitation service after corporatization: Metropolitana Milanese SpA** in “Case histories of Public Enterprises: learning from success and failure” edited by Luc Bernier – [to be published by Peter Lang International]



# Water, sanitation and intergovernmental relations in Italy after WWII : a case study on Milan's water and sanitation service

Olivier Crespi Reghizzi<sup>164,165</sup>

## Abstract

This paper focuses on the case of Milan's water and sanitation service in the second half of the 20<sup>th</sup> century in the wider legislative and regulatory context of Italian Water and Sanitation Services (WWS). We discuss the evolution of intergovernmental financial relations in Italy. We also analyze the water and sanitation regulatory context, the financing tools available and the constraint on water price due to national regulation driven by anti-inflation policies. We look into Milan's water sanitation service focusing on three key issues: a) how were public service mission goals implemented ? b) were the costs covered by revenues endogenous or exogenous to the water and sanitation service ? and c) what is the long run cost allocation ? who did pay *in fine* for the infrastructure ? Our analysis is based on an original dataset collected from the yearly financial report of Milan's municipality.

## Keywords:

Water supply and sewerage, Milan, investments, public service mission,

**JEL:** L95 - H54 - H71 - H72 - H76 - H77

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<sup>164</sup> Centre International de Recherche sur l'Environnement et le Développement (CIRED), AgroParisTech – Paris, [crespireghizzi@agroparistech.fr](mailto:crespireghizzi@agroparistech.fr)

<sup>165</sup> Centro di Economia Regionale, dei Trasporti e del Turismo (CERTET), Università Commerciale Luigi Bocconi – Milano

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# 1 Introduction

Since the 1990's, the water sector in many European countries has moved in the direction of a larger share of the costs being covered by Tariff revenues. Some years later *full cost recovery* was explicitly adopted at the European level through the European Water Framework Directive (Dir. 2000/60). Italy was not an exception to that trend: through the 1990's (and particularly after the 1994 *Galli* act) a large reform of the Italian water sector was launched.

Presently, Water and Sanitation Services (WSS) are operated in Italy by companies under private law status which are owned by public, private or mixed shareholders. The operators deliver a service to the responsible authorities according to a concession contract. The goals of the operator in terms of public service mission have been made explicit in the contractual documents. Full cost recovery (or at least industrial cost recovery) has been adopted and no more subsidies from general taxation flow into Italian WSS. Formally, there are no major links between water and sanitation services and central and local government finance. Since 2003 the water and sanitation service in Milan is operated by *Metropolitana Milanese SpA*, a joint stock company fully owned by Milan's municipality on which we already wrote a paper (Crespi Reghizzi forthcoming f). Previously the service had been under direct municipal provision since its birth in 1888 (Crespi Reghizzi forthcoming b).

Through this paper we take a step back into the past and focus on the case of Milan's water and sanitation service in the second half of the 20<sup>th</sup> century (Section 4) in the wider legislative and regulatory context of Italian Water and Sanitation Services (WWS) (Section 3).

We look into Milan's water sanitation service focusing on three key issues preliminarily defined in Section 2: a) how were public service mission goals implemented ? b) were the costs covered by revenues endogenous or exogenous to the water and sanitation service ? and c) what is the long run cost allocation ? who did pay *in fine* for the infrastructure ?

We start by reminding in Section 2 the definition of some key concepts: public service mission goals & general interest goals and endogenous & exogenous revenues.

The story of Italian WSS after WWII is a municipal one as water and sanitation were part of the municipal administration. That is why discussing the evolution of intergovernmental financial relations in Italy is an essential step (§3.1 & §3.2). We also analyze the regulatory

context, the financing tools available (§3.3) and the constraint on water price due to national regulation driven by anti-inflation policies (§3.4).

Section 4 focuses on Milan's water and sanitation service in the 1956-2000 time frame. Firstly, we cast a glance over the early 20<sup>th</sup> century phase (§4.1) before going back to our time frame. Our analysis is based on an original dataset (collected by the author) of the financial flows of Milan's WSS based on the yearly financial report of the municipality (§4.2). The imbalance between endogenous revenues and operational costs is discussed (4.3). The investment policy is analyzed (§4.4) and the famous stories of postponed investments in drinking water treatment and waste water treatment are given a great attention. The paragraph 4.5 is entirely focused on capital expenditures and on the investment cost sharing in the long run between endogenous and exogenous revenues, local or national taxpayers and among generations.

## 2 Preliminary definitions

### 2.1 Public service mission goals in watsan

In our opinion the concept of “**public service mission**” for a WSS may be specified referring to three main goals:

- a) universal provision and equal access to the service to all citizens,
- b) an investment policy driven by a long run vision and an intergenerational concern, and
- c) water resources conservation and environmental protection.

From a historical perspective the three public service goals have not always been given equal priority. In the early expansion phase the first two goals were seen as key as we will see in §4.1 The third criteria on the contrary has been inserted in the Italian water sector agenda only since the 1970's and in fact implemented only in the late 1990's in Milan (§4.4.2).

Central and Local government have also **general interest goals** : “these include for example policies related to employment, containment of inflation, promotion of research and development, of human capital, of fixed capital accumulation, competition and industrial policies”(CIRIEC 2012). Public service entities or companies behaviour might be influenced explicitly or implicitly in order to fulfil these general interest goals.

## 2.2 Endogenous & exogenous revenues

According to the OECD 3T's paradigm (OECD 2009) the costs of a water and sanitation service may be covered *in fine* by three source of revenues : Tariffs (direct charges paid by the user), Taxes (general taxation paid by taxpayers) and Transfers (subsidies from an upper level of government or from foreign donors).

In Milan, from the beginning of the service in 1888, water was collectively<sup>166</sup> metered and billed to the user according to volumetric a water charge. On the contrary at first sanitation was not charged through a volumetric rate but through a sanitation levy linked to the surface and volume of the building (Crespi Reghizzi forthcoming b). It was only later in the 20<sup>th</sup> century that the sanitation levy was made proportional to the consumed water volumes<sup>167</sup>.

Massarutto (2002; 2004; 2007) points out that “it becomes very difficult to distinguish prices from taxes” (Massarutto 2002, 13) and that “it is often a pure terminological convention that of considering revenues either as direct charges or taxation. What really matters is who pays, for what purpose and how much” (Massarutto 2002, 25). Massarutto (2002, 3) proposes a key distinction between “endogenous” and “exogenous” sources of revenues:

- “Endogenous sources are payments that are directly obtained from service users, regardless the nature of the payment (fiscal or not), with the only requirement that payments are correlated with service consumption and dedicated to the separate accounting of the environmental service.
- Exogenous sources are payments that are made to general budgets, which on their turn contribute, yet without a direct relation, to the service balance.”

We follow Massarutto and we distinguish revenues endogenous to the WSS (Tariff according to the OECD) and ordinary fiscal revenues exogenous to the service (Taxes). According to this line of thought, both the water bills and the sanitation levies are revenues endogenous to the Milan's WSS contributing to the “Tariff” element of the 3T's. By definition costs left uncovered by endogenous revenues are covered by exogenous revenues (general taxation at the local or national level).

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<sup>166</sup> One meter per building.

<sup>167</sup> For sure the 1976 *Legge Merli* imposed a volumetric sanitation levy (§3.3). We do not know whether the sanitation levy in place in Milan was volumetric prior to that date or not.

### 3 The Italian context after WWII

#### 3.1 Municipal finance before WWII

From the beginning, intergovernmental relations in Italy were designed in a centralized way through various acts, particularly the 1859 *Rattazzi* decree (Regio Decreto 23 Ottobre 1859 n°3702) and the 1865 act (Legge n° 2248 20 Marzo 1865).

Municipal revenues were authorized to come from various sources: i) non fiscal sources (such as tariff revenues from municipal services including water and sanitation), ii) autonomous taxes and iii) additional levy on national taxes (the so called *sovraimposta*). No recurrent transfers from the central government were in place (except minor ones).

The *dazio di consumo* (excise duty) was the major municipal fiscal revenue. However a ceiling on the *dazio di consumo* was fixed by the 1865 act in order to avoid excessive taxation on low income people (Cassar and Creaco 2007, 716).

If total revenues coming both from non fiscal sources and autonomous fiscal revenues were not sufficient to cover the compulsory expenses, municipalities could ask to be authorized to impose additional levies on national taxes : income tax, land property tax and building property tax (Cassar and Creaco 2007, 716).

Until WWII, transfers between the central state and the municipalities were not taking place (except minor ones) and own tax revenues to total spending ratio was very high (including both autonomous and non-autonomous tax revenues). Indeed, according to Marongiu “before WWI fiscal decentralization was much more significant than in all the rest of the 20th century”<sup>168</sup>. Surprisingly, no equalizing mechanism was in place in a newly born country which had major geographical variability between the North and the South (Giarda 2005) implying that low revenues municipalities were not always able to deliver public services (Fraschini 1991, 27).

The fiscal regime of municipalities had some weak points which put the municipalities in an uneasy financial situation. A first weakness came from the fact that the central state and the municipalities were sharing the same fiscal revenues. Thus, a significant fiscal competition took place between the two levels of the state. On one hand even if the legislator had thought

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<sup>168</sup> « *Prima della prima guerra si ebbe un decentramento delle entrate quale dopo non si ebbe per tutto il resto del '900* » (Marongiu 1999, 9–15; quoted by Locatelli 2010, 18)



of the *sovraimposte* as last resort source of revenue, municipalities considered *sovraimposte* as an ordinary fiscal source (Fraschini 1991, 26). Indeed, they always preferred to increase *sovraimposte* rather than setting autonomous taxes since *sovraimposte* were less visible and more easily hidden behind the central state mask (Locatelli 2010, 13; Cassar and Creaco 2007, 717). On the other hand the central state, which was facing a tight financial situation too, progressively limited the municipalities' fiscal autonomy (Marongiu 2001, 19) while extending the list of compulsory expenses of the municipalities as stated by Luigi Einaudi : "The central state kept confiscating municipal revenues while it transferred new expenses to municipalities"<sup>169</sup>.

More details on municipal finance in Italy until the 1920's are given in a forthcoming paper (Crespi Reghizzi forthcoming b).

### **3.2 Municipal finance in the new republic of Italy**

After WWII, various attempts were made to reform the municipal finance set of rules and try to solve the financial distress of the Italian municipalities.

According to Piero Giarda<sup>170</sup> the various reforms of the Italian Municipal finance can be classified in 5 historical phases :

- a) 1950's to early 1970's - budget-clearing grants and loans
- b) the 1970's – fiscal centralization
- c) The renaissance after 1978 –till mid eighties
- d) The new squeeze: 1984-1992
- e) The turnaround of the Nineties

#### **1950's to early 1970's : budget-clearing grants and loans**

After WWII, the financing system of local governments was collapsing both due to the price increases during and after the war and to the national government decision not to increase the cadastral values of housing and farm income.

<sup>169</sup> *Lo Stato di fronte ai comuni non ha saputo far altro che togliere entrate da una parte e rovesciare su di esse nuove spese generali e non locali* ; L. Einaudi, *Pronunciamento dei comuni in Cronache*, 1905, II volume, p 203, quoted by Cassar and Creaco (2007)

<sup>170</sup> This paragraph is largely inspired from a very interesting synthetic historical insight on intergovernmental financial relations in Italy written by Giarda (2005).

An attempt to solve such a critical situation was made with the 1952 *Vanoni* reform<sup>171</sup> which was seen as temporary solution allowing to wait for a more ambitious reform expected to be launched later. The reform allowed the municipalities with budget imbalance both to obtain a general purpose grant and to subscribe loans with the Cassa Depositi e Prestiti (CDP) to cover the residual budget imbalance<sup>172</sup>. Further legislative acts<sup>173</sup> fixed each year the total amount of the general purpose grant. After 1955 no more amounts were allocated to the general purpose grant and municipalities were encouraged to subscribe “budget clearing loans” with CDP to solve their budget imbalance. These loans were subjected to the ministry of finance approval. Indeed an effect of the reform implementation was “to give the national government the task to evaluate the appropriate matching of revenues and expenditures of individual local governments on a case by case basis”<sup>174</sup>. When the budget could not be made to balance at the local level (because rates had reached the maximum and/or spending could not be further reduced), a procedure was set for the national government to cover the gap between expenses and revenues. This procedure applied originally to a limited number of governments, but progressively extended to larger and larger numbers. In the later part of the Seventies, almost half of all local governments in the country had access to a so-called “budget clearing” grant” (Giarda 2005) which was implemented through the CDP special loans<sup>175</sup> mentioned above.

### **the 1970’s – fiscal centralization**

In 1973 a major fiscal reform<sup>176</sup> took place in Italy (riforma *Visentini*). The reform cancelled ‘temporarily’ municipal taxes : “all gone in a single stroke under the accusation that local taxes had very high collection costs and that diversity in tax rates violated the principles of

<sup>171</sup> Legge 2 luglio 1952 n°603

<sup>172</sup> It was asked to the municipality to commit to reduce budget imbalance. To be eligible to the grant a municipality had to increase at the maximum rate the additional levy on the land tax. To be eligible to the CDP loan a municipality had to prove that fiscal revenues were not high enough to cover 80% of the compulsory municipal expenses (Locatelli 2010, 78–79).

<sup>173</sup> Legge 1954 n°635; Legge 1956 n°495, Legge 1958 n°30,

<sup>174</sup> “National government functionaries were given the power to condition the efficacy of the budget approved by local governments councils on measures to be taken to balance the budget via tax increases and/or expenditure cuts.” (Giarda 2005)

<sup>175</sup> “The “budget clearing” grant was administered under the form of special loans mostly by the national Cassa Depositi e Prestiti. The debt service charges (interest and capital repayments under a French type amortization plan) accumulated from previous years budget clearing loans could be charged as “necessary expenditure” in next year budget and concur to the legitimate claims for the new “budget clearing” loan. So the loan was formally generating increases in the stock of local government debt, but it was everywhere considered as a current expenditures related grant, never to be refunded.” (Giarda 2005)

<sup>176</sup> “The reform instituted a truly general personal progressive income tax, modified the corporation income tax, introduced the value added income tax, reformed taxation of capital income, redefined procedures for tax payments and tax assessments. The whole Italian tax system was overhauled and modernized.” (Giarda 2005)

horizontal equity. The yield of the abolished local taxes was substituted, for all local governments, by transfers from the national government budget planned to grow at a pre-determined rate in the years from 1973 to 1977. The special “budget clearing” loans (or grants) also were set to grow at a predetermined rate of growth” (Giarda 2005).

#### **“The renaissance after 1978 –till mid eighties”**

In 1977 a reform of intergovernmental financing relations was made through the so called *Decreti Stammati*. Municipalities “were entitled, at the end of 1977, to determine almost freely the whole of their 1977 expenditure lines under the guarantee that the “budget clearing” loans would entirely cover the deficits resulting from the revised budgets. For 1978 and following years the various expenditure categories could increase according to some maximum admissible rate of growth over 1977 values. The “budget clearing” loan and all existing transfer programs from the national budget were repealed and substituted by a new all inclusive “equalizing grant” (equal to the difference between the admissible level of spending and the yield of the remaining local user fees and charges)<sup>177</sup>.” (Giarda 2005)

#### **“The new squeeze: 1984-1992”**

In the 80’s, the fiscal centralization was judged negatively since it had contributed to a massive increase in the size of local governments expenditures. “In 1985 the size of the primary deficit of the Italian general government reached its all time maximum. Starting from 1985 the growth of public spending in real terms was reduced to below 1% per year and taxes increased. Cash limits were imposed on local spending. The amount of equalization funds was strictly tied to a planned rate of inflation.” (Giarda 2005).

#### **“The turnaround of the Nineties”**

“At the beginning of the Nineties the options for decentralization became more attractive to political opinions. The opinion developed that expenditure control at the regional and local level would better be served by a financing structure that relied more on own tax revenues than on transfers from the national government”. In 1992 the country was experiencing a financial crisis and dramatic decisions were to be taken to raise taxes to reduce the public sector borrowing requirement. It was judged that municipal power had to bear a part of the

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<sup>177</sup> “Local governments systematically outsmarted the national government agencies in charge of control on the evaluation of spending needs; the total transfer of resources to local governments was determined by adding up the individual “equalizing grants” computed, in each local government budget, as a difference between the admissible level of spending and the yield of users’ fees and charges.” (Giarda 2005)

political cost of the public sector reduction. To do so, a policy switch had to be implemented from centralization to fiscal autonomy” (Giarda 2005).

Indeed in 1992<sup>178</sup> a tax on the value of housing and residential areas was instituted. At first the *Imposta straordinaria sugli immobili* (ISI) was conceived as a *una tantum* tax allowing the central government (*Governo Amato*) to face the public finance crisis. In the following year the tax was renamed as the “*Imposta comunale sugli immobili*” and became an autonomous municipal tax. It progressively became the main source of revenue of the Italian Municipalities.

### 3.3 Regulation in the water sector & financing tools

Water was defined as a public good in 1884 by the royal decree (*Regio Decreto 2644 - 10 agosto 1884*) which established that a private company had to obtain a concession in order to withdraw water. The water sector was further regulated in 1933 (*Testo Unico sulle acque pubbliche* –Regio Decreto 1775 –11 dicembre 1933).

In 1934 the water service was defined as a universal service which was to be provided every where in Italy (Regio Decreto 1265 del 27 luglio 1934). If a municipality was not able to finance by itself the investments needed, it could submit an investment plan to the central government (represented by the prefect). Once approved, the investments would have been financed by the central government. The central government would own the infrastructures while the municipality would be responsible of the operation and maintenance. This is the “dualistic model where the investments are financed by the central government while the municipality provides the service” (Ermano 2012).

In the first decades after WWII the implementation of the same dual model continued. Indeed, according to a 1949 act<sup>179</sup>, grants (from the central government to the municipalities) were available to finance the municipal infrastructure (including the water and sanitation one). Grants were to be paid over 35 years and covered a percentage of the total approved capital expenditures. Grants percentages varied depending on the kind of infrastructure and on the population size of the municipality. Concerning water and sanitation infrastructure, yearly

<sup>178</sup> decreto legislativo 11 luglio 1992, n. 333

<sup>179</sup> *Legge Tupini*, legge n°589 – 3 *Settembre* 1949,  
[www.normattiva.it/uri-res/N2Ls?urn:nir:stato:legge:1949-08-03:589!vig=](http://www.normattiva.it/uri-res/N2Ls?urn:nir:stato:legge:1949-08-03:589!vig=)

grants<sup>180</sup> spread over 35 years could cover between 5 and 3 % of the total approved capital expenditures respectively for municipalities with less than 5000 inhabitants and for those in the 30 000 – 150 000 inhabitants range. Municipalities in southern Italy could get an additional 1% in the grant percentage value (Locatelli 2010, 73). This kind of financing tool was not available to large cities such as Milan.

Municipalities were also allowed to subscribe loans either through the CDP or through any other bank. In case the loan was not subscribed with the CDP an additional grant could cover up to 40% of the difference between the loan interest rate<sup>181</sup> and the CDP interest rate. A central state guarantee could be given for the loans subscribed by municipalities from southern regions and small municipalities (less than 10 000 inhabitants) which did not have sufficient fiscal revenues (*sovrimposta fondiaria* and *imposta di consumo*) to give as a collateral (art 13 - 1949 act). Municipalities having a population of more than 150 000 inhabitants were not eligible to the grants. The legislator's argument was that big municipalities had little need for governmental grants since they could borrow more easily than smaller ones. Furthermore in big cities the economies of density often made the investments profitable (Ermano 2012).

In 1950, further financing tools were designed to finance public works (in particular roads and adduction and storage water infrastructure) in southern regions (*Legge 10 agosto 1950 n°646* which created the *Cassa per il Mezzogiorno* and *Legge 29 luglio 1957 n°635*) and in underdeveloped areas of central and northern Italy (*Legge 10 agosto 1950 n°647* and *Legge 29 luglio 1957 n°634*).

In 1963 the central government's role in financing the water and sanitation infrastructure was increased even more through the *Piano regolatore generale degli acquedotti – PRGA*<sup>182</sup>. The public works ministry was given the responsibility of designing a national water and sanitation investment plan for the forthcoming 50 years and launching it through a ministerial decree. Financing solutions consisted in yearly grants to the municipalities (as in the 1949 law) and in direct payment of works with the central government acting as the contracting authority (article 5). In 1968 the financing mechanism associated to the PRGA was detailed (D.P.R. 11 marzo 1968 n°1090). Municipalities could choose between the 35 years long

<sup>180</sup> For 35 years, the yearly grant was paid directly to the lender (except in case the subscribed loan had a shorter duration and in that case the yearly grant was paid directly to the municipality).

<sup>181</sup> Up to a maximum interest rate of 7%.

<sup>182</sup> Legge 129, 4 febbraio 1963 - [www.normattiva.it/uri-res/N2Ls?urn:nir:stato:legge:1963-02-04;129!vig=](http://www.normattiva.it/uri-res/N2Ls?urn:nir:stato:legge:1963-02-04;129!vig=)

yearly grants mechanism (as in the 1949 law) or a *lump sum* grant covering up to 70 % of the total capital expenditures costs. Both sanitation and water investments included in the *Piano regolatore generale degli acquedotti* were eligible to those financing mechanisms. In case the 35 years spread grant solution was chosen, the yearly grant value was 4 % of the capital expenditures approved independently from the segmentation according to municipality's population size included in the 1949 law. In 1977 with the creation of the Regions, the planning power previously given to the Public works ministry was transferred to the Regions (Ermano 2012).

In 1976 sanitation and waste water treatment was also made compulsory (*Legge Merli - Legge 319, 10 maggio 1976*). The planning and supervision power was given to the Regions while the operations were the municipalities' responsibility. It was established that a waste water levy was to be paid by the users. Such a levy had to include both a sanitation element (*canone di fognatura*) and a waste water treatment element (*canone di depurazione*). The two levies amounts were fixed in 20 lira/m<sup>3</sup> for domestic users. Higher amounts were authorised upon justification of higher costs of service up to the maximum amounts of 50 lira/m<sup>3</sup> and 80 lira/m<sup>3</sup> respectively for the sanitation and waste water treatment part (article 16 – *Legge Merli*). The waste water treatment levy was to be paid in all municipalities where a waste water treatment plant was in operation even if it was not treating all the waste water produced. The two levies were to be billed and paid together with the water bills on a base of 80% of the drinking water volumes. Municipalities could receive grants from the regions either through the time-spread formula (as in the 1949 law) or through capital expenditures lump-sum grants. Regions were autonomous in defining the details of the grant awarding process (article 19 – *Legge Merli*).

### 3.4 Water price regulation

After WWII, a price regulation regime for various goods and services was implemented in Italy in order to fight against the high inflation of those years and preserve consumers' purchase power. In 1944 the *Comitato Interministeriale Prezzi* (CIP) and the *Comitato Provinciale Prezzi* (CPP) were created (*Decreto Legge 19 ottobre 1944 n°344*). The water tariff regulation was subjected to those committees. Water tariffs were set in an anti-inflation perspective with little regards to the cost of service (Arcangeli 2000, 301). As a consequence in most cities Tariff revenues were largely below the cost of the service. Furthermore only

small percent tariff increase were authorized with the paradoxical effect that the cities starting with a low tariff were authorized smaller tariff increase than those starting with greater tariff.

In 1968 (Dpr 18 Maggio 1968 n°126) it was established that the prices regulation guidelines were to be set by the CIPE (*Comitato Interministeriale per la Programmazione Economica*) reducing the CIP's responsibility only to detailed implementation of the CIPE's guidelines. A total prices freeze was set at first after 1973 in order to fight against the price burst caused by the oil crisis. In 1974 such a rigid regulation was relaxed and new guidelines<sup>183</sup> for the regulation of public services were adopted by CIPE (Arcangeli 2000, 301). The 1974 regulation was based on the following conflicting principles : i) to refrain from major increases in the domestic water users' bills in order to fight against inflation, ii) to allow an indexation of the tariff on the inflation and on the water service operational and investment real costs in order to progressively reduce water services yearly imbalances and iii) to give disincentives to water consumption through an increasing block rate system (Bardelli and Muraro 2003, 349). It would have been tricky to meet both a inflation control objective and a tariff close to real cost of service. In fact the administrative process of a decentralized regulation through the CPP was so slow and complex that the implementation of the 1974 guidelines did not fully take place (Arcangeli 2000, 301).

After the 1979-1980 oil crisis, the control on public services tariff was reinforced again to avoid a snowball effect on inflation. In the 1980's the macroeconomic tariff control was made a priority (particularly after 1984) and it was judged acceptable and necessary to cover public services deficits with fiscal revenues from the general budget (Arcangeli 2000, 301).

With the reforms of the 1990's (particularly the *Legge Galli* of 1994) the price control policies were softened according to the principle that WSS should be financed through Tariffs rather than through Taxes (full cost recovery principle).

## **4 The case of Milan's WSS after WWII**

### **4.1 A glance on the early 20<sup>th</sup> century phase**

In Milan, from their birth as modern services in 1888 water and sanitation were considered as municipal public services as the quotation below from the 1894 municipal council acts shows:

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<sup>183</sup> CIP 45/1974, CIP 46/1974 and *Delibera* 26/1975

“The municipal board is convinced that the municipality should not make any profit from the sanitation service; it is an essential public service which should be provided by the municipality”<sup>184</sup>

Indeed, in Milan the WSS expansion is truly a municipal story as the local public authorities created the first modern water and sanitation service and invested massively to realize an ambitious water and sanitation system which is still in operations nowadays (Crespi Reghizzi forthcoming b). Those were the years of the sanitary and hygienic discoveries of Koch and Pasteur. Expanding the WSS service was then seen as a noble mission aimed at improving the sanitary condition of the city and *in fine* saving lives. Brilliant civil servants and engineers such as Felice Poggi engaged themselves in such a mission. They were hired in the WSS municipal departments in order to design such a key infrastructure and manage the service. A high attention was given to the quality and long lasting characteristics of the built infrastructure. A number of detailed studies<sup>185</sup> made at that time are still the design reference for today Milan’s sewer and water system. Moreover the built infrastructure was truly long lasting since it is still in operations nowadays. Referring to the public service goals detailed in §2.1 there was a strong commitment in favour of the first two while the environmental concern was far from being even considered in that time’s agenda.

From its birth till the 1930’s Milan’s WSS (as most Italian WSS) was strongly aimed at expanding and providing the water and sanitation services through a public service approach (first goal (a) in §2.1). There was also a high concern in favour of future generations’ interests as the commitment in favour of long lasting infrastructure (second goal (b) in §2.1) shows. The concern on intergenerational fairness was also central in the policy debate on whether to implement deficit financing or not as this quotation from the 1891 municipal council debate shows :

“ To justify a loan it is not sufficient to tell that public infrastructure will benefit mostly our grandchild. Since we are confiscating future revenues, we also have to

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<sup>184</sup> Author’s translation “*La giunta è partita dal concetto che il comune dal servizio di fognatura non dovesse trarre lucro ; si tratta di un servizio pubblico essenziale e spetta al comune prestarlo*” (Atti del Municipio di Milano 1893-1894 p 365, 26 febbraio 1894)

<sup>185</sup> Such as *Le Fognature di Milano* by Felice Poggi (1911)



demonstrate that no other infrastructure needs will appear in the future and that we provide nowadays to all the future needs, including the unprevisible ones<sup>186</sup>.

On the contrary using WSS to pursue general interests goals (employment, price controls) was not very much in the agenda at that time as it became in the second part of the 20<sup>th</sup> century.

## 4.2 Data

Our analysis is based on the yearly financial report of Milan's municipality (*conto consuntivo dell'anno*). We have collected an original dataset which includes from the year 1956 to the year 2000<sup>187</sup>:

- Revenues of the WSS (sum of water bills and sanitation levies collected) – collected every 5 years
- Operational Expenditures (OPEX) - collected every 5 years
- Capital expenditures (CAPEXb) – collected on a yearly base

Moreover we have also collected :

- Capital expenditures (CAPEXa) – collected on a yearly base from 1888 to 1924 (Crespi Reghizzi forthcoming b)
- Yearly network lengths (water supply network and sewer system) on a yearly base from 1888 to 2000

## 4.3 Financial flows

In our paper (Crespi Reghizzi forthcoming b) we have shown that until 1899 “Tariff” endogenous revenues were not even sufficient to cover the OPEX costs both for water and sanitation. By definition, costs uncovered by “Tariff” revenues are covered by the city general budget, meaning “Tax” revenues according to the OECD definition. After 1899 “Tariff” revenues were covering OPEX costs both for water and sanitation.

In the decades after WWII water tariffs in Italy were heavily regulated to pursue general interest goals of anti inflation policies (§3.4). It was only with the reforms of the 1990's

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<sup>186</sup> Such a position was taken within a report which argued in favour of a fiscal reform of Milan's excise duty system « *a giustificarli [i prestiti] non basta affermare che i vantaggi delle grandi opere pubbliche ridondano in gran parte sui nipoti ; occorre dimostrare che a tempi nuovi non corrispondano nuove aspirazioni, e che noi provvediamo oggi a tutte le aspirazioni anche le non prevedibili di quell'avvenire di cui andiamo man mano confiscando i redditi.* »(Municipio di Milano 1891b, 42).

<sup>187</sup> The yearly financial reports (1956-2000) are available in a printed version at the *Ragioneria Municipale* – Via Silvio Pellico – Milano.

(particularly the *Legge Galli* of 1994) that the price control policies were softened according to the principle (full industrial cost recovery) that WSS should be financed through Tariffs (endogenous revenues) rather than through Taxes (exogenous revenues).

Our data (§4.2) on Milan's WSS financial flows after WWII confirm this trend. Between 1956 and 1970 endogenous revenues were only covering OPEX at break even. Between the 1970's and the 1990's Tariff revenues were not high enough to cover OPEX (Table 24). As a consequence gross profit was negative. It was only in the 1990's that tariff revenues were high enough again to cover OPEX. Three kind of factors can explain the imbalance of the 1970-1990 years : i)the water tariff regulation policy in Italy in those years aiming at controlling inflation (Tariff revenues were capped while operational expenditures increased significantly as inflation was very high in those years), ii) the reduction in sold water volumes (Appendix F) and iii) the impact of the 1976 *Merli* law on sanitation levies<sup>188</sup>.

**Table 24 : Revenues, Opex and gross profit of Milan's WSS (1956-2000), all values in Lira**

	water and sanitation		
year	Revenues (a)	OPEX (b)	gross profit (c)=(a)-(b)
1956	2 816 016 441	2 412 666 026	403 350 415
1960	4 129 720 834	2 957 839 125	1 171 881 709
1965	5 728 731 413	4 101 642 482	1 627 088 931
1970	6 904 790 660	6 871 698 861	33 091 799
1975	7 286 197 460	7 809 942 946	-523 745 486
1980	14 647 478 995	18 329 273 360	-3 681 794 365
1985	37 283 747 950	48 308 083 461	-11 024 335 511
1990	63 334 093 303	61 066 857 635	2 267 235 668
1995	60 372 081 708	58 008 451 527	2 363 630 181
2000	107 337 122 233	66 531 867 852	40 805 254 381

Source : author's elaboration based on *Conto Consuntivo dell'anno...* [various years]

It is quite clear that after WWII Milan's WSS was much more influenced by general interests goals (anti-inflation policies, over-employment<sup>189</sup>) than in the early 20<sup>th</sup> century phase (§4.1). In the second half of the 20<sup>th</sup> century, public service missions were still considered very relevant but Milan's WSS was not always very effective in implementing that mission. A clear example of a partial failure to fulfil the public service mission is given by the investment

<sup>188</sup> Indeed, since the creation of the sanitation service in 1888 a sanitation levy (higher than opex) had been charged to the users by Milan's municipality . After 1976 Milan's municipality could not charge anymore the water treatment part of the sanitation levy since no waste water treatment plant was in operations. It could charge a sanitation levy only in the limitation imposed by the *Merli* law

<sup>189</sup> Local Public Services were also used as a source of employment and Milan's WSS was not an exception to that trend - source : interview with a high ranked civil servant, former manager of Milan's water department

policies implemented in those years and particularly the two stories of postponed investments in drinking water treatment and waste water treatment (§4.4).

#### **4.4 Investment policy**

After WWII, yearly investments amounts were approved each year by the municipal council. There was little or no connection between the gross profit of the service and the planned investments. The water and sanitation service made their investment plan which was analysed by the municipal budget department and approved by the municipal council. Former employees of the municipal administration told us that it was quite frequent for the authorised Capex amounts to be below the investment plan need since “investments in the water and sanitation infrastructure were not politically visible as those in nursery schools”.

The data we collected show mixed evidence of underinvestment. On one hand the water supply network and sewer system were significantly extended in the 1950's and 1960's to follow the city's expansion as our CAPEX data series show (§4.5.1 and §4.5.3). On the other hand key investments in drinking water and waste water treatments were constantly postponed in the 1970's and 1980's (§ 4.4.1 and §4.4.2).

From our point of view some of the pursued general interests goals were in conflict with public service missions ones : on one hand anti-inflation policies which capped WSS tariff revenues while on the other hand municipal decision making process often gave the allocated investment budget (from Tax revenue) to other municipal sectors. Due to the joint effect of these two processes Milan's WSS kept not investing in the less visible needs (wastewater and drinking water treatment plants) as long as it could.

What is striking is that in both the two cases of postponed investments described below the infrastructure was brought to completion only when facing a severe law obligation coming from an upper level external authority (central government or European institutions). Meanwhile the investments were postponed for years or for decades as the municipal policy makers ignored the large externalities (both on the environment - River water pollution and on human health – poor quality drinking water) caused by such a non-investment decision.

##### **4.4.1 Postponed investments in drinking water treatment plants**

Until the early 1970's it was thought that Milan's underground water was clean and ready to drink. The only pollutant noticed at that time was hexavalent chromium and the wells which were not respecting the WHO limit of 50µg/l were put out of service. In the mid 1970's major

innovations took place in the water quality analysis technology and other pollutants were noticed in Milan's groundwater : trichloroethylene, trichloromethane and other chlorinated solvents. A study commission (including experts from the public health department of the University of Milan) was created and established a temporary limit of 250 µg/l on chlorinated solvents. Such a limit was strengthened by the EU directive (80/770) converted in Italian law by the law n°183 16<sup>th</sup> April 1987 and the decree of the President of the Republic 24<sup>th</sup> May 1988 n°236.

Although the groundwater water quality problem was known since the early 1970's, prior to 1994 only minor solutions had been found (new pumping stations in an polluted part of the acquifer and deeper wells). It was only in 1994 that effective investments (activated carbon technology and stripping) were undertaken in a rush (a decree had allowed Milan's municipality to adopt exceptionally fast procurement rules) to respect the law-limit (30 µg/l) within the deadline (8<sup>th</sup> May 1994).

#### **4.4.2 Postponed investments in waste water treatment plants**

In the late 19<sup>th</sup> century, when Milan's sewer system was designed and built, the choice was made to channel the collected waste water to large farming areas downstream of Milan (the so called *marcite*). While using waste water for land farming without any treatment was common practice at that time, through the 20<sup>th</sup> century progressively European cities installed waste water treatment plants in order to mitigate their negative impact in terms of water pollution. The long story of Milan's waste water treatment plants started in the 70's but due to postponed investment until 2004 the Milan's waste water was still discharged with no treatment in the River system reaching *in fine* the *Adriatic Sea*.

The story of Milan waste water treatment plant started in 1972 when the Municipality chose to build two waste water treatment plants in Gratosoglio and Chiaravalle (designed by the Municipal engineering department). A first tender took place in 1975 but a controversy arose since according to the project the Nosedo plant's was to be built in a environmental sensible area (Massarutto et al. 2006). Furthermore "the project proposal was hindered by the protest of the residents of the concerned areas (i.e. NIMBY syndrome<sup>190</sup>)"(Lobina and Paccagnan 2005). Between 1989 and 1998 various tenders were launched and building contractors

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<sup>190</sup> Not In My Back Yard

selected. However the judicial enquiries during *Tangentopoli* “de facto blocked public works for several years” (Lobina and Paccagnan 2005).

At the beginning of the 21<sup>th</sup> century Milan’s raw sewage was still discharged directly into the river system. In the year 2000 an emergency procedure was authorized by the environment ministry and Milan’s mayor, Gabriele Albertini was awarded the role of special commissioner. Works were awarded and their rhythm sped up. Meanwhile however, an infraction procedure (concerning the waste water directive 91/271) was started in 2000 by the European Commission against the Italian Republic. Although Europe won the procedure in 2002, no pecuniary sanction was imposed. In 2004 and 2005 the three waste water treatment plants (S. Rocco, Nosedo and Peschiera Borromeo) were brought to completion and have been in operations since then.

Although the waste water quality problem was known since the early 1970’s the problem was solved only in the late nineties when effective investments were undertaken in a rush under the “emergency procedure” to respect the law-limit imposed by the EU waste water directive 91/271 and avoid the infraction procedure.

## **4.5 Who did pay for the capital expenditures ?**

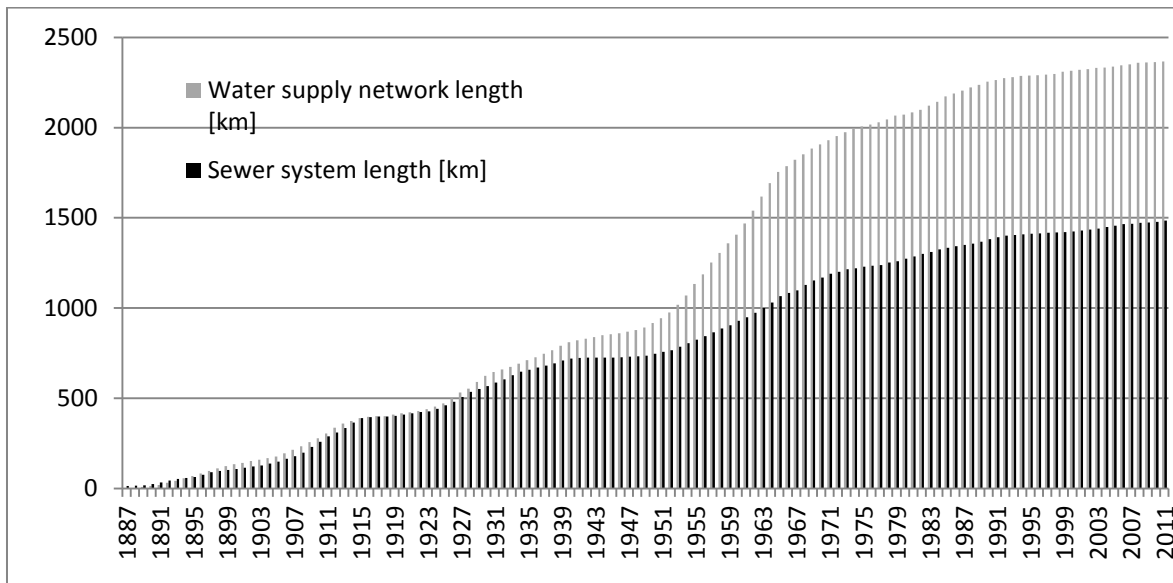
### **4.5.1 Capital expenditures**

We have analysed two different data series on CAPEX : a) yearly water and sanitation CAPEXc (CAPEXa 1888-1924 & CAPEXb 1956-2000) from the municipal yearly financial reports (Figure 35), and b) the yearly length of the water supply and sewer network (1888-2011) from the *Metropolitana Milanese SPA* internal database (Figure 33 and Figure 34).

The third data serie shows that Milan’s water and sanitation networks’ expansion phase started in 1888 and took place until the 1980’s. A slow down can be noticed however during the wars. In the decades after WWII significant investments were made in the networks as the water supply network length increased from 1100 km in 1945 to 2200 in 1988 and particularly until 1970 (1906 km). The number of connections increased also steadily from 28 201 in 1950 to 46 683 in 1988 (Motta 1989a).

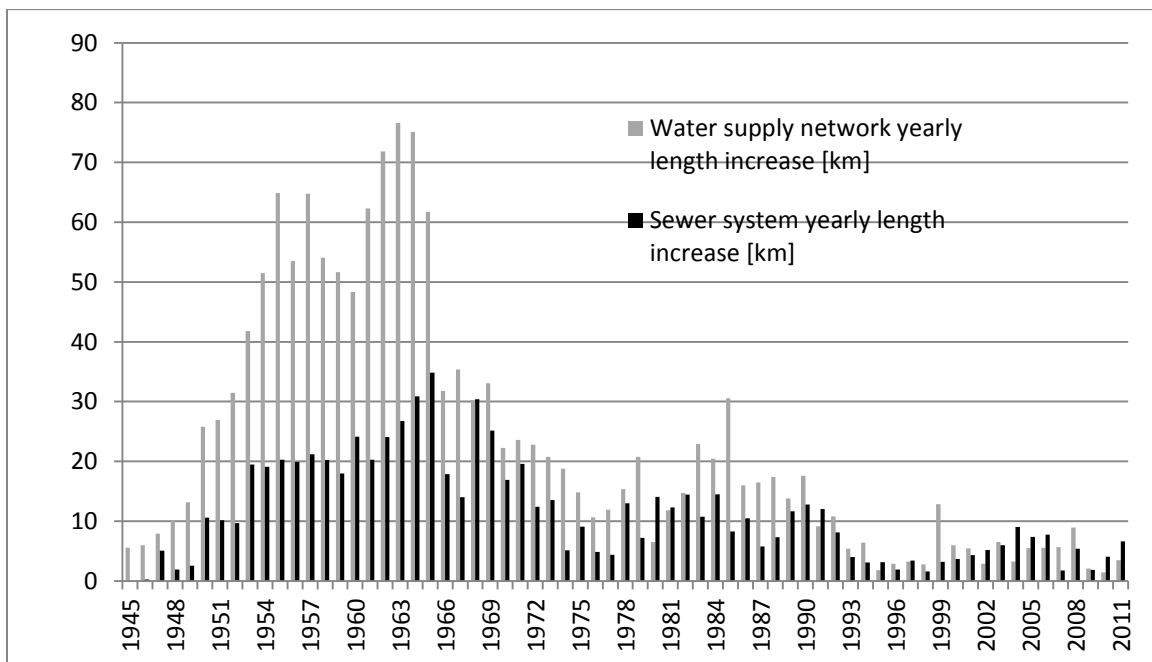
The CAPEX data series in Table 25 also confirm that a significant investment phase took place in the 1960’s and in the late 1970’s. Figure 35 refers only to sanitation and water investments and does not include investment in waste water treatment plant which are shown in Appendix B.

**Figure 33 : Milan’s water supply and sewer system length (1888-2011)**



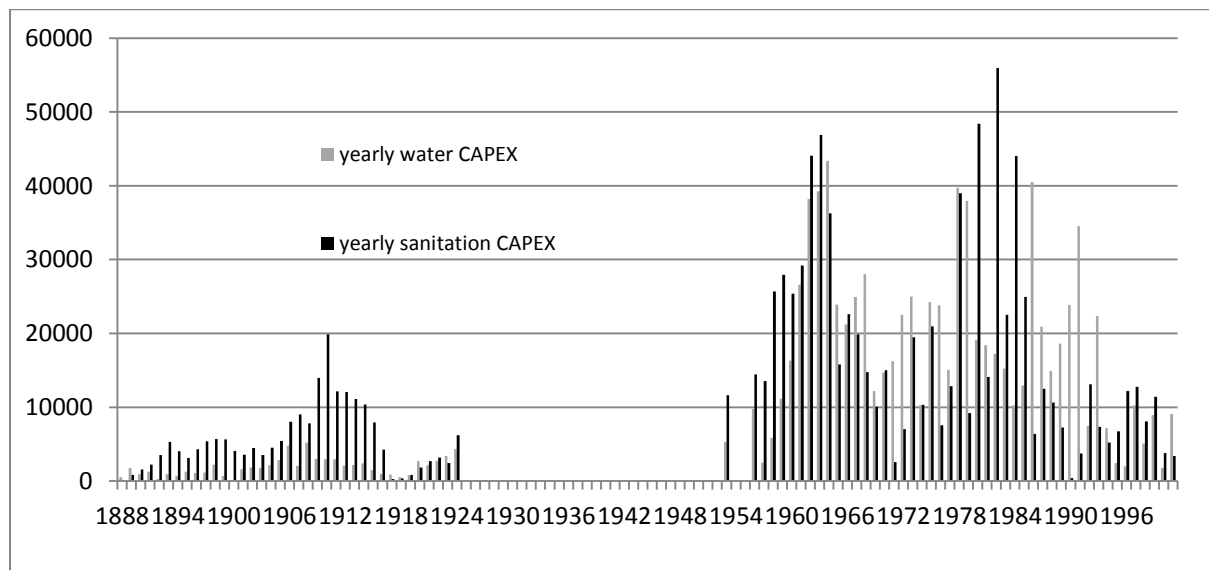
Source : author’s elaboration based on Metropolitana Milanese, internal database

**Figure 34 : Milan’s water supply and sewer system yearly increase (1945-2011)**



Source : author’s elaboration based on Metropolitana Milanese, internal database

**Figure 35 : Milan's yearly water and sanitation CAPEX in thousand euro 2011 value (1888-1926 & 1956-2000)**



Source : author's elaboration based on Conto consuntivo dell'anno [various years] and ISTAT serie storiche

#### 4.5.2 Long run cost allocation

We already analysed Milan's WSS financial flows (§ 4.3) showing that endogenous revenues (Tariffs) were not even covering OPEX between 1970 and 1985. In the 1956-1970 and 1990-2000 phases endogenous revenues despite covering OPEX were not high enough to cover a significant share of the CAPEX expenditures which were covered by general fiscal budget (exogenous revenues - Taxes) on all the time phase considered (1956-2000).

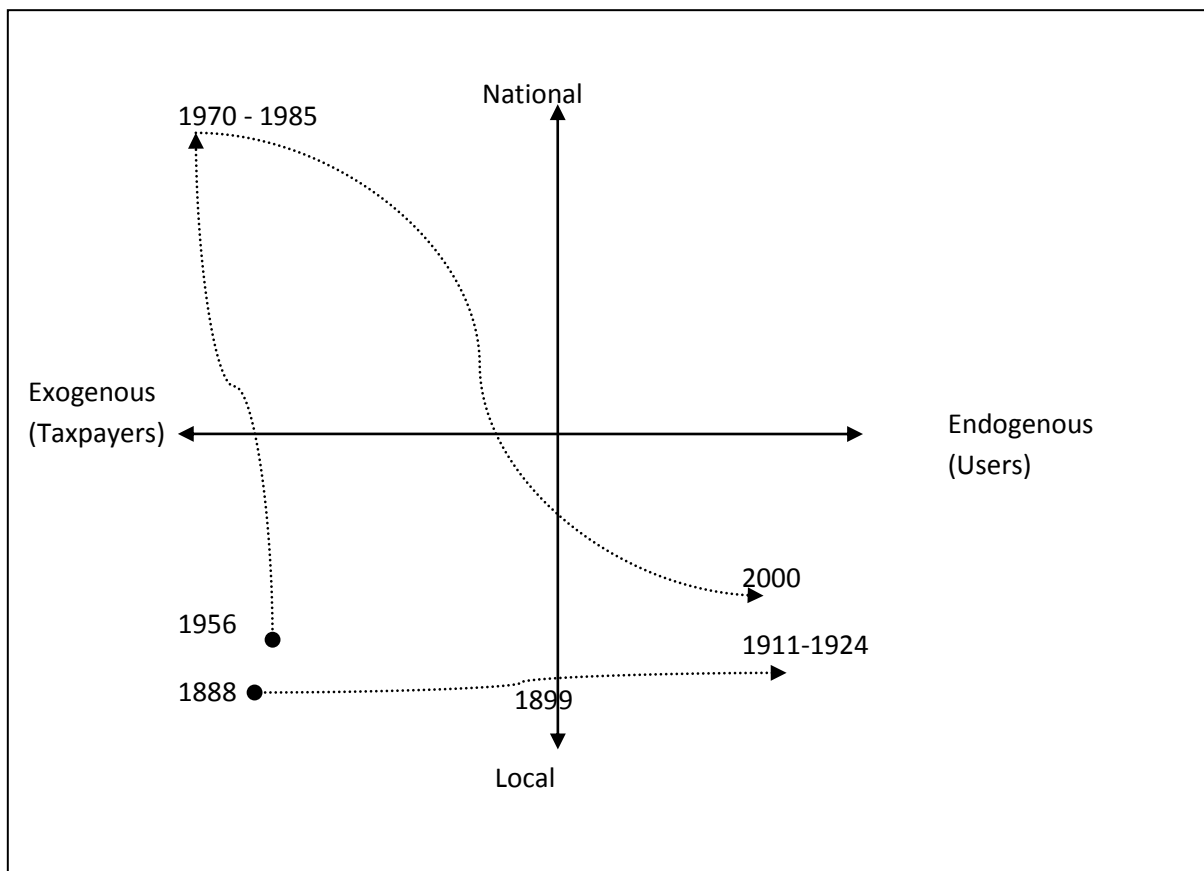
Moreover, while until WWII, transfers between the central state and the municipalities were not taking place and own tax revenues to total spending ratio was very high (§3.1), after WWII, municipalities' financial autonomy was heavily reduced and own tax revenues to total spending ratio got very low. It was only in the 1990's that some autonomous fiscal revenues were given back to Italian municipalities (§3.2).

Who did pay in the long run for the capital expenditures in Milan's WSS ? The users (endogenous revenues) or the tax-payers (exogenous revenues) ? In the latter case were they national or local tax-payers ? The answer to these questions is schematically represented in Figure 36. At the birth of Milan's WSS in 1888 the capital expenditure were paid by the local taxpayers. After 1899 Tariff revenues (endogenous revenues) covered an increasing share of

the Capital expenditures reaching 100 % coverage after 1911 and at least until 1924. We do not have data on the 1924-1956 phase (fascist regime & WWII).

In 1956, the long run cost allocation was very similar to the 1888 one with local taxpayers bearing most of the costs. Between 1956 and 1970 the municipal budget was increasingly fuelled with central government money (grants and budget-clearing loans). After 1970 and until the 1990's WSS CAPEX was then covered mainly by national taxpayers. It was only at the very end of the 1990's that Milan's users covered again WSS CAPEX with the water and sanitation service reaching a financial autonomy close to the one of the 1911-1924 time phase.

**Figure 36 : Long run cost allocation of capital expenditures in Milan's WSS**



Source : author's elaboration

### 4.5.3 Intergenerational cost allocation

Adopting a long run perspective from 1888 to 2000, one could wonder which generation did bear the most the investment's burden. This paragraph is focused on such a question. To tackle it, two data series are available : a) a CAPEXc data series composed of two distincts CAPEX data series (CAPEXa and CAPEXb) coming from the city's yearly financial report



and available respectively on the 1888-1924 and 1956-2000 time frame (Appendix B) and b) a virtual CAPEXd data series computed from the yearly network length associated to the 2011 assets reconstruction value estimation made by *Metropolitana Milanese* (Appendix C and D). The two data series CAPEXc and CAPEXd are computed very differently and thus have very different values (Box below). The full results are shown in the graphs in Appendix B and C.

**Box 6 : Two methodologies and two long run data series**

A) Yearly CAPEXc values in Lira (nominal value) => ISTAT index => Yearly CAPEXc values in Euro 2011  
 B) Yearly length => unitary assets value in euro 2011 => Yearly CAPEXd values in Euro 2011

CAPEXc include not only investments in the networks but also in water pumping and water treatment units. It does not include waste water investments. It includes renovations and extraordinary maintenance. It is not available on the 1925-1955 time frame. It might be biased by the change in the accounting rules through the various decades. It is largely influenced by the ISTAT conversion index which is more reliable for consumer goods than for public works.

CAPEXd is mainly based on the year by year technical inventory which might be more reliable than the accounting data. It refers only to the sewer system and water network and does not include water pumping and water treatment units. It does not include either the renovations and extraordinary maintenances. The monetary value of CAPEXd is based on the (wrong) assumption that cost of works staid constant through the years. It is largely sensitive to the 2011 assets reconstruction value estimated by *Metropolitana Milanese*

Table 25 summarizes the main results for the two data series in terms of cumulative CAPEX over 10 years time phases from 1887 to 2006. It is not surprising that the figures from the two data series are very different since they are based on very different assumptions. Nevertheless, the peak investment decade is the 1957-1966 one according to both series. Conversely CAPEXc seems to underestimate the values prior to WWII when compared to CAPEXd. Indeed second higher investment decade is the 1907-1916 one according to the CAPEXd serie and the 1977-1986 according to the CAPEXc data serie.

**Table 25 : CAPEX in the long run over 10 years periods in M euro 2011**

	Km		M Euro 2011							
	Length		CAPEXd				CAPEXc			
	water	sanitation	water	sanitation	total	Rank	water	sanitation	total	Rank
1887-1896	83	77	46.6	132.9	179.5	0	8.8	25.0	33.8	8
1897-1906	113	87	63.1	151.5	214.5	7	19.2	50.4	69.6	6
1907-1916	202	232	113.0	401.0	514.0	2	25.5	108.7	134.1	5
1917-1926	102	85	57.1	147.3	204.3	8	20.0	30.1	50.1	7
1927-1936	227	189	127.0	327.5	454.5	3	-	-	-	
1937-1946	134	57	75.0	98.0	173.1	10	-	-	-	
1947-1956	327	119	183.1	205.6	388.6	5	-	-	-	
1957-1966	598	238	334.8	412.5	747.3	1	228.5	287.4	515.9	1
1967-1976	232	151	130.0	261.4	391.4	4	202.1	127.8	329.8	3
1977-1986	171	109	95.7	189.4	285.1	6	226.5	277.4	503.9	2
1987-1996	102	70	56.9	120.8	177.7	9	154.4	79.2	233.6	4
1997-2006	54	52	30.2	89.3	119.5	11	-	-	-	

Source : author's elaboration

This issue is further explored using a basic overlapping generation model in which each generation is composed of everyone who is born at the same time instead of “everyone who is alive at a given time (Rosen and Gayer 2010, 466). Our model is conceived as schematized in Appendix E and based on the following assumptions:

Our model cover 12 time phases of 10 years each.

- Each generation is alive along 4 time phases, labelled “young”, “adult1”, “adult2” and “old”
- We consider 14 generations crossing our time frame labelled gen0, gen1, ..., gen14
- In each time phase there are four generations alive in the same time. The burden weighing on each generation is a quarter of the total burden of that time phase (as computed in Table 25).

We computed the investment burden weighing on each generation according to both CAPEX data series CAPEXc and CAPEXd (Table 26).

An issue is how to compare generation on which we have data only on 1, 2 or 3 time phases with the others 4-time phases generations. That is why we estimated CAPEXd\* and

CAPEXc\* which represent the virtual capital expenditures weighing on a generation if we had data on the 4 time phases<sup>191</sup>. CAPEXd\* and CAPEXc\* are useful to rank generations.

**Table 26 : Intergenerational CAPEX cost allocation on overlapping generations**

	from	to	CAPEX d (network length)			CAPEXc (accounting)		
			CAPEXd	CAPEXd*	Rank	CAPEXc	CAPEXc*	Rank
gen 0	1887	1896	44.88	179.53	12	8.44	33.76	14
gen 1	1887	1906	98.52	197.04	10	25.84	51.68	12
gen 2	1887	1916	227.02	227.02	9	59.37	79.17	10
gen 3	1887	1826	278.10	278.10	8	71.89	71.89	11
gen 4	1897	1936	346.84	346.84	5	63.45	84.60	9
gen 5	1907	1946	336.47	336.47	6	46.05	92.10	8
gen 6	1917	1956	305.14	305.14	7	12.52	50.07	13
<b>gen 7</b>	<b>1927</b>	<b>1966</b>	<b>440.88</b>	<b>440.88</b>	<b>2</b>	<b>128.98</b>	<b>515.93</b>	<b>1</b>
<b>gen 8</b>	<b>1937</b>	<b>1976</b>	<b>425.09</b>	<b>425.09</b>	<b>3</b>	<b>211.43</b>	<b>422.87</b>	<b>3</b>
<b>gen 9</b>	<b>1947</b>	<b>1986</b>	<b>453.11</b>	<b>453.11</b>	<b>1</b>	<b>337.40</b>	<b>449.87</b>	<b>2</b>
<b>gen 10</b>	<b>1957</b>	<b>1996</b>	<b>400.36</b>	<b>400.36</b>	<b>4</b>	<b>395.79</b>	<b>395.79</b>	<b>4</b>
gen 11	1967	2006	243.40	243.40	9	266.81	355.75	6
gen 12	1977	2006	145.56	194.08	11	184.36	368.72	5
gen 13	1987	2006	74.28	148.56	13	58.39	233.56	7
gen 14	1997	2006	29.87	119.46	14	0.00	0.00	

Source : authors elaboration

Applying the overlapping generation model on two different data series allows us to draw some remarks:

- According to the CAPEXd data series (based on network length) the investment burden is smoothly shared among generations as they all have CAPEXd\* values in the same order of magnitude.
- On the contrary, according to CAPEXc data series (based on accounting values) there are large inequalities between generations in the CAPEXc\* values. The CAPEXc\* of the first generations (gen 0 to gen 6) are not even in the same order of magnitude of the last ones (gen 7 to gen 14).
- From a methodological point of view, using physical assets data series seems much more effective than accounting data series to analyze intergenerational cost sharing in

<sup>191</sup>CAPEXc\* weighing on a generation is then computed as  $CAPEXc^* = CAPEXc / (\text{number of time phase on which we have data}) * 4$

the long run. Indeed, physical assets data series are not impacted by inflation-index conversion factors which in the long run might distort monetary data series.

- When comparing the ranking on the two data series it is quite striking that the 4 best ranked generations are the same (gen 7 to gen 10). These 4 generations were “alive” between 1927 and 1996. Indeed, these were the decades of a significant demographic growth and urban development in Milan and the water supply network and sewer system had to follow such a rhythm. In 1927 there were 912 000 inhabitants in Milan and 531 km of water supply networks and 507 km sewers were in operations. Milan’s population peaked to 1.8 million inhabitants in 1970 and by that time the water supply network and the sewer system had a total length of 1906 km and 1169 km respectively. By 1996, Milan’s population had decreased to 1.3 million inhabitants and the water supply network and the sewer system had a total length of 2290 km and 1413 km respectively.
- There is evidence that the investment policy in the water supply networks and sewer systems in the first decades after WWII was significant as realizing this infrastructure was essential to urban development and could not be postponed. On the contrary, investments in drinking water treatments and waste water treatments were constantly postponed as they were less “visible” (§4.4.1 and §4.4.2).

One of the caveat of our intergenerational analysis on the 1953-2000 time phase is that we lack of data on the repayable finance tools implemented by Milan’s municipality to finance its capital expenditures. For sure both market-loans and CDP budget-clearing loans were contracted by the Municipality in those decades (§3.2) but we do not have detailed data available. That is why Table 25 and Table 26 are based on CAPEX values and not on debt service values. Due to our lack of information on the repayable finance solutions implemented we may have a wrong perception of the intergenerational cost sharing. Additional research would be need to find the detailed information on the loans contracted and grants received by Milan’s municipality.

## 5 Conclusion

Through this paper we have looked into Milan’s water sanitation service (WSS) focusing on three key issues : a) how were public service mission goals implemented ? b) were the costs

covered by revenues endogenous or exogenous to the water and sanitation service ? and c) what is the long run cost allocation ? who did pay *in fine* for the infrastructure ?

To answer these questions we have manually collected an original dataset. Our analysis is based on the yearly financial report of Milan's municipality (*conto consuntivo dell'anno*) from 1956 to 2000. We have also conducted some interviews with former high ranked civil servant within Milan's municipality.

Even if we focus on the decades after WWII, it is worthwhile to cast a glance on Milan's WSS before WWII. From a financial point of view while the operational costs of the WSS as a whole were largely subsidized by the municipal general budget at first (exogenous revenues), after 1899 an increasing share of the costs was being covered by endogenous revenues. After 1911 and at least until 1924 endogenous revenues were high enough to cover also capital expenditures (debt amortization). In other terms Milan's WSS financial autonomy was pretty high.

We have defined public service mission in watsan through three main goals (§2.1). In the early decades of the 20<sup>th</sup> century there was a strong commitment in favour of the two first goals (universal provision and equal access to the service to all citizens & investment policy driven by an intergenerational concern). After WWII on the contrary, Milan's WSS was much more influenced by general interest goals. Public service mission goals were still considered very relevant but were not always fulfilled with great effectiveness by Milan's WSS. This is particularly striking when observing the investment policy implemented. On one hand, the water supply network and sewer system were significantly extended in the 1950's and 1960's as the city was expanding. On the other hand, key investments in drinking water and waste water treatments were constantly postponed in the 1970's and 1980's (§4.4). These investments were not considered as "politically visible" and were brought to completion (in 1994 and 2005) only thanks to the tight pressure put on Milan's municipality by EU directives and national legislation.

This (under)investment policies might be partially explained by looking into Milan's WSS financial flows. In 1956, when our data series starts, Milan's financial autonomy is much smaller. Endogenous revenues only cover the WSS operational expenditures (§4.3) as tariffs were heavily regulated in Italy by anti-inflation policies (§3.4). Year by year endogenous

revenues covered an even smaller share of the costs : not even the operational costs in the 1970-1985 years.

Costs uncovered by revenues endogenous to the service by definition are covered by general taxation (exogenous revenues). An additional question is whether exogenous revenues are being paid by national or local taxation (§4.5.2). We showed that after WWII, Italian municipalities financial autonomy was heavily reduced and own tax revenues to total spending ratio got very low (§3.2).

The combination of anti-inflation tariff regulation and fiscal centralization policies deviated the long run cost allocation from endogenous revenues (before WWII) to local exogenous revenues (1956) first and to national exogenous revenues later (1970-1985) as shown in Figure 36. It was only in the 1990's that the combination of higher municipal fiscal autonomy and a more costs based water tariffs regulation allowed Milan's capital expenditures to be covered again by local exogenous revenues first and endogenous revenues later.

An additional issue is how the investment burden was shared among generations. Indeed, according to Massarutto (2002) "sustainability is thus achieved as far as inter-generational externalities are avoided independently on how each generation decides to allocate the current cost among endogenous and exogenous sources". Investing or postponing an investment has a clear impact in terms of intergenerational transfers. We used a basic overlapping generation model to show that the investment burden was quite smoothly shared among generations. A significant part of the networks expansion was made between 1927 and 1970 to follow Milan's urban development. On the contrary investments in drinking and waste water treatment were postponed (and their burden transferred on future generations) as they were considered less "essential" and "politically" visible.

## Appendix A

## Milan's water and sanitation service financial flows, all values in Lira nominal values

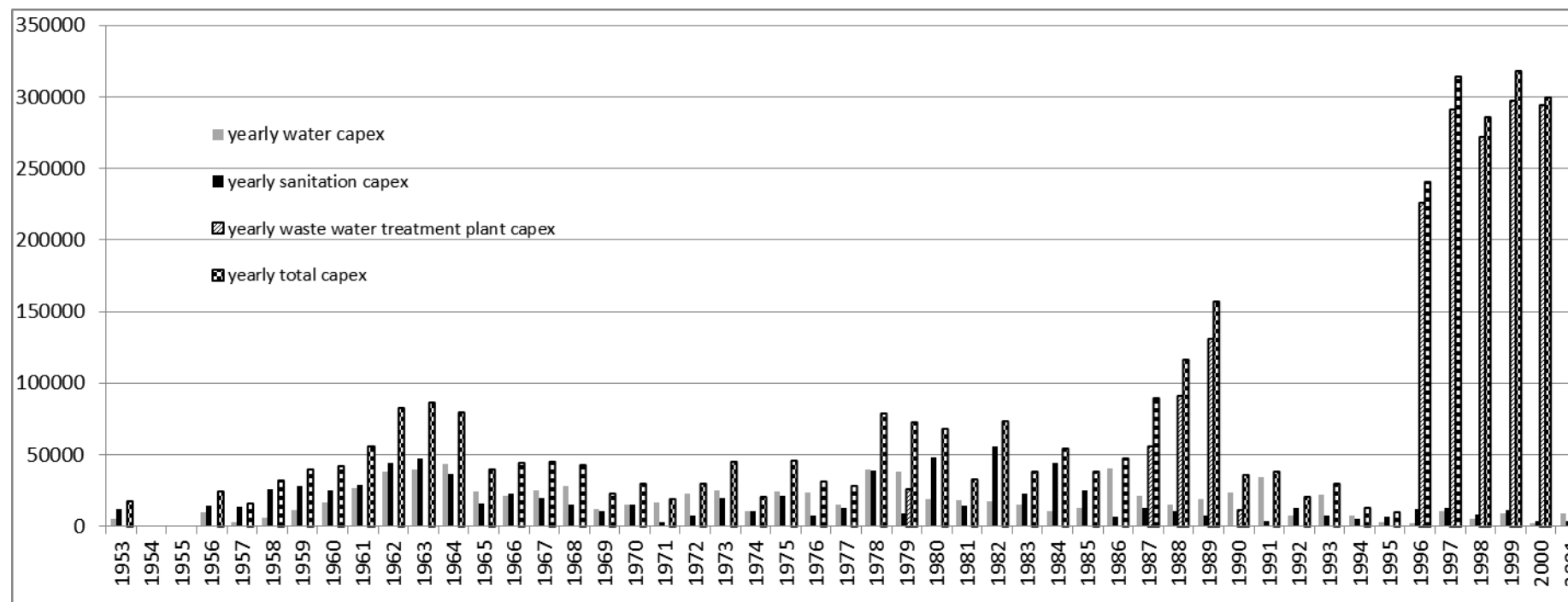
year	water			sanitation			water and sanitation		
	revenues	opex	gross profit	revenues	opex	gross profit	revenues	opex	gross profit
1956	2 765 589 944	2 199 063 707	566 526 237	50 426 497	213 602 319	-163 175 822	2 816 016 441	2 412 666 026	403 350 415
1960	3 398 632 571	2 657 899 851	740 732 720	731 088 263	299 939 274	431 148 989	4 129 720 834	2 957 839 125	1 171 881 709
1965	4 808 634 926	3 746 219 855	1 062 415 071	920 096 487	355 422 627	564 673 860	5 728 731 413	4 101 642 482	1 627 088 931
1970	5 421 027 597	6 487 274 546	-1 066 246 949	1 483 763 063	384 424 315	1 099 338 748	6 904 790 660	6 871 698 861	33 091 799
1975	7 194 983 193	7 041 242 948	153 740 245	91 214 267	768 699 998	-677 485 731	7 286 197 460	7 809 942 946	-523 745 486
1980	14 631 557 767	15 758 370 714	-1 126 812 947	15 921 228	2 570 902 646	-2 554 981 418	14 647 478 995	18 329 273 360	-3 681 794 365
1985	37 259 203 629	43 411 843 634	-6 152 640 005	24 544 321	4 896 239 827	-4 871 695 506	37 283 747 950	48 308 083 461	-11 024 335 511
1990	63 311 973 678	47 984 190 898	15 327 782 780	22 119 625	13 082 666 737	-13 060 547 112	63 334 093 303	61 066 857 635	2 267 235 668
1995	60 371 991 708	44 499 809 651	15 872 182 057	90 000	13 508 641 876	-13 508 551 876	60 372 081 708	58 008 451 527	2 363 630 181
2000	67 320 606 338	49 662 574 585	17 658 031 753	40 016 515 895	16 869 293 267	23 147 222 628	107 337 122 233	66 531 867 852	40 805 254 381

Source : author's elaboration based on *Conto consuntivo dell'anno* [various years]

To the purpose of this paper OPEX does not include assets depreciation, loan's amortization nor debt's service cost. It represents the pure "cost of operations".

## Appendix B

## Yearly CAPEX expressed in thousand euro 2011 value

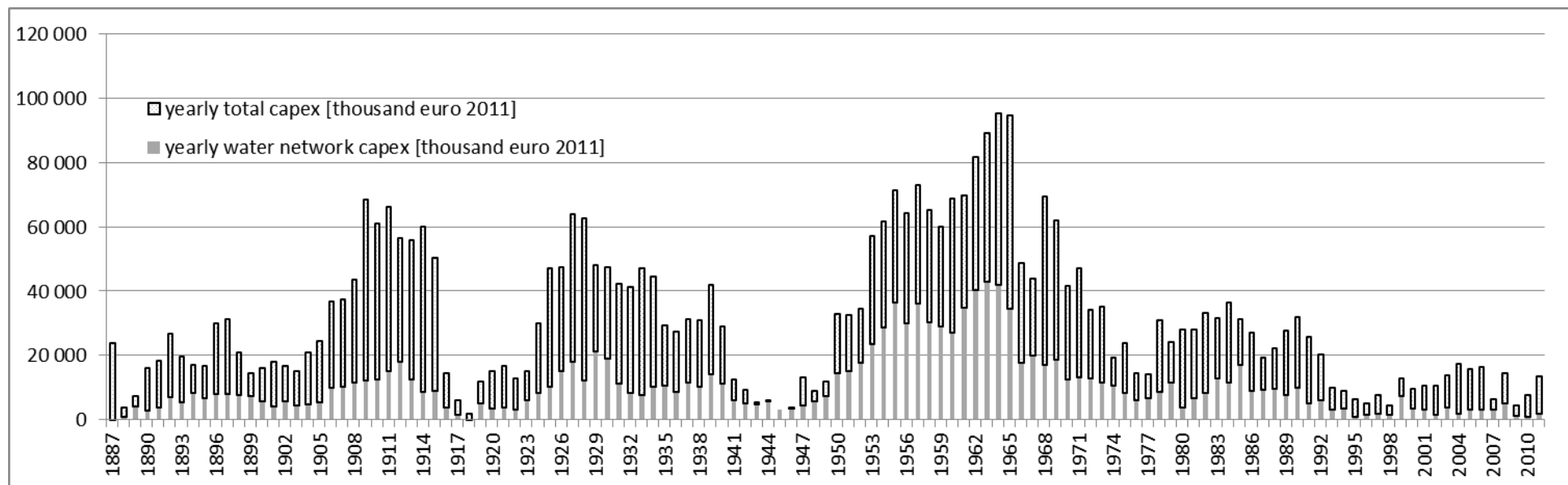


Source : author's elaboration based on *Conto consuntivo dell'anno* [various years] and inflated using an index from ISTAT serie storiche



**Appendix C**

Yearly water network (and total : water network + sewer system) capex in euro 2011 value (1888-2011), computed from yearly network length and 2011 reconstruction assets values.

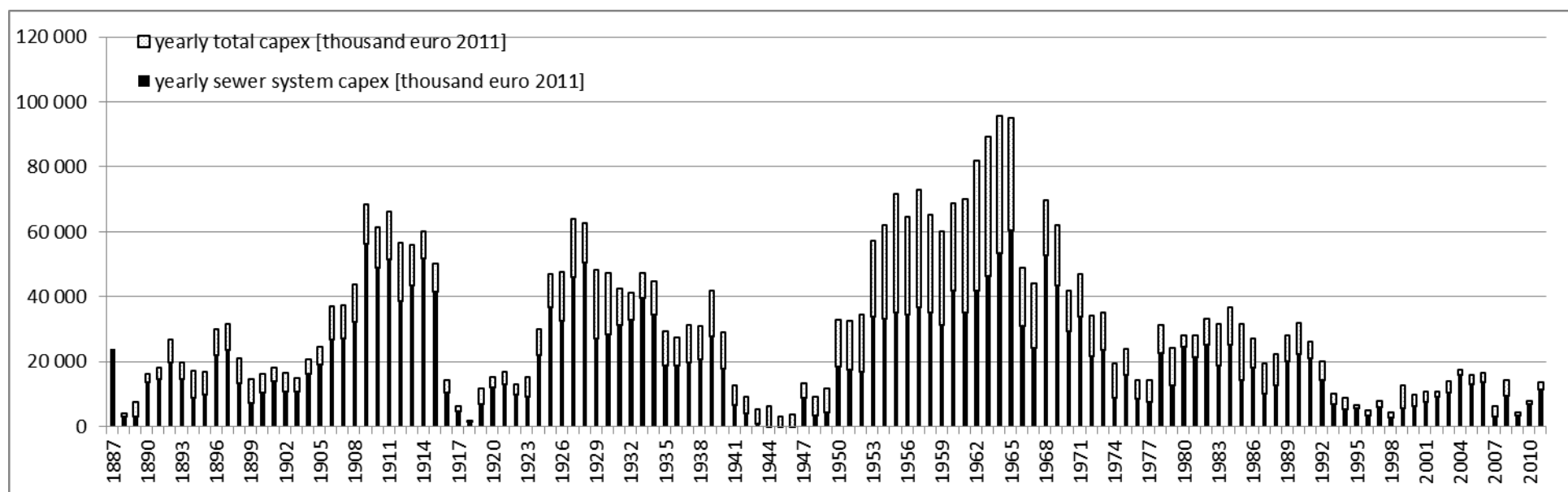


Source : author's elaboration

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 di CRESPI REGHIZZI OLIVIER  
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## Appendix D

Yearly sewer system (and total : water network + sewer system) capex in euro 2011 value (1988-2011), computed from yearly network length and 2011 reconstruction assets values.



Source : author's elaboration

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di CRESPI REGHIZZI OLIVIER

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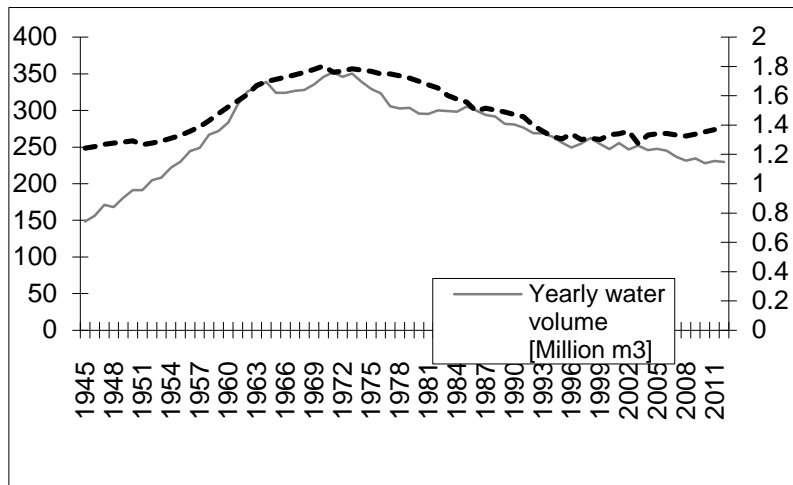
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Sono comunque fatti salvi i diritti dell'università Commerciale Luigi Bocconi di riproduzione per scopi di ricerca e didattici, con citazione della fonte.



**Appendix F**

**Yearly water consumption and population in Milan (1945-2011)**



Source : author's elaboration based on Metropolitana Milanese internal database

## **Institutions, comptabilité et financement des services d'eau et d'assainissement en Italie et en France**<sup>192,193</sup>

O.CRESPI REGHIZZI<sup>194</sup>,

**MOTS-CLES :** eau, assainissement, emprunt, investissement, financement, Italie, France

### **Introduction**

La disponibilité de financements suffisants et soutenables pour les infrastructures des services publics d'eau et d'assainissement (SPEA) est une question clé non seulement dans les pays du Sud où dans de nombreux cas les services d'eau sont encore dans une phase d'expansion mais aussi en Europe où ils ont atteint « un âge mur avec un besoin croissant de remettre à niveau le capital infrastructurel conséquent qui a été constitué dans les décennies passées » (Barraqué 2009). Actuellement en France cet enjeu fait tout particulièrement l'objet d'études et de débats tels ceux qui sont contenus au sein de l'ouvrage collectif qui vient d'être publié dans le cadre des travaux du Comité consultatif sur le prix et la qualité des services publics d'eau et d'assainissement du Comité National de l'Eau (CNE 2013).

De plus la question du financement des investissements publics est encore plus critique dans le contexte économique actuel. En effet l'accès à des financements de long terme est particulièrement difficile pour les collectivités locales du fait de la crise économique que traverse l'Europe et de la mise en œuvre progressive des règles prudentielles de Bâle 3 en matière de réglementation bancaire. Par ailleurs il apparaît que les ratios d'endettement public par rapport au PIB, tels qu'ils sont fixés par le pacte européen de stabilité et de croissance (PESC), déclinés en Italie en un pacte interne de stabilité (PIS) avec les administrations locales, pourraient contraindre la capacité d'emprunt des SPEA italiens (cf. §3.4).

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<sup>192</sup>La recherche a été menée dans le cadre de ma convention CIFRE à Eau de Paris qui s'inscrit dans le projet de recherche « EAU & 3E » sur la durabilité des services d'eau dans les grandes villes. Le projet EAU & 3E est financé par l'Agence Nationale de la Recherche.

<sup>193</sup> L'auteur remercie tous les participants au groupe de réflexion IMMO au sein du groupe de travail ASTEE - AITF sur la gestion patrimoniale pour la richesse des échanges.

<sup>194</sup> Centre International de Recherche sur l'Environnement et le Développement (CIRED) - AgroParisTech – Paris ; [crespireghizzi@agroparistech.fr](mailto:crespireghizzi@agroparistech.fr)  
Centro di Economia Regionale, dei Trasporti e del Turismo (CERTET) – Università Bocconi – Milano

Quel est le régime juridique, institutionnel et réglementaire des SPEA ? Comment celui-ci conditionne-t-il le financement des investissements ? Dans notre travail une classification des statuts des SPEA dans quelques pays européens est dressée (paragraphe 1). Une analyse comparative plus poussée est faite pour la France (paragraphe 2) et l'Italie (paragraphe 3) en s'intéressant en particulier à la régulation et aux contraintes en matière d'emprunt et de placement des fonds. Un aperçu historique sur la trajectoire institutionnelle qui a été empruntée pour arriver à la situation actuelle est fourni pour la France (§2.5) et l'Italie (§3.5). La comparaison des deux cas d'étude questionne certains choix de politiques publiques.

## 1. Une classification des services d'eau en Europe

Les services publics d'eau et d'assainissement (SPEA) sont gérés en Europe selon une grande variété de modèles institutionnels (Barraqué 1995), néanmoins les investissements restent essentiellement une prérogative municipale (ou supra-municipale éventuellement) en terme de maîtrise d'ouvrage et de financement, en gestion directe comme en gérance et dans la plupart des contrats d'affermage. Les seules exceptions sont représentées par les schémas de concession où d'affermage « concessif » (de moins en moins courants), que nous n'allons pas prendre en compte à ce stade dans notre analyse. Nous avons en effet choisi de nous focaliser sur la caractérisation institutionnelle de la maîtrise d'ouvrage publique en classifiant les SPEA en trois grandes catégories (Tableau 1).

**Gestion municipale directe** : les SPEA sont des directions municipales sans autonomie légale, ils sont régis par le droit administratif et la comptabilité publique

**Gestion autonome** : les SPEA sont des entités légales autonomes. Elles restent rattachées à la municipalité (où à un autre échelon de l'administration d'état) et sont régies par la comptabilité publique

**Gestion corporatisée**<sup>195</sup> : les SPEA prennent la forme d'une entreprise de droit privé. Ils sont régis par le droit et la comptabilité privés

<sup>195</sup> Nous parlons de « gestion corporatisée » en faisant référence au terme anglais « corporatization ».

**Tableau 1 : Une classification des régimes institutionnels des SPEA en Europe**

	<b>Gestion municipale directe</b>	<b>Gestion autonome</b>	<b>Gestion corporatisée</b>
Allemagne	<i>Regiebetriebe</i>	<i>Eigenbetriebe</i>	<i>Eigengesellschaften</i>
Espagne	Régie municipale directe	Des formes de syndicats et régies autonomes	Société anonyme
France	régie simple ou régie à autonomie financière	Régie à personnalité morale et autonomie financière, EPIC, EPCI	Société d'Economie Mixte SEM ou Société Publique Locale SPL
Italie	Anciennement <i>servizi in economia</i>	Anciennement <i>azienda municipalizzata</i>	Société Anonymes ( <i>Società per Azioni</i> )
Portugal	Régie municipale directe	Des formes de syndicats et régies autonomes	Holding et filiales <i>Aguas de Portugal</i>
Suisse	Services municipaux	Quelques <i>stadtwerkepflege</i>	
Wallonie	régie directe	Interco	

Source : élaboration de l'auteur, Pezon(2000) pour l'Allemagne, entretien avec AquaWal pour la Wallonie

## 2. Le cas français

### 2.1. Régimes institutionnels

En France les SPEA peuvent prendre la forme de l'une des trois catégories mentionnées au paragraphe précédent: au sein même de la gestion publique, on trouve les régies simples, les régies à autonomie financière (A - Gestion municipale directe), les régies à autonomie financière et personnalité morale (B - Gestion municipale autonome) où enfin les Société d'Economie Mixte (SEM) ou Sociétés Publiques Locales (SPL), récemment créées (C- Gestion Corporatisée).

Au delà de la classification indiquée ci-dessus, le cadre institutionnel des SPEA en France est complexifié par l'échelle territoriale de gestion des services. Ainsi dans de nombreux territoires les SPEA ont été mutualisés à l'échelle supra municipale. Nous distinguerons ainsi par la suite le cas des syndicats à vocation unique (eau ou assainissement) du cas des regroupements inter communaux multi compétences (du SIVOM ayant la compétence eau et/ou assainissement à la communauté urbaine). Du point de vue de notre analyse le premier cas rentre dans la deuxième catégorie « Gestion autonome » tandis que le deuxième cas peut être une variante de la première catégorie que l'on pourra nommer « Gestion inter-municipale directe ».

Nous ne distinguons pas le mode de gestion du service (au sens de la gestion directe / gestion déléguée). En effet, du point de vue des modalités et des contraintes de financement des investissements, les autorités organisatrices ayant délégué le service (à

l'exception des schémas d'affermage « concessif » ou de BOT) répondent aux mêmes contraintes que celle qui gèrent elles-mêmes en régie le service.

Les deux premières catégories (gestion directe et gestion autonome) ont en commun les éléments suivants :

-Obligation de tenir un budget annexe pour l'eau et l'assainissement avec interdiction de transferts entre le budget général et le budget annexe<sup>196</sup>,

-Obligation d'équilibre budgétaire, interdiction de dégager des bénéfices, non imposition à l'impôt sur les sociétés,

-Normes de la comptabilité publique (norme comptable M49) qui prévoient une architecture comptable en section d'exploitation et section d'investissement.

Les investissements peuvent être financés sur la base de l'autofinancement ou de l'emprunt. L'autofinancement annuel est constitué de deux éléments :i) la dotation annuelle aux amortissements qui est obligatoire et ii) l'autofinancement complémentaire qui est facultatif et autorisé en face d'un plan pluriannuel d'investissement.

Les « gestions corporatisées » répondent en revanche à la comptabilité privée ordinaire où l'amortissement est une notion comptable, ayant avant tout une implication fiscale. L'autofinancement n'y est pas normé comptablement de manière aussi contraignante qu'en M49. Elles sont soumises à l'impôt sur les sociétés. Des provisions pour renouvellement sont autorisées.

## **2.2.L'accès à l'emprunt pour les services d'eau en France**

Que la norme comptable soit forte ou pas, dans la plupart des cas, l'autofinancement n'est pas suffisant et les SPEA ont alors recours à l'emprunt pour financer leurs investissements. Nous distinguerons alors deux cas : la gestion municipale directe (cat. A) et la gestion autonome qu'elle soit corporatisée (cat. C) ou pas (cat. B).

### **2.2.1. Gestion municipale directe - cas d'une régie directe ou d'une régie à simple autonomie financière (également cas d'une regroupement intercommunal multi- compétence)**

<sup>196</sup> Des dérogations au principe sont possibles pour les communes de moins de 3000 habitants lorsque l'on a de gros investissements impactant trop le prix de l'eau



Dans le cas d'une régie directe ou d'une régie à simple autonomie financière le recours à l'emprunt passe par la collectivité dont elle fait partie. Le cas d'un regroupement intercommunal multi- compétence gérant l'eau en régie ou en affermage répond également à la même description de cas. C'est la collectivité locale qui souscrit l'emprunt et en affecte tout ou partie à la régie du service de l'eau et de l'assainissement. Dans la pratique, le plus souvent la collectivité a une « gestion globale » de l'emprunt, ce qui signifie qu'un même emprunt finance des investissements du budget général et d'un ou de plusieurs budgets annexes. L'amortissement financier de l'emprunt est alors réparti sur les sections d'investissements des différents budgets qui bénéficient des fonds d'emprunt.

Plus rarement la collectivité a recours à des emprunts spécifiques pour la régie de l'eau ou de l'assainissement. Cela est pertinent lorsqu'il s'agit de financer un investissement ponctuel de taille importante telle qu'une station de traitement ou une station d'épuration.

Si la pratique d'une gestion globale de l'emprunt peut permettre d'optimiser les coûts financiers par la taille plus importante des emprunts, d'un autre côté elle peut avoir l'inconvénient d'obtenir des maturités d'emprunt à taille unique qui sont très souvent peu adaptées aux longues durées de vie des infrastructures eau et assainissement. De plus lorsque le volume d'emprunt est contraint il peut arriver que les investissements requis par les SPEA soient annulés ou différés au profit d'infrastructures plus visibles politiquement.

### **2.2.2. Gestion municipale autonome & Gestion corporatisée - Cas d'une entité à autonomie morale (EPIC<sup>197</sup>, syndicat intercommunal à vocation unique où syndicat mixte, SPL ou SEM)**

Dès lors qu'elle est dotée de la personnalité morale, la régie (où le syndicat à vocation unique) souscrit elle-même les emprunts. Il est théoriquement possible que l'EPIC où le syndicat ait recours à la garantie d'emprunt de/des collectivité(s) à laquelle elle fait référence mais ce ne sont pas des pratiques très courantes. Le cas d'une SPL où d'une SEM est semblable sur cet aspect au cas d'un EPIC.

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<sup>197</sup> Etablissement Public Industriel et Commercial (EPIC)

Le niveau d'endettement d'une régie à autonomie morale, d'une SEM ou d'une SPL ne modifie pas les ratios d'endettement de la collectivité, néanmoins l'endettement des entités « satellites » doit figurer dans le hors bilan de la collectivité.

### **2.3. Mutualisation et péréquation**

On ne pourrait pas analyser le financement des investissements dans les SPEA français sans évoquer le dispositif des Agences de l'eau. Si celles-ci sont fréquemment citées pour le rôle d'internalisation des externalités négatives pour lesquelles elles ont été conçues (CG Plan 1997, 28), la mission qu'elles ont en termes de mutualisation et de péréquation financière, parfois critiquée injustement comme une 'dérive', est tout aussi importante<sup>198</sup> (Barraqué 2009, 13).

En effet le circuit financier des agences (redevances – avances à taux zéro et subventions) peut être assimilé à une mutuelle alimentée par ses membres (à travers les redevances payées) et ayant une action de redistribution des ressources financières avec une modulation dans l'espace et dans le temps (aides et avances remboursables). C'est ce mécanisme de solidarité qui permet de lisser dans le temps et de répartir dans l'espace le poids financier d'un investissement en évitant qu'il pèse entièrement sur une seule génération d'utilisateurs d'un territoire limité.

Si le circuit financier des agences de l'eau constitue le dispositif principal de mutualisation / péréquation, d'autres dispositifs existent à l'échelle départementale<sup>199</sup>. Il s'agit des syndicats départementaux (avec ou sans mutualisation des travaux), du fonds départemental pour le renouvellement des réseaux ou encore du mécanisme de péréquation de l'épargne (Syndicat mixte de Gestion Départementale de Haute-Savoie).

### **2.4. La trésorerie et les placements pour les services d'eau en France**

Les collectivités locales françaises ont obligation de dépôt des fonds auprès du Trésor Public. Ces fonds ne sont pas rémunérés. Les services publics d'eau et d'assainissement

<sup>198</sup> Leur principe mutualiste s'est inspiré des agences de l'eau de la Ruhr, qui, elles ont obtenu en plus la maîtrise d'ouvrage.

<sup>199</sup> Ils ont fait l'objet de plusieurs recherches au sein du projet AquaDep <http://aquadep.irstea.fr/> (Barbier 2012). Une étude commanditée par le MEDAD a également analysé plusieurs dispositifs de péréquation et mutualisation à l'échelle départementale (Bougelot and Loury 2003)

en tant que services industriels et commerciaux (SPIC) peuvent déroger en théorie à cette règle.

En effet sur la base de la loi de finances de 2004 les SPIC (dont les régies d'eau et d'assainissement qu'elles soient en régie simple, en régie à autonomie financière ou à personnalité morale) sont autorisées à placer leur excédent de trésorerie sur trois types de produits : i) Compte à terme auprès de l'Etat Français<sup>200</sup>, ii) Titres émis par les états membres de l'Union Européenne libellés en euros ou iii) Placements en parts ou en actions d'organismes de placement collectif de valeurs mobilières (OPCVM) gérant exclusivement des titres émis ou garantis par les Etats membres de la Communauté européenne libellés en euros. En réalité seule la première catégorie de placements est pratiquée et encore, de manière assez limitée. Par ailleurs en 2012, du fait de la baisse des taux de marché des bons du trésor, les rendements à un an proposés<sup>201</sup> pour les comptes à termes étaient de l'ordre de 0,67 %, ne permettant même pas de compenser l'inflation. Enfin, toutes ces solutions de placement ne sont pas pratiques à manipuler au quotidien par les services pour lesquels une solution simple de placement de la trésorerie, faiblement rémunérée, tel que le Livret A<sup>202</sup> serait la bonne solution.

De plus, les régies des services industriels et commerciaux ayant la personnalité morale (EPIC) peuvent également ouvrir un compte de dépôt auprès d'un établissement bancaire ou de La Poste après autorisation de la part du trésorier-payeur général (TPG). Il apparaît que cette possibilité ouverte par la loi reste très peu pratiquée, en raison d'une certaine pression morale dans le sens contraire de la part du Ministère du Trésor à travers les TPG.

Un cas à part est celui des services en gestion corporatisée (SPL) qui ont toute liberté en matière de dépôt et de placement des fonds.

Par ailleurs il est intéressant de noter que la question du non placement des fonds des régies date des années 1960 : alors même qu'il encourageait une gestion budgétaire de plus en plus « autonome » des SPIC en régie (1959, 1962, 1967) le législateur levait

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<sup>200</sup> Le taux des comptes à terme auprès de l'état français est descendu à 0% en septembre 2012 : [http://www.colloc.bercy.gouv.fr/colo\\_otherfiles\\_fina\\_loca/docs\\_divers/taux\\_cat\\_coll\\_septembre\\_2012.pdf](http://www.colloc.bercy.gouv.fr/colo_otherfiles_fina_loca/docs_divers/taux_cat_coll_septembre_2012.pdf)

<sup>201</sup> <http://www.collectivites-locales.gouv.fr/files/files/tauxcat.pdf>

<sup>202</sup> Tel que pratiqué pour les offices HLM qui ont la possibilité de placer leur fonds sur livret A.

également l'interdiction stricte de placement des fonds publics, pour les régies dont « le solde peut être porté dans un compte courant ouvert dans n'importe quel établissement de crédit » avec l'autorisation du préfet et du Trésorier-Payeur-Général (Pezon 2000, 130). Cinquante ans plus tard, force est de constater que cette porte ouverte à une gestion plus libre des fonds des régies est resté en pratique lettre morte.

## 2.5. Un aperçu historique

### 2.5.1. De la régie simple aux SPL

Par quelle trajectoire historique est-on arrivé en France à cette multitude de régimes institutionnels pour les SPEA ? Nous allons essayer d'y répondre en donnant quelques éléments synthétiques tirés de la fresque historique très complète réalisée par Christelle Pezon (2000). La ligne du haut de la frise historique en Figure 37 résume les principales évolutions en termes de régimes institutionnels.

La première réglementation sur les activités commerciales des communes (incluant le service d'eau potable) voit le jour en 1926<sup>204</sup>. Avec ces décrets la « régie autonome » est créée comme entité municipale nouvelle par rapport aux régies existantes qui sont rétrospectivement labellisées comme « simples » ou « directes ». C'est ainsi un basculement qui est visé : de l'organisation en Service Public Administratif (SPA) vers un nouveau mode de gestion de ces mêmes services en Service Public Industriel et Commercial (SPIC). En effet les régies directes de l'époque puisaient dans le budget municipal et étaient financées par la fiscalité générale (SPA) alors que les régies autonomes auraient dû dans l'esprit du législateur être financées par le tarif (SPIC).

Néanmoins la régie simple (SPA) reste toujours autorisée pour un certain nombre de services dont les services « d'hygiène ». Cette porte ouverte au maintien des SPA est confirmée par la loi de finances de 1930<sup>205</sup> qui autorise les régies créées avant 1926 à conserver la forme de la régie simple (Pezon 2000, 105–107). Il apparaît que les élus locaux préfèrent maintenir intactes leur prérogatives en restant en régie simple plutôt que d'aller vers une régie autonome qui étend le droit de regard de l'administration

<sup>203</sup>Article 43 du Décret 62-1587 du 29 décembre 1962

<sup>204</sup>Décrets-lois des 5 novembre et 28 décembre 1926

<sup>205</sup>Loi 30 décembre 1930 – article 23

centrale<sup>206</sup>(Pezon 2000, 120). N'étant pas considérées comme SPIC mais comme SPA les régies simples échappent ainsi aux règles introduites par le décret-loi de 1937<sup>207</sup> qui a introduit la règle d'équilibre budgétaire en les obligeant à « assurer le recouvrement de leur coûts grâce aux seules ressources procurées par la vente d'eau à domicile »(Pezon 2000, 118).

**Figure 37 : Evolution historique en France**

1926 – régie autonome (SPIC)	1952 – politique limitation prix de l'eau	1954 – création du FNDAE	1962 – comptes des SPIC d'eau doivent permettre calcul du coût intégral	1982 – marché du crédit au collectivités libéralisé	1987 – déréglementation prix de l'eau	Echelle de gestion très variées	Multiplicité des régimes institutionnels (gestion municipale, directe, gestion autonome, gestion corporatisée)
1902 – premier dispositif national de subventionnements des adductions d'eau	1937 – règle d'équilibre budgétaire pour les régies simples	1959 – régie à personnalité morale et autonomie financière	1962 – création agences de l'eau	2005 – suppression du FNDAE	M49 - Equilibre budgétaire des services d'eau		

Source : élaboration de l'auteur, régimes institutionnels, régulation et financement

C'est en 1959<sup>208</sup> que la régie personnalisée est créée. Il s'agit de la régie à personnalité morale et autonomie financière qui constitue la deuxième catégorie (cat. B) de notre classement (§1). Néanmoins cette nouvelle forme de régie ne rencontre « pas plus de succès que la régie autonome n'en avait rencontré auparavant »(Pezon 2000, 155).

En 1962<sup>209</sup> il est établi que les comptes des SPIC d'eau doivent permettre de calculer le coût intégral (incluant les investissements et le service de la dette) et la comptabilité en partie double est introduite. En 1967 et 1969<sup>210</sup> des normes comptables établissent l'obligation (sauf pour les petites communes de moins de 3000 habitants) d'un budget propre pour les services d'eau, « c'est à dire *a minima* adopter l'organisation de la régie autonome » (Pezon 2000, 129). C'est également à partir de 1967<sup>211</sup> que le service public d'assainissement est obligatoirement considéré comme un SPIC sont les coûts seraient couverts par la facture d'eau (Pezon 2000, 154).

Graduellement le principe de l'équilibre budgétaire des SPEA (« l'eau paie l'eau ») s'instaure à travers la mise en place de budgets annexes eau et assainissement que l'on

<sup>206</sup>Un tiers des membres du conseil d'exploitation nommé par le préfet qui approuve également le tarif. Le droit d'ingérence du préfet dans la gestion des régies autonomes (et plus tard des régies personnalisées) ne disparaîtra qu'en 1988 (Loi n°88-13 du 5 janvier 1988 d'amélioration de la décentralisation)(Pezon 2000, 165).

<sup>207</sup>Décret-loi 30 juillet 1937

<sup>208</sup>Décret n°59-1225 du 19 octobre 1959

<sup>209</sup>Décret du 29 décembre 1962

<sup>210</sup>Instructions comptables n°67-113 du 12/12/1967 et n°69/69 du 12 juin 1969

<sup>211</sup>Décret n°67-945 du 24 octobre 1967

connaît bien aujourd'hui. Néanmoins malgré toutes les tentatives du législateur de décourager voire d'interdire une gestion en régie simple et d'encourager les régies autonomes ou personnalisées, force est de constater que la régie simple (renouvelée par l'adoption d'un budget annexe) continue à avoir le vent en poupe et n'a pas disparu du paysage des SPEA français. C'est ainsi qu'en 2013 les SPEA français continuent à assumer une grande variété de formes institutionnelles qui vont de la régie simple à la SPL.

### 2.5.2. Financement des investissements

C'est en 1902<sup>212</sup> qu'un objectif de généralisation de la desserte en eau à domicile est fixé (cf ligne du bas de la frise historique en Figure 37). Afin d'encourager le développement des services d'eau potable, à l'époque quasiment inexistant dans les zones rurales, des subventions pouvant couvrir jusqu'à 50 ou parfois 80% des frais d'investissements sont prévues par la loi pour encourager la distribution collective. La part restante doit être couverte par les communes qui le plus souvent recourent à l'emprunt amorti grâce à des impositions extraordinaires (centimes additionnels). Une petite partie de ces demandes de subventions est satisfaite jusqu'en 1930. En 1934<sup>213</sup> le dispositif de subventions<sup>214</sup> est réformé et renforcé (Pezon 2000, 112–113). Ce mécanisme se poursuivra avec des interruptions au cours des années de guerre et avec des variantes (subventions en capital, en annuité) jusqu'en 1953 (Canneva à paraître).

A partir de 1954 (et jusqu'en 2005) le Fonds National de Développement des Adductions d'Eau (FNDAE), financé par une surtaxe sur les volumes d'eau vendus sur l'ensemble du territoire a remplacé les dispositifs de subventions précédents et a financé les investissements des services d'eau ruraux à travers des prêts concessionnels et, à partir de 1960<sup>215</sup>, des subventions en capital. Les subventions des conseils généraux ont également joué un rôle important en complément des aides du FNDAE (Canneva à paraître).

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<sup>212</sup> Loi relative à la protection de la santé publique du 15 février 1902

<sup>213</sup> Circulaire 29 octobre 1934

<sup>214</sup> Les subventions ont comme origine les fonds du Pari Mutuel, mais également les Plans d'Outillage National et les Plans de Grand Travaux (ces deux derniers fonds étant alimentés par le budget général de l'Etat).

<sup>215</sup> Loi de finance pour 1960, art. 75, (Canneva à paraître)

Du point de vue de l'accès à l'emprunt, les communes, ne pouvaient s'adresser qu'aux caisses publiques (Caisse des Dépôts et Consignations, Crédit Agricole, Crédit Immobilier en premier lieu ainsi que la Caisse d'Aide à l'Équipement des Collectivités Locales à partir de 1966). « Les caisses publiques consentent aux communes des emprunts à taux bonifiés à condition que l'État ait accepté de doter les équipements d'une subvention spécifique » (Pezon 2000, 148).

A partir de 1982<sup>216</sup> les communes ne sont plus tenues de s'adresser uniquement aux caisses publiques et peuvent emprunter librement. Elles ne bénéficient plus en revanche de conditions préférentielles.

### 2.5.3. Tarif

De 1952<sup>217</sup> à 1970<sup>218</sup> une politique de limitation des prix de l'eau est mise en œuvre dans le cadre de la politique nationale de lutte contre l'inflation<sup>219</sup> via le contrôle annuel, exercé par les préfets depuis 1926, lors de la soumission des tarifs de l'eau pour approbation (Pezon 2000, 145).

La politique de contrôle des tarifs de l'eau qui avait été interrompue en 1970 est rétablie en 1978 pour les services d'eau en affermage et en 1981 pour les régies (cf ligne du bas de la frise historique en Figure 37). Au cours de cette deuxième phase de réglementation des prix, l'eau potable est incluse dans un panier de bien réglementés et « un bon nombre de services ont été dissuadés de pratiquer une politique de vérité de prix » (Min. Agriculture, cité par Pezon 2000, 171). A partir de 1987 le prix de l'eau est déréglementé à nouveau (Pezon 2000, 161, 162, 173), ce qui explique la forte augmentation du prix de l'eau en France dans les années 1990 ;

Si d'un côté avec la création des régies autonomes, puis des régies personnalisées (cf. §2.5.1), l'État cherchait à encourager un équilibre budgétaire des services basé sur le tarif (SPIC), d'un autre côté les politiques macroéconomiques de contrôle de l'inflation allaient dans le sens inverse. C'est au cours des années 1980 que l'effet combiné de l'adoption de normes comptables se rapprochant de plus en plus du plan comptable

<sup>216</sup> Loi 2 mars 1982 (Bourdin 2001, 257)

<sup>217</sup> L'Arrêté ministériel du 15 avril 1952 confie aux préfets la mission de limiter l'évolution des prix de l'eau à l'occasion de leur contrôle annuel (Pezon 2000, 145).

<sup>218</sup> Loi n°70-1297 du 31 décembre 1970 relatives aux libertés communales (Pezon 2000, 145)

<sup>219</sup> Ordonnance n°45-1483 du 30 juin 1945 relative aux prix (Pezon 2000, 145)

général (cf §2.5.1), de la libéralisation des conditions d'emprunts pour les communes (§2.5.2) et enfin de l'interruption des politiques de contrôle sur les prix de l'eau a créé les conditions pour un recouvrement intégral des coûts du service par le tarif (*full cost recovery*). L'effet s'est fait sentir dans les années 1990 lorsqu'il a fallu investir dans la modernisation et l'achèvement de l'assainissement et de l'épuration (Directive 91/271 CE).

### 3. Le cas italien

#### 3.1. Les services d'eau en Italie après 1994

Comme la France, l'Italie comptait un grand nombre de petits services en régie municipale, mais quasiment sans participation du secteur privé ni regroupements intercommunaux importants. Une loi de 1903<sup>220</sup> avait institutionnalisé la gestion municipale de ces services en créant des établissements publics industriels et commerciaux appelés *Aziende Muncicipalizzata* (cf. §3.5). Avec la réforme du secteur initiée avec la Loi *Galli* de 1994, les services d'eau en Italie ont progressivement pris la forme de sociétés anonymes de droit privé<sup>221</sup> (*Società per azioni*). Celles-ci peuvent être à capital entièrement public<sup>222</sup> (sorte de SPL), à capital privé où à capital mixte (sorte de SEM).

La plupart des SPEA italiens répondent donc aux normes de la comptabilité privée et ont toute liberté en matière de dépôt et de placement de leur fonds. Ils sont assujettis à l'impôt sur le revenu dès qu'ils ont un résultat positif, ce qui les conduit à limiter autant que possible d'un point de vue comptable le résultat affiché quitte à privilégier d'autres types de transferts en faveur des actionnaires quels qu'ils soient. D'un autre côté le prix de l'eau est encore à des niveaux très bas en Italie<sup>223</sup>, ainsi pour équilibrer le service, les investissements constituent souvent la variable d'ajustement, et les retards se sont accumulés.

<sup>220</sup> Voir aussi Calabi (1980)

<sup>221</sup> Ainsi que le prévoyait le décret n. 448/2001 (art. 35) qui a interdit les autres formes de gestion directe.

<sup>222</sup> C'est-à-dire de propriété d'une ou de plusieurs municipalités

<sup>223</sup> Généralement le tarif oscillait en 2010 entre 0.99 et 1.92 euros/m<sup>3</sup> pour l'ensemble du service de l'eau et de l'assainissement (Massarutto 2011a, 68). En 2012 Milan avait un tarif encore plus bas qui tournait autour de 0,60 euros/m<sup>3</sup>, [http://www.metropolitanamilanese.it/pub/page/it/MM/bolletta\\_tariffe](http://www.metropolitanamilanese.it/pub/page/it/MM/bolletta_tariffe)



### 3.2. La Loi Galli

La loi Galli a introduit le concept d'échelle territoriale optimale de gestion (*Ambito Territoriale Ottimale – ATO*) dont l'extension coïncide souvent avec l'échelle de la *Provincia* (les départements italiens) bien que de notables exceptions existent (ATO à l'échelle d'une seule municipalité comme à Milan – ATO à l'échelle d'une région entière comme dans les Pouilles). Au sein de chaque ATO le service intégré d'eau et d'assainissement est fourni en principe par un seul et même opérateur sur la base d'un contrat de concession (*Convenzione*). Chaque ATO a une autorité de régulation (A-ATO) qui supervise les relations contractuelles avec la société concessionnaire qu'elle soit privée, publique ou mixte. Les investissements sont à la charge et sous la maîtrise d'ouvrage du concessionnaire qui doit mettre en œuvre un schéma directeur d'investissement (le *Piano d'Ambito*). Jusqu'en 2011 les tarifs étaient établis par chaque A-ATO sur la base d'une méthodologie nationale (*Metodo Tariffario Normalizzato-MTN*) qui visait à encourager les gains de productivité en utilisant une méthodologie de type price-cap tout en prenant en compte les investissements à accomplir (*Piano d'Ambito*).

Historiquement, jusqu'aux années 1990, le prix de l'eau en Italie ne permettait pas de couvrir l'ensemble des coûts du service, avec pour conséquence des investissements insuffisants et subventionnés par des fonds publics venant du budget général (§3.5.2). Force est de constater que presque 20 ans plus tard, la réforme de 1994 n'a pas réussi à combler le retard d'investissement dans le secteur (Massarutto et al. 2012). En effet le principe du recouvrement des coûts a été adopté beaucoup plus tardivement en Italie qu'en France. Ainsi l'opinion publique et les décideurs politiques se sont montrés très peu favorables à une augmentation du prix de l'eau. De ce fait, de l'avis de nombreux experts les *business plans* associés au *Piano d'Ambito* étaient « non bancables » et les investissements sont restés à la traîne (Anwandter and Rubino 2006)

Entre 1994 et 2011 la loi Galli a été mise en œuvre avec une grande inertie et avec de fréquentes modifications législatives<sup>224</sup> en particulier concernant le degré souhaité de participation du secteur privé dans le secteur. Et finalement, en opposition au décret

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224Decreto legislativo 3 aprile 2006, n. 152, decreto legge 112/2008, decreto legislativo 16 gennaio 2008 n°4, legge 26 marzo 2010, n. 42

Ronchi de 2009<sup>225</sup>, un mouvement<sup>226</sup> de la société civile s'est organisé contre la « privatisation de l'eau » et un referendum a eu lieu en Juin 2011 sur deux questions : i) voulez-vous abolir les parties du décret Ronchi qui rendent obligatoire la tenue d'un appel d'offre pour choisir l'opérateur du SPEA ? et ii) voulez-vous abolir la composante tarifaire de « rémunération du capital investi » telle qu'elle est prévue par le *Metodo Tariffario Normalizzato* ? Le « Oui » a remporté les deux questions avec une écrasante majorité.

### 3.3. La nouvelle régulation

Peu de temps après le referendum, le pouvoir de régulation tarifaire sur les SPEA a été transféré du CONVIRI<sup>227</sup> à l'*Autorità per l'Energia Elettrica ed il Gas* (AEEG) qui était déjà en charge de la régulation des services du gaz et de l'électricité. L'AEEG a lancé en 2012 une consultation publique<sup>228</sup> en vue de réformer la tarification des SPEA. La question était sensible car il s'agissait à la fois de respecter le résultat du referendum (abolition de la rémunération du capital investi tel que prévu par le MTN) et de garantir le respect du principe du recouvrement total des coûts (y compris les coûts financiers)<sup>229</sup> associés aux investissements pour rendre à nouveau « bancables » les investissements dans le secteur de l'eau. En effet l'incertitude de régulation créée par le referendum a poussé les SPEA italiens à limiter l'investissement et à restreindre autant que possible leur activité aux opérations courantes.

Une formule tarifaire transitoire (*Metodo Tariffario Transitorio* – MTT) a été approuvée par l'AEEG en décembre 2012 (AEEG 2012c) ; elle est applicable sur les années 2012 et 2013 en attendant la mise au point de la méthode définitive qui s'appliquera pour les années à venir. Dans les souhaits de l'AEEG le MTT voudrait à la fois redonner du souffle au SPEA en faisant en sorte que le tarif dégage plus d'autofinancement pour

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225 Le décret Ronchi de 2009 (décret 135/09) a rendu obligatoire la tenue d'un appel d'offre pour attribuer la concession du SPEA au sein d'un ATO. Les entreprises à capital entièrement public pouvaient participer à l'appel d'offre. Bien que le décret n'interdise pas explicitement la gestion des SPEA par des entreprises à capital public (Massarutto 2009; Scarpa 2009b; Scarpa 2009a), l'opinion publique a considéré qu'il imposait de facto la privatisation des SPEA.

226 Forum Italiano dei Movimenti per l'acqua - <http://www.acquabenecomune.org>

227 Le CONVIRI (*Comitato nazionale vigilanza sulle risorse idriche*) qui était l'autorité nationale de régulation prévue par la réforme Galli était très faiblement doté et de nombreux experts et décideurs réclamaient depuis longtemps la création d'une autorité de régulation plus indépendante et puissante.

228 (AEEG 2012a; AEEG 2012b) disponibles sur

[http://www.autorita.energia.it/it/operatori/operatori\\_idr.htm](http://www.autorita.energia.it/it/operatori/operatori_idr.htm)

229 (AEEG 2012a, 12).

leurs investissements, mais aussi donner des incitations pour obtenir des gains de productivités et améliorer l'efficacité.

Le MTT classe les coûts d'exploitation selon : i) des coûts de l'énergie, ii) des coûts internes sur les quels des gains de productivité peuvent être exigés OPEX\*; iii) des coûts internes sur les quels des gains de productivité ne peuvent pas être exigés OPEX\*\* et iv) des coûts d'achat de services en gros auprès de fournisseurs.

Selon le MTT la composante tarifaire liée aux investissements est indexée en année n sur la valeur des immobilisations de l'entreprise en année n-2. Pour cela le concept d'amortissements réglementaires (différents des amortissements comptables qui ont un impact fiscal) est utilisé avec des durées spécifiques plus longues mais bien définies. Dans de nombreux SPEA italiens une partie des infrastructures existantes n'est pas immobilisée dans la comptabilité de l'entreprise du fait qu'elles ont été réalisées et financées par le passé lorsque la gestion était encore municipale directe. Le MTT a donc prévu qu'un fonds fléché vers le financement de nouveaux investissements (FoNI) soit alimenté par une composante spécifique du nouveau tarif dont le volume est basé sur les « immobilisations municipales » réalisées par le passé.

En additionnant les différentes composantes des coûts d'exploitation (énergie, OPEX\*, OPEX\*\* et fournisseurs), la composante liée aux investissements et le FoNI, le MTT calcule un coefficient multiplicateur qui s'applique au tarif précédemment en vigueur.

### **3.4. Emprunt des SPEA et endettement sous-souverain**

Les SPEA italiens ont en principe toute autonomie et liberté d'emprunt en raison de leur statut d'entreprise privée. Cependant une question précise de finances publiques se pose pour les entreprises à capital entièrement public (municipal où inter-municipal généralement) : dans quelle mesure l'endettement de ces entreprises privées à capital public est-il comptabilisé comme de l'endettement sous-souverain et donc *in fine* contribue-t-il à l'endettement souverain tel que calculé en comptabilité nationale ? D'un point de vue normatif, cet endettement devrait-il être considéré comme de l'endettement sous-souverain / souverain ?

La législation européenne (Règlement du Conseil n°2223/96 – SEC95) a établi que les entreprises à capital public qui opèrent sur le « marché » et dont les revenus tarifaires

couvrent au moins 50 % des coûts ne doivent pas être incluses dans la comptabilité nationale sur laquelle se basent les rapports annuels aux institutions européennes dans le cadre du Pacte Européen de Stabilité et de Croissance (PESC) ; en France ce principe est appliqué, et les Services Publics Industriels et Commerciaux (SPIC), incluant les régies d'eau et d'assainissement) ne contribuent pas à l'endettement public au sens de la comptabilité nationale (Cour des Comptes 2011).

En Italie la question est plus compliquée. D'un côté l'endettement public au sens de la comptabilité nationale n'inclut pas les entreprises à capital public opérant des SPIC, et notamment les SPEA. D'un autre côté le gouvernement a imposé (décret n°1/2012) que les entreprises publiques à capital public local qui fournissent « *in-house* » un service public (tels que les SPEA) respectent le pacte interne de stabilité (PIS) qui a été établi en 1998 (Loi 448/1998) afin de mettre à contribution les administrations locales pour le respect des objectifs du PESC en termes de pourcentage de dette consolidée des administrations publiques / PIB (Fraschini 2002, 177). Jusqu'à présent l'application du PIS aux entreprises *in-house* n'a pas été concrètement mise en œuvre étant donné que le décret ministériel détaillant les principes énoncés par le décret législatif 1/2012 n'est toujours pas paru. Elle reste néanmoins d'actualité et semblerait prendre la forme d'un deuxième pacte de stabilité applicable aux entreprises à capital public en parallèle de celui applicable aux administrations locales<sup>230</sup>.

Quand on compare les contraintes sur l'emprunt des SPEA français et italiens un paradoxe saute aux yeux : bien qu'en France les SPEA soient gérés sous la forme de la gestion directe (*régie simple ou régie autonome par exemple*), leur dette n'est pas considérée au sens de la dette sous-souveraine et souveraine consolidée. Au contraire les SPEA italiens, qui sauf exception, ont pris la forme de la gestion corporatisée (qui devrait assurer une plus grande autonomie vis à vis de l'administration municipale de tutelle) sont quant à eux assujettis à des contraintes sur l'endettement basé sur le principe que leur dette serait *in fine* assimilable à de la dette sous-souveraine. Étant donné le faible niveau des tarifs de l'eau en Italie, les SPEA peuvent difficilement dégager un bon niveau d'autofinancement pour leurs investissements ; si on leur bloque également l'accès au crédit ils sont voués à rester dans la situation de sous-

<sup>230</sup> Articles de Gianni Trovati sur *Il Sole 24 Ore* du 30/01/2013 et 04/02/2013.

investissement qu'ils connaissent depuis plusieurs décennies<sup>231</sup>. Leur soutenabilité environnementale est également remise en cause car en absence de crédit et donc d'investissements les objectifs environnementaux (tels que définis par les directives européennes) seront difficilement atteignables.

### 3.5. Aperçu historique

Comme pour le cas français nous allons fournir quelques éléments d'analyse historique sur la trajectoire historique suivie par les SPEA italiens au cours du 20<sup>ème</sup> siècle en matière de caractérisation institutionnelle mais aussi de modalité de régulation tarifaire et financement (faire référence également à la frise historique en Figure 38).

#### 3.5.1. De la gestion directe à la gestion corporatisée

Le scénario institutionnel des services publics locaux en Italie est resté très longtemps régi par la loi Giolitti de 1903 sur la municipalisation (modifié ensuite par le *Testo Unico* de 1925) qui a créée l'*Azienda Municipalizzata*, sorte de régie à personnalité morale et autonomie financière. Lorsqu'une municipalité souhaitait reprendre en gestion directe un service précédemment concédé, celui-ci devait obligatoirement prendre la forme d'une *Azienda Municipalizzata*. Néanmoins la gestion municipale directe (*servizio in economia*) est restée autorisée, en particulier pour toutes les municipalités qui l'exerçaient déjà avant 1903 (Bigatti et al. 1997). Par exemple, la ville de Milan qui a créé son service municipal de l'eau et de l'assainissement avant la loi de 1903 (en 1888), l'a géré en régie simple jusqu'en 2003 (Crespi Reghizzi forthcoming d).

En pratique, si la forme de l'*Azienda Municipalizzata* a été beaucoup adoptée pour de nombreux services publics municipaux (transport publics, électricité, gaz) elle n'a pas été si largement retenue dans les services d'eau et encore moins dans les services d'assainissement. Ainsi en 1975 plus de 80 % des services d'eau italiens restaient gérés en régie directe (34 % des volumes vendus) tandis que seulement 1,1% d'entre eux prenaient la forme d'une *Azienda Municipalizzata* ; ils représentaient néanmoins 29,1% des volumes vendus étant donné que les 134 *aziende* existantes desservaient essentiellement des grandes villes (Massarutto 1993, 171). Quant aux services

<sup>231</sup> Voir les articles d'Antonio Massarutto du 06/02/2013 et 22/03/2013 sur <http://archivio.lavoce.info> et le rapport de recherche qu'il a coordonné pour le IEFE (Massarutto et al. 2012).

d'assainissement Massarutto (1993, 173) estime qu'avant les années 1990 la grande majorité d'entre eux étaient gérés en régie directe.

**Figure 38 : Evolution historique en Italie**

		1949 – Loi Tupini – dispositif national de financement travaux publics	1963 – <i>Piano Generale Acquedotti</i>	1976 – Loi Merli sur l'assainissement	1994 – réforme du secteur de l'eau – Loi Galli	<b>Aujourd'hui</b> Echelle départementale de gestion (ATO) Gestion uniquement corporatisée et Service intégré Eau et assainissement
<i>Servizio in economia</i>	1934 – Service d'eau est considéré service universel	1944 – réglementation prix de l'eau dans une optique anti-inflation	1977-78 – réforme Stammati des finances publiques municipales – forte dépendance de la part de l'Etat central	1990 – réforme des services publics locaux		Equilibre budgétaire des services d'eau Régulation explicite par agence, Régulateur national et local
	1903 – Loi Giolitti sur la municipalisation – Azienda Municipalizzata					

Source : élaboration de l'auteur, régimes institutionnels, régulation et financement

Au cours des décennies qui suivirent la deuxième guerre mondiale, plusieurs tentatives de réforme de la réglementation de 1903 et 1925 se terminèrent sur un échec (Arcangeli 2000, 457) et ce fut uniquement en 1990 qu'une nouvelle loi reforma la discipline des services publics locaux. La loi de 1990<sup>232</sup> prévoyait ainsi que les services publics locaux puissent être gérés selon quatre formes institutionnelles : a) gestion directe (*servizio in economia*), b) concession à un partenaire privé, c) à travers une *azienda speciale* (une nouvelle version de l'*azienda municipalizzata*) ou d) à travers une entreprise de droit privé dont la propriété serait partiellement ou totalement municipale. La réforme ambitieuse du secteur de l'eau adoptée en 1994<sup>233</sup> a restreint ce choix au trois dernières formes en éliminant la gestion en régie directe. A partir de 2001<sup>234</sup> la forme de l'*azienda speciale* n'a plus été autorisée pour les SPEA et la société anonyme de droit privé (à capital privé, public ou mixte) est restée la seule forme légale autorisée.

### 3.5.2. Tarif et financement des investissements

A différence des SPEA français, les SPEA italiens ont connu beaucoup plus tardivement (avec la loi Galli de 1994) des réformes visant leur autonomie et le recouvrement des coûts. Jusqu'à cette date les SPEA étaient considérés comme des services municipaux parmi tant d'autres. Au départ d'ailleurs le service d'eau potable était classé parmi les dépenses facultatives d'une municipalité et ce n'est qu'à partir de 1934 (*Regio Decreto* 1265 del 27 luglio 1934) que le service d'eau potable est considéré un service universel qui doit être obligatoirement fourni sur l'ensemble du territoire. Afin de faciliter la mise en place d'un tel service universel les municipalités n'ayant pas la possibilité de

<sup>232</sup> Legge 8 giugno 1990 n°142

<sup>233</sup> Legge Galli 36/1994

<sup>234</sup> Ainsi que le prévoyait le décret n. 448/2001 (art. 35) qui a interdit les autres formes de gestion directe.

financer elles-mêmes les investissements pouvaient bénéficier d'un financement en subvention de la part du gouvernement central. Dans ce schéma dual l'Etat se chargeait de l'investissement en laissant l'exploitation du service au bon gré des collectivités (Ermano 2012) qui pouvaient le financer à la fois à travers le tarif et à travers la fiscalité générale.

Après la deuxième guerre mondiale un tel schéma a été reconduit avec divers dispositifs de financement successifs tels que les subventions d'équipement prévues par la Loi Tupini de 1949, les dispositifs visant le financement des infrastructures dans les régions défavorisées (*Cassa del mezzogiorno* créée en 1950) où encore les dispositifs de 1963 visant à mettre en œuvre un Schéma directeur national d'eau potable (*Piano regolatore generale degli acquedotti- Legge 129, 4 febbraio 1963*) à travers une mise à disposition de subventions d'équipement.

Il faut également noter un élément de contexte important : l'autonomie financière et fiscale des municipalités italiennes a été de plus en plus réduite au cours des décennies 1950-1980 selon une politique de finances publiques centralisées, où les budgets municipaux étaient alimentés par des transferts venant de l'Etat central et où les déficits annuels des municipalités pouvaient être comblés par la souscription d'emprunts avec la *Cassa Depositi e Prestiti* (homologue italien de la Caisse des Dépôts). Ainsi l'excédent de dépenses municipales (incluant le service de la dette relatif aux emprunts précédemment souscrits) pouvait être couvert par un nouvel emprunt. Cette spirale de l'endettement des municipalités italiennes progressa ainsi jusqu'à la nouvelle réglementation des années 1977-78 (*decreti Stammati*) qui élimina la possibilité d'emprunter pour couvrir le déficit municipal. La forte dépendance des budgets municipaux vis à vis des transferts venant de l'Etat central a duré quant à elle jusqu'aux années 1990 (Giarda 2005).

En matière de régulation tarifaire des SPEA, les municipalités étaient très libres en la matière dans les premières décennies du 20<sup>ème</sup> siècle (en tout cas jusqu'à la centralisation imposée par le régime fasciste). C'est après la deuxième guerre mondiale que les tarifs des services publics (incluant le tarif de l'eau) furent fortement réglementés dans le cadre de politiques macro-économiques de lutte contre l'inflation. En pratique les tarifs étaient le plus souvent maintenus en dessous des coûts

d'exploitation (Arcangeli 2000, 301; Bardelli and Muraro 2003, 349) sans même parler des coûts d'investissement qui étaient couverts par l'Etat central ou par le budget général des municipalités. Quant à l'assainissement, ce n'est qu'en 1976 que la collecte et le traitement des eaux usées ont été rendus obligatoires (*Legge Merli - Legge 319, 10 maggio 1976*) et qu'une redevance a été créée et réglementée pour financer le service des eaux usées<sup>235</sup>.

## Conclusion

La mise en regard des cas français et italien permet de soulever une série de questionnements sur les politiques publiques mises en œuvre en matière de financement des investissements des SPEA. En observant les trajectoires historiques qui ont eu lieu en France (§2.5) et en Italie (§3.5) quelques traits communs apparaissent : après la deuxième guerre mondiale et pendant plusieurs décennies le prix de l'eau a été maintenu à un niveau faible, et contraint par les politiques macroéconomiques de lutte contre l'inflation. De plus, dans les zones rurales des deux pays les infrastructures ont été fortement subventionnées ou financées de façon préférentielle. Enfin, la politique d'investissement dans les infrastructures des SPEA a été pendant longtemps déconnectée de l'exploitation et des revenus. Dans les deux pays, au cours de la phase initiale de création des services, et pendant longtemps, le principe d'équilibre budgétaire n'a pas été adopté et les services sont souvent restés partie intégrante de l'administration municipale (régie simple).

En France néanmoins, à plusieurs reprises, l'Etat central a cherché à encourager des formes institutionnelles impliquant un équilibre budgétaire des SPEA. Certes, ces tentatives n'ont pas toujours abouti mais de notre point de vue elles ont permis un apprentissage collectif qui a fait que le tournant des années 1980 vers un recouvrement intégral des coûts des services moins brusque. En Italie au contraire, jusqu'aux années 1990 l'Etat n'a pas été particulièrement pro-actif sur le thème de l'équilibre des SPEA (en dehors de la création en 1903 de l'*azienda municipalizzata*). Ceci s'explique peut-être par le fait que la crise financière des municipalités italiennes était si grave au cours

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<sup>235</sup>Elle était déjà en place auparavant dans certaines municipalités où le service de l'eau et de l'assainissement existait déjà.



des décennies 1950-1980 que les déficits et le sous-investissement des SPEA ne constituaient pas l'enjeu financier<sup>236</sup> le plus important.

Il nous paraît ainsi que le tournant vers le recouvrement intégral des coûts a été bien plus graduel en France (années '80) qu'en Italie où la réforme Galli a été trop ambitieuse sur ce point, comme sur d'autres d'ailleurs, en sous estimant l'ampleur du changement demandé aux SPEA italiens. Par ailleurs les mécanismes de mutualisation financière mis en œuvres par les agences de l'eau (qui avaient été créées en 1964) ont permis aux SPEA français d'atteindre l'équilibre budgétaire avec beaucoup moins de difficultés que leurs homologues italiens tout en leur permettant de continuer à être gérés à des échelles territoriales de petite taille. En effet, la réforme italienne a cherché elle aussi à introduire de la mutualisation financière. Cependant ce n'est pas la voie française (agences de l'eau) qui avait été retenue mais plutôt une sorte de centralisation à l'anglaise, avec l'augmentation de la taille des services *via* le passage des SPEA à des échelles territoriales plus étendues (les ATO à l'échelle départementale).

En matière de régulation du service, après la double régulation locale (les AATO), et nationale (le CONVIRI – quasi inexistant) dessinée par la réforme de 1994, l'Italie a opté en 2011 pour un régulateur national fort, travaillant avec des compétences et des méthodes inspirés du modèle de régulation anglo-saxon. La France au contraire a fait le choix, entre la loi Sapin et la loi sur l'eau, d'un renforcement de la concurrence associé à une régulation douce par benchmarking mise en œuvre par l'observatoire animé par l'ONEMA. Les approches réglementaires choisies par les deux pays divergent fortement et interpellent. D'un côté la méthode italienne est complexe et on peut s'interroger sur les coûts de transactions élevés qui résultent de l'exercice de régulation imposé par l'AEEG. D'un autre côté elle a le mérite d'inciter les entreprises d'eau (à propriété publique ou privée) à des gains de productivité et d'efficience. Contrairement à l'Italie, en France la « régulation implicite » s'exerce à l'échelle locale et est simple à mettre en œuvre. Cependant elle n'inclut pas des systèmes explicites d'incitations à l'amélioration des performances des SPEA laissant au pouvoir local la question des gains de productivité.

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<sup>236</sup> En effet la question du déficit des régies municipales de transport public était beaucoup plus au centre des débats. L'article de Giarda (2005) fournit une intéressante analyse rétrospective des finances municipales en Italie. Fraschini (1991; 1987) a également beaucoup travaillé sur le sujet.

Si en Italie les SPEA prennent aujourd'hui la forme de la gestion corporatisée, il n'en va pas ainsi pour la France où les investissements des SPEA sont restés du ressort des collectivités territoriales<sup>237</sup> *stricto sensu* à travers la « gestion directe ». Bien que les normes comptables françaises applicables aux SPIC se soient progressivement rapprochés du plan comptable général (qui s'applique au secteur privé) les SPEA français gérés en « gestion autonome » sont encore soumis à un certain nombre de contraintes comptables et financières face auxquelles la gestion « corporatisée » est plus souple.

Par exemple, la règle du non placement des fonds ne s'applique pas aux SPEA gérés en SPL, qui non seulement seraient plus incités à thésauriser pour financer des investissements pluriannuels mais aussi pourraient avoir un accès plus facile au crédit : en effet une SPL serait plus attrayante aux yeux des prêteurs qui pourraient établir avec elle une relation contractuelle complète (emprunt – dépôt) ; ce qui n'est pas autorisé pour les SPEA en gestion directe ou autonome (non placement des fonds publics)<sup>238</sup>. Traditionnellement le principe du non placement des fonds des collectivités locales est cité comme la contrepartie des services rendus par l'Etat en termes de calcul, de recouvrement et de paiement par douzièmes anticipés des taxes locales<sup>239</sup>. Si l'application de ce principe aux collectivités locales peut être compréhensible, son application aux SPIC pose en revanche question, étant donné que leur trésorerie provient des tarifs payés par les usagers et non pas de l'impôt. De plus le non placements des fonds de trésorerie est un élément qui décourage la thésaurisation des excédents budgétaires en vue d'investissements à venir (à cause de l'érosion monétaire) et donne *a contrario* une incitation à recourir à l'emprunt pour financer un plan pluriannuel d'investissement (Wittner 2009). Lorsque l'accès à l'emprunt devient difficile comme dans les dernières années, le système a tendance à se bloquer.

D'un autre côté, vus d'Italie, bien que soumis à certaines contraintes liées à la gestion « directe » ou « autonome », les SPEA français bénéficient d'une situation beaucoup plus favorable au financement des investissements pour plusieurs raisons : i) une mise en place plus précoce du principe du recouvrement des coûts ; un prix de l'eau plus

<sup>237</sup> Municipalités ou communautés urbaines ayant la compétence eau et assainissement par exemple

<sup>238</sup> Débats lors des rencontres Finance Consult du 9 avril 2013

<sup>239</sup> <http://www.collectivites-locales.gouv.fr/gestion-tresorerie>

élevé permet alors de dégager plus d'autofinancement (c'est un des défis que doit relever la nouvelle méthode tarifaire mise en œuvre par l'AEEG – le MTT); ii) l'existence du cycle redevances-aides des agences de l'eau qui permet une mutualisation des moyens financiers dans l'espace et dans le temps et iii) une réglementation moins contraignante en matière d'emprunt des collectivités locales (pas de pacte interne de stabilité) et *a fortiori* de leur satellites gérants des SPIC tels que les SPEA. En effet, la décision du gouvernement italien de vouloir soumettre les SPEA aux contraintes du Pacte Interne de Stabilité (PIS) soulève plus d'une question étant donné qu'elle semble aller même au delà des normes de comptabilité nationale en vigueur en Europe.



## **Milan's water and sanitation service after corporatization: Metropolitana Milanese SpA**

OLIVIER CRESPI REGHIZZI\*

*CIREA, AgroParisTech & CERTET, Bocconi University*

### **Abstract**

This paper presents a case study on Milan's water and sanitation service (MI-WSS) between 2003 and 2013. Historically Milan's water and sanitation service (WSS) was under direct municipal provision since its inception in 1888. After 2003, MI-WSS has been provided by *Metropolitana Milanese SpA* (MM) which is a joint stock company fully owned by Milan's municipality. MM not only operates the water services but also civil engineering services mainly in public transportation. Commitment to public service mission and general interests' goals are discussed adopting a historical approach too to appreciate the switch from full direct provision to corporatized provision. Limiting the analysis to MM only would be too restrictive and we propose instead to adopt a wider perimeter which includes all the stake-holders of Milan's WSS. Such an enlarged perimeter of analysis is particularly relevant to discuss regulation and governance issues. In the water sector public service mission includes many goals which should be appreciated adopting a long run and intergenerational perspective and expressed in terms of sustainability. Applying sustainability criteria to Milan's WSS raises more than one question.

### **Keywords:**

Water supply and sewerage, Milan, corporatization, regulation, public service

**JEL:** L95 – H41 - H54 - H72

### **1. Introduction**

This case study focuses on of Milan's water and sanitation service (WSS). Since 2003, Milan's WSS has been provided by *Metropolitana Milanese SpA* (MM) which is a joint stock company fully owned by Milan's municipality. Previously, from its creation in

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1888 till 2003, Milan's WSS has always been directly provided by Milan's municipality under full direct management (Crespi Reghizzi forthcoming b).

*Metropolitana Milanese SpA* (MM) runs two different businesses: i) the water and sanitation service for Milan city area<sup>240</sup> (we shall refer to MM-WSS in this case study), ii) civil engineering services mainly in the transportation sector (we shall refer to MM-ENG in this case study).

Both business areas are clearly operated distinctly since MM-WSS is tightly regulated (Section 6) while MM-ENG is unregulated and operated on the market. The present case study focuses particularly on the WSS area of MM even though some aspects of MM as a whole will be analyzed too.

#### Box 7 : Metropolitana Milanese SpA

Metropolitana Milanese SpA - Soggetta a direzione e coordinamento dell'azionista unico Comune di Milano. Codice fiscale/partita IVA 01742310152  
 Legal adress & headquarters: Via del Vecchio Politecnico, 8 20121 – Milan – Italy - Phone +39 02 77 471  
 WSS area offices Via Meda, 44 - 20141 Milan – Italy - Phone +39 02 84 77 1  
<http://www.metropolitanamilanese.it>

source : <http://www.metropolitanamilanese.it>, February 26th 2013

#### Box 8 : basic information on Metropolitana Milanese in 2011

MM as a whole  
 -turnover : 233 M euros  
 -number of employees : 714 people  
 -area of operation : Water (E36) and sewerage (E37) + civil engineering services (F42)  
 -owner : *Comune di Milano*  
 MM-WSS (Water and Sanitation part of MM only)  
 -turnover : 123 M euros  
 -number of employees : 463 people  
 - area of operation : water and sanitation services  
 - population served : 1.35 M people  
 -number of meters : 47 136  
 -water volumes billed : 231 M m<sup>3</sup>/year

Source : author's elaboration based on data from Metropolitana Milanese SpA

This case study adopts two perimeters of analysis : i) a company perimeter focused on MM-WSS when one limits the analysis of the water and sanitation service to the company which performs the service and ii) a wider perimeter which includes all the stake-holders of Milan's WSS (see Figure 41).

Section 2 focuses on Operations of MM while section 3 analyses the corporatization process in the water sector in Milan (and in Italy). Section 4 examines the implementation of the public service missions. Technical and financial performances

<sup>240</sup> *Servizio idrico integrato della città di Milano*

are treated in section 5 while section 6 and 7 focus on Regulation and Governance respectively. Section 8 analyses Tariff issues.

## 2. Operations

### 2.1. *Water supply and sewer networks*

MM runs entirely on its own the water service of the city of Milan within the regulatory area of the *ATO Città di Milano* (see also section 6). MM runs entirely on its own the sewer network too, while wastewater treatment plants are operated by external companies.

Operations concerning water supply and sewer networks include: running and monitoring of the wells and pumping stations, daily maintenance of all the water supply and sewer infrastructure, water quality control, metering, billing and customer service. It also includes the asset management of the entire infrastructure: investments planning, implementation of the various administrative steps, procurement and monitoring of the public works. Engineering and design studies are made by the engineering services (MM-ENG) of MM itself and their costs are re-invoiced to the WSS area (MM-WSS). Works are tendered through public bids.

**Table 27 : MM-WSS infrastructure**

water infrastructure	quantity	Sanitation infrastructure	quantity
boreholes	538	Large sewers $3 < A < 20$ $m^2$	101.99 km
boreholes in operation	416	medium sewers $1 < A < 3$ $m^2$	233.12 km
pumping stations in operation	27	small sewers ( $A < 1m^2$ )	1121.89 km
pumping capacity	9000 l/s	total sewers	1457 km
pumping stations with water treatment units	23		
storage units	35	population equivalent capacity of the 3 wastewater treatment plants	2 300 000 inhab
total storage capacity	229 403 $m^3$		
pipeline	2332 km		
meters	47 136		

Source : author's elaboration based on data from MM and Massarutto (2011b)

### 2.2. *Waste water treatment*

Until 2005 the city of Milan had no wastewater treatment plants and water was discharge with no treatment into the river system. Three plants are now in operation:

Nosedo, San Rocco and Peschiera Borromeo. Although MM does not operate those plants, it bills and collects a wastewater treatment fee from the users and pays the external entity in charge of the plant's operation according to the terms of each specific legal agreement.

Nosedo treatment plant (1,250,000 population equivalent capacity) is operated by a private company *MilanoDepur SpA* representing the consortium of companies<sup>241</sup> which built that plant through a project financing scheme (DBOT). According to the DBOT agreement<sup>242</sup> the consortium owns the assets<sup>243</sup> until the end of 2015 and has a management contract until the end of 2019<sup>244</sup>. After 2015 assets will be Milan's municipality's property. MM pays a yearly fee<sup>245</sup> to *MilanoDepur SpA*. MM also pays directly energy and sewage sludge disposal which are not included in the yearly fee.

San Rocco plant (1,050,000 population equivalent) is operated by *Degremont SpA* which was the leading partner of the consortium which built that plant. The initial construction contract included operation of the plant for five years by the contractor. But later the end of the management contract was postponed to the end of 2014. Milan's municipality owns the plant. MM pays a yearly fee to *Degremont SpA* which is inclusive of all the operating costs (including energy and sludge disposal).

The Peschiera Borromeo line<sup>246</sup> treating Milan waste water (250,000 population equivalent) is owned by *CAP Holding SpA* and operated by *AMIA Acque SpA* (previously *CAP gestione SpA*). Milan's municipality owns some shares of both *CAP Holding SpA* and *AMIA Acque SpA*. Milan's municipality and *CAP gestione SpA* (now *AMIA Acque SpA*) have agreed that the Peschiera Borromeo line will treat Milan's

<sup>241</sup> SIBA SpA (leading partner), Degremont Italia SpA, Pssavant Impianti SpA, Veolia WST Italia SpA, Unieco Scarl, Bonatti SpA, Itinera SpA are shareholders of the consortium. Operations are however delegated to *Vettabbia Società Consortile a responsabilità limitata*. source : <http://www.depuratorenosedo.eu> , retrieved the 26/2/2013

<sup>242</sup> Signed with Milan's municipality

<sup>243</sup> In fact the first line of Nosedo treatment plant is already owned by Milan's municipality which financed its construction. Conversely the remaining part of Nosedo treatment plant is owned by *MilanoDepur SpA*. All the treatment plant is operated by *MilanoDepur SpA*. Informations retrieved through various interviews.

<sup>244</sup> With a one year extension option until 2020.

<sup>245</sup> The DBOT agreement was signed by the consortium and by Milan's municipality. However MM pays the yearly fee (*canone g* and *canone f*) to *Milano Depur SpA* on behalf of Milan's municipality.

<sup>246</sup> The Peschiera Borromeo wastewater treatment plant treats mainly waste water coming from the ATO Provincia di Milano sewer system. One line of the plant is dedicated to Milan city's waste water. Obviously the plant is run as a whole and waste water from Milan city and from the Milan provincial are obviously mixed and treated altogether.



waste water until 2022. MM transfers to *AMIA Acque SpA* all the “waste water treatment” revenues billed to users located in the eastern area of Milan’s municipality and connected to the Peschiera treatment plant. MM makes no earnings on the waste water treatment part of the service with those users (except a small billing fee)<sup>247</sup>. From our interviews it appears however that a part of the Peschiera treatment plant was financed by Milan’s municipality. This is puzzling since it means that the ATO Città di Milano has transferred a part of its own waste water revenues to the ATO Provincia di Milano while it kept for itself the investments’ costs.

**Table 28: Management of Milan’s waste water treatment plants**

	Nosedo	San Rocco (ex Milano Sud)	Peschiera Borromeo (2 <sup>nd</sup> line of treatment)
Builder	Consortium lead by SIBA S.p.A.	Consortium lead by Ondeo Degremont	Consortium with Siba S.p.A., -, and Ondeo Degrémont.,
Contractual scheme	Building and operating (incl. project financing)	Building + operating (no project financing)	Building
Investimento	. € 117 milioni for the works +. € 17 milioni per concession costs	€ 87 milioni for the works and € 48 milioni per the 5 years management and additional works	€ 17 milioni for the second line and € 5 milioni for the sewer
Lenders	Banca Intesa and Royal Bank of Scotland		
Other donors	Regione Lombardia and Fondazione Cariplo for the public park		
Infrastructure owner	Consortium until 2015 , Comune di Milano afterwards	Comune di Milano	CAP Holding S.p.A.
Operations	Milano <i>Depur</i> S.p.A.	Degrémont S.p.A.	Amiacque S.r.l. (ex CAP Gestione SpA)
Length of the management (years)	12 + 4 years	5 + 4 +1 years	26 years
End product disposal costs	MM S.p.A.	Included in the operations fee	Amiacque S.r.l.
Energy costs	MM S.p.A.	Included in the operations fee	Amiacque S.r.l.
Gas costs (sludge drying)	MM S.p.A.	Included in the operations fee	-

Source: author’s translation based on Massarutto (2011b)

It appears that no capital expenditure or financial costs on the past investments in the waste water infrastructure are due or currently paid by MM (as we will describe here below). All these costs were and are covered by Milan’s municipality.

<sup>247</sup> “CAP Holding ha realizzato – in adempimento alla convenzione sottoscritta con il Comune di Milano - il potenziamento del depuratore di Peschiera Borromeo, in cui sono depurati i reflui dei quartieri est della città. A seguito dell’adozione del Piano d’Ambito della Città di Milano, si è riconosciuto – con atto del 28 dicembre 2010 – a CAP Holding la quota di cui al DM 1 agosto 1996 fino al 31 dicembre 2022.” Quoted from the yearly financial report of CAP Holding 2011.

-Nosedo treatment plant: the first line of Nosedo treatment plant was financed by Milan's municipality. The remaining part of that plant was built in project financing through a DBOOT scheme signed with Milan's municipality. Financial costs (capital expenditures part of the yearly fee – *canone e*) are still paid to *MilanoDepur SpA* by Milan's municipality and not by MM.

-S. Rocco treatment plant was financed directly by Milan's Municipality.

MM received existing waste water treatment plants as an infrastructure capital stock "granted" with no capital costs, amortization or financial costs induced. Nevertheless nowadays MM is responsible of the investment policy on those assets (maintenance and new investments).

### **2.3. Engineering**

In 2011 the organizational structure of MM was reformed in order to create more integration between the two areas of business (MM-WSS and MM-ENG); the Engineering department of MM (MM-ENG) was organized in four divisions : a) transport engineering & design, b) transport works, c) hydraulics infrastructure engineering & design, d) hydraulics infrastructure works.

The two latter divisions provide engineering services (technical studies, design, procurement, works supervision) mainly for the water and sanitation department of MM. However they also have some contracts with other clients (for example in the framework of the 2015 Milan International Exhibition infrastructure works).

The two first divisions cover the whole project cycle of transport infrastructure from preliminary studies to works procurement and supervision. The main activities concerns underground and periurban railways lines in the Milan area. Most of these activities are provided by MM to Milan's municipality through an in house contract awarding which does not require open tendering. Some activities are still provided by these two divisions for independent branches of MM created to operate separately contracts with other Italian public administrations (*Metro engineering srl* for example in charge of the Naples underground).

However, since 2006, new contracts of MM for other Italian public administrations cannot be signed<sup>248</sup>. Therefore activities of the engineering department of MM in Italy can be provided only to Milan's municipality (including other municipally owned companies such as SEA which owns and runs Milan airports) and to other Italian private sector companies (*Società Autostrade*, the motorways company, for example).

Since its activities are constrained on the Italian market, MM tries to expand its engineering activities abroad on foreign markets. Indeed, starting a few years ago, an officer is in charge of answering international bids mainly concerning engineering services in the transport sector.

Despite increasing efforts to obtain additional work on the international market, services provided internally to the MM-WSS department still represent a significative percentage of the activities of the MM-ENG department.

It appears from our interviews that an internal accounting reform has been undertaken in 2011 together with the organizational one. MM-WSS and MM-ENG are now considered as autonomous entities from an accounting point of view in order to be able to have a transparent view of the profitability and cost-effectiveness of the two areas of business. We have been told that the services delivered from MM-ENG to MM-WSS are billed at market prices but we have not been able to countercheck such information.

According to a internal estimation by MM computed in the framework of the new regulatory regime (§6.2), in 2011 activities re-invoiced from ENG department to the WSS one represented a total amount 2.31 M euros (equivalent to 13 people full time). General company services (chairmanship and board of directors, general direction, administrative and financial department, legal office, communication and marketing) re-invoiced to the WSS department represented 5.45 M euros in 2011 (equivalent to 49 people full time).

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<sup>248</sup>Indeed the Bersani decree (D.L. 4-7-2006 n. 223 e legge 248/2006) established accordingly to the EU principles that services could be provided to a local public administration by companies owned by the local public administration itself through in-house provision. Conversely companies operating in-house for their owner (local public administration) cannot work for other local public administrations. To comply to the new legislation separate branches (*Metro engineering srl* and *Napoli metro engineering srl*) were created to fulfill previously existing contracts (particularly the Naples underground lines) with other public administrations.

**Box 9: The history of Metropolitana Milanese**

*Metropolitana Milanese SpA* was created by the municipal administration in 1955 to design and build the underground. Works started in 1957 and the first line was brought to completion by 1964. In 1969 the first part of the second underground line was completed. In 1990 the first part of the third underground line was completed. MM was responsible of the realization of the underground lines on behalf of Milan's municipality while these are operated by the ATM, the municipal public transport company.

Source : <http://www.metropolitanamilanese.it/pub/page/it/MM/storia>, retrieved April 23<sup>rd</sup> 2013

**3. Corporatization****3.1. A classification of WSS according to their legal status**

Despite the great variety of institutional models of the water and sanitation services in Europe (Barraqué 1995), public water and sanitation entities can be classified in three major categories according to their degree of autonomy and to their legal and accounting rules status as shown in Table 29:

-In the first category (Cat A) water and sanitation services are municipal departments with no legal autonomy, ruled by administrative law and public accounting rules;

-In the second category (Cat B) water and sanitation services are autonomous legal entities ruled by public law and public accounting);

-In the third category (Cat C) there are companies ruled by private law and private accounting rules, fully or partially owned by municipalities or other public bodies.

**Table 29 : institutional status of the WSS in Europe**

	<b>Cat. A</b>	<b>Cat. B</b>	<b>Cat. C</b>
	<b>Full municipal provision</b>	<b>Autonomous municipal provision</b>	<b>Corporatized provision</b>
Germany	<i>Regiebetriebe</i>	<i>Eigenbetriebe</i>	<i>Eigengesellschaften etStadtWerke</i>
Spain	Existing	Existing	Joint stock company
France	<i>régie simple or régie à autonomie financière</i>	<i>Régie à personnalité morale et autonomie financière, EPIC, EPCI</i>	<i>Société d'Economie Mixte SEM or Société Publique Locale SPL</i>
Italy	<i>servizi in economia</i>	<i>azienda municipalizzata / azienda speciale</i>	<i>Società per Azioni</i>
Portugal	Existing	Existing	Holding and subsidiaries <i>Agua de Portugal</i>
Switzerland	<i>Services municipaux</i>	Some <i>stadtwerkepfiege</i>	
Wallonia (Belgium)	<i>régie directe</i>	Interco	

Source: author's elaboration

In Italy, the *Legge Giolitti* on the municipalisation of local public services was approved in 1903 and modified in 1925<sup>249</sup>. The *Azienda Municipalizzata* legal framework was defined together with the legal procedure to be adopted by a municipality wishing to proceed to a municipalisation. “In-house” provision of the service was still authorized, particularly for those municipalities which were already directly providing the service<sup>250</sup> (Rotondi 1997).

Despite various attempts through the decades after WWII to introduce a reform of the 1903 Giolitti act on local public services (Arcangeli 2000, 457), it was only in 1990 that a significant reform of local public services was made (*Legge* 8 giugno 1990 n°142). According to the 1990 act, local public services could be provided through the following four institutional forms: a) direct provision (Cat A), b) concession to a private partner, c) through an *azienda speciale*<sup>251</sup> (a new name for the *azienda municipalizzata*) (Cat B) or d) through a private plc partially or totally owned by the municipality (Cat C).

In 1994 an ambitious reform of the water sector was launched (*Legge Galli* 36/1994). It implied an autonomization of Italian WSS, as only the three last institutional models of service provision were allowed while formal direct provision was excluded. In 2001<sup>252</sup> the *azienda speciale* legal status was not allowed anymore and the joint-stock company was the only legal form allowed regardless of the ownership (public, private or mixed). This was the kick off to the full corporatization of Italian WSS.

### 3.2. *Corporatization of Milan's WSS*

The Milan's WSS were under *direct provision* (*gestione in economia* – CAT A) from their creation in 1888 until 2003 (Crespi Reghizzi forthcoming b).

In Milan as in the rest of Italy the Galli reform was implemented with a significant degree of inertia. In 1997 the *Formentini* municipal administration had chosen to transform Milan's WSS from direct provision into an *azienda speciale*. Such a shift

<sup>249</sup> *Legge* 29 marzo 1903 n°103, *Regio Decreto* 30 dicembre 1923 and *Regio Decreto* 15 ottobre 1925 n°2578

<sup>250</sup> In Milan the water and sanitation services were already existing as municipal departments prior to the 1903 law. Their institutional form was not impacted then by the 1903 reform. Conversely the Azienda Energetica Municipale (AEM) was created to operate the municipal power plants.

<sup>251</sup> Modifications were made to the 1986 decree DPR n°902 which fixed the organisation and accounting rules of the Aziende Municipalizzate.

<sup>252</sup> According to the decree n. 448/2001 (art. 35).

never took place and the forthcoming municipal administration (mayor Albertini) opted instead in favour of a municipally owned joint stock company (Lobina and Paccagnan 2005).

At first the idea was to create a specific joint stock company (SOGEA) which would have been owned by the municipality (99 % of the shares) with a small share holding by AEM (the municipal power company which had been partially privatised). However the 2001 decree (decreto 448/2001) made public tendering compulsory to choose WSS operators with the only exception of WSS operated by fully municipally owned joint stock companies.

In November 2002 Milan city administration decided to award a 3 to 5 year water supply and sanitation concession for the ATO Città di Milano to Metropolitana Milanese (MM) which was formerly responsible of the engineering and design services in the urban public transport sector (Box 9). WSS operations were transferred to MM in June 2003.

What were the reasons behind such a decision? According to our interviewees one of the reasons was the need to budget-balance MM-ENG with new activities and revenues.

#### **4. Public service mission and general interest goals**

##### **4.1. Public service mission goals in watsan**

What do we mean by “**public service mission**” for WSS? This is a vast concept and in this paper when talking of “public service mission” we will refer mainly to the following goals:

- Universal provision and equal access to the service by all citizens.
- An investment policy driven by a long run vision and an intergenerational concern
- Water resources conservation and environmental protection

Central and Local government also have **general interest goals** : “these include for example policies related to employment, containment of inflation, promotion of research and development, of human capital, of fixed capital accumulation, competition and industrial policies”(CIRIEC 2012). Indeed public service entities or companies

behaviour might be influenced explicitly or implicitly in order to fulfil these general interest goals.

To what extent and how are Milan's WSS, now provided by MM, committed to clear public service goals? Is it driven by general interest goals too?

#### 4.1.1. *Explicit public service obligations*

Historically in the decades of full direct provision, the public service obligations were implicit and not formalized. Since 2003 a distinct entity, MM is responsible of the WSS's provision on behalf of Milan's municipality (corporatized model – category B-Table 30). Public service obligations are then formalized through various documents: i) the *Piano d'ambito* (investment plan) theoretically set by A-ATO MI, ii) the *convenzione* (contract) between MM and the A-ATO MI, iii) the *regolamento di servizio* (set of rules applying to the WSS) between AATO-MI, MM and the users and iv) the *carta della qualità dei servizi* (quality standards charter applying to the WSS).

The three public service mission goals listed in §4.1 are then included and formalized in the above documents. The first goal (a- Universal provision and equal access to the service by all citizens) is the most obvious and is clearly included in all the above mentioned documents. The second and third goals (b- An investment policy, and c- Water resources conservation and environmental protection) are at least in theory regulated and formalized by the *Piano d'Ambito*. On the contrary general interests' goals are not mentioned in those documents.

#### 4.1.2. *Non contractual public service operations*

Apart from the public service goals formalized and made explicit, MM provides some other services although they are beyond its contractual mission and not binding. When asked upon why they were providing these services though not bound to do so, the interviewees told us that it was for a "commitment to public service mission". Here are three examples of this kind of activities:

- a) Supplying water to Corsico:** due to a former agreement between Milan's municipality and Corsico municipality, MM supplies drinking water to Corsico inhabitants while Corsico is not included in the ATO Città di Milano but in the ATO Provincia di Milano. Although the agreement expired in 2005, MM still provide water to Corsico users to comply with public service obligations.

- b) Managing and monitoring the shallow aquifer:** Milan is located on the top of an abundant aquifer. In the last decades the water table level has been raising more and more due to industry's decline in Milan area. Flooding of underground infrastructure (such as underground lines but also private basements) is a source of concern since most of these infrastructures were built when the water table level was deep and decreasing due to heavy and increasing water consumption. To control the water table level and avoid flooding, water is monitored and pumped through a system of shallow wells (*pozzi di prima falda*). Investments and maintenance of this system are made by the municipality. Although daily operations (pumps monitoring mainly) on this system should be also under the municipality's responsibility they are undertaken by MM. Energy costs are covered by MM (some pumps run 24 hours a day).
- c) Surface water and flood control:** although they are not visible many rivers and watercourses still flow just below Milan's city. From times to times water flow exceeds the discharge capacity allowed by the underground channels (This is particularly true for the Lambro and Seveso rivers). In that case water spurts out and floods the streets. The phenomenon has worsened through the 20<sup>th</sup> century due to the massive urbanization and soil impermeabilization upstream which increases flood discharge above maximum discharge figures which had been used decades ago for dimensioning the underground river channels. Flood control is the municipality's responsibility rather than MM's. However after 2003 no human resources having the necessary knowledge are left within the municipality. Under a temporary agreement with the municipality (already expired) MM is in charge of taking care and monitoring rivers and watercourses. MM operates these activities for free although it is not legally bound to do so. The technical staff of the MM sanitation department dedicates a significant part of its working hours to these activities (roughly more than 50% according to our interview). These activities are run by MM on a public service mission basis since otherwise "no one else would take care of this essential problem". The fact that no one within the municipality is taking responsibility of the issue is by itself



a problem since investments in this capital intensive area are not judged priorities in the municipal budget arbitrations and constantly postponed<sup>253</sup>.

#### 4.1.3. *Corporatization and commitment to public service*

A part of the Italian civil society movement in favour of reclaiming public water militates for a drawback from corporatized WSSs (category C in Table 29) to a full direct municipal provision (category A in Table 29) or autonomous municipal provision (category B in Table 29) arguing that even if fully publicly owned, corporatized WSSs already implement an unacceptable formal privatisation. Through our interviews we have inquired on how the public service mission commitment and implementation changed when comparing the full direct municipal provision to the MM's corporatized one. From our interviewees point of view the "public service philosophy" (meaning the commitment to public service goals) driving MM's operations has not changed significantly compared to the one previously driving the fully municipal WSS. Indeed MM's commitment to provide "non contractual public service operations" even if not bound to do so (§4.1.2.) might be considered as a proof that public service awareness is still driving MM's operations. According to our interviewees what might have significantly improved is that public service goals have been formalized and that the flexibility (in management, in accounting, in finance) allowed by the corporatized legal status is much more efficient and effective in reaching the public service mission goals.

## 5. Performance

### 5.1. *Financial performance and cost-effectiveness*

Table 30 below shows a reclassified Profit & Loss account for MM as a whole from 2002 till 2011. Please note that the WSS provision was transferred from Milan's municipality to MM in June 2003. That explains the large change in revenues between the years 2002, 2003 and the years afterwards. Table 31 shows instead a reclassified Profit & Loss account for the WSS part of MM only. Figures confirm that the largest part of MM's EBIT is due to the WSS part of the company since MM-ENG's external activities decreased after 2006 (when the possibility for MM-ENG to provide services to other Italian Public Administration was restricted).

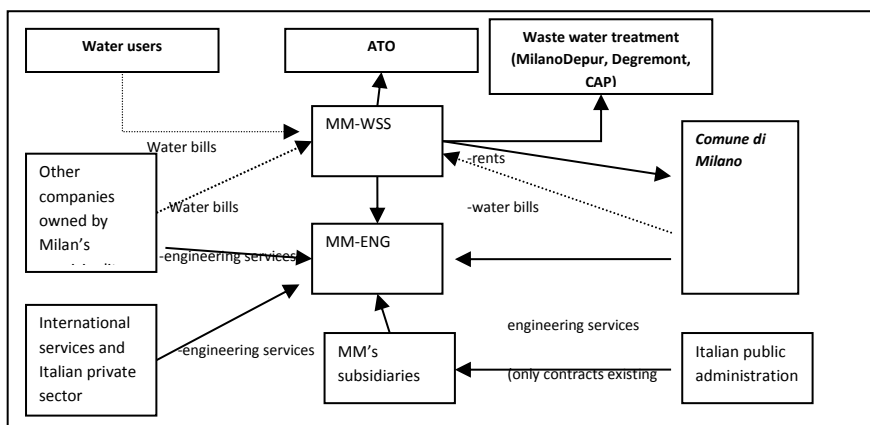
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<sup>253</sup> Apparently the *Autorità di Bacino del fiume Po* and the *Agenzia Interregionale per il fiume Po*, created in 1998 have less power than the previous *Magistrato del Po* in incentivizing or making compulsory investments in Milan's surface water and flood management infrastructure. Source : interview

The “full cost recovery principle” applies to Italian WSS, which means that MM does not receive explicitly any revenues from Taxes or Transfers (3T’s: OECD 2009a) neither from the municipality nor from the Central Government. However, the past investment burden is not weighing on MM but on Milan’s municipality (as we already mentioned in §2.2), and this might be initially considered as a Tax revenue in the OECD 3T’s.

In fact the picture is more complex since some money is also flowing each year from the water and sanitation budget to the general budget of Milan’s municipality. Figure 39 here below shows the financial flows taking place between MM, Milan municipality and other major actors.

**Figure 39 : Financial flows of MM**



Source : author’s elaboration

Although over the last 10 years MM constantly made a profit, no dividends have been given to the share holder (Milan’s municipality). On the contrary the profits made increase the net assets. As classically done by most municipally owned companies, MM’s approach consisted in having a small EBIT for fiscal optimization purpose. This does not mean however that no financial transfers were taking place between MM and its municipal shareholder. It rather means that financial transfers were taking place using the cost side of the business rather than the income side.

Indeed, from 2003 to 2007, MM paid an yearly concession fee (*canone*) of roughly 23 M euros to Milan’s municipality<sup>254</sup>. This is a huge amount (it has the same order of magnitude as all the salaries and wages costs - excluding social security costs); indeed it

<sup>254</sup> (ATO Città di Milano 2007, 185; ATO Città di Milano 2010, 26)

was overestimated in order to transfer money from the water budget to the general municipal budget to avoid fiscal losses in favour of the central government.

In 2006 a decree<sup>255</sup> tried to implement more rigorously the “water pays for water” principle and made clear<sup>256</sup> that no concession fees could be paid by the water operators to the municipalities while it was confirmed that the water operator was responsible of the payback of the loans which had been subscribed by the municipality to finance water and sanitation infrastructure.

To comply with the 2006 decree, in 2008 the concession fee was abolished and replaced by three kinds of financial transfers from MM to the municipality : i) loan’s payback, ii) building rent<sup>257</sup> and iii) other costs for various services. After 2010 the three items add up for a total amount of roughly half of the concession fee previously paid. Although this amount might appear more reasonable it is still an over-estimation of the real costs faced by Milan’s municipality.

A negotiation between MM and Milan’s municipality is taking place now and we are keen to think that the financial transfers from MM to Milan’s municipality are very probably bound to decrease in the future. A first reason in favour of such a trend is due to the budget balance of MM which is tighter and tighter due to the combined effect of lower revenues (due to lower water consumption) and higher costs (mainly due to investments). A second reason is that the new AEEG regulation guidelines (see §6.2) impose a closer scrutiny on all costs faced by water operators on which efficiency gains can be claimed (OPEX\* § 6.2).

<sup>255</sup> Decree 152/2006, article 153, <http://www.camera.it/parlam/leggi/deleghe/06152dl2.htm>, retrieved 4/24/2013

<sup>256</sup> According to the CONVIRI the payment of concession fees from water operators to the municipalities was not legal even before 2006 since the Metodo Tariffario Normalizzato was not mentioning concessions fees among the acceptable costs. CONVIRI, Parere n°7625, Aprile 2011,

<sup>257</sup> The amount paid for “godimento beni di terzi” was of 17.6 M euros in 2008 and 13.5 M euros in 2009(ATO Città di Milano 2010, 26). After 2010 the rent amount was of roughly 6M euros per year. Rent contract (year 2010) between MM and Milan’s municipality <http://www.atocittadimilano.it/public/nicola/fck/file/Sotto%20allegati%20dell%27Allegato%20G%20dell%20Deliberazione%2013%20del%20CdA%20del%2003%20Aprile%202013/All.%20G%206.PDF> retrieved 4/24/2013

**Table 30 : Reclassified Profit & Loss account of MM SpA**

Thousand Euro	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
<b>Revenues</b>	80 828	189 441	279 468	239 943	230 453	248 002	254 292	236 930	260 507	232 792
<b>Operating Costs</b>	75 942	168 980	263 785	227 835	217 517	231 968	237 997	219 967	240 816	201 435
<b>EBITDA</b>	4 886	20 461	15 683	12 108	12 936	16 034	16 295	16 963	19 691	31 357
<b>Depreciation, amortization and write down</b>	2 542	3 986	4 389	5 463	7 314	8 609	9 722	12 522	13 272	15 387
<b>EBIT</b>	2 344	16 475	11 295	6 645	5 622	7 426	5 682	4 442	6 419	11 273
<b>Financial income and expenses</b>	-1 168	-806	-386 983	-877 132	-1 697	-2 749	-2 998	-1 970	(2 077)	(3 388)
<b>Result before taxes</b>	1 765	15 563	10 980	6 078	3 910	4 750	2 684	2 760	4 199	7 282
<b>Income taxes</b>	1 474	6 903	5 581	3 956	3 192	3 586	2 545	2 497	3 346	3 390
<b>Profit (Loss) of the year</b>	291	8 660	2 122	5 399	718	1 164	139	264	852	2 766
<b>CASH FLOW</b>	-4 133	25 730	-19 300	-976	-5 851	-9 137	-1 378	-71	1 712	12 787
<b>Leverage<sup>40</sup></b>	-	-	0.42	0.70	1.41	1.91	2.90	3.60	3.30	2.80
<b>ROI [%]</b>	-	-	24.29	11.18	6.54	6.94	4.82	3.11	3.96	7.35
<b>ROE [%]</b>	-	-	6.46	15.45	2.01	3.16	0.38	0.71	2.24	6.77

Source : Author's elaboration based on data from Massarutto (2011b) and from the "Bilancio d'esercizio" of MM, various years, all values in thousand Euros

**Table 31 : Reclassified Profit & Loss account of MM -WSS**

	2004	2005	2006	2007	2008	2009	2010	2011
<b>Revenues</b>	104 962	116 169	117 668	110 796	110 326	113 917	113 464	123 019
<b>Costs</b>	86 648	101 929	107 097	103 726	99 146	101 856		
<b>Ebitda</b>	18 314	14 240	10 571	7 070	11	12 070	15 900	24 715
<b>Depreciation, amortization and write down</b>	8 928	9 032	8 439	3 794	7 767	7 636	10 686	13 908
<b>EBIT</b>	9 386	5 208	2 132	3 276	3 413	4 434	5 214	10 807
<b>Financial income and expenses</b>	538	237	273		1 999			
<b>Result before taxes</b>	8 848	4 971	1 859		1 414	4 277	4 626	8 804
<b>Income taxes</b>	4 566	2 747	1 369		1 397			
<b>Profit (Loss) of the year</b>	4 282	2 224	490		17	2 086		

Source : author's elaboration based on data from three versions (2007, 2010 and 2013) of the *Piano d'Ambito ATO Città di Milano*. The 2013 version is only an internal draft version, courtesy of MM.

## 5.2. *Technical performance*

A benchmark comparison of MM versus other Italian operators has been undertaken by Massarutto et al. (2011b; 2012). Some figures in terms of technical performances are given in Table 32 and others are reported in Appendix 2. Most data show that MM is well above the average technical performances of Italian water services (which are not so high though). MM delivers water which fully complies to quality standards with no interruption while 245 municipalities in Italy (and 24 in the North of Italy) do not fully respect drinking water standards. Unplanned maintenance interventions are not frequent (0.48 interventions/km of network/year) showing a good reliability of the drinking water network.

In terms of cost indicators (last lines of Table 32) MM figures are affected by the peculiarities of Milan's WSS (typical of a dense big city): a dense network means that the costs per unit of network are relatively high, a large population served (cost/unit of people served is low) and large sold volumes (cost/ volume is low).

**Table 32 : Benchmarking of MM – technical performance**

		MM	Lombardia	Nord	Italia
Water losses	Water (million m3)	221	1.408	3.696	8.143
	Water billed (million m3)	201	1.111	2.727	5.500
	Total losses (%)	-13%	-21%	-26%	-32%
Waste water	Waste water recycled after treatment (%)	33%		0%	0%
	Users connected to a waste water treatment plant	100%	81,5%	84,9%	78,5%
	Users connected to advanced waste water treatment plants	100%	69,9%	68,8%	52,2%
Water non respecting drinking standards	N° municipalities	0		24	245
	Population (millions)	0		0,06	2,1
Network maintenance	Unplanned maintenance intervention on the network (n./km)	0,48		1,25	3,18
Total cost / km network	Euro/km	48.697			23.325
Total cost / inhabitant	Euro/inhabitant	88			135
Total cost / 1000 m <sup>3</sup>	Euro / 1000 m <sup>3</sup>	543			1475
Total cost / employee	Euro / employee	241.25			222

Source : Massarutto (2011b; Massarutto et al. 2012) based on data from MM, ISTAT, Mediobanca and IRPET

Since 2009 relations between MM and its customers are ruled by a *Carta di Servizio* through which MM has made various commitments concerning its customer service. Commitments made by MM appear to be much more ambitious than those made by many other Italian water utilities (Appendix 2).

### 5.3. *Sustainability*

To better tackle the many intergenerational aspects of the public service mission, the three goals mentioned in §4.1 might also be expressed in terms of sustainable development. An interesting approach on the sustainability of WSS has been proposed in the framework of the Water 21 research project based on the concept of the “3 E” namely Economics, Environment and Ethics (Correia 2001; Barraqué 2003a). The sustainability problem can be expressed through three questions<sup>258</sup> (Barraqué 2003a, 205) :

-Economics —is infrastructure capital maintained and upgraded?

-Environment — what new investments/approaches are needed to ensure environmental protection, public health and water resources conservation ?

-Ethics — who pays for sustainability costs? If WSS costs increase due to (1) and (2) will these costs be affordable for all users ?

Another evaluation framework for WSSs based on the concept of sustainability has been proposed by Massarutto (2002; 2004; 2007) : a WSS is sustainable as long as externalities through time and space are avoided. In other words “a WSS is sustainable if it satisfies the present generation without jeopardizing the future generation capabilities” (Massarutto et al. 2012, 25). In practice to be sustainable, one single generation should not damage the natural capital (water resources, natural environment, biodiversity), but maintain the infrastructure capital (networks, treatment plants...) in order not to transfer the costs on the next generation.

Is MM-WSS sustainable? The research report edited by Massarutto has made such a analysis on various Italian WSSs among which MM (Massarutto et al. 2012).

-Economics : in all the Italian WSS considered by Massarutto et al. (including MM) it appears that the undertaken investment allowed by the incomes are still much below

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<sup>258</sup> The EAU & 3E research project on which our PhD thesis is partially financed is based on such a vision of WSS’s sustainability. <http://eau3e.hypotheses.org/>

what would be needed to reproduce in the long run the infrastructure capital. A first reason for such unsustainability is the complexity of obtaining a digging authorization. Another reason has to be found in the water and sanitation tariff levels which have been set too low, determining too low cash flows to make the investment plans (*Piani d'Ambito*) bankable (Massarutto et al. 2012, 84–92).

-Environment : although after years of postponed investments waste water treatment plan have been brought to completion, the river system around Milan is far from having reached the good ecological status recommended by the European Water Framework Directive (see figure below and Massarutto et al. (2006, 27)). Somehow the natural capital had been so terribly damaged by the past generations that the present and future ones is/will be paying the full price of it.

-Ethics: This might be the only point on which Milan's WSS might be considered fully sustainable since its water tariff is low and affordable. However this is largely due to the fact that it is unsustainable on the two previous criteria.

Milan's WSS should not be considered fully sustainable. Indeed if the infrastructure capital was correctly reproduced and a full environmental sustainability was met, the WSS's costs would be much higher and eventually the WSS's tariff deriving from these costs would not be affordable for all users (Massarutto et al. 2012).

## 6. Regulation

### 6.1. *Legal and regulatory framework after 1994*

In 1994 an ambitious reform of the water sector was launched in Italy (*Legge Galli – Legge n°36 1994*). A vast amount of literature<sup>259</sup> has already analyzed this reform and it is not the purpose of our work to make a new analysis. However a synthetic summary of the main features of the legal regulatory framework of the Italian water sector might be useful for the reader. The major features of the implemented reform were:

The concept of integrated water and sanitation services (*Servizio Idrico Integrato*) meaning that water and sanitation had to be run jointly by the same entity.

Economies of scale: WSS were to be run at a larger geographical scale, the *Ambito Territoriale Ottimale* (ATO).

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<sup>259</sup> An updated evaluation of the reform has been recently done by Massarutto and Ermano (2013) and by Massarutto et al (2012). Many interesting papers are included in Muraro and Valbonesi (2003).

WSS could be operated through various formulae: i) direct municipal management, ii) the municipally-owned “azienda speciale”, iii) the partly municipally-owned PLC and iv) a concession to a private partner.

Regulatory powers were awarded to local regulators to be created for such a purpose (Autorità d’Ambito Territoriale Ottimale – AATO). A national regulatory committee the *Commissione Nazionale di Vigilanza sulle Risorse Idriche* (CONVIRI)<sup>260</sup> was also created.

AATO were responsible of the following tasks: i) designing an investment plan (*Piano d’ambito*), ii) choosing how to operate the service (in-house provision, bid for a concession...) iii) signing the contract with the operator (*Convenzione*), iii) approving the business plan and iv) periodic and extraordinary regulatory revision of the ATO investment plan (Piano d’Ambito) and of the tariff.

The CONVIRI was mainly responsible of preserving the users’ interest and supervising tariff regulation. It was also responsible of an observatory and database on the water services. In practice it was an understaffed institution, suffering from huge information asymmetries and having little regulatory power.

Last but not least the water and sanitation services were to be self financing and transfers from the central state were forbidden. A revised tariff methodology (*Metodo Tariffario Normalizzato – MTN*) based on the full cost recovery principle was approved in 1996 (decreto ministeriale 1 agosto 1996). Exceptions to the MTN were made for concessions existing prior to the Galli act. As a result in 2011 many operators were still applying the former CIPE tariff methodology instead of the MTN one (AEEG 2012a, 25).

The implementation of the reform was left to a large extent to the local authorities (municipalities and regions) resulting in large technical implementation discrepancies. Indeed the ATO were to be defined at the regional level, thus a great variety of choices has been made : from a unique regional ATO (as in Puglia where the *Acquedotto Pugliese* was operating the service) to an ATO limited to a single municipality (as in Milano). In most of the other cases the ATO has been placed at the intermediate scale of the *Provincia* (county division).

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<sup>260</sup> At first it was called *Comitato Nazionale di Vigilanza sulle Risorse Idriche* (COVIRI)



Between 1994 and 2011 the Galli reform has been implemented with great inertia and frequent legislative modifications<sup>261</sup>. Legislative changes and debate were particularly frequent concerning the degree private sector participation.

In December 2001<sup>262</sup> an act “imposed *de facto* the selection of water operators exclusively through competitive tendering, with the only exception being represented by the direct award of a concession to a wholly publicly-owned company provided that within two years of the concession award an equity stake of at least 40% was sold to a private operator selected through competitive tendering”. WSS could not be operated anymore by the municipality and should be delegated to autonomous company. The latter could be municipally owned<sup>263</sup> (in-house provision), private, or partially owned by a municipality and by a private partner. To comply to such a decree the responsibility of Milan’s water and sanitation services was given to *Metropolitana Milanese* as a temporary solution at first (Lobina and Paccagnan 2005).

The 2001 legislation was partially at odds with EU principles and in 2003 the law was modified and this time it allowed only three institutional choices for WSS: i) awarding a concession to a private company selected through competitive tendering; ii) a public-private joint venture whereby the private partner is selected through competitive tendering and iii) a company entirely owned by local authorities (in house provision according to the TECKAL ECJ jurisprudence).

In 2009 the Ronchi Decree (decree 135/09) made competitive tendering compulsory to award a concession of the WSS within an ATO. Companies entirely publicly owned could participate to the competition. Although the decree did not exclude WSS run by municipally owned companies (Massarutto 2009; Scarpa 2009b; Scarpa 2009a), it was considered by the public opinion as imposing the privatization of water services. An opposition movement developed<sup>264</sup> and made the legal step to obtain a referendum in June 2011 against the “water privatisation” on two issues : i) did the voters want to abolish the part of the 2009 Ronchi Decree which made compulsory to use competitive tendering to choose the operator for WSS? and ii) did the voters want to abolish the

<sup>261</sup> decreto legislativo 3 aprile 2006, n. 152, decreto legge 112/2008, decreto legislativo 16 gennaio 2008 n°4, legge 26 marzo 2010, n. 42

<sup>262</sup> legge. n. 448/2001, (the 2002 Budget act) art. 35

<sup>263</sup> Or regionally owned in the case of the Acquedotto Pugliese

<sup>264</sup> Forum Italiano dei Movimenti per l’acqua - <http://www.acquabenecomune.org>

“remuneration of the invested capital” part within the water tariff computed by the MTN? The “Yes” won with an overwhelming majority in both cases.

### 6.2. *The new regulatory regime after 2011*

The CONVIRI turned out to be very weak and many experts and policy makers argued in favour of a more independent and powerful national regulatory authority. After the 2011 referendum<sup>265</sup> the regulatory power on water services was transferred<sup>266</sup> to the *Autorità per l’Energia elettrica ed il gas* (AEEG), the national regulatory authority for gas and energy.

The AEEG undertook in 2012 a public consultation process<sup>267</sup> in order to reform the WSS tariff regulation. This was a sensitive task since the new tariff regulation should both respect the 2011 referendum outcome (which had canceled the remuneration of the invested capital element in the tariff formula) and guarantee full cost recovery<sup>268</sup> including the financial costs of investments<sup>269</sup> in order to make investments in the water sector again “bankable”.

Indeed, after the referendum, uncertainty about the regulatory framework had induced operators to avoid investments and to restrain as much as possible their activity to daily ordinary operations.

The AEEG approach consisted in both defining a temporary tariff regulation (Metodo Tariffario Transitorio – MTT) and working on designing a brand new tariff regulatory method to apply afterwards. The MTT was approved in December 2012 in order to be applied in 2012 and 2013 (AEEG 2012c).

### 6.3. *Regulation in ATO Città di Milano*

In Lombardy the ATO were defined in 2003<sup>270</sup> (more than 8 years after the adoption of the Galli act). An ATO was created for each *Provincia* except for the *Provincia di Milano* where two distinct ATO were created: the *ATO Città di Milano* and the *ATO Provincia di Milano*. According to our interviewees, a unified ATO was not chosen

<sup>265</sup> Just prior to the referendum the decree 70/2011 had created the *Agenzia nazionale per la regolazione e la vigilanza in materia di acqua*, which was never effectively in operations.

<sup>266</sup> Decreto legge 6 dicembre 2011 n°201 enforced with the Legge 6 dicembre 2011 n°214

<sup>267</sup> (AEEG 2012a; AEEG 2012b) available on [http://www.autorita.energia.it/it/operatori/operatori\\_idr.htm](http://www.autorita.energia.it/it/operatori/operatori_idr.htm)

<sup>268</sup> Also to comply to EU rules.

<sup>269</sup> « *Un nuovo metodo tariffario per la determinazione della tariffa del servizio idrico integrato... pena la violazione del decreto legge n. 70/11, del diritto comunitario e degli stessi principi affermati dalla Corte costituzionale (sentenza n. 26/11), la copertura integrale di tutti i costi di esercizio e di investimento, compresi i costi finanziari.*” (AEEG 2012a, 12).

<sup>270</sup> la loi régionale 23 du 12/12/03 modifiée par la loi régionale 18 du 08/08/06

mainly for political reasons in order to preserve the autonomy of the two historical operators (Milan's municipal water service operating within the city and CAP operating in the neighbouring municipalities).

The *Ufficio d'ambito ATO Città di Milano* (AATO-MI)<sup>271</sup> was created as an *Azienda Speciale*<sup>272</sup> of Milan's municipality in 2006<sup>273</sup> and is responsible for the regulation over the *ATO Città di Milano*. According to a 2010<sup>274</sup> act, by 1<sup>st</sup> January 2011 the AATO have been abolished and it was left to the regions to choose how to confer the responsibilities exerted by the AATOs. Later on<sup>275</sup> the deadline was postponed to 31/12/2012.

In 2007 the AATO approved the *Piano d'Ambito*<sup>276</sup> for the 01/01/08 – 31/12/2027 time frame. Waiting for such a plan, the most urgent investments (94 millions euros in sanitation to be spread over 20 years) were inserted in a prior investment plan (*Piano stralcio*) approved in 2001<sup>277</sup>. In 2010 the Piano d'Ambito was reviewed (ATO Città di Milano 2010) postponing a significant part of the investments to the second half of the concession period (2018 - 2027) as shown in Appendix 3. In 2013 MM is proposing to the ATO Città di Milano to adopt a new revision of the Piano d'Ambito (ATO Città di Milano 2013) which would modify once again the investment plan. Total figures of the three versions of the investment plan are summarized in Figure 40 and more details are given in Appendix 3. The 2013 revision proposal of the Piano d'Ambito is based on a very different investment plan for the 2013-2027. Major differences with the PdA 2010 consist in:

-153.5 M euros less investments as a whole than in the PdA 2010.

-A more "reasonable" and "realistic" investment plan based on the idea that MM and Milan's urban system cannot implement more than 40 M euros of investment per year

<sup>271</sup> <http://www.atocittadimilano.it>

<sup>272</sup> According to the law the AATO could be established either as a formalized consortium of municipalities or with a lighter formalization as an agreement between municipalities. The *Azienda Speciale* is a special kind of public law entity created by the art art. 114 of the decree n°267 of the 18<sup>th</sup> 2000.

<sup>273</sup> *Delibera del consiglio municipale* 3 aprile 2006 n. 54

<sup>274</sup> legge 26 marzo 2010, n. 42

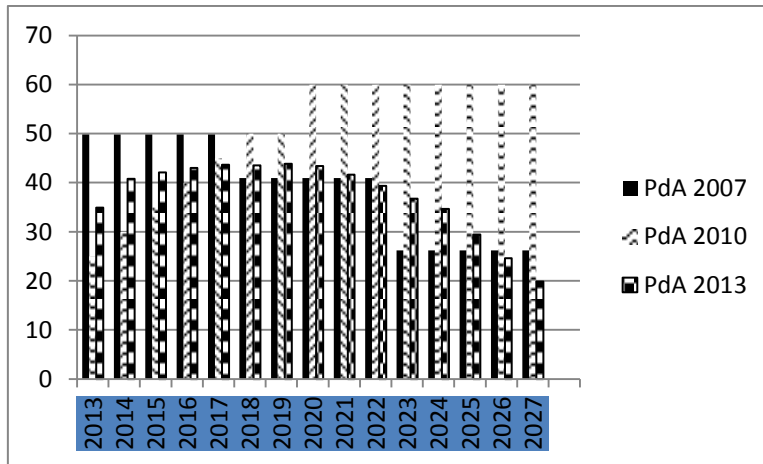
<sup>275</sup> Decreto legge 29 dicembre 2011, n. 216

<sup>276</sup> The piano d'ambito (ATO Città di Milano 2007) was approved by the ATO on the 3/08/07 after the municipal council approval on the 26/07/07.

<sup>277</sup> The *Legge 23/12/2000 n°388* (Finanziaria) had made compulsory to draft a *Piano stralcio* in order to fasten the investment's rhythm concerning the sanitation part of the water cycle.

(due to the risk of congestion and to the contracting out process). As a consequence: more investments in the 2013-2016 years than in the previous version and fewer investments in the 2017-2027 years.

**Figure 40 : yearly investments in Milan's WSS according to various versions of the investment plan**



Source : author's elaboration based on data from Massarutto 2011 and PdA 2013

Massarutto and Ermano (2013) have pointed out that one of the major weaknesses of the Italian regulatory setting is the subjectivity left to the AATOs for the revision of the ATO's investment plan and their lack of capability to correctly implement such a regulatory process. Indeed in Milan, investment amounts were progressively curbed down in order not to increase the water tariff.

Some other considerations on how the regulation is being implemented in Milan's ATO are given in §7.2.

#### **6.4. Borrowing constraints**

Water and sanitation services are not only concerned with formal regulation of the water sector but might also be constrained by other external factors. In particular from our perspective the borrowing constraints faced by Italian WSS are a key issue in a phase where they have huge investments needs.

From a historical point of view despite the great variety of institutional models of the water and sanitation services in Europe (Barraqué 1995), investments in water and sanitation services have mostly been the responsibility of municipalities and other local public authorities. If we make reference to the three classical institutional models of direct municipal provision, *affermage* (leasing) and concession, only in the latter model,

the concession, CAPEX investments are the responsibility of the private *cessionnaire* while on the contrary they are “publicly” driven not only in the direct provision model but also in the *affermage* scheme<sup>278</sup>.

In Italy (Milan included), for decades investments in WSS were undertaken by municipalities. The WSS’s budget was not clearly distinct from the global municipal one. Debt<sup>279</sup> issued to finance WSS investments was considered as municipal debt to all means. Now, Italian WSS have been corporatized (§3.1) and are provided by joint stock companies. Some of these such as Metropolitana Milanese are fully municipally owned. To what extent debt issued by those public entities is accounted for as sub-sovereign debt and *in fine* as sovereign debt? Furthermore, in a normative view, should such a debt be considered as sub-sovereign debt?

In Italy an Internal Stability Pact<sup>280</sup> was approved by law in 1998 (Legge 448/1998), making local public authorities (in particular the municipalities) contribute to the goals of the European Stability and Growth pact (SGP) in terms of percentage of consolidated sovereign debt / GDP (Fraschini 2002, 177). This internal stability pact is seen as a major constraint on Italian municipalities’ autonomy and is presently criticized for constraining public investments and indirectly slowing down the economic recovery.

However according to the EU legislation WSS’s debt should not be considered as sub-sovereign debt. Indeed the European legislation (Council Regulation n°2223/96 – SEC95) established that “market” public enterprises with Tariff covering at least 50% of the total costs should not be included in national public accounting<sup>281</sup> used for yearly reports to EU institutions in the framework of the European growth and stability pact (SGP).

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<sup>278</sup> Indeed, in *affermage* the contract states which investments are the responsibility of the public entity and which ones are the responsibility of the private operator. In France in most *affermage* contracts, and especially in the most recent ones, the great majority of investment is the responsibility of the local public entity (*autorité organisatrice*) while the private operator is only responsible of maintenance and minor investments.

<sup>279</sup> Debt was subscribed at concessional rates with public lending entities such as the *Cassa Depositi e Prestiti*, the *CREDIOP* or the *Cassa del Mezzogiorno*. More details on these aspects are given in the forthcoming papers (Crespi Reghizzi forthcoming b; Crespi Reghizzi forthcoming d).

<sup>280</sup> Not all European countries chose to approve an internal stability pact in order to apply the European agreement. For example France did not create such a tool.

<sup>281</sup> National public accounting made by ISTAT in Italy or by INSEE in France apply such a definition and does not include debt of Water and Sanitation services within national public debt.

Italy follows a twofold approach: although it obviously complies to EU guidelines for computing national public debt, the government also required (decree n°1/2012) the local public companies owned by local public entities providing “in-house” services (such as WSSs) to fulfill to the internal stability pact previously applied to local public authorities only. One of the ideas behind such a decree was that local public authorities were by definition guarantors of those local public companies’ debt in case of financial imbalance (Corte dei Conti 2012). Until now the constraint deriving from the decree n°1/2012 has not been implemented since no implementation ministerial decree has been published yet. It seems that a second stability pact to be applied to fully publicly owned companies could be created in addition to the existing one which applies to local authorities<sup>282</sup>.

An argument in favour of the corporatization of Italian WSS was that corporatized WSS would be more autonomous from the municipal administration; but from our perspective considering their debt as sub-sovereign raises a striking paradox. We have shown that the Tariff level of Italian WSS does not allow a high level of self financing for investments. If their access to debt is also constrained, the critical under- investment in WSS infrastructure is not going to diminish. It is clear that both their economic and environmental sustainability goals (§6.3) will not be met if their access to debt-financed capital is limited. Indeed how will the infrastructure capital be reproduced? How will be undertaken the huge investments to restore the good ecological status in rivers (as required by EU WFD)?

## 7. Governance

### 7.1. *Formal governance*

This section addresses the formal governance of Milan’s Water and sanitation. Two aspects will be analyzed: i) MM’s formal governance as a company, ii) Milan’s WSS institutional mapping and regulatory governance.

MM is a joint stock company fully owned by Milan’s municipality. There is a president and a board of directors (4 members) while a general director is responsible of the operations. The president, the members of the board and the general director are

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<sup>282</sup> Press article of Gianni Trovati on *Il Sole 24 Ore* on the 30/01/2013 and 04/02/2013.

appointed by the municipal council. In 2013 an open call<sup>283</sup> for candidates was launched by Milan's municipality in order to renew the president and the board of directors of various municipal companies among which MM.

MM's formal governance as a company is only a part of the story since a significant part of it does not take place within a straight shareholder-company relationship. The institutional mapping is more complex and observing the figure below might be useful. Indeed a regulatory relationship is taking place too. Regulation is exerted by the *Ufficio d'ambito ATO Città di Milano* (AATO-MI) on behalf of Milan's municipality. The AATO-MI employs five people: a director, an engineer, an economist and two employees. The director is a high ranked municipal civil servant. Since it is an *azienda speciale* (autonomous municipal body subject to administrative law and public accounting rules) the AATO-MI is administrated through a board of directors composed of three people. The board of directors is nominated by the municipal council. Presently the board of directors (nominated the 24<sup>th</sup> November 2011) is composed of independent "experts"<sup>284</sup> who do not receive any indemnity for their mission. Even if AATO-MI is responsible of MM's regulation, its regulatory power is not that high since major decisions of the AATO-MI have to be approved by the city council.

Since 2011 (and in practice since 2012) the national regulator (AEEG) has also had a key role in the governance of Italian WSS since it defines the regulatory method to be applied and it monitor AATOs' regulatory decisions.

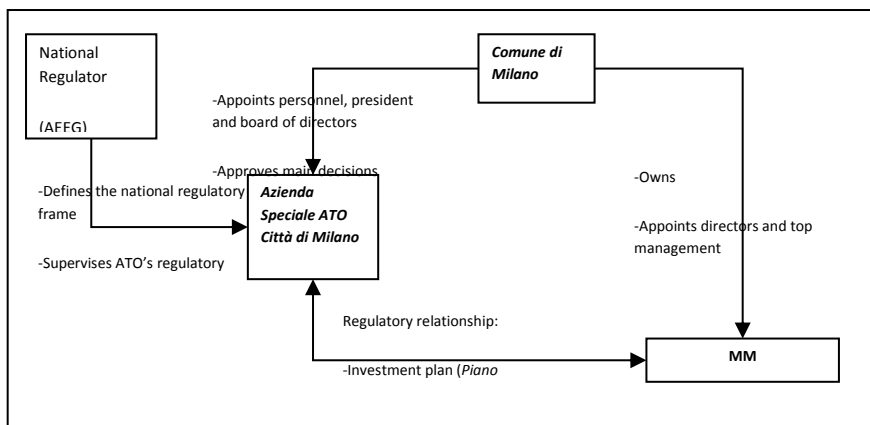
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<sup>283</sup> Retrieved on April 2013 the 23<sup>rd</sup> from

<http://www.comune.milano.it/dseserver/webcity/garecontratti.nsf/WEBAll/1475B3CC880A60A8C1257AFA004E10F7?opendocument>

<sup>284</sup> The president s a professor of economics while the two counselors have been working previously in the water sector and seem to have some political affinity with the left wing Milan administration and with the 2011 water referendum movement.

Figure 41 : Milan's WSS institutional mapping



source : author's elaboration

## 7.2. Beyond the formal governance

In this section we rely on the various interviews we undertook to go beyond the formal aspects of the governance previously analyzed. What are the real relationships between MM and the municipality like? How is the regulatory process between MM and the municipality undertaken in real terms?

One could imagine that the municipality (including the political majority) would try to impose its influence and power on MM on various aspects of the company life. Indeed, as all municipal services, the water and sanitation service can be partially used as an asset in the political arena. Results from our interviews show a twofold relationship. On the one hand the municipality has relatively unfrequent interactions with MM and ignores it as much as possible. Indeed, once MM's board of directors and top management are appointed, the municipality is unaware and does not interfere with MM's daily operations. On the other hand the water price is a political issue and currently Milan municipality (and AATO-MI) is reluctant to adopt the water price increase which results from AEEG new tariff regulation methodology (MTT - § 6.2). Another example of political influence is the decision made in 2013 by MM to install public fountains to deliver sparkling water. From our interviews it appears that MM was encouraged by the municipality although it was not keen on doing that.

Another key aspect to consider is that after WSS's transfer from the municipality to MM (in 2003), all the municipal human resources having knowledge and experience concerning the water sector were transferred to MM too. Nearly no water sector expert has been left within the municipal administration. That means that the municipality and



the AATO are in practice unable to exert by themselves any relevant control on MM. It also means that the Municipality relies on MM for all water related public policies issues.

The pattern is similar within the local regulator, AATO-MI which is in fact not able to truly control and regulate by itself MM's activity. By definition, a classical informational asymmetry takes place between MM which has all the informations and both AATO-MI and the municipality which are "in the dark". What is really striking in Milan's case is the fact that no knowledge at all has been kept within the Municipality and the AATO-MI. In practice MM exerts both the role of regulated entity and regulator.

For example the two past investment masterplans (*Piano d'Ambito*) have been entirely drafted by MM while such a key regulatory document should have been AATO-MI's responsibility (and indeed it bears AATO-MI logo, but only on the front page). In all the key steps of its regulatory mission (ATO's plan revisions, tariff revisions) AATO-MI has recruited private consultants and relied on them to conduct the regulatory process. In our opinion the need for an external help is a clear indication of AATO-MI's weak regulatory capability. The good point might be its awareness of such a weakness and the decision to ask for some external help to compensate the weakness. Unfortunately, no stable partnership has been established with a single consultant but new people have been recruited every time with a continuous loss of regulatory knowledge.

More globally speaking Milan's municipality as a whole is not able to express an unambiguous goal function to which MM should comply. Indeed Milan's municipality is composed of many entities which might give contradictories signals to MM. A clear example is with the administrative process required to undertake infrastructure works: on one hand MM has to fulfill the investments targets defined in the masterplan which has been approved by the AATO-MI and by the municipality, on the other hand MM is subject to a complex administrative process for the works implying to dig under the streets. Apparently to have a dig authorization requires such a high effort that it is the major constraint on MM's investment's level. Indeed from MM's point of view dig autorizations are so hard to obtain that funding is not yet a constraint on the investment policy.

## 8. Tariffs, Finance and Distributional Issues with respect to public missions

### 8.1. The tariff structure

According to the *Legge Galli* and to the *Metodo Tariffario Normalizzato* (MTN) the water service has to be billed with an increasing block rate (IBR). This charging policy, which started in Italy already in the 1970's, was supposedly designed both to ensure WSS financial sustainability and to apply a discount rate on essential water needs of domestic users<sup>285</sup>. In Milan IBR has been adopted and a two-part tariff with increasing block rates is in place. Water is mostly billed through collective metering (one bill per residential building). Indeed there are only 47 136 meters in Milan and the majority of the bills are paid by the condominium administrator who is the "user" from the utility's point of view. The user pays both a volumetric tariff (commodity charge)  $T_{vol}$  and a fixed charge  $T_{fixed}$ . The commodity charge  $T_{vol}$  is composed of four volumetric elements ( $t_w$ ,  $t_s$ ,  $t_{ww}$  and  $t_{stralcio}$ <sup>286</sup>) charging respectively for water, sanitation, waste water treatment and the special part for the *Piano stralcio's* amortization. The three last elements are uniform and charged just the same to all users.  $T_w$  instead is charged differently to domestic, non domestic and agriculture users. Furthermore  $T_w$  is charged according to an increasing block-rate system (Table 33):

The formulas below show how the bill amount is computed:

- (1)  $T_{total} = T_{fixed} + T_{vol}$
- (2)  $T_{vol} = T_w + t_s * V_{tot} + t_{ww} * V_{tot} + t_{stralcio} * V_{tot}$
- (3)  $T_w = t_{w1} * Vol_1 + t_{w2} * Vol_2 + t_{w3} * Vol_3$
- (4)  $Vol A = 0.350 * n^{\circ} flat * n^{\circ} days$
- (5)  $Vol_1 = \min [V_{tot} ; Vol A]$
- (6)  $Vol B = 0.750 * n^{\circ} flat * n^{\circ} days$
- (7)  $Vol_2 = \min [V_{tot} - Vol_1 ; Vol B]$
- (8)  $Vol_3 = V_{tot} - Vol_2$

<sup>285</sup>“ *La ristrutturazione tariffaria deve armonizzare le denunciate ed accertate necessità del graduale ripianamento economico della gestione aziendale con l'esigenza di assicurare all'utenza una tariffa agevolata, limitata ai consumi essenziali.*” (Provvedimento CIP n°26/Agosto 1975)

<sup>286</sup> The *piano stralcio* is a special investment plan to undertake sanitation infrastructures (see § 6.3).

**Table 33 : Volumetric Tariff applied by MM [Euro/m<sup>3</sup>]**

a	b	c	d	e	f	g	h	i=a+f+g+h	i=c+f+g+h
Water Domestic			Water Non domestic	Water agriculture	Sanitation	Waste water treatment	Piano stralcio	Total	
less than 0.350 m <sup>3</sup> /d per flat	Between 0.351 and 0.750 m <sup>3</sup> /d per flat	More than 0.750 m <sup>3</sup> /d per flat							
t <sub>w1</sub>	t <sub>w2</sub>	t <sub>w3</sub>	t <sub>wnd</sub>	t <sub>wa</sub>	t <sub>s</sub>	t <sub>ww</sub>	t <sub>stralcio</sub>		
0.110	0.226	0.382	0.376	0.158	0.108	0.277	0.034	0.529	0.801

Source : author's elaboration based on data from Metropolitana Milanese

The commodity charge (water + sanitation + waste water treatment) for domestic users varies from a total of 0.53 to 0.80 euro per cubic meter depending on the block of consumption. The fixed part  $T_{\text{fixed}}$  is not very significant when compared to the volumetric part.

From our perspective, Milan's IBR system (in presence of collective metering) has many caveats : i) it can hardly pretend to mimic marginal cost pricing, ii) it does not give a clear price signal incentivizing water conservation and iii) it is far from being transparent in the resulting cost-allocation between the various users. In principle all Italian WSS have to apply an IBR and as far as we know many other Italian cities have adopted it in presence of collective metering as in Milan. We think that Milan's IBR system raises many policy questions and that there is the need for further research including data collection on the ground.

## 8.2. *When dirty water pays for drinking water*

From our interviews it appears that even if there is a separate rate for the various services (water, sanitation and waste water treatment) in practice the revenues are not ear-marked and cover MM-WSS as a whole. According to our interviewees it appears that there is a mismatch between the relative value of the three rates and the true costs. The water revenues cover roughly only 40 % of the water supply costs while the sanitation and waste water treatment rates are higher than the cost faced. While the global rates allow Milan's WSS as a whole to break even, when considering instead each segment of the water service separately, these are not financially balanced.

If all users were paying the three rates, one could argue that what matters only is the financial sustainability of the service as a whole. However in Milan there are some users which subscribe only to the water service with MM and receive a subsidized (by all others sanitation users) water service. This is the case for three categories of people:

- Milan's users whose waste water is channeled to the CAP Peschiera Borromeo waste water treatment plant (see also Section 2). Waste water rates for these users are collected by MM on behalf of CAP and transferred almost completely to CAP. As a consequence the water service of all those users is cross subsidized by all other users.

- Users in neighbouring municipalities which are connected to MM's water service while they rely on another utility for the sanitation and waste water treatment services.

- A few users in the rural part of Milan (*cascine*) which are still not connected to the sanitation and waste water treatment service. These users receive a subsidized water.

## 8.2. *Lower volumes, higher rates*

Water consumption is decreasing in many European cities and the case of Milan confirms this general trend as Figure 42 shows. Indeed the yearly water volumes<sup>287</sup> peaked in 1971 (more than 352 Million m<sup>3</sup>) and decreased almost steadily afterwards due to various factors among which the city's tertiarisation.

The tariff revenues are mainly based on the sold volumes of water since the fixed part of the rate is not very significant. On the contrary most of the costs are fixed regardless of the volumes.

In the constrained framework of full cost recovery, when only tariff revenues of the service have to cover its costs, a decrease in sold volumes implies sooner or later an increase in the unitary rate. This is the sustainability dilemma faced by many WSSs in all of Europe.

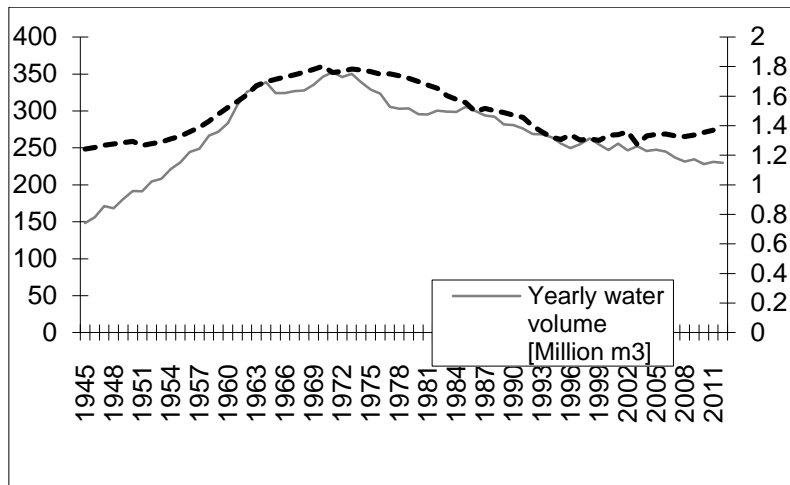
WSSs might be considered as club goods. In cities in developed countries almost everyone is member of the club (Barraqué 2011b, 240). Most of the costs of the club are fixed regardless volumes consumed. Club membership dues (total yearly water bills) are then condemned to remain constant regardless of the sold volumes too.

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<sup>287</sup> The values in the figure refer to the volumes withdrawn from the water table and pumped into the network. According to MM these are the only reliable figures in the long run. Volumes metered and billed to the users are lower.

It might be politically slippery however to first incentivize users to conserve water and then to increase their unitary rates in order to collect roughly the same amount of revenues as if the sold volumes had stayed constant. Such a counter-intuitive fact has to be explained to the users. That's one of the reasons for more users participation in the WSS's governance.

**Figure 42 : : Yearly water consumption and population in Milan (1945-2011)**



Source : author's elaboration based on Metropolitana Milanese internal database

## 9. Conclusion and lessons learned

In 2002, prior to its corporatization, Milan's WSS was the largest<sup>288</sup> Italian WSS under full municipal provision. In 2003 the WSS was corporatized to comply with the national legal framework and the WSS's provision became *Metropolitana Milanese's* responsibility (Section 3).

We have presented an in-depth analysis of Milan's WSS after corporatization. Two perimeters of analysis make sense to fully understand Milan's case study : i) an analysis only focused on *Metropolitana Milanese* as a company and ii) a wider analysis of Milan's WSS institutions as a whole as shown in Figure 41.

### Metropolitana Milanese

From our research MM appears as a well run company with rather good technical and financial performances (section 5). One could wonder however what is the rationality in MM operating two very different business areas (civil engineering especially in underground transport lines, and water and sanitation services); apart from the fact that

<sup>288</sup> Metropolitana Milanese, *Bilancio d'esercizio 2003*, page 15

both areas require knowledge concerning the underground since groundwater is used in Milan. Moreover in this kind of situation, hidden or apparent cross-subsidies might take place. However in the case of MM, the risk of hidden cross-subsidies should not exist anymore. Indeed, since 2011 both areas of business have clear distinct accounting sections in order to enhance transparency on their profitability and cost-effectiveness (§2.3).

The corporatization of Italian WSS can be considered as part of the New Public Management (NPM) paradigm (Osborne and Gaebler 1993; Hood 1995). Admitting that implementing NPM might improve public sector efficiency and effectiveness, one could wonder then whether the corporatized service might imply a loss in the commitment to public service goals or not (§4.1). From our investigation, it appears that despite being a corporatized entity, MM and its staff are strongly committed to public service goals with no significant differences with what was happening previously under full municipal provision. Our results on this point are consistent with Colon and Guérin-Schneider (2012) who show that in selected case studies in two developing countries NPM implementation did not imply a loss of “Public Value” (as defined by M. Moore 1994; 1995). In Milan’s case, one could even argue that the corporatized WSS is more effective in fulfilling public service goals than the full municipal provision was previously, as the stories of postponed investments tell us (Crespi Reghizzi forthcoming d).

#### **Milan’s WSS**

Enlarging the perimeter of analysis to all the stakeholders of Milan’s WSS is much more interesting than focusing only on MM (Figure 41). The results of such an enlarged analysis raise at least two puzzling issues.

The implementation in Milan of the Italian regulation model implying two regulation authorities at the local and at the national level (respectively AATO and AEEG) is puzzling. On the one hand the formal regulation process is formal, complex and costly<sup>289</sup>; on the other hand both Milan municipality and the AATO-MI lack of knowledge, human resources and capability to truly control and regulate MM (§7.2). The regulatory process in place might be compared to a play in which the two actors

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<sup>289</sup> As shown by the quantity of documents required to perform the 2013 regulatory process (available on <http://www.atocittadimilano.it/default.asp?pag=22&tipo=3>) .

(MM and AATO-MI) are forced to perform following a formal and imposed script. Indeed, if it was not for the existence of an expert and powerful national regulator (AEEG see §6.2) which plays the role of the “unwanted third party<sup>290</sup>”, one could even wonder whether a regulatory process would be truly performed since the regulatory key documents (such as the Piano d’Ambito) were *de facto* drafted by MM on behalf of the regulator AATO-MI (§7.2).

Milan municipality as a whole is not able to express an unambiguous goal function to which MM should comply. Indeed Milan municipality is composed of many entities which might give contradictories signals to MM. Let’s take two examples : i) on one hand MM has to stick to the investments level specified by the *Piano d’Ambito* which has been approved by Milan’s municipality, on the other hand digging authorization are so complex to obtain that they slow down MM investments’ rhythm. ii) on one hand the water tariff is a political issue and Milan’s municipality push for keeping a low water tariff, on the other hand the municipality still asks MM to pay a significant yearly fee (§5.1) .

From the general public point of view, Milan’s WSS is seen as a well performing public service delivering the water and sanitation service at an affordable price (the lowest price in Italy). Indeed, if we limit to the first perimeter of analysis our case study confirms that MM-WSS in itself is rather well performing. However an enlarged perimeter of analysis shows that MM is part of an imposed baroque institutional governance system (institutional map in Figure 41) which is neither very effective nor efficient. Indeed, the regulatory architecture at local level is perfectly performed from a formal point of view but does not seem to be truly taking place in substance. This is largely due to the total lack of knowledge and capabilities left to Milan’s municipality and AATO-MI after the corporatization. Luckily, MM’s commitment to public service mission balances such a lack of control.

The entry of a national regulator (AEEG) into the water sector regulation arena might be criticized on the basis that it makes the regulatory process more complex and costly. From our perspective however, additional complexity and transaction costs will be

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<sup>290</sup> *Il terzo incomodo*

justified if AEEG's guidelines and supervision will imply a switch from a formal vision of the regulatory process to its substantial implementation.

One might consider that Milan's WSS is effective and well performing, within the short run public service goal consisting in delivering a good quality water and sanitation service to all users at an affordable price. The judgment might be quite different if one adopts a long run and intergenerational point of view using "sustainability" as an evaluation criterion. Is Milan's WSS fully sustainable? Not really. On the contrary it seems that much more effort would be needed both from the environmental and infrastructural point of view to reproduce the infrastructure capital and to restore the good ecological status of the river system (§6.3).

Capital expenditures and investments are crucial in a WSS service. One of the weakest points of the implementation of the Galli reform was that investment plans (*Piani d'ambito*) were too ambitious and often not "bankable". Things got even worse after the 2011 referendum due to the regulatory uncertainty it created (§6.1). The new MTT implemented by AEEG should help restoring the bankability of the Italian water sector.

However all efforts made by AEEG will be useless if the Damocles sword of an effective extension of the Internal Stability Pact to the debt of publicly owned companies isn't removed (§6.4). Indeed, the low tariff level of Italian WSS does not allow a good level of self-financing of the planned investments. If their access to debt was to be constrained by the Internal Stability Pact, Italian WSS would be condemned to stay in the under-investment status in which they have been for the last decades. Their sustainability would be challenged even more.



## **Part IV. Conclusion**

This last part is composed of three sections. In Section 6 we analyze Italian and French Water and Sanitation Services thanks to the trade-offs matrix detailed in Part I (Table 3 in § 5.3). In that same section we also add a few case stories of development of Water and Sanitation Services in other cities in France and in Italy.

Section 7 focuses on the financing history of water infrastructure in other countries (UK, USA and Germany).

Section 8 is the general conclusion of this thesis.

### **6 Answers to key trade-off in France and in Italy**

This Section summarizes the cases of Paris and Milan water services which have been analyzed in the various papers in part II and III. We refer the two case studies to the public finance theory we presented in the beginning (Part I) and to the trade-offs matrix we sketched (Table 3 in § 5.3). We analyze what were the choices made by policy makers in these two cities. The first paragraph (§6.1) gives a necessary historical analysis on trade-off n°6 : what were the intergovernmental financial relations and the source of exogenous revenues in both countries?

The second paragraph focuses on the choices made in terms of trade-offs in the early expansion phase until 1925 while the third one concerns the 20<sup>th</sup> century after 1925.

As much as possible we try not to limit our analysis to the two case studies and expand it to the national trends in the two countries also using a few more case studies from the existing literature (§6.4 and §6.5).

#### **6.1 Source of the exogenous revenues in France and in Italy**

In our model, costs uncovered by endogenous revenues (club-finance) are covered by exogenous ones (tax-finance). What is the source of these revenues? Are they covered by the Local Government Unit (LGU) or by the central government? Local exogenous revenues may be labeled as “Taxes” in the OECD 3T’s paradigm while National exogenous revenues may be considered as “Transfers”.

This paragraph starts with a snapshot on France and Italy before 1925. It then focuses on local public finance reforms in France after the 1920's. The Italian case has been already discussed in our paper (Crespi Reghizzi forthcoming d) in Part III.

### 6.1.1 France and Italy before the 1920's

This sub-paragraph gives a summary of what has been written on these issues in Crespi Reghizzi (forthcoming c, § 2.1)

At first, through the 19<sup>th</sup> century, both in France and in Italy, there were no recurrent financial transfers from the central government to the municipalities. Thus, the fiscal autonomy of municipal budgets was very high even though municipalities only had partial tax sovereignty on most fiscal sources which were shared with the central government.

Municipal revenues of urban municipalities were coming mainly from indirect taxes and in particular from excise duties (the *droit d'octroi* in France and the *dazio di consumo* in Italy) on goods entering the city. At that time excise duties were shared taxes between the central government and the municipalities. There were various attempts to abolish excise duties but the difficulty to find other fiscal revenues to replace them, postponed their definitive abolition at national scale in France until the 1940's by the *Vichy* regime (Brunet 1981, 118–136). However the percentage share of excise duties over total municipal revenues kept decreasing: 73 % in 1910, 19 % in 1930 and 11 % in 1936. In 1934 excise duties were collected in 278 French municipalities of more than 10 000 inhabitants (Pinol 1999, 71).

Other fiscal sources consisted in piggyback taxes. In France the *centimes additionnels* on the 4 national taxes (*les quatre vieilles*) established after the Revolution were kept as municipal taxes for a significant part of the 20<sup>th</sup> century. In Italy too, municipalities could ask to be authorized by the central government to impose additional levies on national taxes (income tax, land property tax and building property tax)(Cassar and Creaco 2007, 716).

These direct taxes played a minor role both in Paris and Milan as the excise duties represented respectively more than two thirds and more than half of the total municipal revenues of the two cities (Volpi 1959, 25; Cadoux 1900).

### 6.1.2 Italy after WWII

We already showed in one of our papers (Crespi Reghizzi forthcoming d) that after WWII, Italian municipalities' financial autonomy was heavily reduced and own tax revenues to total spending ratio got very low meaning that exogenous revenues came mainly from the central government. It was only in the 1990's that some local fiscal autonomy was given back to Local Government Units.

### 6.1.3 France between 1917 and the 1980's

#### Between 1917 and 1940's

In 1917<sup>291</sup> the French national tax system was heavily reformed. It was not anymore based on the 4 national taxes (*les quatre vieilles : contribution foncière sur le bâti et le non bâti, contribution personnelle mobilière, contribution sur la patente, contribution sur les portes et fenestres*) but on national income tax (*impôt national sur le revenu*). However the *centimes additionnels* were kept as sources of municipal fiscal revenues. The amount of these local taxes was still computed as piggyback taxes even though they were based on a "principal" which was not anymore collected by the central government (Lainville 1928, 26; Lainville 1930, 82; Brunet 1981, 136). The rates of the piggyback taxes were set by the municipalities which however had to respect some constraints. A part of the *centimes* were compulsory while other were freely set. Moreover, when the piggyback tax rate exceeded a specific cap, the prefects authorization was required (Lainville 1930, 13–16). Such an authorization was generally obtained (Lainville 1928, 42).

In 1925, a major cadastral revision was made. However the revised cadastral values had an impact only on the national income tax base while the local piggyback taxes were still based on the previous non revised cadastral values (Lainville 1928, 20–21)

Transfers from the central government were another source of municipal revenues. These transfers were composed of two major categories :

- a) *Fonds communs* (revenue sharing). For example *fonds commun sur les boissons et sur les contributions indirectes, fonds commun sur le chiffre d'affaires*. The

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<sup>291</sup>Loi 31 juillet 1917

central government collected a tax and shared it among the municipalities according to specific criteria (e.g. number of inhabitants)

- b) *Subvention* (transfer grant): most of the time the grant was proportional to the relevance of the level of the piggyback tax rate. Incredibly, the higher was the tax rate (*centimes*), the higher was the grant (Lainville 1928, 66) meaning that the wealthier was the municipality, the higher the grant it would receive. These grants were mostly ear-marked for specific lump-sum capital expenditures such as streets, schools, health centers and water supply networks but there were also some grants for recurrent expenditures such as the fire brigade<sup>292</sup> (Lainville 1930, 12).

Transfer grants were awarded to municipalities both by central government and by the counties. Jean-Luc Pinol underlines that there were huge disparities among municipalities in the level of transfer grants received. In 1934, an average municipality of the Seine county received 169 francs *per capita* from the central government and 68 francs *per capita* from the county. Outside the Seine county these figures were respectively of 36 and 7 francs *per capita* (Pinol 1999, 76).

After 1919, municipal expenses increased suddenly due to both the economic context (inflation) and to the national legislation (in particular the reduction of the daily labour duration to height hours) (Brunet 1981, 117).

### **The 1941 reform in France**

The fiscal reform of 1917, the difficult economic context, the increased municipal expenses and the wish to abolish the excise-duties without giving up their revenues made a new reform of local public finance necessary. It was launched in France in the 1941/1942<sup>293</sup> during the *Vichy* regime, which increased centralisation.

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<sup>292</sup>ex : *subvention du département pour assistance aux familles nombreuses et aux femmes en couche, subvention de l'état pour construction scolaires, subvention de l'état sur les fonds du pari mutuel pour l'adduction d'eau* (Lainville 1928, 66)

<sup>293</sup>Various acts were passed : Loi 14 sept 1941 portant révision des rapports financiers de l'Etat, des départements et des communes & Loi 31 octobre 1941 modifiant le régime des licences des débits de boissons & Loi 6 novembre 1941 sur les taxes additionnelles au droit enregistrement & Loi 6 novembre 1941 autorisant les communes à instituer une taxe locales sur les ventes au détail et prestations de service – Journal Officiel *JO 7 novembre 1941* and *JO 1<sup>er</sup> janvier 1942*

The excise duty was abolished and replaced by a local sales tax (*une taxe locale sur les ventes au détail et prestations de service*)(Vatus 1982). The various revenue sharing mechanisms (*fonds communs*) and transfer grants (*subventions*) were abolished and merged in a single yearly transfer grant. The grant was designed to take into account various factors among which the size of the municipality, the level of its piggyback taxes and the number of children going to school (Lainville 1942).

One of the aims of the reform was to simplify the local public finance system and to partially untighten the interlink between central government and local authorities finance deriving from the revenue sharing mechanisms (*fonds communs*) which were previously in place (Lainville 1942, 23–27).

### **The 1959 reform in France**

The 1941 reform left untouched the piggyback taxes (*centimes additionels*) which kept being collected despite the abolition of central government taxes on which they were supposed to be added in 1917. The mechanism of the *centimes* implied a stable and never changing share of the tax burden between land-owners, tenants and industrial/commercial activities. It was also criticized for being complex, opaque and based on artificial tax bases poorly connected with reality since the cadastral values had not been updated for a long time (Chaix 1986, 15).

In 1959<sup>294</sup>, an administrative act established the principle of replacing the *centimes* with four exclusive local taxes computed on real tax bases and on tax rates quite freely set by local authorities (Chaix 1986, 15) : a) tax on built-up land (*taxe sur le foncier bâti*), b) tax on land (*taxe sur le foncier non bâti*), c) housing tax (*taxe d'habitation*) and d) business tax (*taxe professionnelle*<sup>295</sup>). In fact the implementation of the reform was long and complex and ended only in 1980<sup>296</sup>.

Before the decentralization reforms which were implemented in the 1980's, autonomous fiscal revenues of local authorities averaged only at 25% of total local revenues. 40.5 % and 20.4 % of the revenues came from transfers from an upper level of government, ear-

<sup>294</sup>Ordonnance 7 janvier 1959

<sup>295</sup> What would become the *taxe professionnelle* in 1975 was still labeled as the *taxe sur les patentes* Chaix 1986, 71; Brémond 1989, 152–153)

<sup>296</sup>Loi du 3 janvier 1979 on the « *dotation globale de fonctionnement* ». Loi 10 janvier 1980 on the new local taxes. For more details the reader shall refer to Chaix (1986) and to <http://www.assemblee-nationale.fr/histoire/decentralisation.asp>

marked respectively for capital expenditures and operational expenditures. 13% of the revenues came from loans. Additionally, most of local authorities investments were financed by non autonomous financial resources. As a matter of facts, the fiscal and financial autonomy of local authorities was very low and obliged them to rely heavily on external resources for investments and new public services (Chaix 1986, 18).

#### 6.1.4 France after the 1980's

##### The decentralization reforms

Between 1981 and 1983 various legislative acts increased the decentralization of French multi-level state. An additional level of government had been created in 1963 : the region. The *a priori* control exerted by the central government on local authorities' decisions was replaced by the *a posteriori* control exerted by the *Cour des Comptes*. New responsibilities were given to the communes together with new financial resources<sup>297</sup>.

Between the late 1970's and today the attempt to increase the decentralization of the French multi-level state has been a steady trend implemented through various reforms (on which we do not focus). Indeed "it took France 30 years to move from a highly centralized system to a fairly decentralized one"(Prud'homme 2006, 113).

Rémy Prud'homme also points out that what had characterized the centralized multi-level French state was not only the relatively low local fiscal autonomy but also and mainly the many controls and constraints that central government imposed on local government units: a) prefect's approval of public services fees level, b) imposed minimum and maximum level of local tax rates, c) approval of municipal budgets<sup>298</sup>, d) constrained borrowing and e) constrained investment policy (Prud'homme 2006, 88)

"For a long time, *communes* and *départements* were treated like children who required supervision and guidance. In a *département*, the prefect had more power than the elected council chair; the *département* budget was actually prepared by the prefect staff, and in many cases, the prefect chaired council meetings, even in the presence of the elected council chair.

<sup>297</sup> <http://www.assemblee-nationale.fr/histoire/decentralisation.asp>, retrieved online on April the 2<sup>nd</sup> 2014

<sup>298</sup> For example in 1934 a decree (Décret Loi 25 juin 1934) reinforced the control of the national administration on the municipal budget (Pinol 1999, 70).

This multifaceted control or tutelage of subnational governments defined centralization in France as much as or more than the relatively large ratios of central-to-local taxes and responsibilities. The history of decentralization in France, which occurred over the 1970–1990 period, is largely the history of the gradual relaxation and abandonment of these controls much more than the history of the shift of central-to-local taxes and responsibilities. Now, French subnational governments enjoy an extremely high degree of autonomy. They do pretty much what they want with their taxes, their expenditures, their debt, their regulations, and their employees. Constraints and mandates are minimal. In that sense, today’s France can be considered a relatively decentralized country“ (Prud’homme 2006, 88).

### **Intergovernmental relations after the decentralization process**

In the early 21<sup>st</sup> century, resources of local authorities in France still come mainly from three major sources : a) local service fees and non-fiscal resources, b) local taxes and c) transfers from central government and from the upper levels of government.

The main local taxes are still somehow the heirs<sup>299</sup> of the four *vieilles*: business tax<sup>300</sup> (*taxe professionnelle*), property tax (*taxe foncière*) plus the garbage tax and housing tax (*taxe d’habitation*). For many taxes the tax bases are shared among different subnational levels of government (*région, département, commune*) but not with the central government. However each level has a relative freedom in setting the tax rate level as long as it respects the maximum level of tax rate imposed by the central government (Prud’homme 2006, 94–95).

Transfers from the central government and from others upper levels of government are still very significant. In 2004 “such transfers represented about half of local government income and about 16 percent of central government expenditures” (Prud’homme 2006, 100). These transfers<sup>301</sup> are “formula driven” and “not discretionary”. They are not ear-

<sup>299</sup>(Brémond 1989, 140–141)

<sup>300</sup>The business tax is paid by all enterprises. “The tax base used to be a mix of capital and wages. In 1999, wages were eliminated from the calculation of the tax base” (Prud’homme 2006, 96)

<sup>301</sup> These transfers are composed of general subsidies (mainly the *Dotation Globale de Fonctionnement - DGF* and the *Fond Compensation TVA – FCTVA*), of decentralization subsidies (which were approved when additional responsibilities were given to the LGU) and of compensation subsidies (which are funds paid in order to compensate for some lost local tax revenue when the central government abolishes a local tax or approves a local-tax reduction or exemption)(Prud’homme 2006)

marked. Some of these transfers such as the *Dotation Globale de Fonctionnement*<sup>302</sup> are “a replacement for particular local taxes that were eliminated in a distant past (1969)” (Prud’homme 2006, 103).

Local governments can do what they want with the subsidies they receive, even if and when those grants are calculated in reference to well-defined uses. [...] This arrangement is a great change from the situation that prevailed 30 years ago, when most subsidies were earmarked for a specific use or project. Official documents (followed by many analysts) continue to distinguish between operating subsidies and investment subsidies. This distinction is a mere accounting curiosity with no practical meaning. For a given local government, subsidies are as good as own source taxes (Prud’homme 2006, 100).

## 6.2 The early expansion phase till 1925

### 6.2.1 The initial picture

Here we analyze the early 19<sup>th</sup> century picture prior to the beginning of our time frame with the trade-off matrix we sketched (Table 3 in §5.3 in Part I).

Before the creation of a modern water supply service, water in the urban environment had both a fully public good and a private good nature. In Paris, Seine water and water delivered for free at public fountains was a fully public good. In Milan too water drawn from the canals (*I navigli*) for non drinking purposes was a public good<sup>303</sup> while water drawn from private wells had a private nature<sup>304</sup> (Crespi Reghizzi forthcoming b, § 3.1). In both cities water-carriers (*porteurs d’eau*) offered at a given price home-delivery of water (*l’eau à l’étage*). Once delivered at home, water was fully a private good (market good).

In Paris, some years before, at the end of the 18<sup>th</sup> century, the experience of the *Compagnie des Eaux de Paris* founded by the *Frères Périer* (Box 1 in Crespi Reghizzi forthcoming a) had been an attempt to home-deliver water as a club-good with voluntary membership (and thus with exclusion). However the *Périer* club was obliged

<sup>302</sup> The History of the creation of the DGF is given in Brémond (1989, 118).

<sup>303</sup> In theory public fountains and wells had a public good nature because in practice there could be rivalries to access to the well or to the fountain, possibly regulated by clientelism or by mafia-like systems of power.

<sup>304</sup> Except that groundwater pollution or overdraft could make it a common pool resource.



to set a quite high level of exclusion (relatively high water tariff) since it could rely only on endogenous revenues. Additionally, the Périer club was in competition with public good water delivered for free at public fountains. People did not rush to become members and the *Compagnie des Eaux de Paris* failed.

Waste water disposal also had a dual nature. At that time the sewer system was embryonic and mainly designed for drainage. Waste water collection through the sewers (*tout à l'égout*) was forbidden. The first solution consisted of discharging waste water for free in the urban environment – in the streets or under the ground with significant negative externalities both in terms of public health and environmental pollution.

At some point the public authorities became aware of the negative impact of water pollution in terms of health conditions. Thus, they imposed to stop discharging freely feces and waste water in the environment. When this happened, wastewater and feces were collected through cesspools (*fosses d'aisance*) and sanitary tubes (*tinettes filtrantes*). In Paris, water could be discharged freely but feces were to be collected in cesspools or barrels which needed to be emptied once full (Dupuy and Knaebel 1982, 5). Landlords would need to contract with cesspools emptiers and pay them for the service (waste water disposal with private good nature).

Thus, the prohibition to discharge feces and water for free in the environment created the need for a waste water disposal service to comply with the law.

### **6.2.2 Water as a club good with voluntary membership**

Through the 19<sup>th</sup> century in Paris and after 1888 in Milan the development of a municipal water service took place. At first water was delivered both through domestic water connections (*“service privé” – eau à l'étage* in Paris) and through public fountains (*“service public”* in Paris) having respectively club good and public good nature.

In both cities domestic water delivery was developed by the municipality as a service provided by Collective Consumption Unit (CCU) with voluntary membership and exclusion. However, the exclusion level was not set too high as total costs were at first covered by a mix of endogenous and exogenous revenues. The endogenous revenues had a tariff nature (non fiscal). The exogenous revenues came mostly from local taxation

since there were no recurrent transfers from the central government to the municipalities at that time (§6.1).

In Paris at first, endogenous revenues were not metered and collected through flat payments. After 1876, in Paris, collective meters were installed and the water service was paid through a volume based tariff. In Milan, water was collectively metered from the start of the service and billed through a two part tariff (Crespi Reghizzi forthcoming a, § 4.4; Crespi Reghizzi forthcoming b, Section 5).

Membership to the water service CCU was voluntary and despite the not-so-high exclusion (tariff) level, the subscription rhythm to the water service was not so fast. With the development of the hygienic theories and the discoveries of Koch and Pasteur, policymakers and public opinion became aware of the positive health externalities of improved water supply and sanitation. The water service started being considered as a merit good and the municipal authorities decided to incentivate the subscriptions to the service either through lump-sum connection subsidies or through setting low level of CCU membership (low percentage of total costs covered by endogenous revenues) (Crespi Reghizzi forthcoming a, § 4.4; Crespi Reghizzi forthcoming b, Section 5).

### **6.2.3 Institutional nature of the Collective Consumption Unit (CCU)**

In both cities the water service was provided by a municipal department : according to our matrix this is a collective consumption unit (CCU) internal to the Local Government Unit (Cat A in Table 2 in § 4.6).

The production unit was also municipal as the attempt to award a concession to a private partner failed (Crespi Reghizzi forthcoming a, §2.4; Crespi Reghizzi forthcoming b, §3.1). In Paris however an innovative public-private partnership was made with the *Compagnie Générale des Eaux* which was responsible for metering, billing and collecting the endogenous revenues (Crespi Reghizzi forthcoming a, § 4.1).

### **6.2.4 The intertwined development of water and sanitation services as CCUs with coerced membership and no exclusion**

At a certain point, the path followed by the water service started being tightly intertwined with sanitation. At first sewers were aimed at urban drainage which had a public good nature. Both in Paris and in Milan with the *tout à l'égout* revolution (feces and wastewater collection through the sewer system) sanitation was made compulsory.

This was not the case all over France as we will show in § 6.4.2. The sanitation service was provided as a CCU with compulsory membership and no exclusion. All landlords with a sewer nearby had to become members of the CCU and to pay the service received through an ear-marked sanitation levy (endogenous revenues) which had a fiscal nature. Developing a sewer system required huge investment costs which were covered only to a very small extent by endogenous revenues. Exogenous revenues (tax-finance) played a major role in obtaining a financially balanced budget. In Paris, the sanitation endogenous revenues were collected through a fiscal sanitation levy based on the property value of the buildings (*Taxe municipale sur les tuyaux de raccordement à l'égout*) while in Milan the sanitation levy was proportional to the surface of the house (Crespi Reghizzi forthcoming a, § 4.4; Crespi Reghizzi forthcoming b, Section 5).

In Paris, thanks to the 1894 *tout à l'égout* law (through the decree of August 8<sup>th</sup> 1894), not only sanitation but also the water service became a CCU with compulsory membership (and no exclusion). Officially the subscription to the water service was made compulsory to ensure sufficient fluidity into the sewer system but an implicit objective was also to improve the financial equilibrium of the water service (Tréhu 1905; quoted by Bellanger, Pineau, and SIAAP 2010, 84; Crespi Reghizzi forthcoming a, § 4.4). In Montreal too an obligation to connect to the water service was enforced (see also the Box 10 here below). In France, it seems that such an explicit obligation to connect to the water service is a striking peculiarity of the Paris case which was not generalized to the rest of the country.

In Milan we did not find explicit reference to the obligation to connect to the water service but just before WWI 81 % of the houses were connected to the water service (Crespi Reghizzi forthcoming b, § 5.3). Furthermore, in 1896 in Italy, a ministerial legislative act not only required the installment of latrines in flats in urban areas but also made it compulsory to have a domestic water connection in the urban areas where water is present in sufficient quantities<sup>305</sup>.

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<sup>305</sup>“Nelle città ed aggregati, dove vi sia una sufficiente distribuzione di acqua nelle case, sarà obbligatorio per le latrine, l'uso di apparecchi a chiusura idraulica, con a disposizione almeno dieci litri di acqua di lavaggio al giorno per persona.” Art. 70-72, Istruzioni Ministeriali 20 Giugno 1896 *Compilazione dei regolamenti locali sull'igiene del suolo e dell'abitato*. Source : [http://architettura.it/notes/ns\\_nazionale/anno\\_96/ISTR.MIN.20-6-96.html](http://architettura.it/notes/ns_nazionale/anno_96/ISTR.MIN.20-6-96.html) retrieved online on March 28th 2014

In Milan and in Paris, the sanitation service developed from the beginning as a CCU with compulsory membership while the water service started first as a CCU with voluntary membership. That explains why, at first, endogenous revenues had a fiscal nature for the sanitation service while they had a non fiscal nature for the water service. When the water service became a CCU with compulsory membership in Paris, it kept collecting endogenous revenues through meters on a non-fiscal basis.

We do not know whether these mandates to connect to the water service were enforced tightly or not. Nevertheless, we assume that they played a significant role in the expansion phase since they spread the idea that the water service was an essential CCU to be member of. Furthermore, we argue that the action of getting connected to the water service is almost an irreversible one. Indeed private connection to the water service is such a positive change for people lives that once having experienced it, people would hardly go back to the previous situation. Thus, once people have installed and experienced private water connection, the obligation to connect is not needed anymore as most people would anyway probably choose to stay member of the water service CCU on a voluntarily basis.

**Box 10 : Water provided through a CCU with compulsory membership in Montreal**

In **Montreal** the water service was municipalized in 1843-1845 when the municipality bought the former private operator *Compagnie des propriétaires des eaux de Montreal*. The private operator had run the water service as a CCU with voluntary membership and financed through endogenous revenues.

Once municipalized, the water service kept being operated by a corporation with an accounting system distinct from the municipal one. At first the water service kept being operated as a CCU with voluntary membership and financed through endogenous revenues. In reality the municipality wished to make subscription and payment of the water service compulsory in order to obtain a fast rhythm of subscription to the service and thus reach the necessary economies of scale. However at first the municipality was not authorized to do so. In those years the water service was trapped in an under-investment circle : a slow rhythm of subscription implied little endogenous revenues which did not make possible to expand the network.

A few years later, in the 1850s, having a water supply network in all streets started being considered as increasingly strategic for fire protection. An ambitious investment policy was undertaken to expand the network in every street. According to Fougères, the municipality had to choose among three financing options : i) to subsidize the water service using money from general taxation, ii) to make the municipal fire protection department pay for the investment costs or iii) to make the water users pay the full costs. In fact options i) and ii) implied the same financing choice as the fire protection department was financed through general taxation: it would have meant to cover costs through exogenous revenues. On the contrary municipality chose and obtained to make the water service compulsory. Everyone having a water main nearby had to connect and was charged a compulsory water levy which had a fiscal nature. A similar way of collecting endogenous revenues was also adopted in the UK (see section 7).

Source : (Fougères 2004)

### **6.2.5 Investments, repayable finance and end-payer**

In the previous pages we looked how Paris and Milan answered the trade-offs 1 to 6 at the top of the matrix (Table 3 in §5.3). We now look at the bottom of the matrix (trade-offs 7 to 10).

In both cities, water and sanitation infrastructure planning and management was officially municipally driven. Infrastructure projects were planned and managed by the municipality (the LGU in the matrix). However in practice the municipal autonomy of Paris was not so high as the City was administered by a prefect appointed by the central government (eg. Haussmann nominated by the Emperor Napoleon III). Moreover, the high ranking civil engineers managing the water and sanitation service in Paris were members of the national *Corps des Ponts et Chaussées* and thus were both part of the local and national public administration.

In both cities investments were paid by the municipality through ordinary funds and through repayable finance. The municipality was the borrower. Debt was centrally managed by the municipality to fund municipal needs as a whole. Only in a few cases was debt contracted to cover sector-specific needs. The city's fiscal revenues (exogenous revenues) were given as collateral in most of the loans. Only in a few occasions, endogenous revenues were used as collaterals. Borrowing was submitted to

approval by an upper level of government. No spatial equalization mechanism was in place at that time.

Loans and bonds had a long term maturity and a fixed interest rate. The high inflation of the early decades of the 20<sup>th</sup> century played a major role in lowering the debt service in real terms *De facto* a part of the investment costs were absorbed and transferred to the lenders.

Furthermore in Paris during the Second Empire, Land Value Capture tools also played a significant role in financing urban infrastructure including the water network and the sewer system. This financing tool made possible to lower the costs to be covered by the water and sanitation service.

We showed (Crespi Reghizzi forthcoming a; Crespi Reghizzi forthcoming b) that by the early decades of the 20<sup>th</sup> century nearly all total costs of the water and sanitation service considered as a whole were covered by endogenous revenues. This was possible thanks to the effect of long run fixed interest debt combined with high inflation (and in Paris also thanks to the implementation of land value captures tools) which lowered the WSS total costs.

### **6.3 The evolution beyond 1925**

This section extends beyond 1925 the analysis of the choices made by the two cities regarding the trade-offs matrix. To some extent it is a summary of what has been discussed in the three papers in Part III (Crespi Reghizzi forthcoming d; Crespi Reghizzi forthcoming e; Crespi Reghizzi forthcoming f). However, the analysis through the trade-off matrix is original and includes additional evidence on the French case.

#### **6.3.1 Institutional nature of the Collective Consumption Unit (CCU)**

In **Italy** an autonomous legal form for local public services (Cat. B in §4.6) was created in 1903 (*Azienda Municipalizzata*). However full municipal provision of the service (as in Milan) was still possible (Cat A in §4.6). The institutional nature for the Collective Consumption Unit did not change until the reforms of the 1990's (Legge Galli in 1994 and decree 448/2001) which made compulsory for water and sanitation services to be provided by joint stock companies (Cat C in §4.6) with public, private or mixed ownership.

**Milan**'s municipality kept the water and sanitation services as municipal departments (Cat. A in §4.6) from its inception in 1888 till 2003 when a concession for the WSS was awarded to *Metropolitana Milanese SpA* (Crespi Reghizzi forthcoming f).

We already reminded that in **France** the *régie à autonomie financière* legal status was created in 1926 (larger financial autonomy from the LGU but still within Cat A in §4.6) and that the *régie à personnalité morale et autonomie financière* (Cat B in §4.6) was introduced in 1962 (Crespi Reghizzi forthcoming e, § 2.5.1). This new legal status for water and sanitation services was created by the central government in order to incentivize the WSS services to be budget-balanced, i.e. to cover their costs with endogenous revenues rather than with exogenous ones. However, water and sanitation services created before 1926 were authorized to keep their non autonomous legal status (*régie directe / régie simple* - Cat A in §4.6).

After 1926<sup>306</sup> and 1930<sup>307</sup> local authorities were also authorized to take shares and eventually create joint stock companies with mixed ownership (*Société d'Economie Mixte* – SEM) to provide municipal public services with an industrial and commercial nature (Mourareau and MAT 2007, 7). The SEM legal status was better defined by a 1955 decree<sup>308</sup>. SEM were not very common in the water sector while they very largely used after WWII in urban development and renovation operations. In 1983<sup>309</sup> a reform of the SEM legal status was made. The 1983 reform established that a SEM was to be fully ruled under private law and private accounting principles (Cat C in §4.6). It also made compulsory for local authorities to control the majority of the shares of the company even if they had to stay below 75 % of the shares (and later 85 %). In 2010<sup>310</sup> a new legal status was introduced : the *Société Publique Locale* (SPL). A SPL is a joint stock company fully owned by at least two different local authorities or governmental institutions.

**Paris** water service kept being provided by a municipal department together with a *régie intéressée* contract with CGE until the 1980's when major institutional reforms were made by mayor Chirac (see also Appendix 1). In 1984 the water supply

<sup>306</sup> Decrees *Poincaré* of the 5<sup>th</sup> November and 26<sup>th</sup> November 1926

<sup>307</sup> Judgement of the *Conseil d'État*, 30 mai 1930, *chambre syndicale du commerce de détail de Nevers*

<sup>308</sup> Decret n° 55-579 du 20 mai 1955,

<sup>309</sup> Loi n° 83-597 du 7 juillet 1983

<sup>310</sup> Loi n° 2010-559 du 28 mai 2010

distribution was delegated through an *affermage* contract to the CGE on the right bank of the Seine and to *Lyonnaise des Eaux* (LDE) on the left bank. In 1987 the SEM SAGEP (Société Anonyme de Gestion des Eaux de Paris) was created. SAGEP was owned by Paris municipality (70 %), by CGE and LDE (14% each) and by other public institutions for a small share. SAGEP was in charge of water production through a concession contract.

When the two *affermage* contracts expired in 2009, the water service was municipalized once again and the full responsibility of the service (production, distribution, metering and billing) was given to the new autonomous entity *Eau de Paris*<sup>311</sup>.

What about sanitation in Paris? The local waste water collection part of the sanitation service never stopped being under the responsibility of a municipal department from its creation till now. However the large interceptors system outside the city and the waste water treatment plants were developed and operated on a regional scale by *Seine* county (*Département de la Seine*) also on behalf of the *Seine et Oise* county through a cooperation agreement made in 1933 (Bellanger, Pineau, and SIAAP 2010, 213 & 217). When in 1964 the *Seine* county was dismantled to create 4 counties in Paris and 1<sup>st</sup> ring, the responsibilities on the main sewer system and waste water treatment plan were transferred to an *ad hoc* inter-county entity : the SIAAP – *Syndicat Interdepartemental d'Assainissement de l'Agglomération Parisienne* (Bellanger, Pineau, and SIAAP 2010, 277).

### 6.3.2 Endogenous or exogenous revenues

We showed that after WWII in **Milan (and in Italy)** water tariffs were heavily regulated to pursue general interest goals (anti-inflation policies). Endogenous revenues were capped and in Milan they were even below operational expenditures (OPEX) in the 1970's (Crespi Reghizzi forthcoming d, § 4.3). By definition costs uncovered by Endogenous revenues are covered by exogenous revenues. It was only with the reforms of the 1990's that price control policies were softened according to the principle of full industrial cost recovery.

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<sup>311</sup>*Eau de Paris* is an *Etablissement Public Industriel et Commercial* (EPIC) which is classified in cat C in §4.6. See also Barraqué (2012).



In France, the central government started adopting legal measures to encourage cost-recovery of water services through endogenous revenues back in the 1920's and 1930's with the creation of more distinct and autonomous forms of collective consumption units (*régie à autonomie financière*) in 1926 and with a 1937 decree asking autonomous water services to have balanced budgets. However local authorities were reluctant and kept as much as possible their water and sanitation services under the previous non autonomous regime (*régie directe*) (Crespi Reghizzi forthcoming e, § 2.5.1).

In France during the 1960's it was made compulsory for the water and sanitation services to have balanced budgets including investments and debt amortization<sup>312</sup>. Despite the anti-inflation tariff limitations<sup>313</sup>, step by step the water pays for water principle (*l'eau paie l'eau*) was enforced through the implementation of distinct accounts for water and sanitation services and became effectively applied in the 1980's (Crespi Reghizzi forthcoming e, § 2.5.1–2.5.3).

### 6.3.3 CCU Membership & technical nature of the endogenous revenues

Water and sanitation services in both cities can be considered as CCUs of which *de facto* everybody is member all along the 20<sup>th</sup> century after the end of the expansion phase. We make the assumption that may be due to one or more of the following reasons : i) explicit obligation to connect, ii) enforcement of sanitary rules on buildings and houses or iii) private water connections being considered as an essential living standard.

At first sanitation was paid through a flat levy. In Paris the sanitation levy was introduced in 1894 while in the rest of France it was authorized only in 1926<sup>314</sup>.

Bernard Barraqué (2011a) underlines that as the need to treat wastewater emerged, it implied higher operational costs for the sanitation service and induced policy-makers to adopt a volume-indexed sanitation levy instead of a flat one. The next step was to

<sup>312</sup> Décret 29 Décembre 1962, Décret 67-945 du 24 Octobre 1967 et Instructions Comptables n°67-113 du 12/12/1967 et n°69/69 du 12 juin 1969

<sup>313</sup> Between 1952 and 1970 and between 1978 and 1987 water tariffs are regulated and submitted to the prefect's approval in application of anti-inflation policies.

<sup>314</sup> The *taxe municipale de déversement à l'égout* was authorized by the *Loi du 23 Aout 1926* (Scherrer 1992, 156)

include the volumetric levy in the water bill as it was the easiest way to collect it<sup>315</sup>. This was imposed by the national regulations both in France and in Italy respectively in 1967<sup>316</sup> and in 1976<sup>317</sup>.

#### 6.3.4 Legal nature of the sanitation levy

An open question is whether the sanitation levy has a fiscal nature or not. Is it a payment in front of a service rendered (non-fiscal) or is it a fiscal payment *tout court* that everyone has to pay whether being connected to the wastewater network or not ?

In principle, when one thinks in terms of service rendered, the sanitation service can be considered as being composed by two CCUs with different beneficiaries (members). On the one hand collecting waste water and channeling it away from the city is clearly a service rendered to the water users which are members of the CCU. On the other hand treating wastewater before discharging it into the river is a service rendered to all the people living further downstream. *Stricto sensu* it is not a service rendered to the upstream water users.

In presence of a legislative obligation on the quality of waste water discharged in rivers, waste water treatment might eventually be considered as a collective service rendered to the upstream water users through a collective consumption unit in order to respect the law. This view could be considered as a way of making the *polluter-pays principle* intellectually compatible with the *fiscal equivalence principle* and with the *benefit approach*.

In practice, French jurisprudence considers that in urban areas, once everybody is connected, the sanitation levy becomes a non fiscal payment in front of a service rendered (*paiement pour service rendu*). However all those that can be technically connected have to pay for sanitation even if they are not connected. On the contrary the

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<sup>315</sup> In France it was also the best way to bypass local authorities' reluctance to pay the pollution discharge levy when the French River Basin Agencies were created : thus both the levy and sewer charge were transferred on the water bills (Bernard Barraqué, private conversation).

<sup>316</sup> Décret n°67-945 du 24-10-67 relatif à l'institution, au recouvrement et à l'affectation des redevances dues par les usagers des réseaux d'assainissement et des stations d'épurations.

<sup>317</sup> Legge n. 319 del 10 maggio 1976 Legge Merli

*Conseil d'Etat* ruled against the payment of the levy by inhabitants of rural areas where a sewer system is not present (Barraqué 2011a, 6)<sup>318</sup>.

In Italy the volumetric sanitation levy introduced in 1976 was composed of a waste water collection levy and a water treatment levy. The first one was to be paid by all connected and technically connectable users. The latter was due only if a waste water treatment plant was in operations in the area. In cities, such as Milan, where a wastewater treatment plant was not in operations, this implied lower endogenous revenues collected after the *Legge Merli* than previously (Crespi Reghizzi forthcoming d, § 4.3).

According to the 1994 Galli act all users, even those unconnected to the sanitation service, were obliged to pay the volumetric sanitation levy<sup>319</sup>. In application of the polluter-pays principle, the sanitation levy was considered as an environmental tax with a fiscal nature rather than a payment for service rendered. There were however various legal actions against such a vision and in 2008 the Constitutional court<sup>320</sup> ruled against the Galli act and established that the sanitation levy is a payment for service rendered which does not have a fiscal nature and must not be paid when the service is not provided<sup>321</sup>.

### 6.3.5 Infrastructure planning, management & borrowing

In both countries municipalities (or inter-municipal entities) were formally responsible for planning and managing the water and sanitation infrastructure. However in practice central government had a heavy influence on the municipal infrastructure investment policy.

<sup>318</sup> « *En fait en France comme en Allemagne, on considère désormais que lorsque tous les habitants d'une ville sont raccordés, l'assainissement devient ipso facto un service rendu; donc il peut être financé à son tour par la facture d'eau [...] Et ceux qui sont raccordables mais pas raccordés payent la taxe d'assainissement comme une pénalité. En revanche, le Conseil d'Etat s'est opposé à la couverture des coûts de l'assainissement autonome par la redevance d'assainissement assise sur la consommation d'eau* : CE, Avis de la section de l'intérieur du 10 avril 1996, n° 358783, Rapport annuel 1997, p. 295 ; et art 2224-12 du CGCT. » (Barraqué 2011a, 6)

<sup>319</sup> *La quota di tariffa riferita al servizio di pubblica fognatura e di depurazione è dovuta dagli utenti anche nel caso in cui la fognatura sia sprovvista di impianti centralizzati di depurazione o questi siano temporaneamente inattivi. I relativi proventi affluiscono in un fondo vincolato e sono destinati esclusivamente alla realizzazione e alla gestione delle opere e degli impianti centralizzati di depurazione.* Art 14 legge 36/1994

<sup>320</sup> Corte Costituzionale, sentenza 335/2008, 8 ottobre 2008

<sup>321</sup> This implied also the obligation for the water and sanitation utilities to refund users for the sanitation levies unduly collected, <http://www.altalex.com/index.php?idnot=11347> retrieved online on March 26<sup>th</sup> 2014.

**In Italy**, since 1934, if a municipality was not able to finance by itself the investments, it could submit an investment plan to the central government which could eventually approve and finance them<sup>322</sup>. This was the “dualistic model where the investments are financed by the central government while the municipality provides the service”(Ermano 2012). Central government influence on investments was increased further after WWII with the 1949 *Tupini Act* and with the 1963 National water supply master plan (*Piano regolatore generale degli acquedotti*). Concessional loans were available at the *Cassa Depositi e Prestiti* but municipalities were free to borrow on the market too. Furthermore, after WWII (and particularly after the 1970's) the financial revenues of Italian municipalities were so tightly dependent on centralized transfers that little could be autonomously planned and implemented by local authorities without the central government approval and financial contribution (Crespi Reghizzi forthcoming d, § 3.2).

**In France until the decentralization reforms of the 1980's** local authorities had to obtain an approval from the prefect in order to borrow. If the total borrowed amounts exceeded a specific amount, an authorization from the *Conseil d'Etat* was also required<sup>323</sup>. Generally speaking, the loans collaterals consisted in municipal revenues as a whole<sup>324</sup> and not in service-fees specifically linked to the loan-financed infrastructure.

Municipalities were obliged to borrow from the *Caisse des Dépôts et Consignations*<sup>325</sup> at concessional interest rate and could not borrow freely on the market.

“Central government ministries granted subsidies on a project-by project basis, which made it practically impossible for a mayor to develop a particular infrastructure investment without the agreement and support of the central government.” (Prud'homme 2006, 88).

<sup>322</sup>The reader may refer also to the paper in Part III (Crespi Reghizzi forthcoming d, § 3.3) where these aspects have been analyzed.

<sup>323</sup> « *En principe les emprunts sont approuvés par le préfet. Cependant lorsque la durée d'amortissement doit dépasser 30 années ou que l'emprunt seul ou ajouté aux autres emprunts non encore remboursés excède un certain chiffre, l'autorisation doit être donnée par décret en conseil d'Etat* » (Lainville 1930, 19)

<sup>324</sup> « *Le conseil municipal doit indiquer sur quelles ressources il compte rembourser l'emprunt (imposition extraordinaire, fonds commun ou autre recette ordinaire)* » [Loi du 18 avril 1922 relative au crédit foncier] (Lainville 1930, 19).

<sup>325</sup> Or from other specific institutions such as the *Crédit Agricole*, the *Crédit Immobilier* or the *Caisse d'Aide à l'Équipement des Collectivités Locales* after 1966

Indeed the *Caisse des Dépôts et Consignations* would hardly accept to finance a municipal infrastructure if it had not been approved for a grant subsidy by the appropriate central government ministry<sup>326</sup>.

**Box 11 : National subsidies for water and sanitation infrastructure in France**

**Water**

After 1903<sup>327</sup> water supply infrastructure was partially subsidized by the central government using funds from the *Pari mutual*, PMU, (bets on horse races) at first and after 1920 funds from lottery and other gambling games (“*le produit des jeux*”) (Goubert 2008, 185). Subsidies could cover between 50 and 80 % of the investments costs and were awarded to poorer municipalities especially in rural areas. Between 1903 and 1928, 400 millions francs have been paid by the central government on *Pari mutuel* funds. The investment grant could not be higher than 40% of the investment amount and was capped to a maximum amount of 400 000 francs per each project (Frioux 2009).

Funds from the PMU and from gambling were not sufficient. After 1925, additional financial resources coming from the central government budget<sup>328</sup> were allocated to water supply subsidies in rural areas (Goubert 2008, 185).

The Ministry of Agriculture was responsible for the decisions on how to award the subsidies. Until 1930's only a small part of the eligible projects were subsidized. In 1934<sup>329</sup> the subsidy system was reformed and given more funds (Pezon 2000, 112–113). The same mechanism was in place until 1953 with some light modifications (Canneva à paraître). According to Frioux, after WWII, in the 1950's, the French central government chose to intervene massively in the design and financing of water and sanitation networks : “in may 1953 the total promised grant add up to a total amount of more than 3.6 billions francs to be compared with only 1 billion francs allocated to

<sup>326</sup> « *Les caisses publiques consentent aux communes des emprunts à taux bonifiés à condition que l'Etat ait accepté de doter les équipements d'une subvention spécifique* » (Pezon 2000, 148).

<sup>327</sup> Loi relative à la protection de la santé publique du 15 février 1902 and Loi des Finances 31 mars 1903 (art 102).

<sup>328</sup> *Plans d'Outillage National* and *Plans de Grand Travaux*

<sup>329</sup> Circulaire 29 octobre 1934

urban housing and 1 billion francs allocated to public constructions<sup>330</sup> (Frioux 2009, 445).

Between 1954 and 2005 water supply infrastructure was partially subsidized by an earmarked national fund: the *Fonds National de Développement des Adductions d'Eau* (FNDAE). The FNDAE was a mutual fund fuelled by an additional levy on all volumes of water sold everywhere in France. The FNDAE could finance projects through concessional loans and after 1960 through investment grants. Some *Conseils Généraux* also created some funds at county level or mobilized their general budget which played a significant role in addition to FNDAE (Canneva à paraître).

### Sanitation

In 1919 and 1924 two laws on urban development mandated municipalities to draw urban development masterplans which had to include a sanitation annex masterplan. But this obligation was not respected as most municipalities did not have enough money to finance such a costly infrastructure. “A logical consequence of such a lack of money was that the central government should finance by itself the costs of designing and eventually building the sanitation infrastructure” (Dupuy and Knaebel 1982, 28).

During WWII, a national committee for buildings reconstruction (CRI)<sup>331</sup> was created. In 1943 thanks to the National Delegation for public infrastructure (DGEN)<sup>332</sup> the June 15<sup>th</sup> 1943 act established that the costs of the design of urban development masterplans including sanitation annex masterplans (*avant projet sanitaires*) were to be covered by the central government (Dupuy and Knaebel 1982, 28). After WWII, the ministry for Reconstruction and Urbanism<sup>333</sup> was created from CRI and DGEN. It produced in 1949 an administrative act which states technical standards for sewer systems to be built all over France (Circulaire Caquot, CG1333, 22 février 1949) (Scherrer 1992, 316; Dupuy and Knaebel 1982, 28; Chatzis 1993).

Generally speaking, urban sewer system extensions were subsidized up to 50 % by the ministry of Interior after WWII until 1974 when the national planification was

<sup>330</sup> « Ainsi en mai 1953 le montant total des promesses de subventions pour les réseaux urbains s'élève à 3 milliards 620 millions de francs, contre à peine un milliard pour l'habitat et un milliard également pour le chapitre « constructions publiques » (Frioux 2009, 445), author's translation

<sup>331</sup> *Commissariat à la reconstruction immobilière*

<sup>332</sup> *Délégation Générale à l'Équipement National* (DGEN)

<sup>333</sup> *Ministère de la Reconstruction et de l'Urbanisme*

abandoned under liberal presidency of V. Giscard D'Estaing (Barraqué, private conversation)

With the creation of the *Agences de l'eau* in the 1960's waste water treatment plants and sewer systems were heavily financed through grants and concessional loans coming from mutual revolving funds fuelled by the additional levies on billed water (see also §5.2).

**After the decentralization reforms of the 1980's in France**, municipalities are now free to borrow on the market<sup>334</sup> without requiring an approval from an upper level of government. The only two conditions are that “the borrowings must be exclusively earmarked to capital expenditures” and that municipal accounts have to be balanced.

“The banks receive aggregate demands for borrowings from the local entities, all investment projects are taken together instead of separate demands for each project. Thus the borrowings are considered by the local authorities as a global (i.e. non ear-marked) revenue source for the investments projects”(Gilbert and Guengant 2002, 115).

Water and sanitation services are provided in France by more or less autonomous municipal or inter-municipal collective consumption units (§4.6). Our paper in part III clarifies the borrowing policies in the various cases (Crespi Reghizzi forthcoming e, § 2.2).

**In Italy, after the Galli reform**, water and sanitation services are run by corporatized entities which are in principle free to borrow on the capital markets. Formally, investment plans (*Piano d'ambito*) are set by local regulatory authorities and are part of the concession agreement with the company in charge of the service (Crespi Reghizzi forthcoming f, § 6.2 & 6.3)

## 6.4 Additional cases from France

### 6.4.1 The water service in the Paris suburbs

This paragraph summarizes shortly some aspects of the history of the water service in Paris suburbs. Most information comes from a research report made by Christophe Defeuilley (Defeuilley 2004; Defeuilley 2013a).

<sup>334</sup>Loi 2 mars 1982 (Bourdin 2001, 257)

### **Piece meal private concessions**

In 1860 an agreement was signed between the Paris municipality and the *Compagnie Générale des Eaux* (CGE) : within the Paris administrative area CGE was awarded a *régie intéressée* contract according to which the company was responsible for selling water, handling relations with clients and billing and collecting payments on behalf of the municipality. The CGE kept also the full management of various water services in the suburban municipalities (Crespi Reghizzi forthcoming a, § 4.1).

Indeed in the suburbs, outside the administrative boundaries of Paris, various concessions had been awarded since the 1820's to various private companies. By 1859, the CGE had bought all the previous existing companies and was responsible for the water service in 26 nearby municipalities through concession contracts (Defeuilley 2013a). The CGE activities in the suburbs expanded even more after the 1867 amendment to the 1860 contract. Under this amendment, the City of Paris withdrew from all the water supply contracts with neighbouring suburbs and left CGE totally free to expand its activity as a *cessionnaire* in these neighbourhoods (Bocquet, Chatzis, and Sander 2008). By 1900 CGE was managing the water service in 60 Paris suburban municipalities (over a total of 75 Paris suburban municipalities) through 60 different bilateral contracts (Defeuilley 2013a, 11).

### **Intermunicipal cooperation and the *Syndicat***

After 1890, French municipalities were authorized to create *Syndicats* : inter-municipal entities through which various municipalities can cooperate to provide a specific public service. Since then, the municipalities in the Paris suburbs started to discuss the idea of more intermunicipal cooperation in the water sector. The idea was to create a unified *syndicat* in order to have more bargaining power with CGE (Defeuilley 2013a, 11).

It was only in 1922 that the *Syndicat des Eaux d'Ile de France (SEDIF)* was created. All the pre-existing concession contracts between the municipalities and the CGE were resigned and a single 39 years long contract was signed between SEDIF and CGE. The new contract was not a concession but only a *régie intéressée* one (as in inner Paris). SEDIF had full responsibility over the investments cycle (planning and financing) while CGE was responsible for metering, billing and handling relations with users. Revenues from the sold water were shared between SEDIF and CGE according to an incentive-



based price formula. Additionally an annual fee was paid by the SEDIF to the CGE as an indemnity for all the assets previously built and financed by CGE under the various concession contracts (Defeuilley 2013a, 12). In 1962, at the expiration of the 1923 contract, a new 23 years contract was signed. This contract was extended several times until 2010. In 2011 a new contract was signed with *Veolia* (former CGE) after a competitive tendering.

Christophe Defeuilley (2013a) underlines that step by step the CGE increased its role going beyond its *régisseur* role and taking more responsibilities over the daily operations and maintenance. The CGE also acted as an industrial partner able to provide the required technological solutions and to build the planned infrastructure extension. Indeed works and infrastructure projects planned by the SEDIF were frequently assigned to CGE and its subsidiaries by mutual agreement (no tendering) (Defeuilley 2013a, 15–16).

The 1923 contract left all responsibilities on investments to SEDIF. All along the 20<sup>th</sup> century the population of the Paris suburbs kept increasing steadily (2.5 million people in 1950 vs 4 million people in 1975). In those decades the SEDIF kept investing in water supply infrastructure (Defeuilley 2013a, 14). A detailed analysis on how these investments were financed is not available but it seems likely that most investments costs were covered by a mix of endogenous revenues (Tariff) and exogenous revenues from the national government (Transfers). These transfers were given through the form of either grants or concessional loans. On the contrary we assume that the SEDIF did not receive any contribution from local general taxation.

#### **6.4.2 The case of Lyon**

In the second half of the 19<sup>th</sup> century Lyon was the French city having the third highest population (more than 300 000 inhabitants). As in Paris, under the second empire, the municipal autonomy of Lyon was removed and the authority on the city was transferred to the prefect until 1880 (Scherrer 1992, 140 & 230).

#### **Water service in the city of Lyon**

In 1853, the prefect Vaisse awarded a 99 years concession for the water service to the *Compagnie Générale des Eaux* (CGE) on the basis of a project already drafted by a

*Ponts et Chaussées* engineer. Water was to be drawn from the Rhone alluvial aquifer through a drift and a pumping station (completed in 1859). (Scherrer 1995, 47).

Water was not metered. It was billed by CGE according to a flat rate which was indexed on the number of inhabitants in the flat. (Scherrer 1995, 47–48). In fact the service was produced according to a full concession agreement only between 1853 and 1862. Between 1862 and 1874 the new investments required to increase the volumes of water produced were directly financed by the municipality. After 1862, *de facto* the CGE was operating more under an *affermage* régime rather than a concession one (Scherrer 1995, 47 & 54). In 1874 the municipality imposed a lower tariff.

The agreement allowed the city to buy the assets back from the company after 30 years. In 1885 the municipal council voted in favour of a municipalization of the service but the issue was not settled straight away because the city struggled to find the funds to pay the indemnity to the CGE. In 1900 the service was fully municipalized (*régie directe*) as an application of the “municipal socialism” ideas defended by the mayor Edouard Herriot. The *régie directe* applied a very low level of exclusion. It billed water according to a flat rate which was indexed on the rental value of houses rather than on the number of inhabitants as previously done by CGE. The minimum rate for low rental values decreased significantly from 36 F/year to 12 F/year. In this phase, the water service costs were covered by a mix of endogenous and exogenous revenues from local general taxation. A huge investment plan was undertaken in the 1920’s totalizing more than 22 Million Francs.

Between 1931 and 1934, meters were installed and water started being metered and billed according to a volumetric tariff. Water consumptions decreased significantly (Scherrer 1995, 47–48). After the investment plan of the 1920’s, Lyon stopped investing for many decades. It was only in the 1960’s that it was forced to undertake a major upgrade. In the 1960’s the mayor, Louis Pradel, borrowed massively to finance a new ambitious investment plan. The debt’s amount was so huge that it was still under amortization in the late 1980’s (Scherrer 1995, 50).

### **Water service in the Lyon suburbs and intermunicipality**

As in Paris, in response to the end of the concession contract with the municipality of Lyon, the CGE strategically chose to focus on the suburbs of Lyon where it signed

many concessions agreement with various municipalities. In 1928, the CGE was running the water service in 26 municipalities in the suburbs. In that same year the municipalities decided to create a joint entity, the *Syndicat Intercommunal des Eaux de la Banlieue* in order to better negotiate in front of the CGE. It was only in 1949 that they managed to merge all the municipal distinct agreements in a single contract between the *Syndicat* and the *CGE*. The new agreement was more an *affermage* than a *concession* one, as all the investments were to be implemented and financed by the municipalities (Scherrer 1995, 48–49).

In 1969, a larger intermunicipal multipurpose administrative entity (*Communauté Urbaine* - COURLY) was created and given the responsibility of the water and sanitation service. At first the COURLY kept direct municipal provision in the inner city (*régie directe*) and *affermage* with CGE in the suburbs. Later, in 1986 an *affermage* contract was made between the COURLY and CGE both for the inner municipality and for the suburbs (Scherrer 1995, 51).

### Sanitation service

The first sewer system was developed in Lyon between 1854 and 1870 for a total length of 80 km (roughly 5 km per year). The sanitation service was part of the municipal department in charge of Streets (*la voirie*). The operational expenses were mainly due to the salary of more than 50 sewage workers who were in charge of the maintenance. Both operational and capital expenditures were fully part of the municipal budget (Scherrer 1992, 122–124).

After 1870, the sewer system was extended in Lyon with a slower but very regular rhythm with an average increase of roughly 2.2 km per year between 1867 and 1909 and 2.7 km per year between 1909 and 1948. The slow and regular extension rhythm was also due to the fact that until the 1920's the sewer system was entirely financed by the municipality on the ordinary municipal budget (local exogenous revenues). Each year the municipality spent roughly 100 000<sup>335</sup> francs without any repayable finance tool being implemented. The fact that the municipality did not borrow implied also that its investment decisions were fully autonomous as no approval of the national parliament

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<sup>335</sup> The sum of 100 000 francs is quite small if compared to the annual budget of the municipality of Lyon which totalized 16.8 million francs in 1903. In that same year the operational expenses of the *Voirie* department totalized 2 million francs (Scherrer 1992, 236).

was required. Only a few main sewers next to the river were built and financed by central government in order to protect the city from flooding (Scherrer 1992, 231–233).

Franck Scherrer points out a key difference between the Paris and Lyon cases. In Paris the *tout-à-l'égout*<sup>336</sup> was made compulsory in 1894 together with the setting of a sanitation levy. This was the usual “Paris exception” as the same legislation did not apply to the rest of France. The 1902 act<sup>337</sup> on public health authorized the *tout à l'égout* in France but did not make it compulsory. It was only in 1958<sup>338</sup> that the *tout à l'égout* (with a separate sewer system) was considered as the standard solution in France with some exceptions being tolerated. At first in Lyon the *tout-à-l'égout* was illegal. Through the 20<sup>th</sup> century it was increasingly tolerated on an individual case basis. It was only in 1961 that it was made compulsory as recommended by the 1958 national legislation (Scherrer 1992, 155–175).

In 1926 the collection of a sanitation levy was authorized at national level. After 1931 the story of sanitation in Lyon becomes partly an intermunicipal one with the creation of a joint board with the municipalities on the left bank of the Rhone (*Syndicat Intercommunal de la Rive Gauche du Rhone*). The *Syndicat* was financed by endogenous revenues coming from the sanitation levies. However, the investment plan was heavily dependent on the availability of grants and concessional loans from the national government. Although the central government approved some subsidies to the investment plan in 1937, in 1940 and in 1949, in practice grants and concessional loans were delayed or cancelled many times. In Lyon the central government is more characterized by a non-intervention policy concerning sanitation than by an intervention one. As a result, the *Syndicat* investment plan was constantly postponed and realized only in the 1970's (Scherrer 1992, 126 & 310–316).

In the same decade, the *Syndicat* was dissolved and the sanitation service included in a larger and new intermunicipal entity (*Communauté Urbaine - COURLY*). The new volumetric sanitation levy and the financing policy of the River Basin Agency (*Agence de l'eau Rhone Méditerranée Corse*) allowed the COURLY to undertake and finance a significant investment plan in the 1970's and 1980's (Scherrer 1992, 368).

<sup>336</sup>Meaning the collection of waste water and feces through the sewer system (CrespiReghizzi forthcoming a, § 4.4)

<sup>337</sup>Loi 15 février 1902 relative à la protection de la santé publique

<sup>338</sup>Ordonnance du 23 octobre 1958 sur le branchement obligatoire à l'égout

### To conclude

The development of water and sanitation infrastructure in the city of Lyon is truly a municipal one. Indeed, central government did not interfere that much in the urban development except between 1852 and 1870 and between 1950 and 1960 (Scherrer 1995, 45). No or little intervention from central government implies that the municipality was given much autonomy on its decisions but also that it was given little financial help. As a result, due to the tight municipal budget, investments were spread over a great number of years.

Even if the water service was initially created under a ‘concession’ contract with a private partner, in Lyon the contract very soon turned to be an *affermage* one with the investments being financed by the municipality.

We do not have detailed available data to prove it, but it seems that in Lyon, at least until the late 1960’s, the costs of the water and sanitation service were covered only to a small extent by endogenous revenues with a part of the capital expenditures being covered by exogenous revenues.

#### 6.4.3 Infrastructure end-payer in concession and affermage contracts

In the second half of the 19<sup>th</sup> century various concessions contracts (Regulated Monopoly model in Box 1) were signed between large municipalities (Lyon, Nantes, Toulon and Rouen) and the CGE (see Table 34). In Lyon quite soon such a contract was transformed in a *affermage* one (Delegation Model in Box 1) (§6.4.1).

According to Christelle Pezon, in the beginning, the CGE’s “would very carefully review proposals made by the municipalities and only accept those where the annual fee for public service would not only cover its costs but also provide at least 4% profit. Extra profit would come from the private service which would basically be unlimited as costs would remain fixed while profits increased up to the last connection. In Nantes<sup>339</sup> for instance, the volume of water reserved for the private service was only a quarter of

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<sup>339</sup> At that time Nantes was a rich trading city and required large amounts of water for its ships (Goubert 2008, 181)

the volume approved for the public service<sup>340</sup> but could provide three times more income” (Pezon 2011, 9).

CGE had a risk-free strategy where all costs (including investment costs) had to be covered and guaranteed by the yearly public-service fee which was to be paid by the municipality using money from general taxation. This means that in many cities the built infrastructure was largely paid by exogenous revenues (Tax and Transfers) and not only by endogenous ones (Tariff) as one could think.

**Table 34 : large scale CGE concession contracts**

	Lyon	Nantes	Toulon	Rouen
Start of the contract	1853	1854	1882	1883
Length of contract (years)	99	60	62	60
Date of the municipal decision to terminate the contract	1888	1895	1911	1911
Official termination date	1900	1900	1912	1912

Source : Pezon (2011)

The CGE “failed to develop domestic water supply based on concession contracts”(Pezon 2011, 15). By 1912, all CGE concession contracts with big cities had been terminated (see Table 34). After WWI CGE developed its activities in France mostly under *affermage* contracts.

By definition, in *affermage* contracts investments are a municipal or inter-municipal responsibility. In the general case, the infrastructure was financed in the short run by the municipality using concessional repayable finance if necessary (see §6.3.5). High inflation helped to lower the debt service costs (Pezon 2011, 15). In the long run the investments costs were covered by a mix of endogenous revenues (Tariff) and exogenous revenues (local or national general taxation). Depending on each local context and on each specific historical phase the ratio of the costs covered by endogenous revenues over those covered by exogenous ones could vary.

<sup>340</sup> The term « public service » was used at that time to refer to public fountains, fire protection and water for street washing.

## 6.5 Additional cases from Italy

### 6.5.1 Rome

#### The story

In Rome, the first aqueducts had been built in Antiquity. “It was only at the end of the 1960s that the daily quantity of water provided to the city exceeded the level provided during the Roman Empire“ (Bocquet 2004, 2). Under papal authority new aqueducts were built through the centuries. In 1865<sup>341</sup>, Pope Pio IX awarded a 99 years concession to the *Soci ta dell’Acqua Pia Antica Marcia* (SAPAM) for operating the *acquedotto Marcio* (left bank of the Tiber river). SAPAM had both English and Italian shareholders. The latter mainly came from the ruling aristocratic catholic elite. The other aqueducts (on the right bank of the Tiber river), which were in poorer conditions, were owned and operated by the municipal water service (Bocquet 2004). Such a duopoly continued even once Rome became the Capital of the Italian state as legal acts made by the former Vatican state kept their validity.

Furthermore, in 1885, an additional 25 years agreement between the municipality and SAPAM was signed: “the Acqua Marcia company was granted exclusive rights to any new aqueduct construction. In exchange, it agreed to comply with municipal service demands to implement fixed prices. The municipality agreed to stop any attempt to get new subscriber and to limit expansion of its own network to what was strictly necessary to fulfill municipal and industrial needs. As a compensation, the company agreed to serve eight public water points nearby Rome to satisfy a demand for social equity”(Bocquet 2004, 9). As a matter of fact, the 1885 agreement restrained any municipal attempt to compete with SAPAM until 1910.

In 1937, under the fascist regime, the *Azienda Governatoriale Elettricit  ed Acqua* (AGEA) was created<sup>342</sup> and became responsible for the former municipal water service. According to Battilossi, the aim of merging municipal activities in the electric and water sector was mainly a financial one as operating profits of the electric branch could cover operating losses of the municipal water service (Battilossi 2001, 176)

<sup>341</sup> Rome was still within the Vatican state

<sup>342</sup> The AGEA was the transformation of the former Azienda Elettrica Municipale (AEM) which had been operating in the electricity sector since 1912 (Battilossi 2001, 51).

In 1944, the AGEA was transformed in *Azienda Comunale Elettricità ed Acqua* (ACEA). The duopoly of ACEA and SAPAM coexisted until the expiry date of the SAPAM concession. In 1964 the SAPAM assets were merged into ACEA which became the unique provider of the water service in Rome (Battilossi 2001; Bocquet 2004, 12).

After WWII and until the 1960's, the water branch of ACEA kept operating with significant losses since the municipality constrained the water price to a level even lower than what was imposed by national regulation<sup>343</sup>. On the contrary in the same years SAPAM was billing water at higher tariffs (Battilossi 2001, 276).

As Bocquet underlines, “the uniqueness of the case of Rome, from an economic point of view, was that the water supply was in the hands of two companies: one private and one municipal, and that it was the private one that for a century greatly benefited from both legal protection and protection by a dominant political milieu. The municipally owned company was the challenger, fighting against a de facto monopoly”(Bocquet 2004, 13). In Bologna too a municipal water service was created as a challenger to the private company previously in place (*Società Nazionale Gazometri e Acquedotti*)(Bigatti 1997, 121).

### **SAPAM investments**

We do not have an estimation of the investments made by SAPAM. However we know that SAPAM was awarded a concession in the purpose of “modernizing the Acqua Marcia aqueduct and bringing the water provision network up to date”(Bocquet 2004, 4). The new facilities were inaugurated in 1870 but investments in an improved aqueduct from Arsoli to Tivoli and from Tivoli to Rome would last until 1937 (Battilossi 2001, 162)

A part of SAPAM infrastructure was received from the past as an heritage. We assume from the literature that the costs of rehabilitation and new infrastructure made by SAPAM between 1865 and 1930 were covered by endogenous revenues (Tariff) with no or little contribution from exogenous revenues.

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<sup>343</sup> See also our paper in Part III (Crespi Reghizzi forthcoming d)



Since the 1930s, SAPAM had kept its investment policy at the minimum. Its “priority was to keep earning profits from its old subscribers” while waiting for the end of the concession (Bocquet 2004, 12).

### **ACEA investments**

Since the 1910's the municipality had been planning to invest in a new aqueduct (*Vergine elevato* and *acquedotto del Peschiera*). It was only in 1937 that AGEA started the first lot of works which was financed by the municipality (local general taxation)<sup>344</sup> (Battilossi 2001, 175).

Under the fascist regime, the whole investment policy of AGEA/ACEA was financed by the governorate and by the municipality through grants from the municipal budget and through municipal loans ceded to AGEA/ACEA (Battilossi 2001, 187).

After WWII, the municipality of Rome was in heavy financial distress with a municipal budget constantly in deficit. Additional long term debt could not be issued by the municipality because the piggyback taxes (asked by lenders as collaterals) were already set at their maximum level (Battilossi 2001, 305). As a consequence, ACEA investments (especially in the water sector) were delayed many times.

In 1953, the parliament approved a legislative act (Legge Pella) authorizing Rome to subscribe loans with the *Cassa Depositi e Prestiti* for public works expenses up to a maximum amount of 11 billion lira (Battilossi 2001, 312). ACEA resorted significantly to such financing tools.

For many decades after WWII, the water branch of the company kept covering operating losses with the operating profits of the electricity branch meaning that a cross subsidy was taking place. Globally speaking, investments in Rome water infrastructure made by ACEA through the 20<sup>th</sup> century were mostly financed through municipal loans and other repayable finance solutions coming from public institutions (the governorate, the municipality, the central government, the *Cassa Depositi e Prestiti*). In the long run, investment costs were covered mostly by exogenous revenues : subsidies from the electric sector, subsidies from the municipal budget (Tax) and from the central state (Transfers).

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<sup>344</sup> 11 million Italiana Lira (Battilossi 2001, 185)

### 6.5.2 Genova

#### Two private initiatives in competition

The history of water infrastructure in Genova is an original one as Marco Doria tells us (Doria 2008). At the beginning of the 19<sup>th</sup> century, an ancient medieval municipal aqueduct from the Bisagno valley was still in operation. It delivered water mostly at collective distribution points. Only a few domestic water connections were in place, delivering water to the upper class only. The aqueduct was in very poor conditions and did not allow to satisfy all water needs. Through the 19<sup>th</sup> century, things got worse due to the high demographic growth of Genova. The municipality started thinking and discussing the idea of building new aqueducts to bring additional water to the city but no decision was taken as all these projects implied very high investment costs.

In 1853, the *Compagnia del nuovo acquedotto* was founded to build a new aqueduct from the Scrivia valley. Later it was renamed as *Compagnia dell'acquedotto Nicolay* from the name of its founder Paolo Antonio Nicolay. Huge investments were made by the company between 1853 and 1860. They were financed through equity at first. Most shareholders were people from the higher gentry of Genova. Once the company ran out of equity it relied heavily on debt to finance its infrastructure. Revenues came from the water sold both to private users and to the municipality. At first the company was not profitable at all and did not pay any dividend until 1864. Often shareholders paid the water they used through a partial decrease in their share in the company.

In 1880, another private company was founded (*Società anonima dell'acquedotto de Ferrari Galliera*) to build a new aqueduct from the Gorzente valley which would also allow hydroelectric production. The investments were very costly and the company had to call for several capital increases which were fulfilled by the main shareholders (mostly from the Genova gentry).

In the last decades of 19<sup>th</sup> century, the water service in Genova was run as a competitive duopoly between the two private companies (the ancient municipal aqueduct was nearly not used anymore). In many areas of the city a competition by duplication took place as each company developed its own network (Doria 2008, 146–147) : a textbook example of suboptimal solution in terms of social surplus. In 1916 (and later in 1918 and in 1925) the two companies stopped competing fiercely. A cartel was made as the two

companies agreed to have the same tariffs and to run jointly some activities such as the water supply to the harbor (Doria 2008, 213).

### **Municipal investments to create a third competitor**

Meanwhile, the city needed more water. Some projects were made by the municipality for a new dam and aqueduct (including hydropower) from the Noci River. Works were undertaken between 1923 and 1935 for a total cost of 45 million lira covered by the municipal budget. In 1936, under the fascist regime, a municipal company was created to run the gas and water service : the *Azienda Municipalizzata Gas e Acqua* (AMGA)(Doria 2008, 207–212).

Thus, after 1936 the water service in Genova was operated by three different entities : the two private companies Nicolay and De Ferrari e Galliera and AMGA. After WWII, once more, additional water was needed and the municipality chose to take more responsibilities in the water sector. A project for a new aqueduct (*Brugneto*) was approved by the municipality. The project was financed by a governmental grant, by a loan with the Cassa Depositi e Prestiti and by funds from the municipal budget. By 1961, the Brugneto aqueduct had been completed and was run by AMGA.

In the last decades of the 20<sup>th</sup> century an increasing tension arose between the municipality and AMGA on one side and the two private companies on the other side. Only in 1979 an agreement on exclusive distribution areas was made in order to avoid duplication and make the network system more rational. In the 1990's, to comply with the Galli reform AMGA was transformed in a municipally owned joint stock company : *Mediterranea delle acque SPA*. Various attempts were made by *Mediterranea delle acque* to buy the *De Ferrari Galliera* and *Nicolay* companies (Doria 2008, 316–326). It was only in 2006 that the three companies merged into *Mediterranea delle acque*<sup>345</sup>.

### **Who did pay for the water infrastructure in Genova ?**

The history of Genova water infrastructure is rather a complex one and we tried to summarize it shortly. Investments were made by three entities : the *Nicolay* company, the *de Ferrari e Galliera* company and the municipality either directly or through AMGA.

<sup>345</sup> [http://www.mediterraneadelleacque.it/chi\\_siamo.asp](http://www.mediterraneadelleacque.it/chi_siamo.asp) , retrieved online on June 3<sup>rd</sup> 2014

In the short run, **in the late 19<sup>th</sup> century**, the two **private companies** financed their **investments** costs both through equity and debt. In the long run those investments costs were covered mostly by endogenous revenues (Tariff) with some contributions coming from exogenous revenues. To understand how this was possible various factors have to be taken into account:

- Some water was sold by the companies to the municipality. The municipality paid this water with money from the municipal budget (local general taxation). Thus, these revenues could be labeled as “Taxes”.
- At first both private companies struggled to reach financial equilibrium and get some profitability. No dividends were paid in the first years. Additional financial efforts were asked to share-holders through capital increase operations (*De Ferrari Galliera*).
- The two companies (an especially the *Nicolay* company) relied heavily on debt. We do not have detailed evidence on the debt nature but it is realistic to assume that after 1910, high inflation contributed to lower the debt service in real terms. This means that a part of the investments costs were absorbed by the lenders.
- The two companies sold a part of the water to commercial and industrial activities (such as the harbor activity). Additionally the *De Ferrari e Galliera* had an hydropower activity. We assume that some cross-subsidies took place between industrial and domestic water users and between the electricity and water part of the *De Ferrari e Galliera*.

**Investments** in the water infrastructure **made by the municipality** (after 1920's and especially after WWII) and by **AMGA** were financed in the short run by central government grants<sup>346</sup>, by loans from the Cassa Depositi e Prestiti and by funds from the municipal budget. We lack information to define precisely who was the end-payer of those investments. However, in our paper in Part III (Crespi Reghizzi forthcoming d) we have analyzed how, after WWII, municipal finance in Italy relied increasingly on transfers from central government. We assume that in the Genova case too, municipal

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<sup>346</sup> In the 1970's a new dam and water intake (*Busalletta*) was built by the Nicolay company. The Nicolay company obtained a small grant from the central government and from the region for this investment (Doria 2008, 327–332).

investments in the water infrastructure were mostly paid by exogenous revenues (Taxes and Transfers) and in particular by Transfers from the national government.

We lack of information on the sanitation part of the story but we assume that the municipality undertook most of the investments which were paid in the long run by a mix of endogenous and exogenous revenues.

### 6.5.3 Other cases in Italy

#### Naples

In the 1860's, a tender was made in Naples to award a concession for the realization and operations of a new aqueduct (*acquedotto del Serino*). The company *Mamby and Roberti* won the tender and sold just afterwards the concession right to the Naples Water Works Company. The new aqueduct was inaugurated in 1885 for a total cost of nearly 40 million Lira. The concession terms implied that the municipality had to compensate the company in case the revenues from private consumption were below a minimum level. In return, the municipality kept the right to set the tariff rate (Bigatti 1997, 111). Indeed at first the subscriptions to the service were less than expected and the municipality had to compensate the company with subsidies from the municipal budget. One of the reasons for such a slow rate of subscription was the high price of 0.35 lira /m<sup>3</sup> (to be compared to the 0.20 lira/m<sup>3</sup> in Milan in 1894)(Bigatti 1997, 105–106).

Sanitation in Naples was another key issue in the second half of 19<sup>th</sup> century. In 1883, a project based on the *tout à l'égout* was drafted by the municipal engineers. After the tragic cholera epidemics of 1885, the parliament approved a law on the urban and sanitary renovation of Naples which budgeted some grants from the central government to improve the sanitary conditions of the city. Thanks to these funds, the realization of the sewer infrastructure started in 1888 (Bigatti 1997, 107–108).

#### Other cases of water services as private concessions in Italy

The Naples Water Works Company was a subsidiary of the *Compagnie Générale des Eaux* which was already operating the water service in **Bergamo**, **Venice** and **La Spezia** (Bigatti 1997, 105). The concession model was also implemented in **Verona** and **Bologna** (Bigatti 1997, 120; Calabi 1980, 306).

In **Padova** too a concession had been awarded in the 1880's to the *Società veneta per imprese e costruzioni pubbliche*. The company financed entirely on its own the infrastructure for a total cost of 3 million Lira. However, the tariff of 0.25 lira/m<sup>3</sup> was very high and thus, the subscriptions were much less than expected. The profitability of the project was then so low that the private company decided to resign and sell the infrastructure assets to the municipality. After the municipalization, lower tariffs were approved with a positive impact on the number of subscriptions (Bigatti 1997, 118).

As in Padova, the municipalization of many urban public services started in many Italian cities ten years before the 1903 Giolitti act (Calabi 1980). By 1904, water was operated as a municipal service in 26 county towns (*capoluogo di provincia*) (Bigatti 1997, 112).

As a matter of fact, the development of urban water infrastructure in medium and large size Italian cities is mainly a municipal finance story, as in many cities private concessions played a role only in a relatively short historical phase in the second half of the 19<sup>th</sup> century.

## 7 A comparative review on the financing history of water infrastructure

In this section we compare the Paris and Milan cases with cases in other countries as analyzed by other authors. In particular Christophe Defeuilley's forthcoming book (Defeuilley forthcoming) has been very useful to get evidence and references from the United Kingdom and from the USA (§7.1 and §7.2). The last paragraph focuses on a short overview on what happened in Germany in the second half of the 19<sup>th</sup> century.

### 7.1 The United Kingdom

Thanks to its early industrial development and urbanization, the United Kingdom was a forerunner among European countries in the development of water supply networks and sewer systems.

The history of water services in the UK may be framed in 5 major phases of development

- **Phase 0** - Water services were developed by **private companies** which soon became "statutory" as their monopoly creation needed to be authorized by the parliament (Kraemer and Barraqué 2013, 243).
- **Phase 1 – Municipalism:** after 1840 municipalities bought shares of private water companies and created their own water services<sup>347</sup>.
- **Phase 2 – Consolidation of water services :** with the 1945 National Water Act, UK water services were encouraged to consolidate and merge together "for the purpose of increasing efficiency. Under the terms of the Act the number of separate water supply systems in England and Wales was reduced from 1,400 during World War II to 187 in 1974" (Jacobson and Tarr 1995, 25).
- **Phase 3 – Regionalization of water services :** in 1973 a further consolidation of the UK water sector took place with the creation of 10 Regional Water Authorities.
- **Phase 4 – Privatization of regionalized water services :** with the 1989 Water Act the Water services part of the Regional Water Authorities were privatized in

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<sup>347</sup> This was made possible by the 1835 municipal corporation act.

England and Wales. A national economic regulator (OfWat) and an environmental Agency (National River Authority which became the Environment Agency in 1995) were created too.

In the next paragraphs we shall discuss some aspects of the financing history of water services in London and in the UK. We shall focus on Phase 0 and Phase 1 only.

### 7.1.1 Unregulated private initiatives

In 1581, a private company, the *London Bridge Water Works company*, was authorized to install a hydraulic water plant under London's bridge. However the company was unable to provide water to the whole city due to the high demographic growth<sup>348</sup> (Defeuilley forthcoming).

Hugh Middleton developed a new water supply project from an original idea of Edmund Colthurst. The project consisted in digging a canal to bring additional water to the city of London. The *New River Company* was created for that purpose and given the statutory authorization in 1605-1609. At first, the company was financed through equity coming from 29 shareholders - "adventurers". However the total costs turned up to be more than 3 times higher than the initial capitalization. In 1611, King James 1<sup>st</sup> agreed to pay half of the investment costs in exchange for half of the expected dividends (Defeuilley forthcoming; Defeuilley 2013b).

Until the 1630 – 1640's the subscription rhythm was very slow and the company was not able to pay any dividends. According to Defeuilley, various reasons can explain such a slow rhythm of new subscription to the service: i) an initial *una tantum* connection fee was charged by the company to new users and was quite high (1 month workman salary), ii) new users were reluctant to pay the connection investment costs and iii) there was a reluctance to switch from an *a la carte* water service (water carrier) to a fixed monthly rate service (Defeuilley forthcoming). In our terms, people were reluctant to switch from water as a market good to a water service with a club good nature.

Between 1630 and 1820 the New River Company very slowly expanded its infrastructure and increased the number of its subscriptions. There were only 50 000

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<sup>348</sup> There were 250 000 inhabitants in London in 1605.



new subscriptions over 200 years while London's population increased from 250 000 to 950 000 inhabitants in the same period (Defeuilley forthcoming) : the least we can say is that the water service provided by the New River Company was a very elitist club. Indeed, the company had no obligation to connect everyone and adopted a "Malthusian" attitude consisting in investing as little as possible and adapted the subscription rhythm to the built infrastructure in order to maximize its dividends (Defeuilley forthcoming). This is a textbook example of the typical behavior of an unregulated monopolist.

Between the 17<sup>th</sup> and 19<sup>th</sup> centuries new private water companies were created to provide the water service in other areas of London. There was no real competition between the companies as each one was operating the service in a specific area of the city.

In the same centuries, private water companies developed also in other cities in Britain. In 1700, 8 over 13 of the largest English cities had a private water company operating the service (Defeuilley forthcoming).

In the early 19<sup>th</sup> century the various private water companies operating in London delivered water to 70 000 households over the 110 000 existing ones (Defeuilley forthcoming). In the early decades of the 19<sup>th</sup> century new private water companies arose in London, seduced by the high dividends of the New River Water company. Some of the incumbents chose to compete with other companies in the same areas and undertook an inefficient and costly network duplication : the "London Water wars" episode had started (Graham-Leigh 2000). Competition on prices was so fierce that it led to the bankruptcy or quasi-bankruptcy of many companies.

In 1815-1817, various territorial sharing agreements were made to stop competition among the companies. In 1821, a parliamentary report justified the territorial monopoly as the companies' financial distress might lead to underinvestment and jeopardize London's water safety (Defeuilley forthcoming). Such a position against competition in water utilities was confirmed by various studies and parliamentary reports in the 1840s (Falkus 1977, 142). Indeed, "by the middle of the century, London was fairly well districted by the gas and water companies, whilst in the provinces it was unusual to have more than one company serving a town" (Millward 2000, 321).

In 1845, the water services in England and Wales were mostly operated by private companies : “it seems that whilst there were only 10 municipal corporations in England and Wales operating their own water service in 1845, there were already 67 joint-stock companies”(Millward 2000, 322).

### **Who did pay for the infrastructure ?**

Until the middle of 19<sup>th</sup> century most of the water supply infrastructure had developed in the UK under the responsibility of private investors. Who did pay for such an infrastructure ? There is no clear answer to such a question in the existing literature. It seems however that the New River Company (and other private water companies in the UK) could rely on endogenous revenues only as no subsidies were coming from the local or central government. Under this assumption, in the long run, the costs of the infrastructure built in such a historical phase have been paid by water users. Water meters did not exist yet and the water service was most of the time charged to the users through flat rates. In the case of the New River Company these were proportional to the size of the house (Defeuilley forthcoming, 10; Ward 2003, 9).

We do not know however if it was frequent for municipalities to engage in paying a “public service” (for fire protection, street washing or public fountains) fee to the private operator as in France and Italy in the late 19<sup>th</sup> and early 20<sup>th</sup> century (see also §6.4.3 and §6.5.3). In that case the public service fee paid by the municipality might be considered as an exogenous revenues coming from general taxation.

#### **7.1.2 Mild regulation after the 1840s**

Thanks to the water wars episode, water supply connections increased significantly in London through the first half of the 19<sup>th</sup> century. By 1828, there were 164 000 subscriptions over 200 000 households : these represented 82% of the London’s population (1.5 M inhabitants). By 1849, 99 % of London’s houses were connected to the water service. However, water was delivered through a “stop and go” service and there were severe problems both concerning water quantity and water quality (Defeuilley forthcoming).

Most waste water was flowing though a drainage network straight to the Thames River. With the demographic growth of London and the spreading of water-closets systems, things got even worse and the Thames became increasingly polluted, looking like a

giant open air sewer (Bigatti 1997, 55). In 1858, there was the famous “Great Stink” episode when even the House of Parliament was temporarily shutdown.

Those were also the decades of recurrent cholera epidemics in London : in 1831-32, in 1848-49, in 1854 and in 1866. In the 1848 cholera episode 14 000 people died. The public opinion and the policy makers became increasingly concerned about the poor sanitary conditions of British cities. On these grounds, in 1842, Edward Chadwick argued in favour of more public intervention in the water sector in his famous “The sanitary condition of the Labouring Population of Britain”. One of Chadwick’s arguments consisted in considering more cost-effective for the public authorities to invest *a priori* in water and sanitation infrastructure rather than to cope *a posteriori* with the costs of the poor health condition of the working classes. Indeed, under the “Poor Laws” (existing in Britain since the 16<sup>th</sup> century) the local public authorities were responsible for a minimum level of social and health conditions for the lower income classes. Following this line of thought, the Public Health Act was approved by the parliament in 1848 : municipalities had to create a *Local Board of Health* and were encouraged to make investments in order to improve the sanitary conditions (Defeuilley forthcoming, 38).

**Box 12 : Sanitation in London**

In 1855, the *Metropolitan Board of Works* (MBW) was created in London. It had two missions : i) to monitor and control the activities of the private companies and to fight against the pollution of the Thames River. To achieve the latter, the MBW built between 1859 and 1865 a sewer network parallel to the Thames in order to discharge waste water further downstream<sup>349</sup>. This modernization of the sewers was entirely financed on public funds.

Source : Christophe Defeuilley (Defeuilley forthcoming, 44)

In addition to the sanitary condition argument, starting in the 1840s, British policy makers started being more aware of the existence of “local natural monopolies” with their inefficient outcomes which could not be satisfactorily remedied by the use of competition.

<sup>349</sup> In 1887 all waste water from the city of London was discharged directly into the sea.

“Two steps followed: [a] The *de facto* private monopolies were increasingly subject to parliamentary regulation and control. [b] Also the feeling grew that municipal ownership of such monopolies was the appropriate form of control” (Falkus 1977, 139). This sub-paragraph focuses on the first step while next sub-paragraph focuses on municipalisation. Millward argues that the two steps were not independent as the regulatory regime put in place in the 1840s

“was typical of the mid-century in that the combination of a *laissez-faire* parliament and strong local interests, in the form of Highway Surveyors, Sewage Boards and Poor Law Commissioners and the like, were enough to ensure that the regulations were permissive rather than mandatory. The weakness of the regulatory regime was one of the factors behind the drive to municipalisation in the forty years up to the First World War”(Millward 2000, 318).

In London, soon after the water wars episode, concessional rates had been set for charities and schools and water for fire protection purpose was delivered for free. In 1852, the Metropolitan water act set some additional regulation on the London water service : i) to improve water quality, Thames water intake had to be located further apart from the waste water disposal and water filtration became compulsory, ii) a cap on water tariff and a cap on the company’s dividends were introduced and iii) the obligation to connect every client within the operating area was set.

The cap on water tariff was not very tight. Indeed water was billed according to a flat fee proportional to the rental value of the house. The cap was set between 4 and 7.5 % of the yearly rent value. However companies were left free to compute the rental value as they wished. The average rental values increased from £37 in 1851 to £73 in 1896 (Defeuilley forthcoming, 42,52). Indeed, water prices in London “rose by about 30 % in the period 1820 to 1900 while all other prices kept falling in Britain”(Millward 2000, 320). The cap on dividends (10% of the invested capital) was not very tight either as most companies managed to artificially increase their accounting capital base in order not to exceed the cap (Millward 2000, 322; Defeuilley forthcoming, 46). Globally speaking, according to Defeuilley, all along the 19<sup>th</sup> century private water companies in Britain made very large profits and paid very high dividends to their shareholder (Defeuilley forthcoming, 46–51).

### 7.1.3 Municipalization

In the second half of the 19<sup>th</sup> century British municipalities grew in importance and responsibilities in various sectors (poor relief, education, police, public health and improved sanitary conditions) we shall refer to them as “social sector’s” municipal activities. In the same historical phase, British municipalities also increased their activities in the so called “municipal trading”. Through this terms we refer to “all these undertakings carried on by municipalities which if they were carried on by companies or individuals would be carried on for the purpose of making a profit” (Mackenzie 1927, 244). Municipal trading included water supply, electricity, gas and tramways (Falkus 1977, 135).

Between 1845 and 1870 water supply services run by local authorities in Britain had a spectacular growth and reached the number of 250. By 1930, four fifths of British water supply services were municipally run (Millward 2000, 324–328; Falkus 1977, 152). For instance, the municipalization of the water services in Glasgow and in Birmingham are two famous example of such a trend (Kraemer and Barraqué 2013, 249–251). In the same historical phase, British municipalities also increased significantly their activities in the gas and electricity industry and later in tramways and urban transport (Millward 2000, 324–328).

Expanding municipal activities in “social sectors” implied both investments and operational costs. How to finance them was a challenge for municipalities as there were no significant and recurrent financial transfers from the central government. Indeed, in the second half of the 19<sup>th</sup> century

“central government might establish standards for poor relief, education, policing, and public health [...] but it was not willing to use general income taxes or indirect taxes to support or equalize the burden on local communities. Here the central government continued to behave in a minimalist fashion and collective action at the local level could be accorded intellectually within the principle of local self-help. This left a severe fiscal problem especially for the rapidly growing urban areas. Pressure for better services came from local citizens and central government. Finance was not forthcoming from the centre at least initially, the tax on local property—rates—as the main source of income

even though ratepayers were not the sole beneficiaries of the new services” (Millward and Sheard 1995, 501).

Many authors have pointed out that one of the reasons behind the rise of municipal trading in those decades was the business-oriented mentality of the members of the municipal councils. Many of them were entrepreneurs which were in favor of an expansion of municipal trading in order to capture the profits of natural monopolies and increase non-fiscal source of revenues for the municipality (Millward 2000). Such a vision has been labeled as “municipal capitalism” (Waller, quoted by Millward and Sheard 1995). Only much later, in the early 20<sup>th</sup> century, municipalization of utilities was advocated by the Fabians on ideological grounds (particularly in London) and was referred to as “municipal socialism”.

Very often municipal trading in the gas and electricity sectors was a profitable activity even after taking into account the huge capital expenditures and loan charges. As a matter of fact, municipal trading in the gas and electricity sectors was a way to fuel the municipal budget with money coming from gas and electricity users rather than from tax payers<sup>350</sup> (Millward 2000, 333). Such a policy was largely implemented not only in the famous case of Birmingham under Chamberlain’s leadership but also in other British cities such as Leeds (Millward and Sheard 1995, 527)

On the contrary in most cities the rationale in favor of municipal water supply was not profit-making as these activities were much closer to break-even once the huge capital expenditures and loan charges would be taken into account (Falkus 1977, 145; Millward 2000, 339).

In London the municipalisation of the water service took place only with the 1902 Metropolitan Water Act and the creation of the Metropolitan Water Board (MWB) in 1904. The assets of the former 8 private companies were transferred to the MWB. In exchange, an indemnity of 30.6 millions £ was paid by the municipality (equal to 15 times the companies’ turnover or 38 times the companies’ earnings). The municipality issued long run water bonds (100 years payback & 3% interest rate) to pay the indemnity to the companies (Defeuilley forthcoming, 58–59).

### **Who did pay for the infrastructure ?**

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<sup>350</sup> Generally speaking the users and tax payers categories did not overlap.

Not only in London, but also in the whole UK, debt played a key role in allowing municipalities to invest in infrastructure and expand their activities. Between 1875 and 1890, debt of British municipalities more than doubled (Defeuilley forthcoming, 60). Between 1884 and 1914, the great majority of the municipal trading debt (water, gas, tramways and electricity) of British municipalities was imputable to the water sector infrastructure (Falkus 1977, 135).

In most cities in the UK, the water service was unmetered and endogenous revenues were paid by users through a flat fee which often had a fiscal nature and was indexed to the size or to the rateable value of the house. One of the advantages of municipal water supply vs private one was that the municipality could force everybody to be member of the CCU and thus to pay the fee through a compulsory contribution having a fiscal nature. This is underlined by Millward who argues that “a great attraction of municipal operation was that it involved the finance of water services by rates, the tax on rateable values. By such a uniform levy, councils automatically enrolled all tax-payers on to the water undertakings books”(Millward 2000, 332).

However, in the general case, due to the very high investments costs, endogenous revenues of the water service were not high enough to cover both the operating costs and the debt service : “water supply emerges as the largest source of gross profits but, net of loan charges, it barely broke even” (Millward and Sheard 1995, 508). Falkus also confirms that municipal water services were run at loss and subsidized from exogenous revenues (Falkus 1977, 157)

Exogenous revenues could only come from local source of revenues (municipal budget or other municipal trading activities) since at that time there were no recurrent or significant financial transfers from the central government to the municipalities. Indeed, in some cities the water service could be partly subsidized by the profits of other municipal trading sectors: “water supply in Manchester and Leeds was openly cross-subsidized from gas profits” (Millward and Sheard 1995, 508). In other cities income from municipally owned estates (properties) was a source of relief for the municipal budget as whole which might have been used to subsidize the water service too (Millward and Sheard 1995, 508).

According to Hassan, an original cost recovery solution was adopted in some cities : Manchester, Liverpool and Glasgow. It was based on a dual rating system, introduced after 1851 : “As well as the domestic rate charged to all private customers, a public rate was levied upon all property-owners, whether customers or not, in consideration of the external benefits generated by the municipal supply, particularly reduced fire-losses”(Hassan 1985, 545). Such a dual solution can be considered as a water service split in two CCUs from an accounting point of view. On one hand the water service *stricto sensu* was a CCU with voluntary membership charged through endogenous revenues to the members only. On the other hand the water for fire protection activity was considered a public good and delivered through a CCU with compulsory membership where everybody had to pay the fee.

## 7.2 The USA

### 7.2.1 New York

#### **An embryonic municipal initiative**

In 1774, New York municipality approved a water supply project based on wells, a reservoir<sup>351</sup> and wooden distribution mains. The project had been proposed by Christopher Colles, an engineer. The municipality financed all the investment costs through an ear-marked municipal bond labelled as “water works money”. The service was operated by a municipal company managed by Christopher Colles himself. We assume that operating costs had to be covered by endogenous revenues (Tariffs). It seems that the scarce availability of water discouraged potential users from subscribing to the service. The whole service and infrastructure was abandoned a few years later (Defeuilley forthcoming, 75).

#### **The Manhattan Company experience**

In 1799, the Manhattan Company (MC) was authorized to run a water service on the Manhattan island. 5% of the shares were owned by the municipality. MC was awarded a perpetual concession for the water service with the only engagement of satisfying the city water needs before 1809 (Defeuilley forthcoming, 82). MC was created under the initiative of Aaron Burr. Christophe Defeuilley analyzes finely how Aaron Burr

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<sup>351</sup> A pond “the collect” is also used as reservoir.



managed to curb down the initial reluctance of the municipality to authorize a private company to operate the water service. The story is quite original as Aaron Burr was not so much interested in the water business but considered it as the best stratagem to have the authorization to create a private bank. Indeed the 1799 act authorized the Manhattan company to freely use the profits from its water activity on other activities including financial services (Defeuilley forthcoming, 83).

The MC invested as little as possible in the water infrastructure while it opened from the beginning a banking subsidiary. The water provided by MC was available in small quantities and had a very poor quality. Thus subscription rhythm was very low. *De facto*, the MC was only an “excuse” for Aaron Burr banking activities.

### **Municipal initiative and the Croton aqueduct**

Things got even worse through the following decades due to high demographic growth of the city. In the first half of the 19<sup>th</sup> century New York was far behind its rival city Philadelphia in terms of water supply. Indeed, the 1832 cholera epidemics was much more lethal in New York than in Philadelphia and Montreal where better water supply was available. The lack of a good quality water supply and distribution in New York was also a big problem in terms of fire protection. In 1835, a fire caused huge damages to the city (Defeuilley forthcoming, 87–91).

To solve the water issue, the municipality chose an ambitious solution consisting in a water intake on the Croton river and on an long distance aqueduct to channel water to the city. In a 1835 referendum, the New York citizens pronounced themselves in favour of such a project. Works lasted until 1842 when the water service (operated by NY municipality) started. To finance such a costly infrastructure (12 Million Dollars) the municipality largely used municipal bonds.

In 1848, endogenous revenues covered only 36 % of the interest on the issued bonds. The total endogenous revenues between 1842 and 1868 were not high enough to cover the total initial investment costs (Defeuilley forthcoming, 95).

In 1877, the municipality decided to invest in two additional water intakes in the Croton river area. Works were undertaken between 1886 and 1892. Other works in the Catskills system were also made in the early 20<sup>th</sup> century, until 1928.

Thanks to the 1893 Webster act, the city engaged in an ambitious policy of water resources protection through massive land acquisition in the Catskill area (Defeuilley forthcoming, 96). Such a policy is considered as an early example of the “payment for ecosystem services” approach (Barraqué and Isnard 2012).

Land acquisitions and infrastructure costs were once more financed through debt. In 1886 NY had a total debt amount of 126 million dollars to be compared with the annual municipal budget of 49.1 million dollars. Revenues from municipal commercial services were flowing into a special fund ear-marked for debt servicing. Revenues from the water service were the major contribution to such a special fund. Revenues flowing in such a fund were not high enough to cover fully the debt service which was also covered by the municipal budget (local taxation) (Defeuilley forthcoming, 96).

In 1920, municipal infrastructure assets were estimated at a 341.5 million dollars value. In 1919, endogenous revenues from the water service managed to cover both operational expenditures and debt service on past investment (Defeuilley forthcoming, 116). We assume that in NY too, as in Paris and in Milan, inflation played a role in lowering the debt service in real terms.

### **7.2.2 From private concessions to municipal water services**

In **Boston**, the municipality awarded a concession for the water service to the *Aqueduc Corporation* which had been created in 1794 by local private investors. It seems that the business was not so profitable. Quite soon some tensions arose between the municipality and the company. The municipal authorities were asking the company to invest more in order to connect the whole city to the water service. On the contrary the company was reluctant to invest in a business which did not seem profitable enough. In the 1840's - 1850's, the municipality chose to buy back the private company and to create a municipal water service (Defeuilley forthcoming, 73). Boston issued various municipal bonds to finance its water infrastructure. The municipality considered the water service as an *ante litteram* merit good : it adopted a low water tariff policy to make water affordable for all and to encourage subscriptions to the water service. For many decades endogenous revenues did not cover the costs of the water service. In particular the debt was not serviced by endogenous revenues but by the municipal budget (Bartlett 2003, 26).

The Boston municipality also chose to heavily subsidize the investments to be made within the private buildings to connect to the water service (Bartlett 2003, 24–25).

The Boston story with a first phase under private concession and a municipalisation in a second phase also took place in many other US cities : New York, Cincinnati, Pittsburgh, Saint Louis, Chicago, Baltimore, Rochester and San Francisco (Defeuilley forthcoming, 104).

**Montreal** followed an original path as we showed in Box 10 (at page 332): on one hand the former private service was municipalized, on the other hand it was not subsidized by exogenous revenues to keep tariff low and encourage subscription. On the contrary the choice was made to make connection to the water service compulsory and collect endogenous revenues through a compulsory ear-marked water levy having a fiscal nature (Fougères 2004).

The first US city to have a modern water service was **Philadelphia**. Its story however does not fit into the two-phases paradigm as from the beginning, in 1801, the municipality developed, financed and managed the water service on its own. The works were financed through a municipal bond subscribed mainly by the city inhabitants. A water tax was set by the municipality to help paying the bond back. The subscription rhythm to the water service was not so fast and in 1814 endogenous revenues were covering less than half of the operational expenditures and could not cover the debt service.

Based on these case studies, Christophe Defeuilley reminds us that the development of urban water services in the USA may be framed in two different phases : a “**phase 0**” where water services were created by **private investors** under concession agreements and a “**phase 1**” where **municipalities** took back full responsibility over their water service (Defeuilley forthcoming) . Jacobson and Tarr confirm such a trend :

“Overall, the proportion of government owned waterworks in the United States increased from about 6 percent in 1800 to about 53 % in 1896. [...]By 1896, only nine of the largest fifty cities in the United States still relied upon privately owned waterworks. By 1900, all but one of the eleven cities in the United States with a population of more than 300,000 had acquired or constructed a municipally owned waterworks”(Jacobson and Tarr 1995, 11).

In many American cities, during “phase 0” the private water company failed to extend to the whole city a good level of water service in terms of quantity and/or quality. This had consequences both in terms of poor sanitary conditions and of ineffective fire protection. Many USA municipalities considered that municipalisation was the best way to solve such a market failure.

From an infrastructure financing perspective, the major switch was not the change from private to publicly run water services. The big change was the shift from an infrastructure financed by private equity (and private debt), serviced mainly by endogenous revenues, to a municipal-debt-financed infrastructure serviced, for a significant part, by exogenous revenues.

In fact, even during “phase 0”, often all costs were not fully covered by endogenous revenues. Indeed, in many cases the municipality agreed to pay an annual fee to the private company for each fire plug installed. In general fees were high enough to cover the financial losses of the first years of concession (Defeuilley forthcoming, 101). Obviously the fire protection fees paid by the municipality came from general taxation and can be considered as exogenous revenues.

### **7.2.3 The role of municipal debt serviced by exogenous revenues**

We already discussed how the major development of water infrastructure in Philadelphia, in New York and in Boston was municipally driven and financed through municipal bonds. Similar stories took place in other US cities. Generally speaking, water debt was serviced by exogenous revenues (general taxation) and not by endogenous revenues only. Indeed, most municipalities set a low water tariffs policy, not only to make water affordable for all but also to encourage subscriptions to the water service and thus obtain more endogenous revenues later. Thus, at first, endogenous revenues were not large enough to cover the debt service. Sometimes they did not even fully cover the operational costs.

As Sarah Bartlett writes :

“In light of low willingness to pay under private sector provision in Boston, the Commissioners generated demand by subsidizing all connections, offering a low tariff and warning citizens that water department deficits would be paid out of general taxation. [...]. From the perspective of Boston’s water planners, low

prices meant improved cost recovery because low rates would encourage more people to connect to the system to help pay for the costs” (Bartlett 2003, 54).

Boston municipality wished to encourage everyone to be member of the water service CCU. To do so costs of the water service were to be covered by general taxation by all inhabitants rather than charged to the water service user only.

Boston water service was then a CCU where the implementation of the exclusion principle was technically possible but not desirable (CCU A2 in §2.5). Boston’s policy was clearly stated by its 1848 Mayor Josiah Quincy Jr:

“The water rent is placed at a price that renders it economical for every one to take it. All citizens, whether they take it or not, will, after the expiration of two years from the completion of the work, be obliged to make up the deficiency of the rent in the general tax. All therefore are called upon by the natural desire of enjoying what they are obliged to pay for, from economy and from public spirit, to take the water and receive a blessing which, after enjoying it for one year, neither they nor their families, would abandon for ten times its cost.” (quoted by Bartlett 2003, 26)

Jacobson and Tarr indicate that “cities in the United States have typically funded their waterworks through a combination of user fees, assessments on abutting property-holders for water-main extension and general tax-revenues”(1995, 12).

As a matter of fact, US municipalities financed their water infrastructure mainly through municipal debt serviced by exogenous revenues. “Between 1860 and 1922, municipal debt increased from 200 million dollars to more than 3 billion dollars”(Melosi 2008, 84). A very significant portion of such a debt was imputable to water infrastructure (Melosi 2008, 98). “Available statistics suggest that in 1905, waterworks were the largest debt line item of municipal government”(Cutler and Miller 2005, 21 quoted by; Defeuilley forthcoming, 118).

Exogenous revenues used to cover the debt service came both from general taxation and/or from specific land value capture tools. At that time, in the USA, municipal fiscal revenues came mostly from properties taxes linked to the cadastral value of properties. Water and sanitation infrastructure has a positive impact on the values of the properties connected to the service. Such a land value increase may have been partially captured

either through the general ad-valorem property tax<sup>352</sup> or through specific land value capture tools (refer also to § 2.11).

US municipalities massively used debt to finance urban infrastructure also because they were submitted to quite loose borrowing rules. Indeed until the 1840's, US municipalities were not submitted to any borrowing cap. After the 1840's many States set some borrowing rules:

- 1) the scope and the total debt amount should be clearly identified,
- 2) local taxes should be set at a sufficient level to payack the loan and
- 3) subscribing the additional debt and setting the additional tax needs to be approved by referendum (Defeuilley forthcoming, 117).

By 1890, a borrowing cap had been set by most US States. Often the borrowing cap was expressed as a percentage of the total cadastral value of properties. Indeed such a value was the key determining factor of municipal fiscal revenues which were mostly based on the “*ad valorem* property taxes”. However, in most States the borrowing caps were set to a quite high level which was not perceived as a constraint by municipalities (Defeuilley forthcoming, 117). Moreover, very often, water loans were even less constrained (Bartlett 2003, 22) as “legislatures were more lenient in allowing cities to float water bonds than incurring other forms of public indebtness, since they were stable and demonstrated a good payment record” (Melosi 2008, 84).

Not only did the municipal borrowing regulation did not slow down municipal investments but according to some authors it also played a stimulating role as municipalities had to carefully study and calibrate the sustainability of the debt-financed infrastructure project (Defeuilley forthcoming, 118).

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<sup>352</sup> Such an option would require to keep updated cadastral values which however is not so frequent in practice

**Box 13 : Financing sanitation in US cities**

What about **sanitation** ? The development of sewer systems in the US was municipally driven too. If possible, private investors played an even smaller role than in water supply development as “the only large city to grant a sewerage franchise was New Orleans, but it was short-lived”(Melosi 2008, 98). US sewer systems in large cities developed heavily between, 1870 to 1920 thanks to municipal bonds serviced mainly by exogenous revenues (both land value capture tools and general taxation)

Source : (Melosi 2008, 98; Jacobson and Tarr 1995, 14)

**Box 14 : The New deal and Federal involvement in water infrastructure financing**

Until the 1920's, water infrastructure was a municipal issue in which State and Federal governments were not interested. Things changed with the New Deal. The Federal government chose to be involved and finance water infrastructure either through grants or through loans. Projects could entirely be financed by the federal government or eligible only to a partial federal financing. Such a federal financing policy made possible also for smaller municipalities and more rural areas to get a water supply system (Melosi 2008, 137). Later , in 1972, the Clean Water Act set up the Revolving Fund (fuelled initially by a federal grant) to be repaid at low interest rate. See also § 5.2 in Part I.

**7.3 Germany**

In this paragraph we give a very short summary on how water and sanitation infrastructure developed in Germany in the second half of the nineteenth century.

In the middle of the nineteenth century no modern water and sanitation service was in place in most German cities. Water was available from wells and fountains only. The municipalities were responsible for the maintenance of public wells, public fountains and of the few sewers already in place. The *tout-à-l'égout* was not yet existing and generally speaking, private landowners were responsible for emptying cesspools and discharging untreated waste water into rivers, canals or sewers where they existed (Bigatti 1997, 72–73).

Through the second half of 19<sup>th</sup> century a fast and massive demographic urban growth took place in German cities with frequent epidemics of cholera and typhoid fever. To

face such a health crisis most municipalities got involved in a sanitary revolution which included the provision of modern water and sanitation services.

By the end of 19<sup>th</sup> century, all cities having more than 25 000 inhabitants had a water supply network in operation (Bigatti 1997, 81). The extension of the sewer system in German cities took place at a slower rhythm and with some decades of delay. However, by the early years of the 20th century all cities having more than 100 000 inhabitants had a sewer system in operation (Bigatti 1997, 83). “From a peak of 30.7 per 1,000 during the cholera epidemic of 1865-1867, urban mortality in Prussia dropped to 19.2 by 1905. Typhoid fever, a commonly used barometer of the state of public health, had all but vanished by the turn of the century”(Brown 1988, 307).

In Prussia, the largest of the independent states which were unified by Bismarck in 1871, municipal authorities had a large autonomy and were authorized to be involved in the economy and to create municipal corporations. Since then, in Germany, municipalities have been considered “the main citizen defence against the arbitrary power of the central government” (Barraqué 1997, 1). This might be one of the reasons which explains the fact that in most cities utilities were operated from their birth as municipal services (Kraemer and Barraqué 2013, 257). People referred to such an involvement of municipalities into the economy as “*Munizipalsozialismus*”, a sort of “social municipalism” which had not much in common with the “municipal socialism” coined in Britain by the Fabians (Kraemer and Barraqué 2013, 258).

With the exceptions of Köln and Berlin, water services developed in Prussia under municipal initiatives. At the outburst of WWI more than 90 % of German water services were provided by municipalities (Kraemer and Barraqué 2013, 256)

Indeed, “from 1850 to 1913, real municipal expenditures rose 4 percent per year and debt grew at an annual rate of 6 percent. A significant share of this growth stemmed from expenditures on public health programs and bond-financed investments in new sanitary infra-structure. In 33 of Prussia's largest cities, for example, sanitary infrastructure accounted for one-third of a sevenfold increase in per capita spending on debt retirement from 1869 to 1908”(Brown 1988, 307).

Indeed, repayable finance played a major role in allowing municipalities to finance in the short term their huge investments in water and sanitation infrastructure. In addition



to that, who was the end payer of such an infrastructure in the long run? The literature seems to give a two-fold answer to such a question for the water and sanitation service respectively. Water was metered and billed to the users and the water service was financed at least partially by tariff. In fact, according to Bigatti, municipalities had to make a choice in an essential trade-off : should they bill the service to the user at a price as low as possible or should they on the contrary use the municipal water service as a source of profits for the municipality (Bigatti 1997, 80) ? Sanitation had a different business model : large capital expenses and very little endogenous revenues. As a matter of fact, the huge capital expenditures necessary to develop a sewer system were covered by two financial sources : local general taxation and land value capture mechanisms<sup>353</sup> (Bigatti 1997, 82–83). Indeed in Prussia in 1875 and 1893 two laws<sup>354</sup> made provision for the infrastructure burden to be covered by side-residents (refer also to § 2.11). A hybrid solution consisted, in Berlin, in using the profits of the water service to partially subsidize the sanitation one (see Box 15).

**Box 15 : The birth of the water service in Berlin**

In Berlin a public-private company owned by English private investors and by the municipality (13% of the shares) was created in 1856. Initially central government imposed the private concession model despite municipal opposition. The company was awarded a 25 years long concession for the water supply service. According to the concession contract the company had to comply with various obligations : i) a fixed minimum amount of extension of the water supply network per each year, ii) free water supply for fire protection, street washing and five public fountains. The company could set the water tariff but there was a rate of return (cost-plus) regulation with a 10% maximal authorized return. All profits exceeding such a cap were to be transferred to a special ear-marked fund for sanitation investments. Quite soon the private investors bought back from the municipality its shares in the company. Tension arose quite soon between the company and the public authorities since the latter were not satisfied by the company slow rhythm of investment. In 1874 the company was municipalized.

Source : Kraemer and Barraqué (Kraemer and Barraqué 2013, 247–248)

<sup>353</sup> The relevance of land value capture mechanism in financing urban infrastructure in Prussian cities is also confirmed by Kraemer and Barraqué (Kraemer and Barraqué 2013, 261)

<sup>354</sup> Law July 2nd 1875 and Law July 14th 1893. According to the 1893 law betterment taxes were included among the ordinary municipal fiscal revenues.



## 8 Conclusion

Through this thesis we have looked into the financing history of water and sanitation infrastructure through the lens of public finance theory. The originality of our research approach consisted in bearing in mind the present challenges of the water sector both in developing countries and in the western world when looking into the past.

Our research was bi-directional: on the one hand we used the terms and paradigms of the present water sector public policy debate to analyze the public policies of the past. On the other hand, we are convinced that a long run perspective can be useful to challenge and give more depth to the present policy debate.

Our conclusion is also twofold. In § **Erreur ! Source du renvoi introuvable.** we summarize our main findings and research outcomes while in § 8.2 we attempt to use our long run analysis to draw some policy lessons both for developing countries and for the western world.

### 8.1 Research outcomes

This paragraph focuses on the main research outcomes from our PhD.

- The first sub-paragraph summarizes the results from our papers in Part I on the 19<sup>th</sup> and early 20<sup>th</sup> century phase of Milan's and Paris' WSSs.
- Sub-paragraph 8.1.2 focuses on Milan's WSS from WWII to the present.
- Sub-paragraph 8.1.3 recalls the public-finance matrix of the trade-offs for water and sanitation services.
- Sub-paragraph 8.1.4 suggests to frame the development of French and Italian WSSs in four historical phases.
- Sub-paragraph 8.1.5 sketches a general path that countries in the West followed in developing their water and sanitation infrastructure.

#### 8.1.1 Economic history - the inception phase of water and sanitation services in Paris and Milan

##### Original financial model of primary data sources

A significant part of our analysis is based on an original use of primary data sources: the yearly financial reports of Milan and Paris municipalities. No previous study had

exploited these data sources to analyze the financial equilibrium of water and sanitation services (WSS) in a specific historical phase.

To perform our analysis, we manually collected three series of financial data from the water and sanitation accounting sections of the yearly municipal financial reports : one series concerns Paris' WSS from 1865 to 1930 (Crespi Reghizzi forthcoming a) and two series concern Milan's WSS from 1888 to 1924 (Crespi Reghizzi forthcoming b) and from 1956 to 2000 (Crespi Reghizzi forthcoming d). Using these data series, we built and computed an original financial model of these services. By itself, such a thorough analysis of the financing history of Milan and Paris WSSs based on rich primary data is one of the strengths of our research.

### **Main results**

Through our analysis in the **three papers<sup>355</sup> in Part II (Crespi Reghizzi forthcoming a; Crespi Reghizzi forthcoming b; Crespi Reghizzi forthcoming c)** we show that both in Milan and in Paris, the municipality provided the infrastructure and financed it through debt at fixed interest rate with long payback duration. Due to the high inflation from the 1910s to the 1930s, the debt's service was lowered in real terms, and a significant part of the debt's burden ended up being absorbed by the lenders.

The debt was mostly multi-sector and managed as a whole at municipal level. In both cities, the endogenous revenues (Tariff) were insufficient at first to cover the full internal costs (operational expenditures OPEX and debt service). Moreover, the sanitation levy revenues were below the OPEX and a cross-subsidy was taking place between the water and sanitation services. Hence, the debt service was first covered by a mix of exogenous (Tax) and endogenous revenues (Tariff), and later by endogenous revenues only, once it had already been lowered in real terms thanks to inflation.

A major difference between the two cities is the large-scale land acquisition and resale policy implemented in Paris during Haussmann's massive urban renovation. In Milan, on the other hand, land value capture mechanisms did not play a significant role in financing urban infrastructure., Milan lacked the two essential conditions for such a

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<sup>355</sup> The two first papers have been accepted by the book editors and submitted into the editorial process respectively at Oxford University Press and MIT Press. The third paper has been accepted by the journal *Flux – International Scientific Quarterly on Networks and Territories*. See also the Table in Appendix 2.

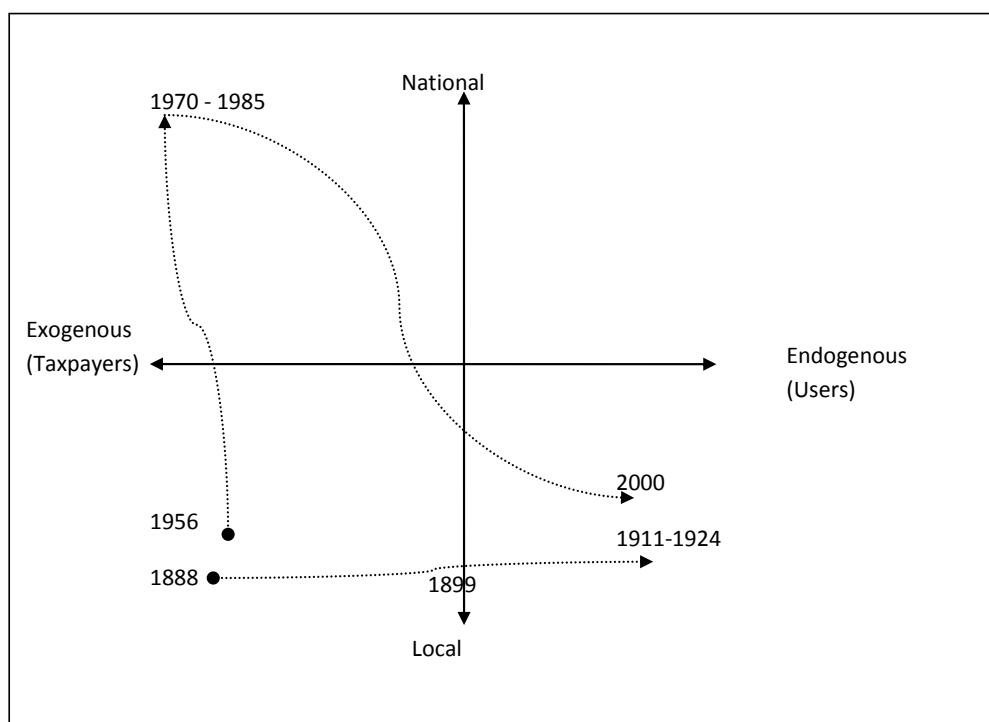
policy; available expropriation tools were weak and the municipal borrowing policy was very cautious and constrained<sup>356</sup>.

### 8.1.2 Milan's water and sanitation services after WWII

In two of our papers in part III we extend our analysis on Milan's WSS from WWII to the present.

Specifically, in **Crespi Reghizzi (forthcoming d)** we examine the history and financial flows of Milan's WSS between the 1950's and 2000 through an original prism: we look at the long run evolution of the intergovernmental financial relations and the water and sanitation regulatory framework. Thanks to our analysis, we build a two-dimensional map of the evolution of the long run cost allocation of capital expenditures in Milan's WSS (graph here below). The x-axis tells us whether costs were covered by endogenous revenues or by exogenous ones. The y-axis shows whether exogenous revenues are local (Taxes : local general taxation) or national (Transfers from the central government).

**Figure 43 : Long run cost allocation of capital expenditures in Milan's WSS**



Source : author's elaboration

<sup>356</sup> In French, this is called '*gestion en père de famille*' to which Haussmann did not stick. Indeed, Morizet suggests that Haussmann was fired because *petits bourgeois* opposed government taking part in land speculation (Morizet 1932).

We show that while the operational costs of the WSS as a whole were initially largely subsidized by the municipal general budget (local exogenous revenues), after 1899 an increasing share of the costs was covered by endogenous revenues. Indeed, after 1911, and at least until 1924, endogenous revenues were high enough to cover capital expenditures (debt amortization). as well. In other terms, Milan's WSS financial autonomy was high.

The dynamics changed after WWII. The aftermath of the war greatly reduced Italian municipalities' financial autonomy. The own tax revenues to total spending ratio was very low. The combination of anti-inflation tariff regulations and fiscal centralization policies led to a switch in the long run cost allocation from endogenous revenues (before WWII) first to local exogenous revenues (1956) and to national exogenous revenues later (1970-1985). This partly explains why investments in drinking water and waste water treatments were constantly postponed in the 1970's and 1980's in Milan. These investments were not considered as "politically visible" and were completed (respectively in 1994 and 2005) only thanks to the tight pressure put on Milan's municipality by EU directives and national legislation.

It was only in the 1990's that the combination of higher municipal fiscal autonomy and a more cost-based water tariff regulation allowed Milan's capital expenditures to be covered again by local exogenous revenues first and endogenous revenues later.

Since 2003, Milan's WSS has been operated by a municipally owned corporation : Metropolitana Milanese SPA (MM), on which our last paper in Part III focuses (**Crespi Reghizzi forthcoming f**). MM appears to be a well-run company with good technical and financial performance. Despite being a corporatized entity, MM and its staff are strongly committed to public service goals with no significant differences with what was happening previously under full municipal provision. One could even argue that MM corporatized WSS is more effective in fulfilling public service goals than full municipal provision was previously, as the stories of postponed investments tell us.

However, we also show that MM is part of an imposed baroque institutional governance system which is neither very effective nor efficient. Indeed, the regulatory architecture at local level is perfectly performed from a formal point of view but does not seem to be

truly taking place in substance. It remains to be seen whether the presence of a new national regulator (AEEG) will fully imply a positive switch from detailed regulatory process on paper to its actual implementation.

### **8.1.3 A public finance insight on the key trade offs for water and sanitation services**

In Part I, we discuss various aspects of public finance theory: impure public goods, natural monopolies, collective consumption units (CCU), land value capture tools, repayable finance for infrastructure and local public finance. Based on this public finance review, we build an original matrix of the trade-offs to be made in the water and sanitation sector (§5.3 and Table 3):

- Compulsory or voluntary membership to the CCU?
- Endogenous or Exogenous revenues?
- Institutional nature of the CCU
- Legal nature of the endogenous revenues
- Technical nature of the endogenous revenues
- Source of the Exogenous revenues
- Infrastructure project planning and management
- Who borrows ?
- Infrastructure end payer
- Spatial equalization and financial economies of scale

Such a trade-off matrix is a significant outcome of our research which can be used for many purposes. From a research perspective, the trade-off matrix can be an effective prism through which to analyse past and present policies in the water sector as we did for France and Italy (Section 6 in Part IV).

The trade-off matrix could be a powerful tool for policy makers too. Indeed it could be effectively used to challenge, reshuffle and improve present policies in the water sector but also (with some minor modifications) in other local infrastructure sectors (e.g. urban transport).

### 8.1.4 Four phases of development of Watsan infrastructure in France and Italy

Based on the trade-off matrix, we analyze the evolution of the water and sanitation sector in France and in Italy (Section 6 in Part IV and **Crespi Reghizzi (forthcoming e)**). Thanks to that analysis we suggest that the development of water and sanitation infrastructure in France and in Italy may be framed in four phases:

- Phase 0 : Privately owned water services based on the concession model.
- Phase 1 : Municipally driven infrastructure development (19<sup>th</sup> century - 1920's)
- Phase 2 : Local initiatives under the central government's influence
- Phase 3 : Self-financed CCUs & the decentralization paradigm

#### **Phase 0: Privately owned water services based on the concession model**

In many cities in the two countries (and elsewhere as we discussed in Section 7), water services developed first as private initiatives led by entrepreneurs. Generally speaking, in this phase, infrastructure was financed by private capital (both equity and debt). Formally, in this model, share holders' dividends and debt's payback were entirely covered by endogenous revenues.

However we showed that in many concession agreements (as in Naples and in Nantes - see § 6.4.3 and §6.5.3), a yearly fee was paid by the municipality to the private company for the so-called "public service" (fire protection, public fountains and other municipal water needs). This means that the service costs were covered *de facto* by a mix of Tariffs and Taxes.

In Paris, an example of private concession is the early and short experience of the *Compagnie des Eaux de Paris* (Perier brothers) (§6.2.1) which however did not receive any revenue from the municipality (Crespi Reghizzi forthcoming a, Box 1). In fact, one could wonder whether this was one of the reasons behind the company's early failure.

On the contrary, Milan did not even go through this phase because the attempt to award a concession for the water failed (Crespi Reghizzi forthcoming b).

In many cities, at a certain point the water service was municipalized on sanitary grounds as early private initiatives did not manage to extend water service to the whole city.



### **Phase 1: Municipally driven infrastructure development**

This second phase began sometime in the second half of the 19<sup>th</sup> century and lasted until the 1920's. It is analyzed in the papers in Part II and discussed further in §6.2.

During this phase, the municipality led the development of urban infrastructure in the larger and wealthier<sup>357</sup> cities in both countries<sup>358</sup>. A hybrid solution which was also often adopted in France consisted in choosing the delegated management model (*affermage*) where the investments in infrastructure are kept under municipal responsibility (Pezon, 2011).

Municipalities were largely autonomous in their revenues (no recurrent transfers from central government). Water and sanitation infrastructure developed as part of the whole urban infrastructure with little or no separation from the municipal general budget. It was largely financed using long term repayable finance which had municipal fiscal revenues as collaterals. Debt service was lowered in real terms thanks to high inflation in the early 20<sup>th</sup> century. Total costs (including investments costs) were covered by a mix of endogenous and local exogenous revenues. The cases of Milan and Paris also illustrate this phase.

### **Phase 2 : Local initiatives under central government influence**

This phase starts in the 1920's and lasts until the 1970's / 1980's in France and until the 1990's in Italy.

Municipalities (or inter municipal entities) were still responsible for water and sanitation services; however this took place under a tight influence of the central government:

- Through various reforms, municipal finance was made less autonomous and more dependent on central government transfers and shared revenues. This phenomenon was particularly sharp in Italy.
- Municipal borrowing was also heavily constrained too.

<sup>357</sup> « *Cette antériorité des villes polyvalentes et prospères leurs assure une avance considérable sur le reste des cités et bien plus encore, sur l'ensemble du monde paysan* » (Goubert 2008, 197)

<sup>358</sup> « *Les grandes villes de province, héritières d'une tradition urbaine ancienne, ont pour l'essentiel réussi à s'équiper souvent en ayant recours à l'emprunt. Ce choix a débuté avant le premier conflit mondial. Les équipements ont alors été remboursés d'autant plus facilement que l'inflation consécutive au conflit a joué en leur faveur.* » (Pinol 1999, 80)

- Infrastructure planning, design and financing was increasingly centralized.
- Water tariffs were subjected to an upper level of government approval and constrained in the dominant anti-inflation macro-economic policies of the time.
- A dual system was in place where the central government had great influence on the infrastructure development while it left the provision of the service to the municipalities.

Milan, Paris and many large and wealthy cities in both countries had already developed a significant part of their infrastructure during Phase 1. They pursued the infrastructure development in phase 2 sometimes with constant investment postponing (such as in Milan).

Smaller or poorer municipalities (particularly in rural areas or in the South of Italy for example) had not been able to develop the Watsan infrastructure in Phase 1. Central government subsidies policies in phase 2 (e.g. in France FNDAE) were an attempt to reduce disparities in infrastructure endowment through incentivizing local authorities to develop a Watsan infrastructure. However the effectiveness of such a policy was partially jeopardized by the constraints on municipal financial autonomy and on public services tariffs.

### **Phase 3: Self-financed CCUs & the decentralization paradigm**

The fourth phase started in the 1970's/1980's in France and in the 1990's in Italy. It is characterized by the following major trends.

- With the decentralization reforms, municipalities were given more fiscal and financial autonomy. The ratio of local exclusive taxes to total municipal revenues increased.
- Municipal borrowing became less constrained
- Water and sanitation services were given more autonomy from the municipality through the creation of more legally and financially autonomous collective consumption units (CCU) *regimes*.

- Local Government Units were increasingly encouraged to cover water and sanitation costs through endogenous revenues and to avoid covering them through exogenous revenues<sup>359</sup>. Progressively, the “water pays water” principle was adopted by policy makers in France. The full cost recovery principle was then adopted in Europe on environmental grounds.
- In France, thanks to the spatial equalization (cross subsidies) implemented by the *Agences de l'eau* mutual system, the transition to full cost recovery was gradual while in Italy the shift was abrupt (Crespi Reghizzi forthcoming e).

### 8.1.5 Sketching the 19<sup>th</sup> century expansion phase of water and sanitation infrastructure in selected countries in the western world

In section 7, we compare our analysis on France and Italy with the literature on the experiences in other countries (UK, USA, Germany). Each country and each city followed a specific path. Nevertheless, we sketch a general path that countries in the West followed in developing their water and sanitation infrastructure with some common features among the 5 countries we compared: France, Italy, UK, USA and Germany.

Generally speaking, in all selected countries there has been an **initial phase** where the water infrastructure developed under the **private concession model**. In such a model, the water infrastructure costs were covered in the long run by a city-specific mix of endogenous and exogenous revenues. In some cities, municipalities paid the concessionaire a yearly fee for the “public service” scope of the infrastructure. These yearly fees can be considered as exogenous revenues coming from local general taxation. They covered a part of the infrastructure costs and lowered the investor risk.

In other cities, no exogenous revenues came from the municipality and all costs were covered by endogenous revenues only. However, this model had problems. Relying on endogenous revenues only was one of the reasons behind the failure of the concession model to effectively generalize the water infrastructure to the whole city in a context of fast urban expansion. This was the case in Paris with the short experience and failure of the *Perier* brothers company.

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<sup>359</sup> « *Faire payer l'utilisateur plutôt que le contribuable semble de bonne politique financière. C'est aussi une politique de vérité des prix qui permet à chacun de mieux saisir le coût réel du service qui lui est rendu* » (Chaix 1986, 18)

The private concession model phase was particularly significant and long lasting in the UK. On the contrary, that phase was much shorter and less relevant in Germany, the USA, Italy, and France.

Despite these differences, all five countries switched to a **municipally-driven model to develop water and sanitation infrastructure** between the middle of the 19<sup>th</sup> century and the early decades 20<sup>th</sup> century. In all considered countries<sup>360</sup>, the municipal switch coincided with the inception of the expansion phase of a city-wide and universal water and sanitation infrastructure. We shall refer to this second phase as the “**expansion phase.**”

A clarification has to be made for France to anticipate a possible objection. The private sector continued to play a significant role in the French water sector even during the expansion phase of water services. Nevertheless, the private sector did not have a major role in the expansion of the infrastructure *stricto sensu* since it was mainly involved through the delegation model (*affermage*). In these contracts, the most of the investments were a municipal responsibility and not delegated to the private partner (see also § 6.4.3)

Taking this into account, we argue that **most of the expansion of water and sanitation infrastructure in large cities in selected countries in the Western world was a municipally-driven story.** This statement should however not be read as an expression of the classical public versus private debate. On the contrary, we already wrote that such a debate is not relevant when one focuses on investments and infrastructure as we do.

There are at least four other issues implied in the previous statement which are relevant in terms of infrastructure financing during the expansion phase: i) large municipal autonomy and low central government involvement in the expansion phase, ii) a municipal debt story, iii) water and sanitation services as merit goods which should be incentivized and iv) local exogenous revenues to cover the initial infrastructure costs.

**i) Large municipal autonomy and low central government involvement during the expansion phase.** We show through our analysis of intergovernmental relations that during the 19<sup>th</sup> century expansion phase, municipalities in all 5 countries were largely

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<sup>360</sup> However we have to take into account that London and some other British cities already had a relevant endowment in water infrastructure when the municipal switch took place.

autonomous in their fiscal revenues. No significant and recurrent transfers from the central state were in place. Thus, the first issue implied in the previous statement is that “the expansion phase of water and sanitation infrastructure was municipally driven” since the central state was not significantly involved. In fact, in many countries the central state became increasingly involved in water and sanitation infrastructure issue much later in a subsequent historical phase (see also §**Erreur ! Source du renvoi introuvable.** for France and Italy, §7.1 for the UK and Box 14 for the USA). The progressive involvement of central government in the water sector can be considered as an attempt to equalize the infrastructure endowment over the whole country and to smooth the inequalities among wealthier and poorer areas and among urban and rural ones.

**ii) A municipal debt story.** The second issue is that the huge expansion of water and sanitation in large cities was financed by the massive use of municipal debt (both bonds and loans). This was only possible because of the existence of modern financial markets, of the availability of capital and savings banks in the context of economic growth and to the financial credibility of municipalities as responsible borrowers. At that time most, of municipal loans had long payback duration at a fixed interest rate. Thus, the high inflation of the early decades of the 20<sup>th</sup> century significantly lowered the cost of debt service in real terms, meaning that the lenders absorbed a significant part of municipal infrastructure costs.

**iii) Water and sanitation services as merit goods.** In most cities municipalities pursued the expansion of water and sanitation infrastructure as the major strategy for improving sanitary conditions their citizens and fighting against recurrent epidemics. Both carrot and stick approaches were adopted by municipalities in order to enhance the subscription rhythm of water and sanitation services as they were considered as merit goods. In the general case, connection to the sanitation service took place on a compulsory basis. Often sanitation endogenous revenues were collected through compulsory levies and taxes.

On the contrary, connection to water supply was usually left to individual voluntary decision and incentivized both through setting a low exclusion level (low endogenous revenues level) and subsidizing the necessary investments, even in private properties

(standpipes and other works). In some cases however, such as in Paris and in Montreal, connection to the water service was explicitly made compulsory. In other countries, such as in Italy, the obligation to have tap water in flats was indirectly made compulsory through housing standards set by law.

**iv) Local exogenous revenues to cover the infrastructure costs.** The main incentive to connect to water and sanitation services consisted in the low endogenous revenue level (Tariff in the OECD 3T's) adopted by most municipalities in the early expansion phase. By definition, costs that were not covered by endogenous revenues were covered by exogenous ones. At the time, municipalities had great financial autonomy with no recurrent transfers being paid by the central government. Thus, exogenous revenues had a local origin: they came mostly from local general taxation. In some cases, cross-subsidies from other municipal trading sectors (mostly gas and electricity) and land value capture tools also played a financing role.

## 8.2 Challenging today's policy

Financing needs for urban water infrastructure in the forthcoming years are huge. This is true not only in developing countries where a generalized access to clean water and sanitation is still a key challenge, but also in the Western world where the water industry is mature and has “an increasing need to reproduce the (huge) infrastructure capital which was set up over decades” (Barraqué 2009).

Our long run analysis shows which choices were made by policy makers in terms of trade-offs in each country and in each historical phase. In the previous paragraphs, we summarized our main research outcomes from an academic research perspective, trying to generalize and sketch the major development patterns of the water and sanitation infrastructure in France, Italy and in three other countries in the Western world (UK, USA and Germany).

De Luca and Lorenzini wrote: “history teaches us that one single model or pattern, fitting all at the same time, does not exist. The same financing system can be successful in one country while it can fail in others, or even in other parts of the same state” (De Luca and Lorenzini 2013, 26). We fully agree with such a vision which is particularly true for a local infrastructure like water and sanitation. That is why one should be very cautious and humble when extracting some policy lessons from a historical analysis.

Nevertheless, in this paragraph we adopt a policy oriented attitude and attempt to challenge today's policy, using the main findings from our long run analysis.

Sub-paragraph 8.2.1 focuses on the case of developed countries while sub-paragraph 8.2.2 addresses the case of developing countries.

### **8.2.1 The case of developed countries with a mature infrastructure**

#### **Reproducing a mature infrastructure**

At the opening ceremony of the last World Water Forum in Marseille, the OECD General Secretary warned the audience about the growing financing needs for the water sector in developed countries who will “now face huge costs to replace and modernise ageing water infrastructure, and to upgrade systems to meet stricter quality standards” (Gurria 2012).

These financing needs for infrastructure replacement take place in a historical phase where water demand is decreasing in most large cities in the developed world. This implies also lower revenues for the water operator since in most countries<sup>361</sup> water and sanitation endogenous revenues are paid by the users on a volumetric basis. In particular, in Europe, water pricing through volumetric rates has been imposed (or at least heavily recommended) by European legislation on environmental grounds in order to incentivize users to conserve water (UE 2000; UE 2003, 180–181).

#### **Challenging the Full Cost Recovery & volume-indexed rates paradigm**

Water consumption kept increasing through the 20<sup>th</sup> century in western countries. In that context, the volume-indexed rating provided increasing revenues for water and sanitation services. Today, water and sanitation endogenous revenues in Europe have been rigidified by Full Cost Recovery (FCR) principle on the one hand, and by volumetric water pricing on the other hand. Thus, lower volumes distributed imply lower revenues for water and sanitation utilities. By definition FCR means that all costs have to be covered by endogenous revenues. However, there is a tragic mismatch between volume-indexed revenues and costs which in the water industry are mostly fixed. Indeed, the present business model is “being questioned” in the context of a

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<sup>361</sup> This is not the case in the UK and in Ireland where water is still often unmetered and charged through fixed rates proportional to the rateable value of houses. “Today still, 60 % of British households (and even more in Irish ones) have no meter and pay rates instead”(Barraqué, Trancart, and Leflaive 2013, 6).

“looming crisis” of water and sanitation services which “brings operators to look for new business models” as Barraqué et al. write in an OECD report (Barraqué, Trancart, and Leflaive 2013, 3–5).

In our opinion, water pricing is a public policy tool which is presently being twisted by two conflicting views and objectives. One view considers water pricing to be a public finance tool: water rates should cover the water utilities costs and allow a sufficient level of self-financing for upcoming investment plans to be bankable. A second view considers water rates to be an environmental incentive: water-pricing should be mostly proportional to the consumed volumes in order to encourage water conservation. In a decreasing consumption phase, the two objectives are in conflict and a trade-off among the two goals appears.

The environmental incentive conception of water pricing is behind the adoption of FCR and volume-indexed water pricing in EU policies. However we offer two arguments against the soundness of such a policy: i) water conservation is not an absolute objective to be achieved *per se*; its relevance depends on the local area conditions (e.g. is it an area with abundant or scarce water resources?); and ii) the price-elasticity of domestic water consumption is not such a clear-cut issue, particularly in presence of collective metering as in many large European cities (including Paris and Milan). Moreover, Massarutto reminds us that “once the pricing rule deviates from the orthodox Long Run Marginal Cost, the choice of the pricing structure is by far a political decision whose pros and contras originate from other reasons than allocative efficiency” (Massarutto 2002, 66).

Both in areas where water resources are not scarce and in contexts where water pricing is not such an effective tool to incentivize water conservation, the EU policy, of FCR and fully volume-indexed rates, raises more than one question from a public finance perspective. Looking into the past helps us challenge present policy solutions. Full cost recovery based on fully volume-indexed water pricing is not the only possible water pricing policy.

This does not mean however that pricing policies should go back to cost sharing systems purely based on exogenous revenues (Taxes and Transfers). Indeed, such a solution would heavily jeopardize the water sector’s financial autonomy in the context



of the financial crisis of European national states. Low financial autonomy could in particular threaten the capability of the water sector to reproduce its infrastructure capital. Indeed, we showed in Crespi Reghizzi (forthcoming d) how the low financial autonomy of the water sector Collective Consumption Units was one of the cause of the dramatic underinvestment in water and sanitation infrastructure in Milan (and also in other Italian cities) in the second half of the 20<sup>th</sup> century.

### **Cost recovery based on tailored endogenous revenues**

What we propose instead is to keep full cost recovery but to take some distance from the volume-indexed rates *dogma*. We suggest a **cost recovery system based on tailored endogenous revenues** where the latter could be collected in various ways, not only by fully volume-indexed rates: through a two part tariffs, through a flat fee, through volume-indexed rates, or through a mix of all three.

This could allow local policy-makers to balance the revenue and cost structures and to adopt a pricing solution tailored to the local context. For example, in areas without major water scarcity problems, rates could rely more on flat fees rather than on volumetric ones; and *vice versa* in areas where water conservation must be heavily incentivized. Moreover, when water pricing systems are designed to encourage water conservation, their effectiveness should be measured and tested.

Local policy makers could also adopt endogenous revenues systems based on earmarked levies having a fiscal nature. Depending on the local context, these levies could be based on the rateable value of houses (as it is presently done in the UK) or on other specific parameters (e.g. on a flat fee per family as waste water treatment in the Netherlands).

In fact, we do not suggest a ‘the’ perfect water pricing policy since we doubt that it exists. A long run perspective tells us that each historical phase and each local context calls for specific pricing policies. The time to challenge and re-shuffle water pricing policies in Europe may now have come.

### **A fair accounting of the costs**

Today in France and Italy, all internal costs of the water and sanitation collective consumption units (CCUs) are charged to the users. However, a part of these costs

comes from appendix functions which could be considered as public goods and should not be billed to the users of the water and sanitation CCUs. These appendix functions include fire protection, urban drainage, street washing and irrigation for public parks. In France, a recent report by the *Comité National de l'Eau* argued that the costs of all these appendix functions should not be covered by water and sanitation endogenous revenues but by exogenous revenues (local taxation) (CNE 2013). We agree with that position.

Another issue is that the existence of a well-maintained water and sanitation infrastructure has a positive impact on the abutting properties. A parallel can be made with a condominium (a jointly owned block of flats). Long-lasting investments in the condominium are shared among all the co-owners. The better the building is maintained, the higher the property value.

Similarly, water and sanitation infrastructure can be considered as a condominium among all the abutting properties owners. Here too, the infrastructure endowment and the level of maintenance has an impact on properties values. Thus, according to land value capture theory, the infrastructure costs (new infrastructure and renewal) should be charged to the properties owners.

The water pricing system in the Fribourg canton in Switzerland is an example of the application of these two principles in practice: the variable costs are charged to the users, the infrastructure costs are charged to the properties owners and the public good functions costs are covered by general taxation (see Box 2 on page 104).

On the one hand, cost recovery systems, based on fair cost accounting which allows distinguishing among appendix functions, investments costs and variable costs, could be an attractive way of financing water and sanitation services. On the other hand, one potential problem with this kind of recovery approach is its accounting complexity. A trade-off has to be made between a fair cost sharing with complex accounting system with sophisticated sharing keys and a simple accounting system in which no costs are charged to property owners.

### **Equalization and repayable finance**

No matter the chosen long run cost-sharing policy, repayable finance tools will be needed to smooth the investment renewal burden overtime. Three issues should be

carefully considered: i) equalization, ii) financial economies of scale and iii) financial and borrowing autonomy.

Water and sanitation CCUs in developed countries will have to reproduce the existing mature water and sanitation infrastructure in the forthcoming years. A part of this infrastructure was financed in the past with significant contributions from exogenous revenues. Today water and sanitation CCUs are asked to reproduce it under the tight constraint of the Full Cost Recovery principle which has rigidified the financing system of the water sector. This might be particularly critical in rural areas where the infrastructure costs per capita are very high due to diseconomy of density. Some type of **spatial equalization** system is required among the different CCUs in countries such as Italy where these kind of equalization funds do not exist (see also § 5.2 in Part I).

The equalization systems can also be designed to fulfill a **financial economies of scale** function. This means that the equalization fund helps the CCUs to pool together to get easier and cheaper access to debt financing. Such mechanisms could be essential to lower the costs faced by water and sanitation CCUs.

One last issue is that the water and sanitation CCUs should be given enough **financial and borrowing autonomy** (together with **budget accountability**) in order to be able to use debt to finance their investments plans. In the current period of financial distress for European states, national governments might be tempted to include water and sanitation CCUs into the national public deficit accounting, or more generally to include the water sector financial circuit in austerity policies.

This is what happened in Italy when the *Monti* government tried to make it compulsory for water sanitation services to comply with the national stability pact. Luckily, until now this regulation has not been applied in practice (see § 6.4 in Crespi Reghizzi (forthcoming f) and §3.4 in Crespi Reghizzi (forthcoming e) in Part III).

Another example is the decision made by the French Parliament in the 2014 Budget bill to cut the French River Basin agencies' budgets by 10% and transfer it to the general

budget of the French government<sup>362</sup>. This means transferring money fuelled by levies paid by water and sanitation users to the general budget.

Clearly there is no public finance rationality behind this type of decision, except for political will to grab easy money from less politically visible sectors such as water and sanitation. To be consistent, one cannot ask the water sector to be fully based on endogenous revenues and then use the water sector budget to fuel the national government general budget. Similarly one cannot transform WSS CCUs into corporatized entities which should service their debt with endogenous revenues, and at the same time cap their debt to conform to the national borrowing capping.

### **8.2.2 The case of developing countries with a water and sanitation infrastructure in expansion**

Improved access to water and sanitation is still a key issue for many developing countries. This is particularly true in urban areas where there is an urgent need to develop a modern water and sanitation infrastructure in response to rapid rural migration to cities and demographic growth. There are some similarities<sup>363</sup> between cities in developing countries today and cities in the western world during their infrastructure expansion phase. Based on our long run analysis, we are brought to challenge today's policy in developing countries. Due to our past experience in Sénégal, we restrain our geographical area of interest to French-speaking Western African countries.

#### **Public vs private production is not the most relevant debate when focusing on infrastructure financing.**

Since the last decade 30 years, the public policy debate on water and sanitation services has mostly focused on the choice of management models (Direct Public Management - DPM, Regulated Monopoly -RM or Delegated Management - DM) and on whether to support private sector participation (PSP) in the management of these services.

We already discussed that the management model and the degree of PSP is not very relevant when looking at infrastructure expansion, as investments in water and

<sup>362</sup>See [http://www.maire-info.com/UPLOAD/FICHIERS/AMF\\_308\\_P018.pdf](http://www.maire-info.com/UPLOAD/FICHIERS/AMF_308_P018.pdf), and <http://www.senat.fr/questions/base/2013/qSEQ130908157.html> retrieved online on June the 25<sup>th</sup> 2014

<sup>363</sup> There are also some key differences to bear in mind when making this comparison. See **Erreur ! Source du renvoi introuvable.**

sanitation infrastructure are under the financing responsibility of the public sector (with the notable exception of the RM model - full private concession<sup>364</sup>). This does not mean that PSP in the water sector is useless or negligible, but only that it is bound to have a marginal role in financing the infrastructure expansion.

We showed through history, there are many other trade-offs which were more relevant than the public-private debate from an infrastructure financing perspective.

**How to share responsibilities on the water and sanitation infrastructure between Local Government Units (LGU) and National Governments is a very relevant issue.**

A key trade-off has to be made when allocating responsibilities on water and sanitation infrastructure development between Local Government Units (LGU) and central government or other national institutions. On the one hand, decentralizing the power to the LGU is justified by the devolution principle (§4.2 in Part I) since it “makes it possible to match local public services with citizens’ preferences” (Dafflon and Madiès 2011, 13). On the other hand, the unitary principle justifies some kind of centralization or equalization among LGUs in order to smooth spatial inequalities in infrastructure endowment between areas.

We showed through our historical analysis that in France and Italy (and in other countries), water and sanitation infrastructure first developed under municipal responsibility. The inception and initial expansion of modern water and sanitation infrastructure in larger and wealthier cities (such as Milan and Paris) took place in that phase with full municipal mastery and little financial help coming from central government.

The involvement of an upper scale of government (e.g. central government, national equalization funds or regional authorities) in the expansion of water and sanitation infrastructure took place progressively through the 20<sup>th</sup> century in France, in Italy and in the UK. The increasing influence of central government (or regional authorities in the UK) over the water and sanitation sector can be considered as an attempt to reduce inequalities in infrastructure endowment in particular in the rural and less wealthy areas where water and sanitation had not developed previously.

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<sup>364</sup> Concession which is now found rigid and risky, just as it was in Europe at the end of 19<sup>th</sup> century

History tells us that water and sanitation developed in large cities in the western world mostly under municipal control. On the contrary, there are many developing countries<sup>365</sup> where the responsibility on water and sanitation infrastructure has been granted to a national public entity. In these countries, municipalities have little or no say over their water and sanitation services. Although history cannot give a one-fits-all policy solution, it questions the rationale of such a choice. Why do municipalities in large<sup>366</sup> cities in developing countries lack the same level of control over and responsibility for their water and sanitation infrastructure that many cities in the western world had in the 19<sup>th</sup> century ? Probably some help from sociology and other social sciences would be needed to answer this question.

### **Municipal financial autonomy and municipal debt to finance urban infrastructure**

In many large cities in the western world, water and sanitation infrastructure was financed by municipal debt in a historical phase where municipalities had great financial autonomy. Municipal debt was used to finance urban infrastructure in many different sectors and municipal revenues as a whole were used as collateral.

On the contrary, in many French-speaking African countries municipal financial autonomy is very low. Indeed, in many of these African countries, decentralization reforms took place only on paper with no or little decentralization taking place in practice in terms of municipal financial autonomy. This is one of the reasons behind the fact that municipal debt does not play a significant role in financing urban infrastructure.

In these countries, most of the time, water and sanitation infrastructure is financed through sovereign grants and loans awarded by international lending institutions to the central governments, and then transferred either as grants or loans to the national public entity in charge of water and sanitation.

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<sup>365</sup> This is particularly true in some French speaking African countries e.g. Sénégal with SONES or Burkina Faso with ONEA, Mali with EdM and so on...

<sup>366</sup> The issue is different for rural areas where the argument in favour of centralization comes from the fact that local government units often lack of the technical and financial capabilities to manage water and sanitation infrastructure.

We believe that unless municipal entities in those African countries are given some financial autonomy, as European municipalities in the 19<sup>th</sup> century had, they will hardly be able to take control over their water and sanitation infrastructure development,.

**Box 16 : Key Differences between municipal debt in the 19th century and today**

If there are some similarities between some 19<sup>th</sup> century European cities and today's cities in the developing world there are also many differences to bear in mind when making some comparisons:

i) In the 19<sup>th</sup> century, municipal debt had a long payback duration and fixed interest rates. High inflation played a significant role in lowering the debt service in real terms. This a key economic context factor to take into account.

ii) European and American municipalities managed to issue huge amount of municipal debt thanks to various factors: a) the existence of well established financial markets, b) a high economic growth phase with high amount of capitals available, c) municipalities were considered as credible borrowers, d) middle classes were ready to pay for all this.

Many of these conditions are not easily met today in developing countries.

**Defining the best policy mix to incentivize connections to the water and sanitation service**

We showed that during the expansion phase, cities in the western world had a merit good conception of the water service and adopted a great variety of 'carrot and stick' approaches to enhance the subscription rhythm to the water and sanitation service. Specifically, "stick" approaches consisted either in explicit or implicit enforcement to connect while "carrot" approaches included subsidizing the necessary investments in the private properties (standpipes and other works) and setting a low exclusion level (Tariff).

On the contrary, in the 1990's, developing countries were adviced by international institutions to adopt full cost recovery pricing in application of a market-based conception of the water service rather than a merit good rationale.

"The World Bank believes that cost recovery should be sufficient to pay for operations, maintenance and a fair return on capital investment, and provide for

this outcome through loan covenants” (Bartlett 2003, 12 quoting a 1993 World Bank report)”

History suggests that during the initial expansion phase, access to water and sanitation should be considered as a merit good and encouraged both through a mix of coercion and exogenous support. Policy makers in each country should define their own policy mix to make everyone to join the water club.

History also tells us that once everybody is connected to the service (after the expansion phase), the CCU level of exclusion can be progressively increased as users “after enjoying [the water service] for one year, neither they nor their families, would abandon for ten times its cost” (Boston’s mayor in 1848 quoted by Bartlett 2003).

### **Challenging the best mix of the 3T’s**

In the last ten years, international institutions and donors progressively softened their position from *full cost recovery* to the more realistic and pragmatic concept of *sustainable cost recovery* and the 3T’s (OECD 2009a).

Nevertheless, when manipulating the OECD 3T’s paradigm, there is still the widespread belief among international institutions, that Tariffs (Endogenous Revenues) are more legitimate than Taxes (Local Exogenous Revenues) and Transfers (National Exogenous Revenues) to finance water and sanitation services. The OECD general secretary expressed this opinion at the opening ceremony of the 2012 Marseille World Water Forum:

“Key amongst these is the need to take a strategic approach to financial planning, to encourage greater use of water pricing and to enhance the use of water tariffs as a central part of what we call the 3Ts – Tariffs, Taxes and Transfers!”(Gurria 2012)

Through our long run analysis, we showed that in each city and each specific infrastructure phase a different mix of the 3T’s was chosen to cover the infrastructure costs. History reminds us that one policy solution does not fit all situations. Covering the infrastructure costs with endogenous or exogenous revenues is a trade-off to be made by policy makers on normative grounds depending on the local context and on the specific phase within the infrastructure cycle.



In particular, we showed that during the inception and expansion phase in many large cities in the western world, water and sanitation infrastructure was financed by local exogenous revenues (mostly local general taxation - Taxes). This was the expression of the municipal wish to set a low level of exclusion to the service and to encourage everybody to be member of the 'water club' and enhance the subscription rhythm. Should water and sanitation services in developing countries follow the European example which comes from the past?

### **Financing urban infrastructure through land value capture tools**

We showed that in Paris, land value capture tools played a significant role in financing water and sanitation networks in the 19<sup>th</sup> century expansion phase (Crespi Reghizzi forthcoming a, §3.5). On the contrary, in Milan, these tools played a very limited role as as neither of the two essential conditions for such a policy were met: available expropriation tools were weak and the municipal borrowing policy was very cautious and constrained.

A greater use of land value capture tools to finance urban infrastructure is a key recommendation made by many experts and international institutions (Peterson 2009; Paulais 2012a) and we fully agree on that vision. Until now however this seems to be a vain wish in French speaking African countries where land value capture policies are very rarely implemented<sup>367</sup>. Land is often a sensitive issue. Implementing a land value capture policy not only requires specific policy tools to be available but also a strong political will.

### **8.3 Further research**

At a certain point during a PhD research, one has to decide to restrain his research scope and leave other research topics and questions for the future.

Here below are listed some of the topics left apart for further research.

- i) There is some asymmetry in our research since we did not have the time to make a detailed and deep analysis of the financial flows of Paris water and sanitation

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<sup>367</sup> On the contrary China is often quoted as an example where land value capture policies are effectively used to finance urban infrastructure (Lorrain 2011). Medellin in Colombia is also quoted as an example of this kind of policies (Paulais 2012b; Paulais and Stein-Sochas 2007; Paulais 2012a). See also the following link [http://www.landandpoverty.com/agenda/pdfs/paper/walters\\_full\\_paper.pdf](http://www.landandpoverty.com/agenda/pdfs/paper/walters_full_paper.pdf).

service from WWII to present time as we made it for Milan. This could be a first direction for further research. Specifically, it would be very interesting to analyze the temporal and spatial averaging out role played by the Agence de l'eau Seine Normandie<sup>368</sup> (AESN) in Paris. Each water and sanitation service (each Collective Consumption Unit) is both a contributor to the AESN mutual and a recipient of the AESN loans and grants. In the long run was Paris' WSS a net financial contributor to the AESN mutual fund or a net recipient from it ? And also, what was the effect of AESN mechanism in terms of intergenerational transfers between Paris water users ?

ii) A second theme could be the implementation of land value capture tools to finance urban infrastructure today. We believe that this theme is very relevant both for developing countries and for developed ones. In the former, the issue is how to finance the development of a modern urban infrastructure while in the latter, a hot topic is how to finance the transition to a more sustainable city.<sup>369</sup>

iii) Another research direction would be to apply our trade-offs matrix to other case studies within the water and sanitation sector in developing countries.

iv) A last research topic could consist in adapting the trade-offs matrix to a different local infrastructure sector such as urban transport and subsequently analyse a few case stories in that sector.

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<sup>368</sup> Some of these questions are analyzed through an anthropological and social science prism by Patrick Laigneau in his PhD thesis (Laigneau 2014)

<sup>369</sup> See for example the « urban fabric » research theme at IDDRI, <http://www.iddri.org/Themes/Urban-Fabric/>.

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**Appendix 1 : Main steps in the institutional history of the Paris water service,**

Years	Institutional phase	Water production and transport	Water distribution	Sanitation	Comments
1807 - 1860	Pure municipal service	Municipal department	Municipal department (mainly through public fountains)	Not existing yet (but already drainage)	Private concession on the Canal de l'Ourcq and canal Saint Martin
1860 – 1984	Mixed scheme	Municipal department	Municipal department + <i>régie intéressée</i> with the <i>Compagnie Générale des Eaux</i> (CGE)	Municipal department, progressively with intermunicipal cooperation	
1985 – 1986	Transition scheme	Municipal department	Private companies <i>CGE</i> and <i>Lyonnaise</i>	Municipal department + SIIAP at the intermunicipal scale	
1987 – 2009	Delegation scheme	SAGEP	Private companies <i>CGE</i> and <i>Lyonnaise</i>	Municipal department + SIIAP at the intermunicipal scale	SAGEP (70 % of shares owned by the city of Paris and 28 % of the shares owned by <i>CGE</i> and <i>Lyonnaise</i> )
After 2009	Municipalization	Eau de Paris	Eau de Paris	Municipal department + SIIAP at the intermunicipal scale	

Source : author's elaboration

## Appendix 2 : A summary table of the various essays

	Title	First conference	Other conferences	Working paper publication	Essays in Phd thesis	Publications
I	The financing history of urban water infrastructure in Paris (1807-1925) : lessons from the past to enlighten present and future challenges ?	Milan European Economic Workshop – University of Milan – June 2012	Congrès de l'association française de science économique – Aix en Provence – June 2013	Already published as a working paper online on REPEC. <a href="http://ideas.repec.org/p/mil/wpdepa/2012-22.html">http://ideas.repec.org/p/mil/wpdepa/2012-22.html</a>	<b>a - The Finance of Paris Water: Local Public Goods at the Onset of Industrialization</b>	In “Infrastructure Finance in Europe - Insights into the History of Water, Transport and Telecommunication” –Y. Cassis, G. De Luca, M. Florio editors – <b>Oxford University Press</b>  <b>Accepted by the editor, under OUP blind review process</b>
II	Providing and financing a municipal infrastructure : a long run analysis of water and sanitation investments in Milan (1888-2000)	CESIFO summer institute Venice – July 2013	Annual meeting of the Società Italiana di Economia Pubblica – Pavia – September 2013	Already published as a working paper online on CESIFO <a href="http://www.cesifo-group.de/portal/page/portal/CFP_CONF/CFP_CONF_VSI/VSI%202013/vsi13-eip-Picot/Papers/vsi13_eip_CrespiReghizzi.pdf">http://www.cesifo-group.de/portal/page/portal/CFP_CONF/CFP_CONF_VSI/VSI%202013/vsi13-eip-Picot/Papers/vsi13_eip_CrespiReghizzi.pdf</a>	<b>b - Providing and financing a municipal infrastructure: water and sanitation investments in Milan (1888-1924)</b>  <b>d - Water, sanitation and intergovernmental relations in Italy after WWII : a case study on Milan's water and sanitation service</b>	In “The Economics of Infrastructure Provisioning - The (Changing) Role of the State” – A.Picot, M. Florio, N. Grove, J. Kranz editors – <b>MIT Press</b> <b>Accepted by the book editor, under MIT blind review process</b>  <b>Journal of Competition and Regulation in Network Industries</b> <b>Accepted with minor revisions</b>
III	Providing a municipal infrastructure: how did Paris and Milan finance their water and sanitation infrastructure (1853-1925) ?	International Water History Association – Montpellier June 2013		No	<b>c - Providing a municipal infrastructure: how did Paris and Milan finance their water and sanitation infrastructure (1853-1925) ?</b>	<b>FLUX</b> International Scientific Quarterly on Networks and Territories <b>Accepted</b>
IV	Milan's water and sanitation service: from full direct provision to corporatization	Milan European Economic Workshop – University of Milan & CIRIEC – June 2013	Sixth Annual CRNI conference – November 2013	Already published as a working paper online on CIRIEC <a href="http://www.ciriec.ulg.ac.be/fr/telechargements/WORKING_PAPERS/WP13-08.pdf">http://www.ciriec.ulg.ac.be/fr/telechargements/WORKING_PAPERS/WP13-08.pdf</a>	<b>f - Milan's water and sanitation service after corporatization: Metropolitana Milanese SpA</b>  <b>d - Water, sanitation and intergovernmental relations in Italy after WWII : a case study on Milan's water and sanitation service</b>	In “Case histories of Public Enterprises: learning from success and failure” – L. Bernier editor - <b>Peter Lang International Accepted</b>  <b>Journal of Competition and Regulation in Network Industries</b> <b>Accepted with minor revisions</b>
V	Institutions, comptabilité et financement des services d'eau et d'assainissement en Italie et en France	Le service d'eau potable à l'épreuve du développement durable – Grenoble November 2012	Poster at ASTEE congress in June 2013	NO	<b>e Institutions, comptabilité et financement des services d'eau et d'assainissement en Italie et en France</b>	<b>Published</b> in « Le service public d'eau potable et la fabrique des territoires », L'Harmattan 2013

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di CRESPI REGHIZZI OLIVIER

discussa presso Università Commerciale Luigi Bocconi-Milano nell'anno 2014

La tesi è tutelata dalla normativa sul diritto d'autore (Legge 22 aprile 1941, n.633 e successive integrazioni e modifiche).

Sono comunque fatti salvi i diritti dell'università Commerciale Luigi Bocconi di riproduzione per scopi di ricerca e didattici, con citazione della fonte.

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