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1 **Governing urban water services in Europe:** 2 **towards sustainable synchronous regimes**

3 4 5 **Introduction**

6
7
8 Contrary to national or regional territories that exhibit a degree of inertia (due to their limited
9 margins for manoeuvre and political power relationships that hinder reform), cities benefit
10 from greater flexibility and thus have the potential for fairly innovative institutional
11 dynamism that can lead to highly instructive management experiments (Barraqué, 2006;
12 Lorrain, 2014). These can then constitute spaces for building technical and economic
13 opportunities to provide solutions to the multiple challenges presented in contemporary
14 governance of drinking water and sanitation services (OECD, 2015, 2016)¹: water-supply,
15 energy and financial risks, loss of biodiversity and the associated productive, protective and
16 regulatory functions, lack of technological innovation, institutional and regional fragmenting.

17
18 To structure the framework of action in a manner allowing to embrace these diverse aspects,
19 the notion of a socio-technical system seems to be an essential starting point. Indeed, most
20 social science studies focusing on water start by affirming that it is essential to life. However,
21 although it is seen as a naturally available resource, it is important to remember that it was
22 first distributed in contemporary societies a long time ago and that this process has dovetailed
23 with the development of urban infrastructure since the 19th century. Indeed, inhabitants of
24 towns, cities and megacities now view their water supply and sanitation service as a vital
25 socio-technical system, in the same way as gas, electricity, transport and telecommunications.
26 This highly embedded system ties in with the physical aspects of social life and its

¹ See also table 3.

1 environment: its morphology and properties (water resources, rainfall, topography,
2 ecosystem) determine economic factors (fixed assets) and legal factors (contracts). It also
3 corresponds to a set of institutional measures for managing it within a given area that has its
4 history and is occupied by social groups with their interests – and conflicts of interest.

5

6 Considering the water sector as just one technical system among others is an opportunity to
7 step out of a sector-based mindset that is shared by the research world and professional
8 sectors alike. Above all, it offers a means of shifting the focus away from issues that are
9 deemed essential by the ‘doxa’ (Lorrain and Poupeau, 2014), and that form the structure of
10 today’s water supply service: efficiency of public-private partnerships (PPPs), implementation
11 of the full cost recovery principle, universal development of water access, reduction of urban
12 splintering, etc. While all these questions are legitimate and call for pragmatic answers, they
13 tend to isolate and focus on technical aspects of the issues whereas, on the contrary, it seems
14 urgent to link them and to find collective social and political solutions (Ostrom, 2005, 2011).

15

16 The ‘urban regimes’ concept has emerged in the academic world in the past three decades in
17 order to better understand the socio-technical systems. Defined as “the matrix of a city’s
18 capacity for collective action” (Pinson, 2010, p. 12), this concept is crucial insofar as it asserts
19 that the real challenge of urban water service governance lies at the intersection between
20 issues relating to structured contractual arrangements, the configuration of the actors
21 involved, and the instruments mobilised². This research tradition emerged in the United States
22 in the 1970s to try to understand in detail how local power was developing and report on the
23 different types of city government. It focuses on the emergence and stability of distinct

² Today’s urban stakeholder systems in cities are characterised by a high level of complexity, fragmentation and interdependence between stakeholders, and dispersal of resources. The pivotal issue for urban governance is hence to introduce enough cooperation between the scattered components of the community “to make sure things get done” (Stone, 1993, p. 227).

1 configurations of stakeholders ('growth coalitions') that help to explain the transformation of
2 American cities (Logan and Molotch, 1987; Stone, 1993). The adoption of these research
3 models as a means to understand European cities has been extensively studied, prompting
4 lively debate (cf. for example Le Galès, 1995). They have been tested more recently to
5 analyse water governance in the megacities of the Global South (Lorrain, 2014).

6
7 Although this approach is increasingly successful (Pinson, 2010), its pertinence and accuracy
8 should be questioned. Lorrain (2013) presents four 'critiques' that question its heuristic
9 capacity head-on: i) failure to address the long-term; ii) lack of reflection on the nature of
10 urban 'producers'; iii) reduction of the trio of institutions (formal, second-tier, and informal)
11 to formal institutions alone; and iv) understanding of governance does not take into account
12 hierarchical coalitions. It also seems that this approach, which is socio-political in nature and
13 criticises neoliberal management trends gaining ground in large urban areas, seeks to embrace
14 new issues such as the 'valuation' of development projects undertaken by distinct coalitions.
15 This issue of the autonomous definition of norms in cities, whereby they deem themselves
16 capable of establishing 'the right ones' for themselves, is echoed particularly in concerns
17 expressed by proponents of public value (O'Flynn, 2007), who question the dominance of
18 New Public Management over urban governance³. Such discussions focus on methods and
19 instruments allowing public and private values now deemed compatible to be expressed
20 regarding urban regimes (Mossberger and Stocker, 2001 ; John et al., 2009 ; Stone, 2015).

21

³ Beyond the negative effects of introducing new instruments such as performance measurement, New Public Management reforms have tended to result in objectives being displaced: public organisations have concentrated on adopting instruments instead of focusing on the purpose of their action, thereby losing some of the meaning of public action.

1 A second approach, which is quite different from the first one in terms of epistemological and
2 methodological assumptions (Markard and Truffer, 2010), makes the issue of developing
3 sustainable urban socio-technical systems its key concern (Bates et al., 2008; Pahl-Wostl,
4 2010; Frantzeskaki and Loorbach, 2010; Truffer et al., 2010; Westley et al., 2011; Brown et
5 al., 2013a). The ‘sustainable transition’ approach also focuses its analysis on the socio-
6 technical regime concept. A regime is defined by a set of rules embodied in institutions,
7 practices and infrastructure. It represents the structure that coordinates the activities of social
8 stakeholders and groups: they provide the system with stability and momentum. They are
9 responsible for lock-in mechanisms, meaning that the stakeholders carry out their tasks in
10 accordance with these rules and do not look beyond them (Geels, 2005; Geels and Shot,
11 2007). Such regimes also have a rigid structure that hampers innovation and thus prevents
12 them from developing successfully and fulfilling their potential. However, they remain
13 potentially dynamic since innovation still occurs at this level: they can give rise to sustainable
14 transitions (Geels, 2005). Created and maintained by a range of relatively autonomous but
15 interdependent social groups (companies, consumers, regulating authorities), the regimes
16 govern the systems, i.e. they guide individuals’ behaviour and the decision-making process
17 and thus provide a degree of stability. To become more robust, this perspective must be
18 capable of meeting three key analytical challenges (Fuenfschilling and Truffer, 2014): i)
19 accounting for a diverse range of socio-technical regimes, ii) consolidating the theoretical
20 foundations of sustainable transition studies, and iii) considering the pairing of institutional
21 and material aspects. By incorporating recent developments in institutional sociology
22 (Lawrence et al., 2009), some authors are trying to answer these critiques by considering
23 urban socio-technical systems as regimes developed by stakeholders with distinct institutional
24 rationales (Fuenfschilling and Truffer, 2014) and reconfiguring their founding hydro-social

1 contracts from a sustainable perspective (Brown, 2009, 2013a)⁴. However, the theoretical
2 consolidation efforts must be pursued in order to gain a better understanding of the
3 institutional structure of the strategic framework in which supposedly sustainable
4 compromises are negotiated.

5

6 In this paper, we question the potential for proposing a renewed urban regime-based approach
7 geared to the specific context of water management in European cities. Such an approach
8 must thus be capable of integrating considerations regarding the sustainable management of
9 water-related services, power relationships within stakeholder configurations and the
10 technical dimensions of infrastructure into a single analytical framework. We are therefore at
11 the crossroads between approaches focusing on the development of growth coalitions and the
12 sustainable transition of urban socio-technical regimes. The question that connects them can,
13 therefore, be worded as follows. To what extent and in what way is it possible to combine the
14 horizontal dimensions (i.e. relating to instruments that both permit and manage the strategic
15 behaviour of stakeholders) and the vertical dimensions (i.e. relating to the multi-level
16 structuring of urban reality) of socio-technical regime governance in order to obtain a better
17 understanding of sustainable development in European megacities? Or, in other words, what
18 types of social and material support can be deployed to make the institutional rationales
19 developed by the various stakeholders involved in European urban water regimes compatible,
20 in order to co-produce ‘shared value’ that contributes to their sustainable development?

21

⁴ For Brown et al. (2009), the ‘hydro-social contract’ is a term used to describe the pervading values and often implicit agreements between communities, governments and business on how water should be managed. This contract is shaped by the dominant cultural perspective and historically embedded urban water values, expressed through institutional arrangements and regulatory frameworks, and physically represented through water systems infrastructure.

1 To answer this question, this article will start by drawing on the theory of institutional
2 resource regimes ('IRR'; Gerber et al., 2009). In our opinion, this theory provides a response
3 to some of the limitations of the *Urban Regime Approach* identified by Lorrain (considering
4 the long term and institutions in a multi-level perspective with several stakeholders), while
5 referring explicitly to the issue of regime sustainability (*Sustainable Transition Approach*).
6 However, we will then amend it to obtain a better analytical understanding of the interaction
7 between material and institutional dimensions as well as the wide range of strategic issues
8 addressed by stakeholders involved in urban water regimes. Lastly, we will conclude by
9 discussing the conditions for bringing about 'synchronous' sustainable urban regimes
10 characterised by complex institutional structures, i.e. by a wide range of challenges and
11 objectives as well as several action rationales and coordination systems. To conclude, in order
12 to make such regimes sustainable and to meet the challenge of technical and institutional
13 complexity, we will formulate an avenue for further consideration: contributing to the
14 emergence of 'democratically negotiated' innovations.

15

16 **I - Institutional regimes for resources and infrastructure: a research programme to** 17 **analyse sustainability**

18 Although cities today appear to be among the few spaces favouring institutional innovation,
19 they are still a product of historical and institutional factors resulting from multi-dimensional⁵
20 dynamics whose sustainability is questionable (Heynen et al., 2006; Whitehead, 2013;
21 Pacquot, 2015). The Institutional Resource Regime (IRR) approach, applied to the
22 governance of water services in Europe, offers a consistent and stimulating initial analysis. It
23 allows us to place public policy and property rights back in the centre of the analysis, at a time
24 when cities appear to be torn between objectives of 'sustainability' and 'urban ecological

1 security' (Hodson and Marvin, 2007). More precisely, it represents the key analytical building
2 block with which we can redevelop a robust analysis of urban regimes and thus understand
3 their potential sustainability (see Figure 1).

4

5 Insert Fig. 1 : Towards sustainable urban regimes : an analytical framework

6

7 *1.1. The Institutional Resource Regimes approach*

8

9 The Institutional Resource Regimes framework is dedicated to analyses the link governance
10 structure and the sustainability of natural resource uses (Gerber et al. 2009). An IRR
11 coordinates resource users and owners through public policies and property in a delimited
12 territory (Fig. 2)⁶. The framework has a significant added-value compared to others
13 frameworks for our purpose (Saleth and Dinar 2005; Pahl-Wostl et al. 2010). It takes into
14 account property rights and public policy as well as the ways in which these two elements of
15 governance interact with one another (Kissling-Näf I. and Kuks S., 2004; Gerber et al. 2009,
16 Bolognesi, Nahrath, 2017).

17

18 Insert Fig 2.

19

20 IRR framework contributes to determining a potential for sustainable use according to regime
21 extent (number of regulated uses) and coherence (clarity of property rights and public policy
22 definition). Depending on its extent and coherence, an IRR could take four forms: non-
23 existent, simple, complex or integrated (Fig. 3). Initially, the framework's central hypothesis
24 claimed that if the scope and coherence of the IRR increase, then uses strive to be more

⁶ Public policies and property rights are the institutions of the regime, i.e. the rules of the game (North, 1990). The analysis focusses only on formal institutions.

1 sustainable (Gerber et al. 2009). Therefore, an integrated regime appears as an ideal-type.
2 Today, this hypothesis is nuanced. Actors behaviors could differ from what is expected
3 regarding property rights structure and public policies. This is due to the way they use
4 institutions (cheating, misunderstanding of rules, etc.) (North, 2005)⁷. As an illustration, in
5 many French cities, water tariff structures do not comply with regulations deliberately in
6 order to balance the budget or to make political gains. Therefore it is better to talk about the
7 potential sustainability offered through the IRR governance framework (Bolognesi, 2014).

8

9 Insert Fig. 3

10

11 *1.2. Institutional Resources Regime and Urban Regime*

12

13

14 IRR perspective allows incorporating historical and multilevel dimensions of governance
15 structure within urban regime approach, contributing to developing the latter approach.
16 Analysis of the evolution of an IRR leads to identify stages and nature of change, as well as
17 the new institutional constraints and opportunities that frame power games and actors
18 strategies. Similarly, it contributes to taking into account the multilevel structure of
19 governance. Assessing the characteristics of an IRR entails determining from which level
20 public policies and property rights emerge. It is of first importance regarding an urban regime
21 because it highlights the institutional tools that actors could use or need to make inefficient to
22 attain their goals. Therefore, one could deduce that power games exceed the urban territory
23 and draw these new frontiers. Finally, these two perspectives enter hierarchical alliances into
24 the scope of an urban regime (Lorrain, 2013).

⁷ This statement replaces in the analysis two characteristics of actors, opportunism and bounded rationality. Because of these two features, the future is uncertain. Actors may adopt unexpected behaviour and institutions might be less incentivizing than though by decision-makers. This point emphasises the need to think linkages between institutional structure (rules of the game, IRR) and the power games (the game, Urban Regime).

1
2 The analysis of the evolution of urban water regime in Europe illustrates the potential of
3 integrating historical perspective into the urban regime approach (Kaika, 2003; Kallis and De
4 Groot, 2003). This evolution went through three stages of regulation (Allouche et al. 2008,
5 Bolognesi, 2014b). During the first stage (1973-1988), the focus was on resource quality
6 control and on not impeding diversified use, notably through the introduction of common
7 drinking water quality standards and pollution thresholds. The second stage (1988-1995)
8 followed up on already established ambitions by adding many specific and sectoral measures
9 to the IRR, such as the 1991 Directive on urban wastewater treatment (91/271 EEC). Since
10 then regulation has mainly taken the form of a command and control system. During this
11 stage, environmental uses expanded the scope of the regime. The third phase represents a
12 paradigm change in European urban water management, with the objective of modernising the
13 sector (Bolognesi, 2014a). This modernisation seeks harmony between environmental and
14 economic objectives, supporting Integrated Water Resource Management. The IRR seeks to
15 rationalise governance via a process of commoditisation and liberalisation, with the latter
16 theoretically encouraging sustainable usage (Table 1).

17

18 Insert Table 1

19

20 The IRR perspective on urban water resources in Europe allows us to characterise the
21 governance structure in which users and owners should currently operate. Four key points
22 appear:

- 23 • The sustainability objective replaces the usage protection objective;
- 24 • Economic incentives and market instruments are privileged in stakeholder
25 coordination;

- 1 • Regulations aim to facilitate the proper functioning of market-based mechanisms and
2 incentives rather than to control usage directly;
- 3 • The pool of regulated users and stakeholders contributing to regulation is increasing
4 and diversifying.

5 The new institutional structure impacts on power games within European urban regimes.
6 First, actors have to manage with the liberal requirements. As an illustration, economic
7 performance of services takes more and more importance while “public value” becomes a
8 second-order interest (Tabi and Verdon, 2014; Renou, 2015). Private participation gains in
9 legitimacy and develops (Bolognesi, 2014a; Thomann et al., 2016).

10

11 Additionally, the impacts of institutions from different levels on an urban regime are
12 perceptible. For example, Article 9.1 of the Water Framework Directive (2000/60/EC) states
13 that incentive tariffs should ensure full cost recovering and resource preservation. It induces
14 significant economic and financial constraints for service managers in European cities. Actors
15 strategies and alliances change to compete mostly through the cost effective requirement or
16 propose alternative views. A second illustration is the impact of European Directives on
17 procurement and concession contracts that deeply change the way actors may interact, from
18 discretionary and relational negotiation to competitive tenders (Chong et al., 2016).

19

20

21 *1.3. Institutional Resource Regime and Sustainable Transition Studies*

22

23

24 IRR framework could strengthen Sustainable transition studies in two aspects. First, it
25 consolidates theoretical explanation of the link between institutions and sustainability.
26 Focussing on extent and coherence of the regime helps to understand why regime path may be

1 more or less sustainable (Gerber et al. 2009). Moreover, extent and coherence notions
2 contribute to understanding the diversity of regimes and transitions.

3
4 Brown et al. (2009) propose the concept of Water Sensitive City to understand sustainable
5 transitions. They advocate that coordination in a water sensitive city be adaptive, underpinned
6 by a flexible institutional regime, with multiple infrastructures. It puts the emphasis on the
7 local level taking for granted that water governance is complex and fragmented. Nonetheless,
8 these socio-technical regimes cannot take any forms. Possibilities are limited by a set of
9 feasible institutional arrangements. In that respect, the concept of coherence in IRR
10 framework contributes to determining this set of feasible sustainable transitions.
11 Consequently, even if the local level is gaining importance in the governance of water
12 services in European cities, autonomy remains relative due to the IRR being extended by
13 control. European Directive and public policies create a strong institutional environment
14 marking out the boundaries of local actors options. Stakeholder actions that produce standards
15 for self-organisation within the IRR should, therefore, be appropriately coordinated with
16 upper-tier rules (Teisman and Edelenbos, 2011).

17
18 The second input of IRR to Sustainable Transition Studies is the understanding of the impact
19 of governance structure on sustainability, both theoretically and empirically. Currently, water
20 governance in European cities is driving by a multiplication of formal rules and an increase in
21 technical and economic complexity of service provision. It leads to contradictions, the
22 increasing extent of the regime results in reduced coherence (Bolognesi, 2014b). As an
23 illustration, the water sector represents the largest number of violations of EU environmental
24 law, i.e. 20% of disputes (Keller, 2011).

25

1 The IRR in which European megacities are developing thus facilitates local regulation but
2 tends to lead to incoherence in governance due to the difficult relationships between different
3 levels of government (EU, national, regional and local). Contracting takes the form of local
4 self-organisation with little or no state involvement, standing out from traditional types of
5 public regulation (Ostrom, 2010; Bakker, 2010; Bolognesi, 2014). Thus, the European urban
6 water IRR is evolving into some form of integration yet remains ‘trapped’ in a complex form
7 due to difficulties in improving system coherence (Table 2). Bolognesi and Nahrath (2017)
8 provides with theoretical explanations of this trend. They argue that European water
9 governance tends to be lock-in an institutional complexity trap, which limits governance
10 quality. It is of prime importance for Sustainable Transition Studies as it highlights and
11 explains limitation for the efficiency of such transition.

12

13 Insert Table 2

14

15 Urban water management remains a complex and fragmented area relying on traditional,
16 technical, linear management approaches. Understanding institutional capacity is then vital.
17 The local level is gaining importance in the governance of water services in megacities, but
18 autonomy remains relative due to the IRR being extended by control. Stakeholder actions that
19 produce standards for self-organisation within the IRR should, therefore, be appropriately
20 coordinated with upper-tier rules – one of the main structural challenges for water
21 management in European megacities (Teisman and Edelenbos, 2011). In analytical terms, this
22 requires the framework surrounding IRRs to be dovetailed with another capable of identifying
23 stakeholder actions at the megacity level can be identified in order to appreciate how complex
24 practices are in relation to the institutional framework. It will lead us to break away from the
25 IRR approach in three ways: i) Abandoning of the concept of integration as a ‘normative

1 horizon' guiding the governance of water services in Europe (Molle, 2008). This will be
2 replaced by the concept of 'synchronicity' in order to construct an alternative typology for
3 urban regimes; ii) Renewed interest in the question of values, which must be taken into
4 account when reflecting on sustainability policies and the instruments used to implement them
5 (Allaire, 2013); iii) Widening the analysis of institutional diversity, not focusing on formal
6 institutions but integrating these with second-tier institutions (Lorrain, 2013).

7

8 **2- Towards synchronous urban water regimes? The contribution of 'complexity'**

9

10 We propose that the 'complexity' theory, applied to the case of urban centres and coupled
11 with questions on their instrumentation and values, can give a greater understanding of how
12 contemporary urban regime stakeholders interact in order to 'produce' the city (and thus the
13 mode of water services governance). To do this, it is helpful to put aside the established
14 'public' and 'private' categories and to take into account the instruments used, the principles
15 that these put forward and the values held by stakeholders. It then leads to a renewed typology
16 of urban regimes that are qualified as 'synchronous'.

17

18 *2.1. Embracing complexity to obtain a better analysis of water service governance*

19

20 According to Teisman and Edelenbos (2011), attempts to implement policies pertaining to
21 integrated water resource management are bound to fail repeatedly: "Fragmentation... is not a
22 problem that can be solved... Our starting point is that solutions based on the idea of
23 'regaining control' and 'taking back responsibility' will ultimately only lead to further
24 fragmentation. [...] Coordination and integration amount to drawing new boundaries and
25 creating new disputes over who is in charge or what has to be integrated or coordinated again"

1 (pp 104-105). These authors contend that the definition of boundaries has, from this
2 perspective, become a continual process contesting the idea of a stable balance between
3 policy, structures and processes in an efficient governance. Therefore it is the very concept of
4 integration that must be reconsidered: “Integration is still needed in order to create mutually
5 satisfactory results, but it will be impossible to obtain an integrated plan, a lead organisation
6 or a dominant procedure. A more precise conceptualisation of integration is needed” (p 106).

7

8 *2.2. Integration, multi-tier adaptation and synchronisation*

9

10 These same authors thus propose to view integration as a dual process of mutual adaptation
11 that is taken into account through the complexity theory (Cilliers, 1998). For horizontal
12 integration and mutual adaptation processes, this approach indeed encourages self-
13 organisation, a concept that deals with the ways in which processes emerge, develop and
14 evolve. According to Teisman et al. (2009), these processes are formed out of events, actions
15 and interactions and together create an institutional structure.

16

17 One important point must be stressed: self-organisation stems from the *de facto* freedom of
18 choice and action granted to people and organisations, whatever their position in the system.
19 Even when subject to an extreme power, they are still able to choose and act freely. This
20 freedom can be used to act either self-referentially or more adaptively⁸¹. Without the capacity
21 for self-organisation, integration beyond contradictory boundaries will not be easy to achieve:
22 “Integration takes place when the outcome of mutual adjustment and interactive governance is
23 supported by people and organisations higher up in the formal bureaucratic government

⁸ Self-organisation is defined in complexity theory as the emergence of new structures implemented through local interaction but not imposed by an external or internal stakeholder. It is inspired by the responsive capacity of stakeholders and (sub-)systems that are capable of receiving, encoding, transforming and registering information and of using it to enlighten their actions (Teisman et al, 2009).

1 system. Yet these people and organisations can easily reject or thwart these self-organisation
2 capabilities. In such cases, fragmentation will become a source of complaints. Integration
3 takes place when self-organising units comply with rules, procedures and policies developed
4 by people and organisations higher up in the system. They can, however, also obstruct them.”
5 (Teisman et al., 2009)

6

7 This understanding of coordination and integration differs slightly from conventional ideas on
8 mutual adaptation. Synchronisation supposes that a structure is insufficient to stimulate
9 integration, but that there is institutional diversity (Ostrom, 2005) within which the
10 boundaries are constantly changing, requiring new interconnections to be made between them
11 (Williams, 2002). Furthermore, synchronisation supposes that continual adaptation must take
12 place between scales and levels (Young, 2002). Due to the ‘nested’ nature of water
13 governance systems, constant interaction is required between the (autonomous) system and
14 the system as a whole (Adger et al., 2005). Synchronisation in systems takes place between
15 sectors, schedules, areas, procedures, projects and programmes without any of these systems
16 losing its respective logic or added value (Flood, 1999; Teisman et al., 2009).

17

18 In the end, integration results from a process of synchronisation in which stakeholders with
19 mutually accepted identities form coalitions capable of cooperating on a series of actions at a
20 certain place and time without being part of a hierarchical structure (Hunt and Shackley,
21 1999, p. 147). Synchronisation becomes clear once the stakeholders concerned can balance
22 their personal interest with the development of a mutual interest acceptable to all. Insisting on
23 the coalition concept as an element of an integration process based on synchronisation also
24 creates a link with the urban regime concept defined in the introduction while clarifying its

1 theoretical consistency. The next step is to understand the diversity of situations observed
2 through these concepts.

3

4 Two different types of self-organisation can be found in the complexity theory: autopoietic
5 self-organisation and dissipative self-organisation (Teisman et al., 2009). The former
6 reinforces sub-system stability. Stakeholders do not mutually reorganise, at least not radically:
7 they continue to exist as they are, but are entirely conscious of their interdependence with
8 other stakeholders and organisations. The second type of self-organisation is dissipative, or
9 adaptive, whereby sub-systems are confronted with results that are unsatisfactory for them
10 and the system generally, so they start to envisage new boundaries for the content and system.
11 Dissipative self-organisation incorporates the process into a more dynamic system in which it
12 can attain a new temporary balance and become compatible with its environment once again.

13 Synchronicity is based on the idea that governance systems are not clearly organised, stable or
14 demarcated and can evolve according to an array of trajectories depending on the nature of the
15 synchronicity taking place. There is no ideal level or perfectly-defined boundary in terms of
16 the people and elements called on to resolve pernicious and complex issues (Adger et al.,
17 2005). In this context, the analysis of these systems should focus more on the tools or
18 instruments that are created through mutual action and geared towards joint action rather than
19 on the structures. Once these elements are available, a diverse range of ‘synchronous’ regimes
20 can be envisaged.

21

22 *2.3. Instrumentation and complexity: a typology for synchronous urban regimes*

23

Our hypothesis is that water governance challenges differ in their nature (territorial and
institutional fragmentation inherent to the water sector, multi-tier governance, low capacity of

local-level stakeholders, lack of clearly defined roles and responsibilities, contested use allocation) and that an approach based on complexity and, in particular, synchronicity is required in response.

1 An OECD report (2011) covering 17 countries concurs: it points out that in most countries,
2 whatever the level of decentralisation, public water governance is fragmented and would
3 benefit from better water policy coordination. Due to the importance of local stakeholders and
4 territorial particularities in the water sector, decision makers should not try to avoid
5 difficulties by favouring traditional ‘top-down’ policies, but should instead find the means to
6 *maintain coherence* while preserving diversity. The real challenges are to implement policies
7 that are clearly identified, adjust them to local contexts, overcome obstacles to reforms, and
8 bring together the principal stakeholders in different sectors so that they cooperate to share
9 risks and responsibilities. The OECD report (2011) thus explores ‘deficits’ in terms of water
10 policy coordination, based on a methodological framework created to diagnose the challenges
11 of multi-level governance in decentralised public policies and to identify suitable mechanisms
12 to address them. This report, therefore, suggests making a connection between deficits in
13 water systems and the type of instrumentation to be deployed (Table 3).

14

15 **Insert Table 3**

16

17 Based on the research and considerations introduced in parts 1 & 2, an initial summary may
18 be attempted. The theory on institutional resource regimes will be amended by: i) abandoning
19 the concept of integration; ii) replacing it with that of synchronisation; and iii) using concepts
20 of extensions (by control or self-organisation) and cohesion (autopoietic or dissipative).
21 Combining these variables gives us a typology for synchronous urban regimes (Table 4).

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Insert Table 4

Each polarised case can be presented rapidly and relates to an archetypal case. In order to understand their entire content, reference can be made to the works of Bulkeley et al. (2006 and 2016)¹ and the *Flux* journal issue (2014) on the history of urban water networks⁹.

- *Integrative synchronous regime*: in a framework of action where predictive control and problem-solving dominate, urban regime stakeholders follow an integration rationale and will seek the multi-scale and multi-level alignment of the wider structure and the different urban functions (Teisman et al., 2009);

- *Entrepreneurial synchronous regime*: in a framework of action where non-predictive control and problem-solving dominate, urban regime stakeholders follow an effectuation rationale (Sarasvathy, 2008). The effectiveness of this rationale is not based on optimising or maximising gains (as the future is unpredictable), but on minimising authorised losses (since the future – and particularly the related risks – has to be managed);

- *Resilient synchronous regime*: in a framework of action where predictive control and problem framing dominate, urban regime stakeholders follow a resilience rationale (Adger et al., 2005) that aims to re-establish a ‘meta-stable’ balance between the various urban water functions (Piquette and Wintz, 2009);

- *Transformative synchronous regime*: in a framework of action where non-predictive control and problem framing dominate, urban regime stakeholders follow a transformation rationale. This involves revising the nature of the hydro-social contract that structures the city’s development and moving towards the construction of ‘water-sensitive’ cities (Brown, 2009).

⁹ See the journal issue on the history of urban water networks (2014, vol 3-4, issues 97/98)

1 A situation of pluralism, overlapping responsibilities and scattered resources that created
2 incentives for cooperation ultimately allowed capacity for action to be rebuilt in cities
3 (Pinson, 2010). Mechanisms for aggregating interests, as well as forms of inter-institutional
4 dialogue, were invented to enable organisationally complex situations to prosper. A set of
5 incentive, association, enrolment and mobilisation mechanisms intended to enable consistent
6 collective action in a context of organisational fragmentation and dispersed resources has
7 thus, *a priori*, brought about renewed diversity in governable urban regimes. In order to
8 facilitate the empirical validation of the proposed approach and to demonstrate its originality,
9 we can summarize our contribution as follows: it seems possible to understand the diversity of
10 urban water regimes after requiring the three "Ps" (Policies, Persons, Places) introduced by
11 the OECD in its recent studies (2016, p. 20). The issue is to focus on three new key variables
12 characterizing the new context of urban action (more complex): "Problem framing" (degree of
13 autonomy of local actors in the enunciation of the nature and boundaries of the urban
14 problems to be solved), "Procedures" (the mechanisms aiming at reducing institutional and
15 organizational fragmentation in urban areas), "social Processes" (the social dynamics
16 involving the various stakeholders in the urban fabric). A first ordering of the empirical
17 diversity mobilizing these categories was carried out (Appendix 1). It needs to be completed
18 and enriched.

19

20 Far from the constant reconfiguration of functional territories that institutional territories
21 attempt in vain to emulate, an alternative to the 'chaos' scenario seems to have prevailed in
22 the large cities of developed countries (of Europe in particular). With regard to this first
23 appraisal, many authors call for the widespread implementation of the normative ideal
24 borrowed from 'hydro-sensitive' cities¹⁰. A deeper examination of urban development enables

1 this proposition to be qualified: the sustainability of synchronous regimes that borrow as a
2 priority from the ‘transformative’ ideal form must be considered in the light of its position
3 within a globalised economy, which distorts the way in which the instruments supposed to
4 give it substance function.

5

6 **3 – Cities, globalisation and values: the viability of synchronous regimes in question**

7

8 According to numerous analysts, the new urban coalitions that have come to power would be
9 capable of making complex territorial systems viable by means of new instruments. In the
10 field of water service governance, the central issue involves nothing less than inventing new
11 urban forms to be structured around ‘flexible’ socio-technical mechanisms. The main
12 argument here is that, while modernising under the effect of restrictive, incentive-based
13 policies, cities have been swept along by economic globalisation since the end of the
14 20th century. The new phenomenon that must be highlighted concerns the increasing role
15 being played in urban development by new protagonists, in particular large private firms that
16 are listed on the stock market and have market value¹¹. The viability of these set-ups can be
17 questioned from three points of view: 1) the democratic deficit in the functioning of these
18 regimes; 2) urban development stakeholders coming under the partial control of the global
19 financial system; and 3) controlled isomorphism in urban development standards.

20

21 *3.1. The democratic deficit: legitimacy and responsibility in question*

¹⁰ See the many contributions in journals dedicated to transition studies in the past ten years: Environmental Innovations and Societal Transitions, Technological Forecasting and Social Change, Research Policy etc.

¹¹ These firms may all be different, but since they are listed on the stock market they are all subject to the demands of financial performance and will assess projects from a value perspective. This economic and financial rational penetrates quite deeply, both directly and indirectly, into the ‘range of instruments’ shaped by synchronous regimes in order to structure the development trajectory of the urban territories considered.

1 The legitimacy, responsibility and power held by or delegated to the new urban development
2 stakeholders can indeed be questioned. Regarding the governance of water services in France,
3 Canneva and Guérin Schneider (2011) denounced the influence of certain industrial lobbyists
4 who attempted to water down a law proposed by D. Voynet aiming to reform water sector
5 governance by establishing performance indicators to be supervised by the public authority.
6 Since 2002, they have succeeded in reducing this instrument, intended to bring about modern,
7 efficient and fair regulation, to a mere ‘reporting’ mechanism.

8 The ‘problem’ for cities and megacities will hence not appear in terms of institutional
9 fragmentation, dispersed resources or lack of governability, but rather in terms of the effects
10 of coalition mechanisms on the distribution of power and forms of political mobilisation. The
11 consolidation of urban regimes, qualified here as ‘synchronous’, in particular risks pushing
12 city governance towards oligarchy and post-democracy (Pinson, 2010; Swyngedouw, 2005)¹².
13 The concept of ‘institutional evasion’ introduced by Pinson thus echoes the observation that
14 most decisions are taken outside local assemblies, be they municipal or inter-municipal.
15 Moreover, collaboration on large projects and strategic planning mechanisms within ad-hoc
16 committees generally associates a limited number of elected officials with important technical
17 and economic stakeholders who end up constituting an urban authority elite operating outside
18 the official sphere of representative democracy. In his analysis of the link between cities and
19 the market, Lorrain (2013) also expresses concern about the excessive power acquired by
20 certain growth coalitions: these new alliances combine access to exceptional public resources
21 and an integrated architecture making them ‘absolute developers’. Their power is not limited
22 by the usual checks and balances of certified accounting, shareholder reporting, political
23 opposition or an independent press. These growth ‘hierarchies’ thus have a disturbing amount
24 of power, which should be better controlled (Barreteau and Daniell, 2014).

¹² Swyngedouw denounces “the grey accountability of hierarchically articulated and non-formalised and procedurally legitimised, associations of governance” (2005, p 199).

1 *3.2. The operational deficit: complications in management and partial control over*
2 *stakeholders in urban development*

3
4 If we wish to pinpoint precisely the new urban regimes that have emerged, it is useful to take
5 into account all the stakeholders operating in urban development and not just the most visible
6 ones. Influence begins very high up in the decision-making chain: the traditional circle of
7 promoters, developers and utility providers should be widened to include conglomerates,
8 engineering consultancies, and industrial firms developing new (sustainable) equipment. The
9 ‘water-energy nexus’ concept is thus giving rise to a whole new sector where providers
10 offering ‘smart’ equipment to make cities ‘sustainable’ (World Economic Forum, 2011)
11 regard themselves as ‘specifiers’ of technology in competition with one another. Likewise,
12 recent developments have affected the funding of urban development, notably with increasing
13 involvement from pension funds giving value to market(able) solutions (Torrance, 2008 ;
14 Brenner, 2013). As shown by Truffer et al. (2010), urban regimes ultimately find themselves
15 at the centre of conflicting institutional rationales which, far from allowing the emergence of
16 water-sensitive cities, instead of hinder and complicate urban governance. Although the
17 water-sensitive paradigm emerges to an extent, it has to contend with resistance from the
18 traditional water paradigm and with the increasingly assertive market paradigm, ultimately
19 making the urban territory difficult to govern. The urban socio-technical system is then
20 considered as a ‘semi-coherent’ organisational field, i.e. characterised by institutionalisation
21 levels, some robust and aligned and others less so, and honed within the system itself by a
22 wide range of institutional, sometimes conflicting rationales. In the end, the sustainable nature
23 of contemporary socio-technical urban transitions has to be reassessed¹³.

¹³ For Truffer and Fuenfshilling, “assessing the semi-coherence of a socio-technical system and its regime is important to appreciate potential transition trajectories in a more fine grained way. This approach enables the specification of regime strength, the delineation of socio-technical regimes, the identification of technological niches and the specification of impacts from broader landscape pressures on socio-technical regimes. In that

1

2 We should also avoid too much focus on formal institutions and the short term, and study all
3 the modes of action¹⁴. This methodological positioning led Lorrain (2013) to become
4 interested in “the financial sector’s discreet hand in urban development”. At first glance, this
5 sector does not seem to be one of the main urban stakeholders, as it operates on the periphery
6 as a specific supplier offering only capital. However, it has a clear influence through several
7 strategic channels such as assessing the quality of stakeholders. These stakeholders then take
8 part in appraising and setting up large projects in different ways: the term ‘triple-play’ is used
9 to refer to the actions of an investment bank that supplies advice, provides credit and invests
10 in the capital of the company carrying out the operation.

11

12 To sum up, the principles of global capitalism come into play in two ways: i) the calculation
13 techniques used project a certain reading of what is a ‘just’ value for operations (the market
14 value); and ii) the comparison between asset classes and between countries results in
15 (localised) urban markets being swallowed up by the vast movement of global trade. In a
16 globalised world, urban governance procedures hence cannot be self-referential: they are
17 over-determined by benchmarks imposed by standardisation authorities that steer towards a
18 particular type of governance.

19

20 *3.3. The efficiency deficit: control and urban normative isomorphism*

21

22 It is common to see urban elites, associated with what we have called ‘regimes’, forge a
23 shared heritage of ideas that often go on to become a fully-fledged urban development

sense, it provides an important element for the conceptualization of transitions in infrastructure sectors” (2014; p 787).

¹⁴ According to Lorrain (2013), “the influence of capitalism on the city is played out as much through the use of invisible technical instruments (assessment methods, reporting tools, book-to-sale or technical ratio) as through an operator’s legal nature”.

1 ideology, delegitimising any alternative vision. Growth (demographic, economic, of financial
2 and real estate values) is often considered to be an ‘unattainable horizon’. It is striking to see
3 how, more than in any other sector, cities and urban policies are crippled by a shared sense
4 and ideology of what makes a ‘virtuous city’. This vision is shared by a significant number of
5 urban regimes, particularly due to the many public policies transferred from the EU to
6 member states.

7

8 In the field water services, the hard surfacing of urban ground and burying of the water cycle
9 to cover over miasmas and dry out the city is giving way to asphalt removal and water
10 network restoration programmes. When a canal is reopened, or storm-water retention basins
11 or even urban marshes are created, the water cycle progressively returns to the surface. The
12 craze for green grids, wildlife corridors and natural infrastructure is gaining ground
13 (Maughan, 2014), but these policies (which can be found duplicated in a number of countries)
14 seem to be an indicator of institutional isomorphism in urban development, rather than the
15 result of a normative form of co-production involving a diverse range of stakeholders.

16

17 Ultimately, even if the city “is a possibility and opens up possibilities” (Emelianoff, 2008),
18 the sustainable urban development concept that has been appropriated by urban regime
19 stakeholders seems to have smothered innovation by importing universal standards that do not
20 fit well with the co-production of solutions geared to the local environment. Even though this
21 rhetoric is no longer systematic, its spirit is now integrated into the definition of
22 environmental protection in European cities, and its vision in this respect has become a
23 standard, as has its approach to problem-solving. This approach seems to herald damaging
24 consequences: the advent of a standardised ‘elitist consensus’ to be incorporated into urban
25 sustainability policies, the domination of politics over policies (Béal, 2009), and an inability

1 or lack of will on the part of political stakeholders to take citizens' demands into account (low
2 normative co-production). This pushes the prospect of sustainable urban development into the
3 distant future. The interests of public authorities and private entities are thus converging in
4 urban assemblies dedicated to creating a 'global sustainability value' that will place them high
5 up in the international urban competitiveness rankings but will also weaken their foundations
6 (reciprocity), thus calling into question their ability to satisfy the needs of citizens.

7

8 **Conclusion**

9

10 The different actors involved in managing water services in Europe are contributing to the
11 construction of urban regimes that aim to achieve sustainability. Urban water service
12 governance may give rise to stakeholder strategies that aim to make cities 'sustainable' or
13 even 'water-sensitive' (Brown, 2009, 2013b), but the fact remains that it is guided by a
14 physical reality partially determined by technological considerations that can create inertia or
15 blockages (Lorrain, 2013)¹⁵. Furthermore, following our analysis which focused greatly on
16 institutional aspects, we conclude that these urban regimes do indeed seem to be 'semi-
17 coherent' (Fuenfshilling and Truffer, 2014): far from being integrated, they are shaped by
18 strains between diverse institutional rationales and can be characterised as complex
19 arrangements between 'market-driven', 'hydraulic' and 'water-sensitive' rationales (Ibid).

20

21 In this article, we argue that the diversity of urban water regimes in Europe can hence be
22 understood by fully embracing a complexity approach focusing on governance instruments
23 (Teisman and Edelenbos, 2011). This leads us to propose a typology of synchronous urban
24 water regimes based on four ideal forms and to question their sustainability. The apparent

¹⁵ The governance is thus partially 'weighed down' by the choices made when design and sizing networks, and institutional changes to it can only be understood from the angle of the 'inherited' situation (Ibid).

1 flexibility of these forms, which can even reconfigure themselves according to the challenges
2 and hazards that might befall them, is finally put into perspective: a critical analysis of
3 integration practices, the sustainability of governance by instruments and the production of
4 shared values demonstrates the importance of socio-political relationships that are based on
5 power (particularly concerning the role of the global standardisation ‘industry’ that has
6 emerged over the last three decades) and the paramount importance of history. Whereas the
7 advocates of ‘modern’ regimes claim only to identify apolitical coordination procedures that
8 are outside any form of historical determinism, critical analysis reveals a more complex urban
9 reality, in which the political effects of liberal globalisation call into question the
10 sustainability of large urban centres. The city and the water services structuring it can thus be
11 viewed as a series of layers of historical complexity (including neo-liberal globalisation and
12 the instruments symbolising it) that complement the historical dynamics but do not erase them
13 completely.

14

15 This observation calls for renewed scrutiny of the role played by public authorities in urban
16 coordination and the co-construction of sustainable regimes. This particularly involves
17 examining the methods that allow such authorities to become established as the ‘teachers’ of a
18 sustainable form of development based on a shared local value. Recent developments in terms
19 of reflexive governance (Brousseau et al., 2012) serving the interest of an ‘insurance-based
20 city’ (Veltz, 2005)¹⁶ deserve more systematic exploration in this respect. Such a perspective
21 does not make it possible for us to postulate that sustainable urban development is a norm
22 theoretically shared by the protagonists; it is rather the result of a negotiation process
23 instigated by the public authority. As it involves multiple players and levels, this can be
24 considered as a process during which the multi-scale issues deemed essential to urban

¹⁶ The territory thus becomes a trusted operator, providing solid relationships and facilitating learning, allowing risks to be managed and uncertainties and transaction costs to be reduced.

1 sustainability are identified and discussed with a view to obtaining a balanced situation and
2 proposals to achieve this goal are formulated.

3

4 Ideally, these proposals should comply with (at least) two fundamental principles: i) the close
5 intermingling between local and global issues in urban governance (Sassen, 2008), and ii) the
6 close relationship between physical and institutional aspects of natural resource governance
7 (Manuel-Navarette, 2015). The synchronous urban regimes developed in this context could
8 give rise to sustainable socio-technical innovations, i.e. ones based on technologies with
9 managed (spatially appropriate and temporally predicted) impacts and compliant with social
10 requirements that have been expressed. These ‘negotiated innovations’ (K. Daniell, 2014)
11 could thus represent a solution to the ‘transactional complexity’ (Rogers et al., 2015)¹⁷
12 characterising today’s urban water regimes. To be efficient, this solution could refer to values
13 making explicit reference to the ‘commons’ (Allaire, 2013; Dardot and Laval, 2014)¹⁸.

¹⁷ This notion refers to “the interaction of diverse institutions, infrastructures and actors to meet societal objectives” (2015; p 61).

¹⁸ For these authors, "commons" is a regime of practices based on an institutional infrastructure negotiated democratically and drawing its strength from the commitment of those who collectively developed it.

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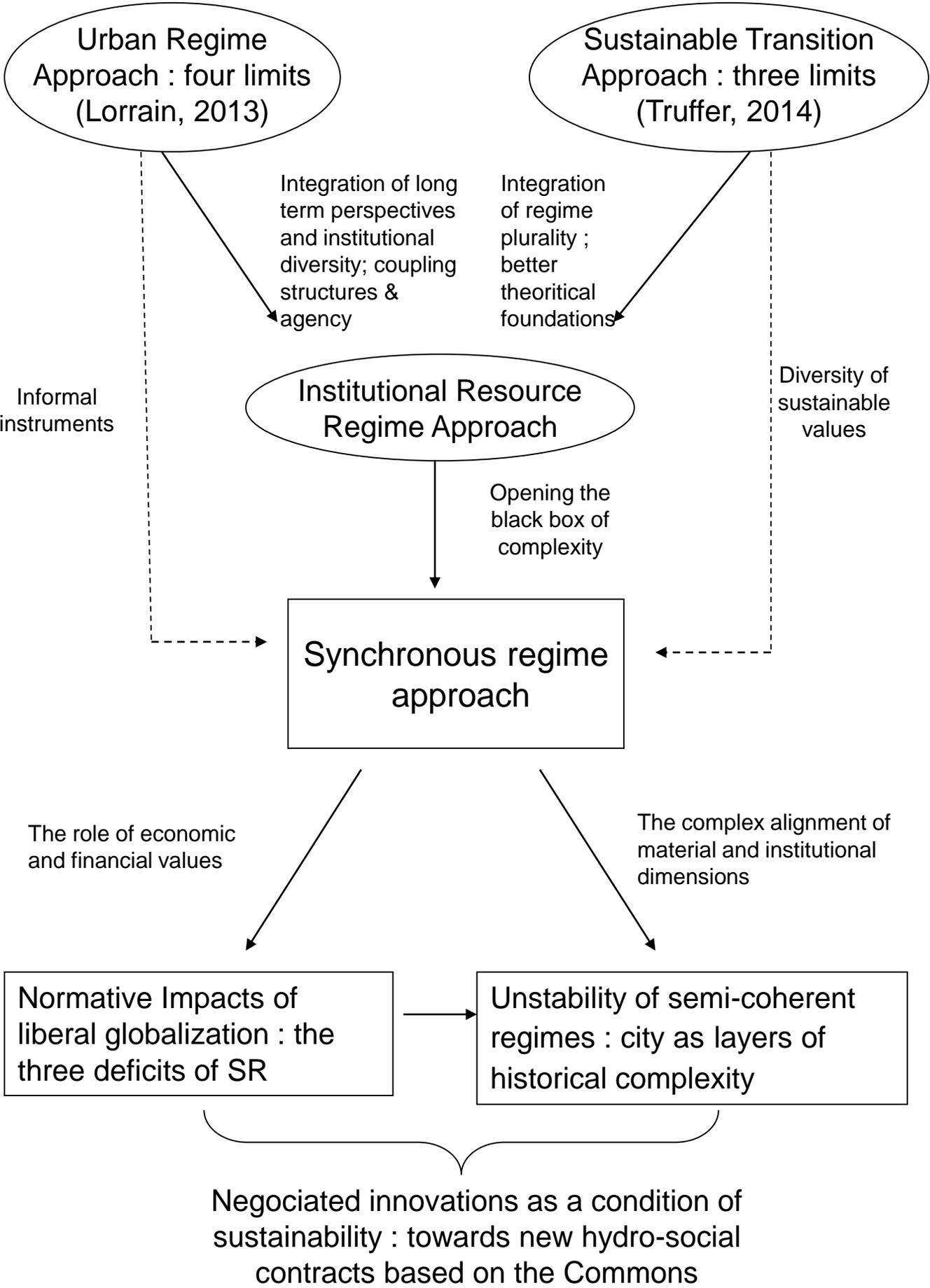
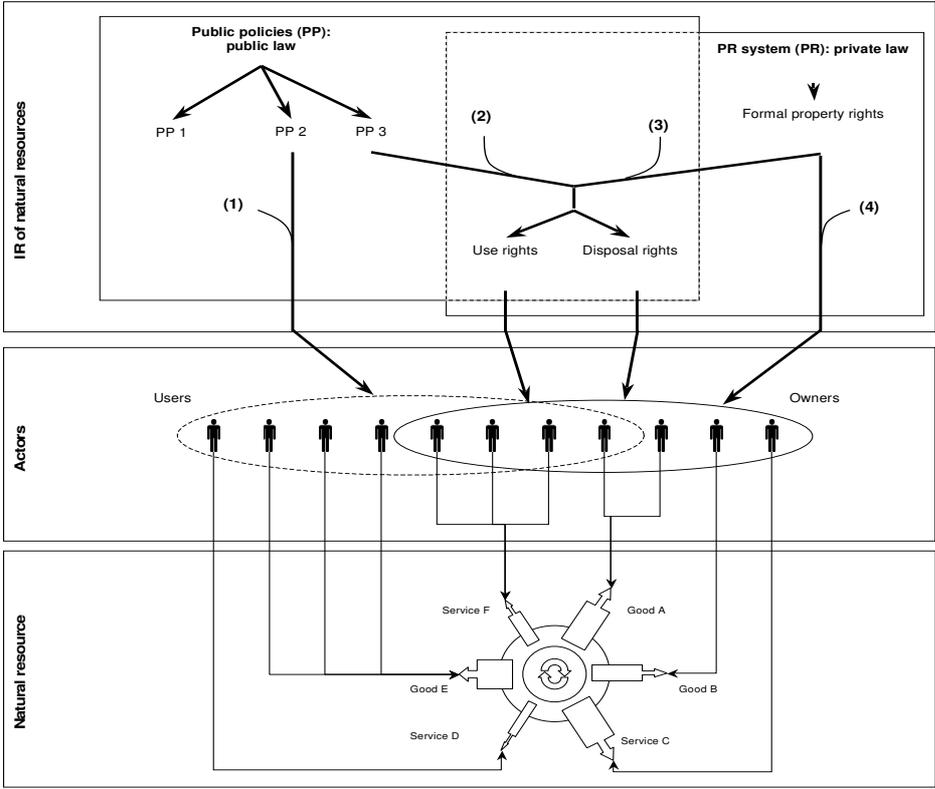
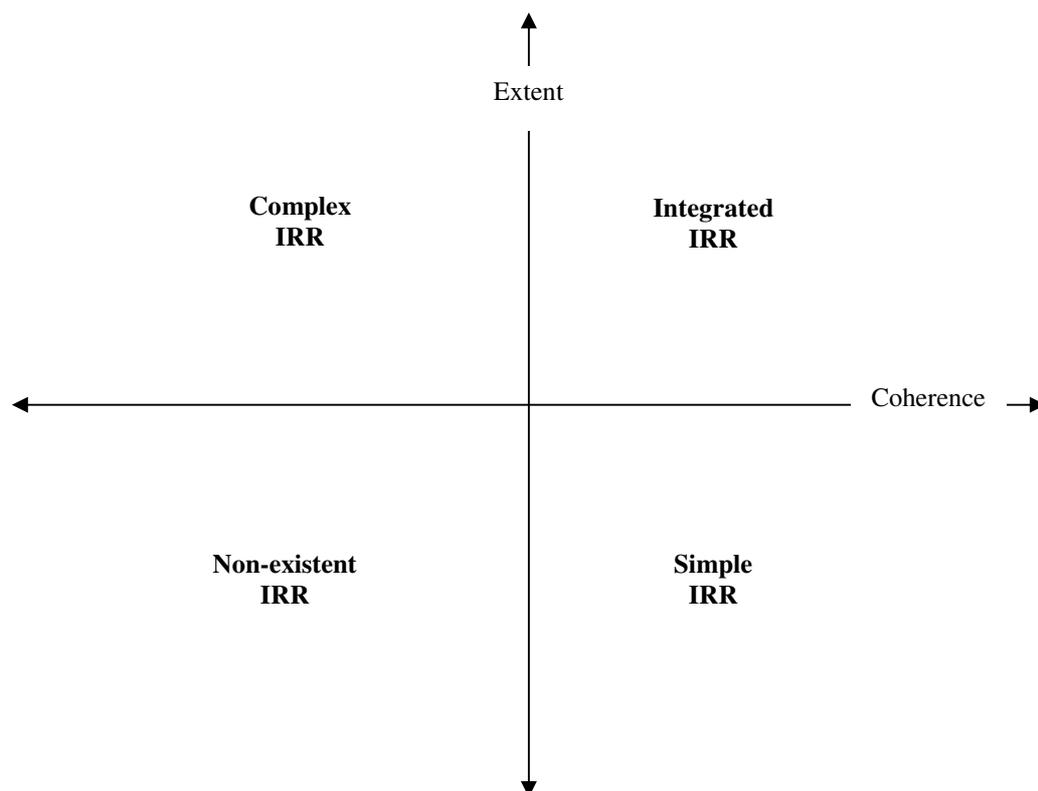


Fig. 2 : Relationships between Institutional Resources Regime, actors and natural resources



Gerber et al. (2009)

Fig. 3: Typology of Institutional Resources Regimes according to their extent and coherence



Gerber et al. (2009)

Table 1 : Summary of the development of urban water regulation in Europe.

	Phase 1	Phase 2	Phase 3
Objectives	-Quality control -Limitations of impacts on usage -EU environmental policy harmonisation -Public health protection	-Pursue and reinforce Phase 1 -Environmental protection	-Sustainable development -Rationalisation
Instruments	Immission standards: -Drinking water standards -Pollution thresholds	-Immission standards -Immission standards -Specific targets: sources, sectors, etc. -Command & control	-Immission standards -Immission standards -Integrated water resource management -Market-based mechanisms
Political design	Classic policies	Classic policies	-Sustainability policies -Distinctive sustainability policies
Regulatory system			-Privatisation -Liberalisation
Type of IRR	Simple	Complex	Complex

Bolognesi (2014)

Table 2 : The complex Institutional Resources Regimes for the European urban water sector

	Low coherence	High coherence
High extent	<p>Complex IRR</p> <ul style="list-style-type: none"> -Multiplication of formal rules (regulation, contracting, etc.) -Increased regulation complexity -Decentralisation and self determination of behaviour 	<p>Integrated IRR</p> <ul style="list-style-type: none"> -Difficulty putting into place multi-tier gov. -Organisational tensions -Relative efficiency of incentives
Low extent	<p>Non-existent IRR</p> <ul style="list-style-type: none"> -Significant technical standardisation -Development of property rights -Multiplication of contractual relations 	<p>Simple IRR</p> <ul style="list-style-type: none"> -Difficulty putting into place multi-tier gov. -Organisational tensions -Relative efficiency of incentives -Significant technical standardisation -Development of property rights -Multiplication of contractual relations

Bolognesi (2014)

Table 3 : Gaps in water policy design and type of instrumentation

Nature of gap	Characteristics	Instrumentation challenges
Administrative gap	Geographical ‘mismatch’ between hydrological and administrative boundaries. This can be at the origin of resource and supply gaps. => Need for instruments to reach effective size and appropriate scale.	Aligning institutions along hydrological boundaries Performance contracts Multi-level partnership targeting an urban development policy based on water
Information gap	Asymmetries of information (quantity, quality, type), between different stakeholders involved in water policy, either voluntary or not. => Need for instruments for revealing and sharing information.	Framing and evaluating water related objectives Compiling databases Benchmarks on the integration of water issues into urban development plans
Policy gap	Sectoral fragmentation of water-related tasks across ministries and agencies. => Need for mechanisms to create multidimensional/systemic approaches, and to exercise political leadership and commitment.	Establishing multi-party governance mechanisms Collaborative consultancy organisation Multi-level learning networks, mechanisms for power sharing
Capacity gap	Insufficient scientific, technical and infrastructural capacity of local actors to design and implement water policies (size and quality of infrastructure, etc.) as well as relevant strategies. => Need for instruments to build local capacity.	Mechanisms for consolidating water services Information sharing between stakeholders
Funding gap	Unstable or insufficient revenues undermining effective implementation of water responsibilities at sub-national level, cross-sectoral policies, and investments requested. => Need for shared financing mechanisms.	Transfers between different levels of government Equalisation Innovative instruments to widen the scope of funding
Objective gap	Different rationales creating obstacles for adopting convergent targets, especially in case of motivational gap (referring to the problems reducing the political will to engage substantially in organising the water sector). => Need instruments to align objectives	Overlapping training programme Creation of organisations to formulate a common interest Sectoral conferences
Accountability gap	Difficulty ensuring transparency of practices across the different constituencies, mainly due to lack of interest, awareness or participation and to insufficient user commitment, lack of concern, awareness and participation. => Need for institutional quality instruments. => Need for instruments to strengthen the integrity framework at the local level. => Need for instruments to enhance citizen involvement.	Consultation procedure Collaborative planning Public involvement Reporting Integrity pact External audits Registering claims

Table 4 : A typology of synchronous urban regimes

	Autopoietic cohesion	Dissipative cohesion
Extension by control	<p><i>Integrative synchronous regime</i></p> <p>Logic of action: integration</p> <ul style="list-style-type: none"> - Definition of problem boundaries (high-stake territories) by the public authority - Ad-hoc and autonomous adjustment of standards governing sub-systems <p>Instruments: targeted public policies (subsidies, incentive mechanisms), generic contractual arrangements</p> <p>Structuring principle : integrity (of the urban system)</p>	<p><i>Entrepreneurial synchronous regime</i></p> <p>Logic of action: effectuation</p> <ul style="list-style-type: none"> - Delimitation of metropolitan problems (high-stake territories) by the public authority - Recurrent and interactive redefinition of standards governing the urban system and sub-systems <p>Instruments: public policies and dedicated (ad hoc) consulting/ coordination organisations, specific contractual arrangements</p> <p>Structuring principle : subsidiarity</p>
Extension by self-determination	<p><i>Resilient synchronous regime</i></p> <p>Logic of action: resilience</p> <ul style="list-style-type: none"> - Co-definition of metropolitan problem boundaries (high-stake territories) by the urban coalition - Ad-hoc and autonomous adjustment of standards governing sub-systems <p>Instruments: evolving institutional arrangements (directing principles), functional solidarity</p> <p>Structuring principle : adaptability</p>	<p><i>Transformative synchronous regime</i></p> <p>Logic of action: transformation</p> <ul style="list-style-type: none"> - Co-definition of metropolitan problem boundaries (high-stake territories) by the urban coalition - Recurrent and interactive redefinition of standards governing the urban system and sub-systems <p>Instruments: reflexive institutional arrangements, interpersonal trust</p> <p>Structuring principle : reflexivity</p>