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Sustainability Indicators for Assessment of Urban Water Systems: The need for a common ground

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Abstract

The cities are facing a growing pressure for sustainable water services in a scenario where water is becoming increasingly scarcer. Most urban water systems (UWS) were developed under criteria guided by hygiene and efficient performance goals that are not necessarily encompassed with sustainability principles. Are the UWS sustainable? Answering this question is strategic to plan viable cities in the future. But measuring sustainability is a challenge itself.

Indicators are one tool in the attempt of assessing sustainability. In this paper, 13 different set of indicators have been analyzed. Many similarities where found but also many underlying conceptual differences. This comparison raises five main tensions when sustainability indicators (SI) for UWS are designed. 1) What is the system under analysis? Or, in other words, what is UWS comprised by? 2) What is considered as "sustainability" of UWS? 3) Should the emphasis be on current water problems or on thinking about the future viability of the city? 4) Should the emphasis of SI for UWS be on internal performance or external effects? 5) How should the diverse stakeholders' views and interest be taken into account? These are key questions with not easy answers. Multiple visions of sustainable development need to be contrasted in order to come up with a set of indicators in both technically sound and politically relevant terms. It is a call for integration of methods from diverse disciplines that allow a dialogue, not only among parties involved but also among disciplines. In that sense, an initial proposal is made in this work.

Keywords: Urban Water system sustainability assessment, sustainability frameworks, sustainability indicators, system analysis

1. Introduction

From the sustainability point of view, cities can be understood as a human strategy for survival. Cities have complex systems that deliver vital goods and services to a large, dense population, being in that sense comparable to ecosystems (Lee 2006, Hassler *et al.* 2004). In the case of water, urban water systems (UWS) perform functions such as water supply for production and cleaning, removal of fecal matter and handling of wastewater, drinking water provision, prevention of flooding by drainage of water, provision of water for urban

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agriculture and provision of water for pleasure and for recreational aspects of urban culture (Larsen and Gujer 1997)

UWS evolved to fulfill expectations rather different than those related with the concept of sustainability. They were developed mostly in a linear manner, to provide good quality water in large amounts (Juuti and Katko 2005). As consequence, water is the largest single flow of material for all current cities as figure 1 shows (Brunner and Rechberger 2002). Today, this arrangement has been deeply challenged: the urban population is growing while there are increasing difficulties to expand the existing systems; there are yet uncovered areas that are usually the poorest ones; and above all, the water resources are increasingly scarcer and with larger variations in stocks and flows as consequence of climate change (WWAP 2006, WWAP 2002).

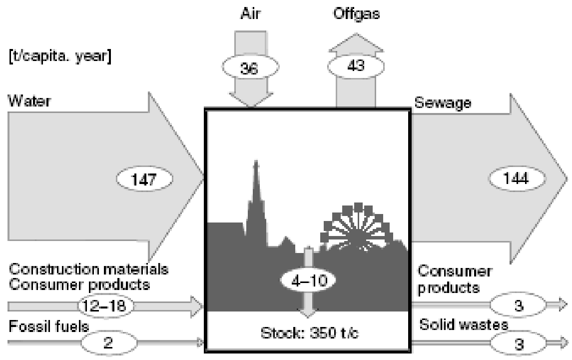

FIGURE 1. The flows and stocks of materials in the city of Vienna. All units in tons per capita per year (Brunner & Rechberger 2002)

This situation raises a vital question. Are UWS sustainable in the long-term? An answer will allow knowing whether a city is viable in the future, at least due to water availability. It makes measuring sustainability in UWS a strategic task for both urban planning and the water sector. Indicators are a tool to attempt such assessment, consequently multiple efforts have been done to design a consistent set. This paper presents and compares 16 cases. They have been grouped according to common frameworks of sustainability indicators (SI- Later differences among frameworks are explored. As a result, 5 main tensions are identified. They need to be solved in order to get information both technically sound and politically relevant to support strategic decision-making.

2. Indicators, Indexes and the sustainability assessment of UWS

Indicators are pieces of information, which summarize important properties, visualize phenomena of interest, quantify trends and communicate them to relevant target groups. (Lundin 2003). They are useful tools in decision making when additionally a) provide information for spatial comparison, b) provide early warning information and c) anticipate future conditions and trends (Lundin 2003). An aggregation of indicators is called index. Indexes aim to provide compact and targeted information for management and policy making (WWAP 2002).

The construction of indicators and indexes is a major topic in the sustainability discourse since quantifying sustainability is of foremost importance for policy action and a mean towards the operationalization of the underlying principles (Scheller 2000). Therefore many efforts have been done to construct SI and indexes. According to Scheller (2000), as well as to Henzi and Dovers (2005), SIs have been designed from the existing experience in each discipline of science, being the origin of diverse approaches. Each approach seeks to understand what a sustainable society means, using SIs as a way to assess whether a development pattern (for a nation, a region, a city or a company) leads to sustainability as goal. A summary of approaches can be found in Table 1. Some approaches are deeply rooted in economics, as it is the case of adjusted economic accounting. Some others follow technical/engineering internal logics as Material Flow Analysis (MFA). The Pressure-State-Response (PSR) framework is deeply rooted in environmental sciences. Last, but not least, planning studies have a propensity of “pick and choose” approach, taking approaches borrowed from geography, policy sciences, public administration and sociology. This is likely the case of approaches to describe dimensions of sustainability.

2. Review of current integrated sustainability frameworks

As part of the literature review in SI for UWS, 16 frameworks were explored. The following description introduces them grouped by approach, in spite of the fact that they might have different focus. In that sense, some frameworks try to build systems applicable to as many situations as possible. Some others are built at city level, company level or UWS level.

TABLE 1. Main approaches used for developing SIs

Approach	Main features	Final result – indicators
Dimensions of sustainability	Sustainability is understood as a sum of effects in three (o more) dimensions. It is common to consider at least environment, society and economy.	List of indicators by dimension.
Adjusted economic accounting	The environmental good as and services are valuated in monetary terms, to include them in the national accounts	Economic-wide indicators i.e. Modified GDP
Biophysical accounting	Accounting of natural resources required to perform certain economic activity or to sustain a national economy	Ecological footprint Water footprint
Resource and Material Flow accounting (MFA)	They seek to describe "the city metabolism". It means to determine stocks and flow paths of resource/material along all the uses into certain boundary (territorial, sectorial company)	Static or dynamic models about how material flows and where.
Pressure – State of environment – Response (PSR)	They seek to describe the causal chain of a particular effect considered as negative for sustainability. There are some modifications: DPSIR (Driving forces, Pressure, State, Impact, Response, DPSEEA (Driving Forces, Pressure, State, Exposition, Effect, Action)	The description of a causal chain of certain effect as well as the possible effects caused by certain decision
Guided by objectives	They measure the achievement of a particular goal considered as beneficial for sustainability. Do not describe how such objective should be reached.	i.e. MDGs indicators

2.1 Cases that followed an approach of Dimensions of Sustainability (DoS)

Under this group, five frameworks are considered, as summarized in table 2. As common feature, here sustainability is a wanted outcome in the interaction among society, environment and economy. However, such interaction is understood in different ways. In some cases, technical, institutional or society factors become important under the analyst's perspective. In some cases only impacts to society/environment are considered but other also considers possible underlying causes either internal or external to the unit of analysis.

In the cases of Wuppertal Institute (WI) and City of Toronto(CT), there is a clear systematic approach. In WI there is a focus on physical dimension of sustainability, i.e. leaving intact the stability of the internal evolutionary process of planet earth (Spangenberg and Bonniot 1998). To consider such limit, there is a consideration of stock of natural resources withdraw for human economies and how they flow causing later environmental/social problems due to its return to nature. It links with an MFA approach. In CT, there is a similar link, but also consider the life cycle of UWS (including building, transport and delivery service) as well as population growth and the extension of services as driving forces that may increase demand (Sahely *et al* 2005). In both cases, the problems of DoS are tackled, in particular the lack of consideration of links among dimensions.

One advantage of this approach is the compatibility to develop a multi-criteria decision making method. That is the case of SWARD and U. Toronto. There, dimensions and as well as criteria and sub-criteria are weighted. Weights are obtained by methods such as stakeholder dialogue and Delphi. However, it remains controversial as valid method to assess SDince there is subjectivity in assigning a value, so natural limits might be not well considered.

2.2 Cases following a PSR/DPSIR approach

One of the most extensively used framework is the PSR and its variants. It was created by the OECD in 1994 and it considers the interaction between society and environment as a cause-effect relationship. PSR considers that human activities exert pressures on the environment and affect its quality and the quantity of natural resources ("state"). The society responds to these changes through environmental, general economic and sectoral policies and through changes in awareness and behavior ("societal response"). As a manner to broaden this model, the EEA developed the DPSIR framework. It can be seen in figure 2.

TABLE 2. SI frameworks following a "Dimensions of sustainability" approach

Author	Objective	Dimensions considered	Focus	Result	Unit of Analysis
UN –CSD	Assess if a policy is being followed. The policy is believed as right path towards sustainability	Env. (Atmosphere, Land, Oceans, Freshwater, Biodiversity) Social (Equity, Health, Education, Housing, Security, Population) Econ (Economic structure, Consumption and production patterns) Institutional (inst. framework, inst. capacity)	Reporting Comparison DM	57 indicators	Multiple territory
City of Toronto – University of Toronto	Develop a framework for sustainability assessment of UWS relation	Environmental (Resource use, residuals) Economic (Expenditures and revenues, investment in innovation) Engineering (performance as reliability, resiliency and vulnerability) Social (accessibility, Health and safety, acceptability)	Investment planning Asset mgm Env. reasons Efficient service DM	System analysis Indicators Feeding a DST	City
Wuppertal Institute	Establishment of an integrated system of SI Try to recognize underlying trends in order to allow precautionary measures	Env. (Resource use and state indicators) Social (Health Care, Housing, Social Security, Unemployment) Economic (GNP, Growth rate, Innovation, competitiveness) Institutional (Participation, Justice, Gender Balance) Link econ-env (resource intensity of production) Link env.-social (distribution of access to env. resources, transport intensity) Link econ-social (HDI)	DM	Framework Indicators per dimension Interlinkage indicators	Multiple-territorial Utility
SWARD – UK	Develop a methodology to aid complex decision making into water utilities	Econ. (Life Cycle Cost, Willingness to pay, Affordability, Financial risk exposure Env. (Resource utilization, Service provision, environmental impact) Social (Risk to human health, acceptability to stakeholders, Participation and responsibility, public understanding and awareness, social inclusion) Technical (Performance, Reliability, Durability, Flexibility and adaptability)	Day-to-day DM	Primary and secondary criteria in each dimension Indicators Feeding a DST	Water Utility
Global Reporting Initiative	Reporting to external or internal groups about the corporative performance regarding sustainability	Econ. (Economic performance, Market share, indirect economic impact) Env. (raw materials, energy, water, biodiversity, emissions and waste, products and services, legal compliance, transport, general aspects) Social (Employment, relation company-worker, Occupational Health, Capacity Building, Equal Opportunities) Human Rights (Investment and provision practices, non discrimination practices, unions, child labor, forced labor, security practices, indigenous rights) Society (Community, Corruption, Public Policy, Disloyal competence, legal compliance)	Reporting, Comparing	Framework Indicators	Company Utility

NOTE: DM= Decision Making, DST=Decision Support Tool, Env=Environment, Econ= economy, Inst= Institutional, Mgm=management, HDI= Human Development indicators
SOURCES: GRI 2006, Sahely et al 2005, Ashley et al 2004, UNCDS 2001, Spangenberg and Bonniot 1998.

Under this approach, six cases were reviewed and are summarized in table 3. Despite a common framework, the final result is highly varied. Regardless the different objective and unit of analysis, the variation is mostly caused by different interpretations of sustainability, as well as by a blurred interpretation of each dimension (D-P-S-I-R) and interlinks by the analysts.

Regarding the definition of sustainability, it is understood as a desired state with little impact to people and environment, with no reference to its physical limits. It might be related with the fact that many definitions of SD intrinsically consider economic growth as a given goal, regardless of physical incompatibility with endless growth. In that sense, OECD framework had included decoupling indicators, which measure the structural change in the development path by indicators that relate GDP with uptake of natural resources as well as of waste generation. (OECD 2003).

Besides, social aspects tend to be undervaluated, mainly by PSR. OECD has been working to complement the existing set of indicators with others that focus in the social-environmental interface. There are two types of social concern: 1) those related to how environmental quality is distributed across different members of society and 2) those related to the distribution of the financial effects of SD policies (OECD 2006).

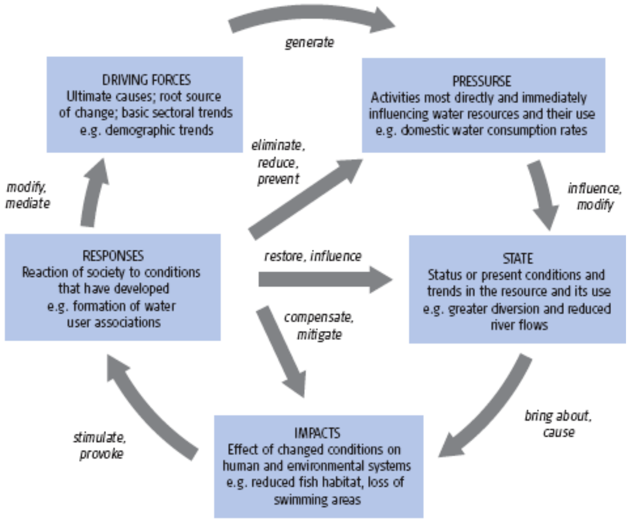

FIGURE 2. DPSIR Framework (WWAP 2006)

TABLE 3. SI frameworks following a PSR/DPSIR approach

Author	Objective	Features	Focus	Result	Unit of Analysis
OECD	Measurement of env. progress and performance. Monitor policy integration Allow international comparison	PSR. Descriptive indicators according 14 major issues. As result, four kind of indicators are done 1) Core set (keep track of env. progress) 2) Key Indicators (give an overview of key issues) 3) Sectorial Indicators (monitor integration of env. concerns in sectorial policies) and 4) Decoupling set (measure the decoupling of pressures from economic growth, reflecting structural changes). Lately, Efforts have been made to complement the existing set with indicators for MFA.	DM State-of-environment (SoE) reporting Comparison	40-50 core indicators , 10 key indicators , Several sets of sectorial indicators	Multiple-territorial and sectorial
WWAP Global Water reports I and II	Assessment of the state of the water resources. Identification of emergent water resources issues. Monitoring of progress towards achieving water policy objectives.	DPSIR. Descriptive indicators, showing the state of water resources and its links with diverse water relevant issues. Indicators are separated as 1) Basic indicators (no directly policy-relevant), 2) Key indicators (directly linked with policy goals) 3) Developing indicators (those in formative stage) and 4) Conceptual indicators (require considerable methodological advance, resolution of data issues and fieldwork)	SoE reporting	First, 176 indicators . Later, 64. separated by sector and DPSIR dimensio n	Multiple – territorial
UNEP-Grid Arendal CEROI	Assessment. Make science-based knowledge understandable to the public and to DM for SD	DPSIR. Descriptive indicators, showing the state of environment in the cities and its causes. Effort made in 25 cities and in development in other 25 cities. Reporting on internet	SoE reporting Comparison Raising Awareness	D: 18 inds; P:18 inds; S: 19 inds; I:10 inds; R: 46 ind	City
Plan Bleu. Mediterra-nean CDS	Create a common reference system among Mediterranean countries	DPSIR - MFA . Descriptive indicators, showing the state of environment in the nation. Some indicators are linked with the balance sheet of water use in the country. Later complemented with 34 priority MDGs indicator not linked directly with DPSIR	SoE reporting Comparison	130 indicators	National
Project “Water Strategy	Development of alternative options and long-term	DPSIR –MFA. Descriptive indicators, showing the dynamic of water demand/quality in an arid region highly affected by tourism activities.	Strategic Planning Modeling		Provincial – Regional in arid or

Man"	scenarios for water deficient regions.		Feeding DST		semi-arid regions

NOTE: Inds= indicator
SOURCES: OECD 2004, OECD 2003, WWAP 2006, WWAP 2002, National University of Athens 2002, MCSD 2000

There are particular efforts to integrate DPSIR with modeling of water resources at river-basin level (as in Pirrone *et al* 2005, Masill *et al* 2004). Such link has been made in order to allow the use of DPSIR indicators in strategic planning. However, the main inconvenient lies in the difficult correlation between causes – effects in many cases and in the difficulties to describe properly diverse technological arrangements as options regarding sustainability.

2.3 Cases following a MFA/LCA approach

MFA accounts the amount of materials – as classes or individual substances – that enter an economy (like an urban economy), accumulate in capital stock such as housing or products, or exit to the environment as waste (Wernick and Irwin 2005). According with Ayers and Ayers (2002), MFA is the basis for tools as LCA. LCA is a widespread method for environmental impact assessment from "the cradle to the grave". MFA and LCA have the potential to be used in strategic planning.

The first case analyzed in this work was the project MISTRA (Sweden). The project aimed at developing tools for supporting strategic planning about the future UWS. Sustainability is considered as composed by five dimensions: Environment: (eutrophication, pollution and resource utilization), health (microbial risk and chemical related risk), economy (total cost of investment, operation and maintenance), socio-culture (organizational capacity, context adaptability, household perspectives) and technical function (effectiveness, efficiency, reliability, adaptability and flexibility). A very short list of SIs was designed following such dimensions. The environmental indicators were defined in accordance with a MFA approach. The analysis included not only water but also nutrients as N and P, as well as hazardous substances as heavy metals. Then, different technology systems were assessed as options in different cases. Indicators were linked with steady-state models (Malmqvist 2006).

In a second case, Lundin (2003) developed a methodology based on LCA for development of environmental SI for UWS. Lundin proposes to define first the UWS boundary. Later the function of interest i.e, what is the functions that UWS perform. In LCA theory, system boundaries and a functional unit are critical to allow a fairer comparison of technological options.

3. Discussion: five tensions to be solved

3.1. Tension 1. Does the UWS mean the same than the water utility? – An issue of system boundaries-

The boundary of a system under analysis will significantly influence the final result of an assessment and therefore the solution devised (Larsen and Gujer 1997, Lundin 2003, Malmqvist 2006). Regarding UWS, four different boundaries were here used. Some authors considered boundaries defined by particular processes, as drinking water or wastewater treatments (Palme 2004). Others were guided by company boundaries (GRI 2006, Lundin 2003). A third group used the coverage of water infrastructure in the city as boundary (Lundin 2003). A fourth group considered the city as boundary, where UWS in only one of the elements assessed (CEROI). A smaller boundary means that strategic synergies are overlooked or not fully considered.

Most of system boundaries are focused on the main infrastructure. However, such approach might not represent fully the water flow in the city. When city areas are not covered or there are problems of low maintenance or high tariffs, urban dwellers organize complex means to acquire water, dispose fecal matter and deal with floods. Other water sources, other practices and other systems are then developed. These phenomena usually go unaccounted (Kjellen and McGranahan 2006). From a strategic point of view, those two issues needs to be properly tackled.

UWS are not only comprised by a physical system. There is also a social structure in charge of management. According to Rees (2006), there are decentralized and centralized options available, but in practice some options are poorly considered. Water managers *“consider a much reduced “perceived” range [of options] determined by the jurisdictional boundaries (spatial and functional) of agencies, their professional training and the ‘norms’ of professional practice, and the solution options employed in the past” (Rees 2006).*

3.2. Tension 2. What is considered as sustainability?– An issue of objective-

Despite the common use of the definition of sustainable development (SD) stated by the Brundtland Commission, most authors coincide that it is too vague for implementation (Korhonen 2006b,Labuschage *et al* 2005, Sahely *et al* 2005, Lundin 2003), besides representing a very contested concept, prone to different interpretations (Korhonen 2006a Harding 2006, Hueting and Reijnders 2004, Scheller 2000, Larsen and Gujer 1997). A clear definition of sustainability is the utmost importance regarding a UWS comparison in strategic planning. No comparison is possible without a clear criteria used as reference.

When the 14 frameworks are reviewed, there are deep differences among them regarding sustainability. In cases as UN-CDS, SWARD, SD is considered as directly compatible with economic growth. In opposition, Hueting and Reijnders (2004) consider that this is an assumption neither demonstrated nor plausible. Therefore, SI designed with such assumption might be misleading. In the case of OECD, incompatibilities are recognized and an effort is made to measure the decoupling of economic growth and environmental damage.

Regarding social issues, this is one of the aspects where more variations were found and more room for improvement exists. The comparative assessment of frameworks done by Labuschagne *et al*(2005) in a corporative level shows that differences are higher regarding social issues, proposing a radically different set of criteria. Therefore, clarification of terms such as “social” and “institutional” is urgent since different authors do a different consideration about what belongs to each one. Something similar is required for terms as “social” and “economic” (Hueting and Rijnders 2004)

3.3. Tension 3. Solving urgent water problems or thinking in the future? – An issue of timeframe-

There are strong social demands for quick solutions to huge water problems. The common practice to answer them is to consider a reduced range of technological and managerial options, determined by the jurisdictional boundaries of related agencies and past practices (Rees 2006). It can result in problems displacement or problem shifting. (Korhonen 2006a). Regarding technology, this practice only allows technological evolution via incremental changes to existing UWS. In this way, societies become “path dependent”, despite may be such technology is not the most efficient and sustainable. (Korhonen 2006 b)

Strategic planning for sustainable UWS must extent the time frame of analysis significantly. When focus become the long-term city viability, it is possible to consider the emergence of radical and fundamental changes in UWS either in technologies or managerial practices. (Korhonen 2006 b). It implies a radical change of view point in decision making.

However, practitioners might be reluctant to radical changes since they follow more immediate goals when talking about sustainability (Starkl and Brunner 2004). It is reflected in SIs. In frameworks as the ones guided by objectives or PSR/DPSIR, responses are analyzed in accordance with the most common technological or managerial practices, promoting them which difficult the diffusion of more sustainable technologies/practices. In that sense, resulting SIs might become a factor that impede longer-term view regarding technological and managerial change.

3.4. Tension 4. Internal performance or external causes/effects?

Companies, technical units, or UWS have an internal process that is affected or affect the external environment. Diverse approaches are more prone to identify one more than the other. For example, GRI is more focused in the external effects, than those processes that happen internally in the companies (Labuschagne *et al* 2005). This also occurs in PSR/DPSIR. But in approaches where UWS was the unit of analysis, internal processes are also considered, particularly as technical performance.

However, it is common internal aspects and external cases/effects are disregarded or poorly taken into account in social and institutional aspects. For example, regarding institutional dimension, there are external rules of the game for the urban water stakeholders and internal procedures and policies of water companies that affect both, the internal performance and the external effect. Most frameworks consider institutions as given, not able to be modified, therefore not subject of assessment. But this is not the case. Aspects as participation, accountability, transparency and justice are can be interpreted and implemented in diverse manner for water companies, local authorities and citizens. They also need proper monitoring. One example is given by SWARD project. They consider aspects as participation and responsibility, public understanding and social inclusion; despite they are classified as social aspects.

Then, for SI to assessment of UWS, it might be an advantage to consider both. It could help to clarify and balance which internal and external aspects should be analyzed.

3.5. Tension 5. Among stakeholders' needs and interest and real natural limits.

Diverse stakeholders have a diverse interpretation of sustainability and boundaries of UWS as well as diverse interest linked (Harding 2006, Starkl and Brunner 2004, Scheller 2000). It means that design and selection of SIs become a space where those differences need to be settled. If SIs are selected by an expert group, SIs will be scientifically sound but certain aspects will be included and others overlooked. (Scheller 2000). If SIs are chosen through a stakeholder dialogue, there are less risk to overlook some aspects, but time spent is necessarily longer.

In both cases, consensus among experts or stakeholders do not imply a fully recognition of physical sustainability. Practitioners emphasize feasibility and are prone to accept limitations in sustainability (Starkl and Brunner 2004). Or in other cases, Indicators can be designed in proper terms according with disciplines as economy and social science, but there is a disregard of physical sustainability, despite their limits cannot be overlooked. (Hueting and Riejnders 2004).

4. A way forward

Since a UWS is a complex system in a territorial jurisdiction, a multilayered perspective is proposed. Information at four levels is needed: 1) watershed (s) level since competition for limited water resources exist among diverse territorial units and among users; then SIs related with water availability and allocation can be highly useful.2) At city level for strategic purposes, since all territory/population will be monitored, synergies can be found and technological change can be fairly promoted 2) at formal UWS, since there is certain unity as sector, sharing an institutional arrangement and similar resources, allowing certain degree of synergy in management 3) At company level, since stakeholders in water sector need to perform fairly regarding SD in individual terms and 4) at technology system level, since technology change is one of the main factors in the core of strategic choosing. SIs in each level need to be considered, allowing considerations of internal performance and external effects at appropriate levels. It means that several sets of indicators should be obtained.

MFA is going to used as bases for SIs design. It allows a systematic analysis, a concrete link among stakeholders and levels and an a good basis for DM. Authors as Hezry and Dovers (2006), OECD (2006) and Korhonen(2006) pointed out the existing opportunity to integrate MFA approach with social sustainability via the analysis of distributional effects and the use of complementary social tools. For instance, when socio-spatial distribution of water is analyzed, links with socio-economical distribution can be found. It might build a necessary bridge towards a better interpretation of social sustainability. Similar bridges might be done with economic issues. Therefore, opportunities to complement MFA with other tools will be explored.

Since sustainability is a very contested term, stakeholders will be consulted in this regard. But not only stakeholders need to be considered, but also the natural limits and the timeframe regarding sustainability. In any case, decoupling indicators proposed by OECD might be advantageous and will be further explored. The DM process about SIs must be carefully considered in order to allow both scientifically soundness and political relevance. To do so, an stakeholder analysis, an a consultation process is going to be considered, but without disconnect it with the use of tools as MFA and the models that could be obtained. Stakeholder consultation needs also to consider the diverse layers where decisions are made (water utilities, city planning departments, watershed authorities) in a structured way.

5. Conclusions

In the present paper 13 frameworks for designing SIs were described and analysed. It was found tha develop SIs for UWS there is a need of common ground regarding four main aspects 1) What is the UWS under analysis? 2) What is considered as “sustainability” of UWS? 3) Should the emphasis be on current water problems or on thinking about the future viability of the city? 4) Should the emphasis of SI for UWS be on internal performance or external effects? 5) How should the diverse stakeholders’ views and interest be taken into account?. A proposal is made that 1) analyze UWS as a multilayered system with multilayered needs regarding monitoring 2) Utilize MFA as central tool, complemented with other social, economic and environmental tools that are compatible 3) Utilize Stakeholder analysis and consultation, in a way that is deeply rooted to MFA and other tools used.

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