Tracking governance – indicators and measurement for constructing learning water management systems

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Abstract

There is a growing consensus on the importance of "water governance" as a key to overcome the remaining gaps and to achieve sustainable management of the resource and the goals in terms of water and sanitation services. The United Nations system, by means of its World Water Assessment Programme, has the aim of using its extensive database to track the evolution of countries towards a better governance of the resource, which is considered equivalent to implementing integrated water resource management (IWRM) principles as a key to improve the overall performance of water management in each country. In this paper[1], an evaluation of the conceptions of governance and their relationship with water management evolution is proposed, as well as a review of a set of previous efforts to model the assessment of governance, water governance, sustainable management and overall performance of countries and river basin organiza-

[1] This paper summarizes the analysis performed by the author during his research internship at the World Water Assessment Programme, at UNESCO headquarters, under the direction of Prof. Michel Nakhla, from the CGS. All the opinions and the information presented remain under the responsibility of the author.

tions in terms of water management. The rationale and the formal aspects of the models are analyzed.

Two major pathways are depicted. First, the aim to implement a benchmarking system of aggregated point values of governance as a mechanism for inducing governments to improve their performance, which in the case of water management is found to be a complex task because of the lack of comparable information and the weak and unpredictable expected effect on the agents to which the mechanism would be addressed. Second, the potential to use a system of indicators to build up a shared strategic vision between stakeholders within a river basin management system is highlighted, to define the crucial information upon which the improvement in the system's overall performance is going to be evaluated, to support the decisions concerning allocation of resources and to allow shared learning within the system. The implementation of a decision support tool based on constructivist multi-criteria approaches is proposed as a means to induce this kind of process.

A paradigm shift from rational comprehensive approaches to water planning and management, still present even in some interpretations of the IWRM model, is seen as instrumental to open up towards the utilization of different tools coming from management sciences, as a complement to the usual instruments from water sciences.

1 Water crisis as a problem of governance

1.1 Motivation for an international action

There is a generalized consensus on the global scale of water crisis, which has potential consequences on the security, stability and environmental sustainability of nations. Phenomena potentially harmful to international relationships and to the human being's welfare and development can have their origin in a bad management of this resource, thus justifying the intervention of the UN system.

Since information is widely recognized to be instrumental to achieving effective water management, the United Nations System implemented in 2000 the World Water Assessment Programme (WWAP), to coordinate the UN-Water agencies in their effort for gathering, processing and disseminating data and information about water resources management in the World, while supporting capacity building efforts and knowledge creation and sharing within this sector; a knowledge base has been set up, two

World Water Development Reports have already been published and an extensive information and capacity building system is operational.
For the phase 3 of the programme, it was proposed to create an Internet-based system to have a comparative vision of water governance *by means of the implementation of a consolidated governance index*, as a means to "enable the countries to better manage their water resources" providing a base for comparison of water governance [WWAP, 2006].

The last of these aims gives place to the following analysis and reflections.

1.2 Water management evolution and approaches

Water management has been showing an evolution, from centralized and technically based paradigms, towards multi-level, multi-stakeholder decentralized settings, mainly as a result of the growing complexity of managing the resource as it reaches shortage and scarcity stages, and management measures shift from structural supply-driven responses to demand-driven ones, based on allocative efficiency and adaptive management models [Turton and Ohlson, 1999]. The persistence of over-exploitation, quality degradation, damages from natural phenomena and other setbacks in water management have reinforced the consensus on the managerial nature of the water crisis

Approaches underlying water planning and management can be analyzed in terms of the usual models [Mitchell 1998], [Proulx, 1992]. First, a rational-comprehensive model would lie on a sequential procedure, where problem and objectives are defined, alternative solutions are designed, assessed, selected, put in place and monitored, with eventual retroactions in the process; this approach is ideally adequate if planning object's behavior is stable, collective preferences are complete and steady as represented in the set of objectives, and decision power is unified, as well as rational and capable of selecting the subset of dominant alternatives according to their aggregated performance. The "disjoint incrementalism" model seeks to focus on small short-term improvements in a desirable long-term direction, where adequate if knowledge on the system's response is imperfect, environment is turbulent, time and resources are limited or long-term uncertainty is high. Finally, mixed approaches make use of rational-comprehensive approaches to set long-term strategies, plus incrementalist approaches to allow short term or lower scale adjustments, suited to local settings or to face variability in the planning object's characteristics or environment. Interactive methods can be used also to allow an interaction be-

tween stakeholders, to adjust priorities according to the continuous re-assessment of preferences and to favor implementation of agreed actions.

The suitability of a planning approach would depend on data requirements, variability and uncertainty in the environment. Remarkably, when turbulent planning environments and distributed decision powers are present, rational approaches tend to fail in implementation phases, while mixed - interactive approaches become more effective. Thus, mixed interactive approaches are closer to IWRM paradigm, since evolution of water resources management within a basin having reached the 'closure' stage [Molle, 2003], with problems growing in dispersion, complexity and variability, and where a system of several actors must get coordinated to implement a set of actions, makes inevitable to take a mixed approach. Nevertheless, basic conceptions of water resource planning remain biased towards rational approaches, which pervades to the conception of IWRM implementation.

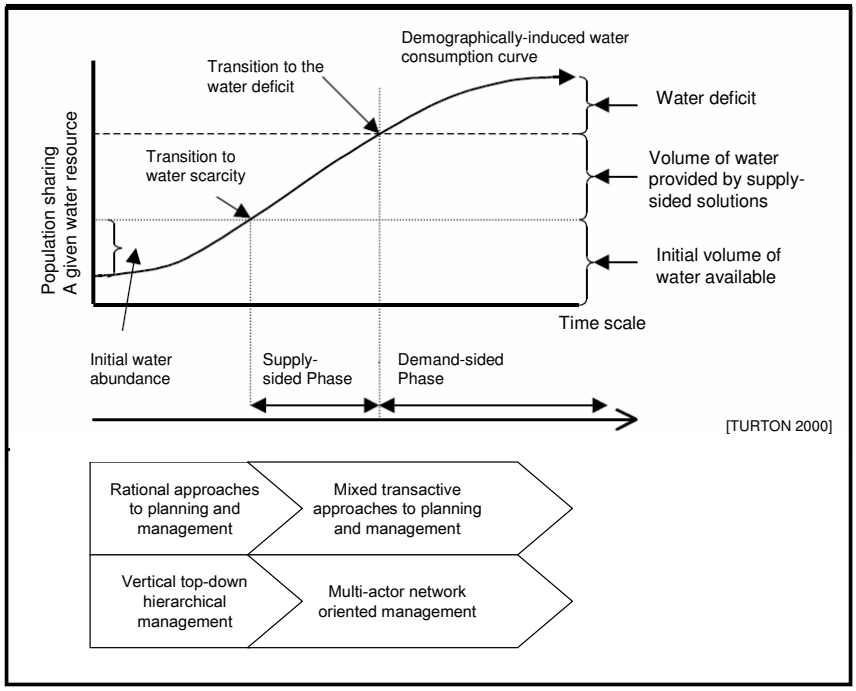

Fig. 1 Evolution on water management approaches

Public participation, for instance, is seen as an additional requisite for the rational planning process:

"The relatively recent acknowledgement that stakeholders need to be fully included in the decision-making processes ***complicates the life*** *of professional planners and managers. However, important sources of information come from discussion groups, public hearings, negotiations and dispute-resolution processes"* [Loucks and Van Beek, 2005]

"…the greatest difficulty to improve water management lies in non-structural questions like the political, economic, social and institutional aspects. What we normally lack off is a better knowledge ***of the society's capacity to implement the measures considered to be the correct ones****, so to achieve integrated water resource management"* [Dourojeanni, 2002]

This kind of bias is also present in the way governance conceptions have been translated into water governance models.

2. Governance and water governance

2.1 Definitions of governance

Governance is a concept for which several meanings have been proposed and are currently utilized, whether for descriptive, analytic or normative purposes, with some common elements:

- The aim to improve a system's overall performance, corresponding to a set of shared objectives
- The legitimacy in the definition of those shared objectives by an adequate aggregation of stakeholders' will
- Setting up the needed mechanisms to ensure an adequate level of evaluation and control of the manager's behaviour and actions, consistent with the stakeholders' objectives; this can include an effort to harmonize the organisation's strategy in reference to the shared objectives of co-workers, subordinates, clients, sub-contractors and other stakeholders
- Implementing a set of "rules of the game", ideally reflecting the collective interests and regulating interactions to promote the realisation of shared objectives, while allowing the system to manage diverging and potentially conflicting interests

A managerial extension of the conception of governance would imply a change in management styles, a quest for coordination of actors having different logics and interests, an inter-linkage of management levels, a shift from hierarchy towards cooperation, from top-down decisions to interaction and, in the end, towards a reflexive rationality in which the ensemble of actors operate within a permanent re-evaluation of the effects of their collective action [Allemand, 2002], thus corresponding to a third level of learning within the learning organization's paradigm [Bouvier, 2004].

Going beyond the single- and double-loop learning processes, a managerial conception of governance would allow the ensemble of actors to multiply and facilitate the interactions from which collective decisions gain in pertinence and legitimacy, enabling the organization to enhance its innovative capacities and its "collective intelligence", through which the system decodes, describes and assesses the efficacy of choices. These conceptions tend to give a response to emerging issues in Organizations Theory, where new management structures, working within more complex settings, call for new management styles.

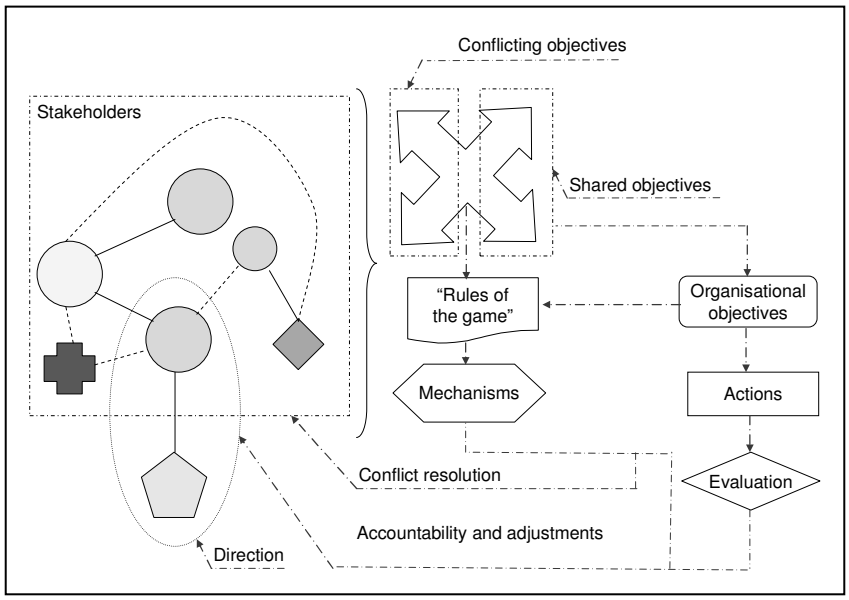

Fig. . 2 Governance conceptual model

2.2 Translation of governance definitions to water management

According to the Global Water Partnership (GWP):

"*Water governance refers to the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society*" [Rogers, 2002].

Since recent changes in society have questioned the capacity of central States to manage the increasingly complex development issues by themselves, hierarchical and market-led governance models are evolving towards distributed governance models. Water governance implies to determine the roles and responsibilities of the different interests – public, civil and private – in water resource management and development; to look at the balance of power and the balance of actions at different levels of authority, which should be re-adapted and translated into specific political systems, laws, regulations, institutions, financial mechanisms and civil society development and consumer rights; to go beyond the traditional public sector and market oriented governance systems towards coordinated schemes in which new, accountable but dynamic relationships between the different players and stakeholders arise [GWP 2003].

This vision of water governance clearly matches with an adaptive-mixed, multi-actor and network-oriented approach to water planning and management. Nevertheless, when proposed to the water sector public officers, specialists and related stakeholders, some nuances show up. From the "dialogues" favoured by the GWP to implement IWRM (assimilated to water governance implementation), a concern arose about the unclear demarcation of roles, the complex interactions, legal overlaps and disparity of capacities and information, seen as a potential hazard to "rational" water management. From this approach, there seems to be a conviction about the "external" nature of the governance problem, in reference to the usual water sector actors; it would only take to get political and budgetary support and "informed participation", to implement IWRM.

This has led to an implicit "rational conceptual model" of governance, in which a set of conditions determine whether water governance can be

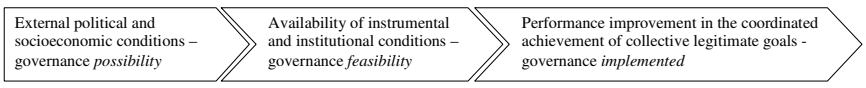

Fig. 3 Rational conceptual model of water governance

improved. This conception could bias water governance assessment towards the verification of the existence of such conditions, thus underestimating the importance of the effective implementation of reforms in management structures, including accountability and adjustment measures needed to favour a results-oriented management.

The Second World Water Assessment Report makes a hard statement, going beyond in this direction:

"Water stress tends to occur where individual rights and liberties are limited. A country-based comparison of per capita water availability and democratic governance would show that many countries are facing a double challenge of water scarcity and stress and limited political rights and civic liberties. (…) Reform of the water sector, therefore, must go hand-in-hand with overall governance reform. It is highly unlikely that more effective participation, transparency, decentralization and IWRM will take firm root in water sectors unless the country's overall governance system allows it." [Executive Summary, WWDR2, 2006, p. 7]

Even when no statistical foundation is offered to support this assertion, it directs water governance towards a specific causal model, in which the implementation of check-lists is favoured, where countries are evaluated – often, indeed, self-evaluated – according to the number of specific legal reforms and systems put in place, mainly in a formal fashion, rather than effectively put in practice.

From a preliminary review on existing assessment models, more hints can be obtained in order to assess the pertinence and the potential effects of putting in place, in this context, an integrated water governance index.

3. Modeling governance and performance assessment

3.1 World Bank Institute's Governance Index

The World Bank Institute's model for the assessment of country-level governance is aimed to show the relationship between the perceived existence of some qualitative conditions and processes, related to a specific definition of governance, and what is considered as a quantitative evidence of positive trends in development, as expressed in the evolution of socio-economic indicators; there is a careful underlying statistical analysis but the fact that a presumed correlation is not necessarily a proof of a causal relationship is not sufficiently addressed. The authors accept that they ha-

ven't got to prove a statistical correlation, but a "strong evidence" of the relationship between the perception of high levels of governance and the achievement of development goals; they also accept that the differences between countries with similar point values of governance could not be statistically significant – since 90% confidence intervals are often overlapped for adjacent point values [Kaufmann, 1999]. Nevertheless, short-term variations are usually emphasized by the press and the governments willing respectively to stress relative decline or improvement in the country's indicators and ranking. From a formal point of view, the inclusion of new countries or the change in the size of the databases being used has an effect, at least local, on the ranking and the relative values of some countries. The creators of the index are right when telling this hasn't a relevant effect when using this index for broad long-term analyses, but beyond their intentions, as in many similar cases, aggregated values tend to create the idea of a complete stable ordering, and the calculation nuances remain invisible for most of their users. Nevertheless, the original intention – promoting reforms towards a set of predefined values and practices as a key to get development results – is achieved by putting pressure on governments towards that direction (for instance, by promoting the use of this index for country risk assessment and, in consequence, for investment and external financial aid attraction), even though neither a statistically significant correlation between indicators, nor a corresponding causal relationship, are technically proved (or refuted).

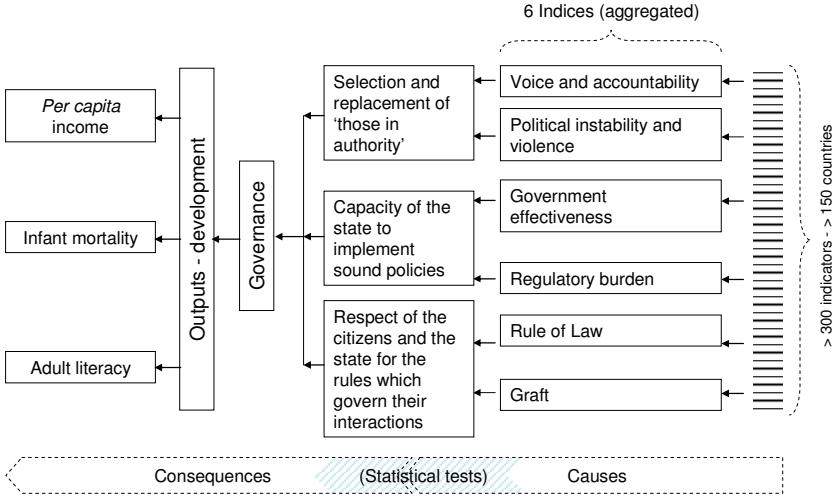

Fig. 4 Rationale of World Bank Institute's Governance Index

3.2. UNESCO's System for the Support of Water Governance

The model developed within the WWAP as a "System for the Support of Water Governance" (SAGA, for its Spanish acronym), which never reached an operational phase, was intended to respond to the objective of reinforcing national capacities for implementing IWRM. The creation of a "water governance index" would facilitate to make a comparative vision of water governance, to allow countries to better manage their resource.

Its objectives were stated as:

- Propose a definition of the "governance function" and its components
- Support the provision of reliable, timely and accessible information for the decision processes within water management
- Render a comparative vision of water governance between countries
- Make visible the roles and responsibilities of decision makers
- Build up a system of water governance indicators

The logic inherent to the model follows a causal chain, in which the existence of information and management systems would allow a country to put in place a good water governance structure; the underlying approach is a rational one, according to which, rational decisions for water management require good information and legal-institutional mechanisms to be implemented for satisfying society's needs (including public participation mechanisms to feed the technical decision process).

SAGA's water governance index is formed as a weighted average of four levels of indices; the lower one consists on 90 variables, which represent the level of existence, quality or development of a set of information or management items or processes, which are then aggregated in a weighted fashion to form 48 indices at a superior level, six indices at a "level 2" and two indices at a "level 1", whose average finally forms the overall governance index.

The list of items which form a water information system, as well as those concerning institutional items, can be very useful to check the existence and the level of quality and development of such elements, so as to better focus and improve United Nation's efforts towards the strengthening of national water management capabilities. Nevertheless, the conception, construction and logic of the SAGA system present several failures:

- There is no conclusive argument on how the mere existence of information and management systems would reflect the level of water governance or improve it,
- Being a weighted average, this index has compensation problems, which means that a bad performance on a specific item can be compensated by

high performances in other fields; similar indices would result for countries with different settings or water management levels of performance

- The objective of supporting the implementation of IWRM by making pressure on national governments to put in place information systems, administrative procedures and legal reforms would not necessarily be realized and, even that being the case, the presence of these systems as enabling conditions neither guarantees the achievement better performance levels, nor allows to derive a comparative measure of governance itself, since it would disregard the actual existence of better coordination processes, the achievement of goals and the operation of effective accountability mechanisms
- However, a wider aim to improve the information and the exchange of experiences between water professionals has been later achieved, since the SAGA formulation contributed to reinforcing the Water Portal of the Americas and the Inter American Water Resources Network, also under the auspices of WWAP

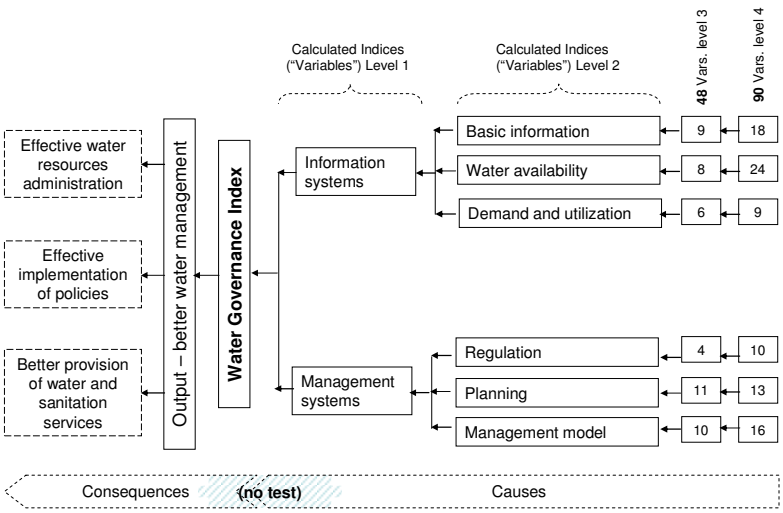

Fig. 5 Rationale of the water governance index in SAGA project

3.3 Key performance indicators for river basin organizations

In [Hooper, 2006] a system of indicators for assessing the performance of river basin organizations (RBO's) is proposed; this method is based on self-assessment subjective evaluations conducing first to a classification of

the river basin organization in terms of its degree of development, secondly to an evaluation of its development in reference to a set of conditions reflecting the level of implementation of IWRM, that is, of water governance, according to the author's definitions. The author doesn't seek to obtain a single aggregated performance index. His conception of governance emphasizes the implementation of mechanisms for interrelating actors for maximizing the results of the collective action towards IWRM.

A set of 115 indicators was proposed, organized according to 10 groups, as shown in Figure 6; a prior assessment is proposed in order to classify the River Basin Organization in terms of its degree of development, which determines the processes actually taking place in it.

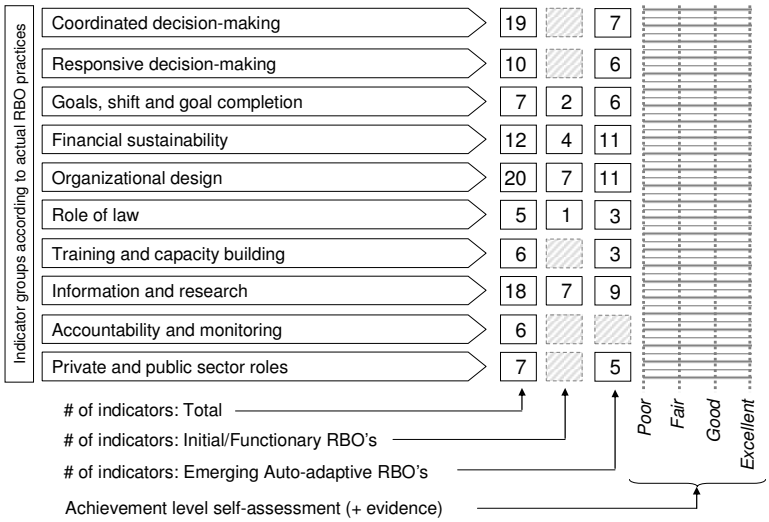

Fig. 6 Organization of RBO's self-assessment with performance indicators. Based on [Hooper, 2006].

Even when a numerical ranking procedure is proposed for the first classification, the analyst is given the freedom to place the RBO in the most suitable development stage, to the eyes of the analyst and/or the stakeholders. The aim of the procedure is to produce a scorecard which can be used by RBO's manager, staff and stakeholders to get a common idea of a pathway towards a higher level of development and performance. Pointing out that governance assessment is an evolving concept, as well as the exploratory character of his work, the author calls for a flexible, innovative and locally-adapted use of the proposed tool.

In this context, what could be remarked is, still, that this model doesn't help tracking the pace and degree of the evolution in the management of

the resource, but on a subjective and imprecise manner (since it was not its purpose). A stronger relationship with each basin's natural and socio-economical settings, as well as with specific goals and indicators related to the way resources are being managed, could be explored. This approach could help to orientate the construction of a shared vision between stake-holders and RBO's management staff of what numerical indicators should be chosen, measured and evaluated to assess the evolution in overall per-formance of the system and in the way RBO's management is fulfilling its tasks. The most interesting feature is that, in comparison with SAGA, it in-troduces two important dimensions: the evaluation and the identification of concrete evidence of governance processes in operation, as well as an as-sessment, though subjective, of the extent in which goals are being at-tained. SAGA's listing of the items needed for having good information and management systems can, however, support the task of evaluating a RBO's level of development.

3.4 Assessment of Water Resources Sustainable Management

In [Chaves, 2007], another model for evaluating the sustainability in water resources management within a river basin is proposed. He uses a concep-tion inspired in the pressure-state-response model and proposes the weighted addition of a set of indicators for obtaining a "water sustainabil-ity index". Figure 7 shows the general structure of this model.

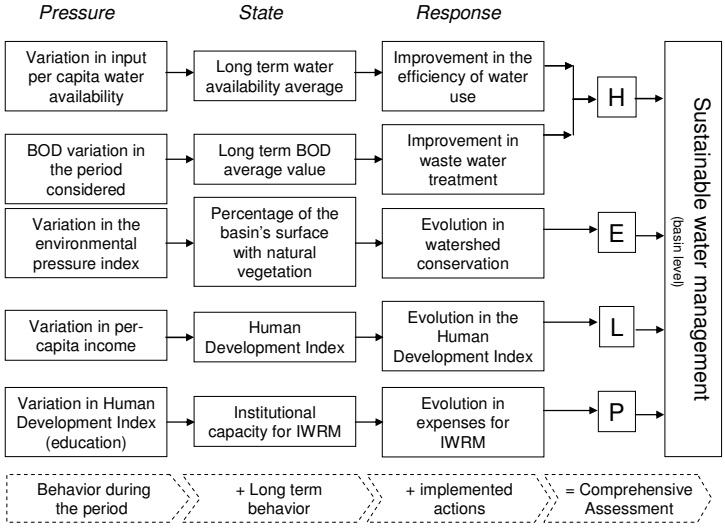

Fig. 7 Rationale behind the "water sustainability index".
Based on [Chaves, 2007]

This model adds to the preceding ones the consideration of long and short term environmental characteristics, as well as an evaluation of the measures put in place to modify the state of the resource. Its simplicity, presented as an asset by the author, is also the source of its limitations, since the meaning of the aggregated index is not clear and the relationship between river basins with similar values, formed by the weighted combination of different structures of behavior and performance, could show the same compensation problems that almost any index based on weighted averages without a statistical test of significance. From a broad scope, such an index can be helpful to classify river basins according to their differences in terms of natural and socioeconomic environments, but relating "response" indicators to specific "state" evaluations could become more helpful if some separate analysis of relevant indicators was performed. Also, the intention of eliminating biases by setting up similar weights to variables is only apparent, since an item subdivided in more components makes each one of these components "lighter" than others at the same level, but belonging to an item with less subdivisions; this could bias the response as to favor the investment or the action in those components having the bigger influence on the aggregated index. Taken as it is, it could happen that a well preserved but poorly managed basin appear to be equally or more "sustainable" than deteriorated ones, where however big efforts of rehabilitation could be under way; a closer analysis of paths within the data gets then necessary to enrich the interpretation of the model, loosing the advantage of simplicity but certainly gaining a framework to depart from.

4 Governance modeling and tracking as a learning tool

4.1 On indicators, indices and scorecards

An indicator should be an observable variable which serves to analyze a non-observable reality; an index would be a synthetic indicator built by aggregation of basic indicators [Boulanger, 2004]. This means that the construction of an indicator implies the assumption of a "reality" of which a measure is been sought, as a level or degree of presence of a determined quality or set of quality descriptors. Indicators can be used to analyze, describe, classify or evaluate the behavior of the object under analysis. When creating an indicator, an analyst conceives a reality which he wants to communicate, but there is always the risk of not finding an indicator which

is meaningful to the target audience, which communicates a wrong message or which doesn't even is significant or consistent in relation to the reality perceived by the analyst himself. That is why indicators are usually asked to fulfill a set of technical, logical and even *political* conditions.

Technically, even when some conditions are not simultaneously or thoroughly achievable, an index from which a complete order of a set of alternatives is sought, should not show compensation problems (where a bad performance in some components can be compensated by a good performance in others, this remaining invisible to water users and undermining the original intentions). Scale normalization also has an effect on the aggregated scores and orderings, and it should be carefully analyzed. When representative numerical databases exist, indicators and indexes can be subject to regression analyses and the way an index is adjusted to a presumed distribution can help define its construction. When translating a qualitative perception into a numerical scale, the choice of the values and limits of the scale will also have important consequences on its application, especially if it is aimed to be used for normative purposes; for instance, when they change from one numeric value to the next in a discrete or non gradual fashion, local problems of non monotony can weaken the effect sought by the analysts, by not reflecting an increase or decrease in the quality being analyzed, until it reaches the predefined threshold. In [Marchand *et al*, 2003] an extensive analysis on these issues is presented; the authors underline that no indicator system can be completely free of disadvantages but they point out that the analyst should be aware of not favoring the misunderstanding and misuse of the indicators, in reference to the assumptions and intentions that were originally sought.

In terms of their ease of application and understandability, [Seager, 2001] proposes a set of properties; indicators should be:

- Representative
- Scientifically valid
- Show trends in time
- Give an early warning of future events
- Be sensitive to changes in the processes they are aimed to reflect
- Being based on easily availablel indicators, or obtainable with a reasonable investment
- Use data sufficiently documented, with known quality
- Capable of being updated on regular intervals

This shows the importance of building an index by following an ordered procedure, as the one suggested in [Boulanger, 2004], departing from a conceptual analysis, the identification and selection of variables reflecting

the relevant dimensions, the definition of scales and procedures for measuring the values in each variable which gives place to the indicators, the analysis of the aggregation procedure and the proposition of the final index.

All these conditions – which would serve to produce indicators with minimal soundness and relevance in relation to the phenomena under analysis – are not enough to ensure that the consequences of producing and publicizing the indicators are going to respond to their creators' intentions. Boulanger also remarks the double role of indicators, which are meant to be scientific constructs but also political ones. Quoting Judith Innes, he states that indicators will have influence in the extent they reflect socially shared meanings and policy objectives, as well as a sound technical methodology. When an indicator is meant to produce a reaction within a set of potential users, it is fundamental to set up a good communication process in order to create a shared interest about the consequences of interdependent activities reflected in an index, when it's related to the evaluation of a collective action. Once again, stakeholder participation in the definition of indicators, from the moment of their conception should favor a good implementation.

This conception would call for a constructive approach to the implementation of indicators as a tool for assessing overall performance of multi-actor systems. In complex organizations, decision tools are simultaneously a means for monitoring their performance, as well as an exploration and a learning vector for the stakeholders. Decision tools are related with the organization's dynamic evolution, its structural transformations, the innovation processes that occur within it, the mechanisms for producing knowledge and the relations between the actors taking part in decision making. Following these ideas, a proposal to work with indicators around the concepts of overall performance, sustainability and governance, is proposed.

4.2 A proposal for exploring the use of indicators for the assessment of sustainable water resources management

If indicators are going to be used to evaluate the quality of water governance within a country or a river basin management system (which would include the RBO and all the relevant actors having influence in the use and behavior of the water and related resources), according to the proposed procedure, a sound conception should precede any effort, based on the widest discussion possible between analysts and representatives of the target audience.

Two major pathways are envisageable. First, if the objective is to implement a benchmarking system built on a single governance index as a mechanism for inducing governments to improve their performance, a careful analysis on the chances of producing such an induction should be performed. Will the publication of governance index produce the desired behaviors in the relevant actors? Are the necessary conditions to reach a desired level of influence present in the target settings? In what extent does the aggregated dimension (water governance) has a unified meaning? Are the incentives present, for implementing methods making accountable the performance of RBO's management staffs? Besides those conceptual concerns, river basins throughout the world have not only fundamental differences that make difficult to compare them without making a previous classification, at least according to their fundamental descriptors linked to climate, geology, land characteristics and topography. An additional problem derives from the heterogeneity in methods, scales, density and reliability, which can be assessed – as it has been done within the WWAP – but whose complexity within aggregated indices gets invisible to the media and society.

Secondly, if indicators don't appear to be easily suitable for comparing different countries or river basins in terms of their aggregated performance in managing water, the potential to use a system of indicators to build up a shared strategic vision between stakeholders within a river basin management system can be high. Defining the crucial information upon which the improvement in the system's overall performance is going to be evaluated, to support the decisions concerning allocation of resources and to allow shared learning within the system, can be a means for supporting a river basin management system's integrated management.

In both cases, each water management system's evaluation would ideally allow analysts, managers and stakeholders to assess the rate of improvement in its performance according to its original or previous situation, as well as in relation to the evolution in their environment and internal structure, in order not to compare non-comparable systems.

Most of all, the identification of performance measures and indicators, the construction of partial or total aggregation mechanisms and the way of sharing and coding information and reacting consequently, should be a primary way for setting up multi-level and multi-stakeholder learning organizations.

4.2 Guidelines for building a model for evaluating water governance

According to what could be the concerns from an international perspective, two possibilities could be explored:

1. To develop a processus for building a tool to assess how far is a river basin from a desirable state of sustainable operation, or at least to compare the performances of different river basins management systems through time, in terms of the evolution of the state of their water and related resources according to a set of selected dimensions.
2. To develop a process to favor the implementation, within each water management system, of a tool for analyzing its evolution through time in the different dimensions of a river basin's water management.

In both cases, a conceptual definition of water management should be proposed, in terms that the ensemble of stakeholders and managers get as satisfied as possible. This definition could consider:

1. *What is going to be analyzed*? A preliminary classification of river basins according to their original characteristics which define the distribution, intensity and behavior of water quality and presence in the different media, as well as their relationship with demographic pressure and the level of development of hydraulic structures allowing to extract and control the resource. This would have the aim of assessing how far is each basin from its "closure" – the stage where water offer cannot be augmented within the reasonable limits of affordable resources – and, in that sense, how complex is its planning environment. The objective is not to compare incomparable items.
2. *What is happening to the resources?* The assessment of the state of the water resource and the other resources whose balanced utilization is required for achieving sustainable development [ECLAC, 1991], that is the natural milieu, financial resources, institutions, human capacities, infrastructure and technology, and the structure of social values regarding to water. Whether these resources are being preserved or depleted, that gives a view on how the actions having place in the river basin are affecting its overall sustainability. This would follow the "response" criteria.
3. *What is being achieved of what society expects?* The evaluation of the degree of accomplishment of the goals and objectives corresponding to the river basin's structure and the will of its stakeholders. The aim here would be to assess effectiveness and, ideally, to assign a degree of responsibility to each one of the agents. Objectives can include:

- Preservation or recuperation of water quality

- Sediment control
- Preservation or recuperation of watersheds
- Flood control
- Drought attention
- Recreation
- Care of cultural and landscape values linked to water
- Protection of subsistence activities
- Water supply and sanitation in rural, periurban and urban settings
- Agricultural irrigation
- Industrial and commercial supply
- Navigation
- Commercial fisheries
- Power generation

4. *How it is being achieved?* The assessment of the mechanisms put in place to reach the defined goals within the specific context of each basin – including normative, contractual and inductive actions and policies.
5. *How well shared objectives are attained while managing conflicting ones and ensuring a responsive management?* The presence and degree of conflict within the system, as well as the mechanisms for rendering accountable the behavior of managerial staff, are especially important if quality of governance is to be assessed.

A compared evaluation of the trends of river basins where different processes and values identified with IWRM and good governance practices are in place, and the trends of their achievement of goals and evolution in the state of the resource indicators, would reveal whether there is a positive relationship between those practices and concrete results. This shouldn't be taken for granted when the purpose is analytic, nor be accepted blindly when the purpose is normative[2]. Moreover, if governance means a specific balance of incentives, law enforcement and coordination measures, according to each setting, the correlation between the presence of specific governance mechanisms – that is the number, characteristics and extent of governance principles of practice, put in place to better manage the resource – and the actual behavior of the resources and the attainment of the objectives, would be difficult to establish, since different settings would

[2] See for example [Turton and Ohlsson, 1999] when trying to show the relationship between water scarcity and human development index, as well as in the paper of [Grey and Sadoff, 2005], where the recursive relationship between water management level and economic growth and stability is underlined.

call for different combinations of management measures to attain similar performance levels.

Once an agreed definition would be available, the selection of relevant dimensions, the choice of indicators and the design of the methods upon which they should be measured, their scales normalized and their aggregation performed, would be subject to the technical pertinent analyses.

Some of the authors that have been cited coincide in the perception that a shared discussion, definition and revision of the set of indicators and their evaluation can help the set of stakeholders, managerial staff and analysts to build a learning process, in which knowledge exchange and communication can play an instrumental role for rendering the river basin management system adaptive towards changes in its planning environment.

4.3 About the approach and the method

The construction of a single aggregated indicator for reflecting and tracking governance has shown to be not only difficult, but perhaps useless, in the sense that the desired incentive effect could be absent and even undesired consequences could arise.

Anyway, a comparison of different water management systems still seems possible, if a different approach is explored. The cited authors, Boulanger and Marchand *et al* coincide in the similarity between the aggregated analysis of indicators and a classical multi-criteria problem, with the difference that in creating an index, no decision problem – and in consequence, no single preference structure – is apparent.

Once the dimensions and mechanisms for their evaluation would be proposed, the use of a multi-criteria method – of the ELECTRE or PROMETHÉE style – would be interesting because of several reasons [based on Arondel, 2000]:

- They allow the analyst to work with heterogeneus data, because of their nature, their precision degree, uncertainty and even redundance or interaction
- The objective would not be to get to a complete optimal and stable order, but to have a tool to explore how the basins perform between each other, once different assumptions on the indicators – which play the role of assessment criteria – are tested
- Different interests and perceptions, characteristic of water management in complex settings, can be supported with such methods, since they allow to explore different preferential structures

- They are useful to get to the desired answer, which is not a decision but an assessment of which are the basins which are closer and farther from an ideal of sustainable water management, in what extent and how they behave through time.

Of course, the implementation of such a model would require a careful analysis of how an initial classification should be performed, how the implicit tradeoffs present in the selection of the objectives need to be addressed, how should a set of weights or relative importance of indicators should be built, how should stakeholders take part of the process and how should it be communicated to ensure this tool would have a positive impact on collective learning within the system. Technical concerns, such as computational effort derived from the number of items under analysis and the number of indicators, should be carefully addressed. To have a pertinent conception of the interactions between variables would take to have a thorough understanding of how the different processes interact in the water management system.

Anyway, developing a model based on multi-criteria decision making approach would certainly show yield a different view of the problem. The comprehensive assessment of social, economic and environmental processes and objectives remains a major objective which makes this kind of exploration interesting.

5. Concluding remarks

Water governance, as understood from a managerial approach, requires a paradigm shift towards a different way of performing water planning and management, not only a minor adjustment in current management practices. For instance, participation and institutional reforms should be considered as a way to overcome the inevitable bounds imposed to rational planning by environmental complexity, uncertainty, as well as by the proliferation of new dispersed and variable problems whose translation into rational models and processes of planning, linked to centralized decision structures, can reveal serious limitations. These environmental characteristics are not going to disappear, but they will rather become more frequent.

This means that:

- Mixed interactive planning and multi-actor network-oriented management are the most suitable models for facing complex environments characterizing water management in 21st century. Rational approach, when used to analyze long term behavior of crucial indicators related to

the response of water and related natural resources upon the application of alternative actions and policies, will always be needed; its degree of development is one of the most important assets of water management, but it shouldn't preclude it to make use of management tools, which are much more suitable to solve management problems.

- Setting up new distributed governance structures is not a way for improving the efficacy of classical rational approaches, but an alternative way of approaching reality, where analysts, managers and stakeholders shall learn, share their knowledge, timely react and adjust to the changing environment, for which setting up organizational learning processes can be instrumental.
- Building a single aggregated index for tracking governance can reveal to be highly complex, risky and even useless; instead, working with more flexible ways for exploiting scorecards and indicators, as to assess which basins are closer to a sustainable operation, as well as how a single basin performs in comparison to other basins and to its own evolution, can reveal more useful and fruitful.
- No correlation between practices following a set of values and results in terms of development goal achievement should be accepted without a prior evaluation; for the sake of addressing international concerns about effective water management, concentrating on results and the actual implementation of different managerial practices seems much more appropriate than focusing exclusively on self-assessment checklists of good practices and legal reforms implementation.

The analysis and proposals presented in this paper are at an exploration stage. The urgent need for innovation in water management calls for the most open consideration of alternate ways for addressing this major challenge for humankind.

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