

# Normative scenarios and stakeholder involvement in sustainable management of transboundary river basins

Nisete A. Amigo

*Department of Environment and Planning, CESAM -- Centre for Environmental and Marine Studies, University of Aveiro  
Campus Universitário de Santiago 3810-193 Aveiro PORTUGAL*

## Abstract

The natural resource management literature argues that sustainable natural resources management requires a process to facilitate understanding through exchange of experiences and validation between the parties involved to reach a consensus. The analysis of involved stakeholders does not by itself create such a negotiation platform. Coupled normative scenario and participatory approaches support stakeholder discussions on trade-offs between the current and future situation in an iterative process, of building normative scenarios as to converge towards a shared vision of a common future. The aim of this study is to show that the use of normative scenarios combined with the participation of stakeholders could facilitate more informed, sustainable and equitable decision making regarding water resources management futures. Building trust and understanding among stakeholders allow for the legitimacy of alternative views, which for transboundary river basins is even more critical though absent in the development of single (international) transboundary river basin plans.

**Keywords:** Normative scenarios, negotiation platform, transboundary basins

## 1. Introduction

From the Dublin Principles, the river basin is considered a unit of global planning and water resources management and emerges as the backbone of the Water Framework Directive 2000/60 /EC (Mostert, 2003). The Water Framework Directive (WFD) aims at the "good water status in European waters by 2015" to be achieved through a participatory planning of watershed management and supported by various assessments and extensive monitoring. This emphasis on integrated river basin analysis is introduced not only in Europe, but also in the US, Australia (Ward, 2009), and in numerous developing countries (GWP-TAC, 1999).

In reference to the sustainable management of transboundary water resources, the WFD focuses on the search for efficiency in integrated management of water resources through a joint plan for international river basin. Thus, there is a need for policies to manage water resources more efficiently, equitably and sustainably (Ward, 2007). Border countries should identify their international river basins and together create an international river basin district with a single international river basin management plan. If proven the impossibility of a single plan, each state must make a plan for their part of the watershed. The programs of measures must be defined nationally but should be coordinated internationally (WFD, 2000; Mostert, 2003), which demonstrates the complexity of such management. Historical differences and cultural issues contribute yet more to this complexity in transboundary river basins (Raadgever, 2008).

A framework for water resources management has been developed within the scientific community to deal with such complex issues of water resources management, in order to improve their performance based on social, environmental and economic sciences (Medema et al., 2008). This Integrated Water Resources Management (IWRM) framework is described as a "...process that promotes the coordinated development and management of water, land and related resources in order to equitably maximize the economic welfare and social results without compromising the sustainability of vital ecosystems" (GWP-TAC, 2000). The fundamental objective of IWRM is to achieve holistic and sustainable water resource management, via integration and coordination of stakeholders (Braga, 2001).

The watershed as the backbone of water resource management is a key issue too in terms of governance, since introduces in water management process a greater number of aspects to consider regarding the spatial issue, thus implying rethink managerial policies administrative, economic-financial and socio-environmental that support this new dimension of water resource management.

The natural resource management literature argues that sustainable natural resources management requires a process to facilitate understanding through exchanges of experiences and validation between the parties involved as to reach a consensus (Rist et al., 2007) that meets the sustainable development principles. Methods that use stakeholder participation can facilitate social learning (Reed et al., 2010). Acknowledging this, researchers and policy makers are exploring new approaches based on the combined knowledge of the natural and social scientists as well as local stakeholders (Dougill et al., 2006; Bohnet and Smith, 2007). In particular, the use of normative scenarios conjugate with stakeholder participation facilitates discussions on trade-offs between current and future situations.

The aim of this paper is to highlight that the use of normative scenarios and stakeholder involvement can be a key tool in building a negotiation platform in the transboundary basin planning and management process. Normative scenarios combined with the participation of stakeholders could facilitate more informed, sustainable, and equitable decision making regarding water resources management futures. Promote trust and understanding among stakeholders, which facilitate the exhibition and conciliation of different viewpoints. This is critical in transboundary river basins given the complexity of geopolitical and cultural issues involved, when there is no development of single (international) transboundary river basin plans.

The structure of this paper is as follows. Section 2 introduces some visions, concepts and classification of scenarios in the context of prospective studies. Section 3 presents an overview of the importance of participative natural resources management and presents an approach for building a negotiation platform for making decisions that lead to sustainable management. Section 4 discusses the question of scenario construction methodology, and presents a methodological approach for the construction of normative scenarios for transboundary water resources management (TWRM). Section 5 discusses the importance in use of participatory normative scenarios for TWRM. Some final considerations are made in Section 6, with a view to using this approach of normative scenario participatory in a case study of transboundary river basin management, underway.

## **2. Scenario in prospective studies context**

Prospective scenario studies have been used to describe alternative futures, based on probable and plausible hypotheses for a reality laden with uncertainty, to assist in management decision making (Buarque, 2003). The scenarios term gained popularity with the book "The Year 2000" by Hermann Kahn (1967). In the 1980s, Pierre Wack, Michel Porter, Paul Singer brought success stories of scenarios. In literature there are various views on scenarios and settings, which justifies the variety of approaches used in prospective studies.

In an internationally accepted view as the Michael Porter, a scenario is an internally consistent view of what the future might be, and its main functions the explicit evaluation of the planning assumptions, supporting the formulation of goals and strategies, evaluation of alternatives, stimulating creativity, blending of languages and to prepare for discontinuities (Wright and Spers, 2006).

To (Godet, 1996) "Scenario is a description of a future situation and the course of events which allows one to move forward from the original situation to the future situation".

To (Rotmans et al., 2000) "Scenarios are archetypal descriptions of alternative images of the future, created from mental maps or models that reflect different perspectives on past, present and future development".

To (Buarque, 2003) "Scenarios are descriptions of the future based on consistent sets of assumptions about plausible and likely behaviors of uncertainty."

Some definitions of scenarios are cited in Duinker and Greig (2007), bringing the idea that scenario-building does not focus on making predictions or forecasts but, instead, on describing images of the future that challenge current assumptions and broad perspectives:

"...a description of a possible set of events that might reasonably take place. The main purpose of developing scenarios is to stimulate thinking about possible occurrences, assumptions relating these occurrences, possible opportunities and risks, and courses of action"  
(Jarke et al., 1998);

"...an internally consistent view of what the future might turn out to be — not a forecast, but one possible future outcome"  
(Porter, 1985);

“...a tool for ordering one's perceptions about alternative future environments in which One's decisions might be played out”  
(Schwartz, 1996);

“...a set of reasonably plausible, but structurally different futures”  
(Van der Heijden, 1996);

“...conjectures about what might happen in the future”  
(Cornish, 2004).

In the scenario literature there are different classifications of scenarios (Rotmans et. al., 2000), and some of them will be presented to exemplify the categories diversity used on studies about future. The two major categories identified, for example, by (Godet, 1996; Buarque 2003), depend on the type of vision adopted with exemption or the presence of the desire of the planners:

- i) exploratory –starting from past and present trends, leading to the likely future. Intentionally seeks to exclude the wants and desires of policymakers in the design and description of the future;
- ii) anticipatory (normative) – built on the basis of alternative visions of the future according to the desire of the planners. 'Normative' word is used in a retro projective sense.

Based on the literature of scenarios (Rotmans et. al., 2000) highlighted another classification of scenarios, comprising four categories:

- i) forecasting and backcasting scenarios – respectively explores future consequences of a sequence of assumptions, and backward start from some assumed final state, and explore the preconditions that could lead to this state;
- ii) descriptive and normative scenarios – an ordered set of possible events irrespective of their (un)desirability, and normative scenarios take specific targets to be reached;
- iii) quantitative and qualitative scenarios – are often model-based, and qualitative scenarios are based on narratives, but pathways into the future are then qualitatively described;
- iv) participatory and expert scenarios – participatory scenarios refer to approaches in which stakeholders (non-scientists), play an active role, are co-designers of the scenario; expert scenarios are developed only by a small group of technical experts.

The scenario classification, according (Borjeson et. al., 2006) shown in Figure1 – scenario typology, presents variants of the categories probable, possible and preferable, based on principal questions about the future, respectively:

- i) What will happen? – predictive – attempts to predict what is going to happen in the future;
- ii) What can happen? – explorative – explores situations possible to happen, usually from a variety of perspectives;
- iii) How can a specific target be reached? – normative – interest on certain future situations or objectives, and how these could be realized.

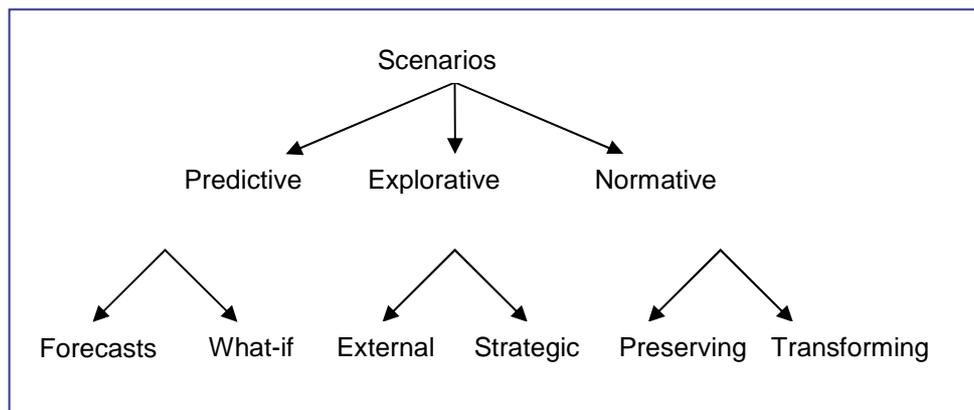


Figure 1 – Scenario typology with three categories and six types.  
Source: Borjeson et. al., 2006

There is an increasing tendency towards the use of participatory methods for development scenarios, combining qualitative and quantitative information (Rotmans et. al., 2000; Volkery et. al., 2008).

### **3. Normative scenarios as participatory process approaches**

The natural resource management literature argues that sustainable natural resources management requires a process to facilitate understanding through exchange of experiences and validation between the parties involved to reach a consensus – a negotiation. The analysis of involved stakeholders does not by itself create a negotiation platform (Reed et al., 2009), nor scenarios, however participatory methods have been commonly used in the scenarios construction involving a group of stakeholders more diverse. Therefore brings together different knowledge, expertise and perspectives that enrich the process of scenario building. Participatory scenarios are considered approaches in which stakeholders play an active role as co-designers of the scenarios (Rotmans et al., 2000).

The stakeholder participation in normative scenarios construction supports discussions on trade-offs between the current and future situation on use of natural resources, can be a facilitator of sustainable resource management. Therefore, normative scenario coupled with the involvement of stakeholders in the scenario construction can become a negotiation platform in the pursuit of sustainability to natural resource management. A natural resource management that according to (Reed et al., 2009) has often been driven by initiatives that rarely explores the local knowledge of stakeholders who live in and interact with the landscape (Reed et al., 2009).

The construction of normative scenarios stimulates then the stakeholders to reflect about their reality and possibilities for the future (Buarque, 2003; Amigo, 2009), promotes stakeholder discussions on trade-offs between current and future situations in several iterations, up to convergence towards a common shared future vision. Allows participative management with greater propensity of success, since scenarios improves communication between different languages and expands a vision of reality, and can serve as framework for social learning (Buarque 2003).

The main benefit of scenario approaches lie in the fact that scenarios provide an opportunity to organize ideas, systematize thoughts and improve communication on a particular subject, and not simply deliver results. The use of rational and simple tools to build scenarios, stimulates the imagination, improves consistency and enables the appropriation of these scenarios (Buarque 2003) by the stakeholders.

"The imperfection of the tools, the inaccuracy of data, and the subjectivity of interpretations are unavoidable realities which prompt us to opt for pluralistic and complementary approaches." (Godet and Roubelat, 1996). Whatever the approach for development of scenarios, organization and management of uncertainties are central points of any methods. A theoretical model is necessary to ensure the plausibility of the hypotheses and to analyze the combinations between them, to generate a grounded description of reality, (Buarque, 2003).

### **4. Methodology for normative scenarios construction**

There is no methodology or an original method for the construction of scenarios; there are some basic principles to be followed. Several approaches have been created by experts as Jouvenel, Godet and Wilson, and have been used to develop scenarios in the world, as outlined in Godet (2000), and also by Michael Porter:

Jouvenel, H.: *Sur la Méthode Prospective: Un Bref Guide Méthodologique*, *Futuribles* 179 (Sept. 1993);

Godet, M. *From Anticipation to Action*. Unesco, Paris, 1994;

Wilson, I. *Linking Intuition and Structure: An Integrated Approach to Scenario Development*, in M. Aguado-Monsonet and F. Roubelat, eds., *Scenario Building: Convergences and Differences*. European Commission, IPTS, report EUR-17298-EN, 1995;

Godet, M. *Fore front: How to be rigorous with scenario planning*, *Foresight* 2(1), (2000).

To Buarque (2003) in the construction of scenarios, you must create a mental model that interprets the central variables and their interactions as a reduction in the complexity of reality, using a systemic approach. This understanding of the object of study allows the analysis of the relevance and consistency of assumptions and their ramifications in the variables that determine future performance.

To deal with the complexity and uncertainty is necessary to consider some basic principles and recommendations on the methodology: to reject the consensus, avoid Impressionism and immediacy, to

explore intuition, to accept the unthinkable, to increase the diversity of views, emphasizing the qualitative analysis.

The methodology for the scenarios construction proposed by Buarque (Figure 2) is an approach that involves the participation of stakeholders in this construction, and serves to creating a negotiation platform for the natural resources management. The normative scenario – "desired scenario" – should be built from a vision of the desires and aspirations of society in general.

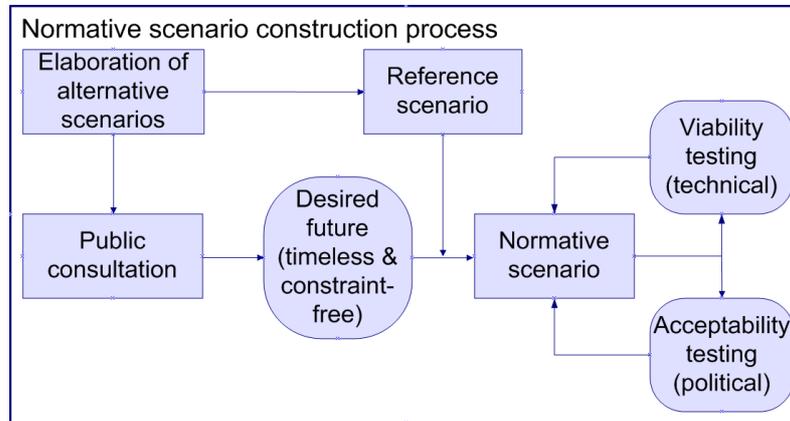


Figure 2 – Normative scenario construction process approach  
Source: Buarque (2003)

Through stakeholder participation, the process of normative scenario construction consists of confronting desires with concrete reality studied to calibrate expectations – an iterative process that converges to a common desired future, and plausible. The desired future is timeless and without restriction, for a time horizon defined after the desired future, subject to plausibility.

In the process of normative scenario construction are developed alternative scenarios, with the task of comparing the desire for the future with the probable future over time, to indicate the trajectory of the object of analysis. These probable futures can therefore be used to form a concrete and viable reference of future – a reference scenario, which would serve as the basis for the test of consistency and viability of desires. The construction of alternative scenarios may occur before the start of the normative scenarios construction, or not, depending on the need to stimulate the reflection of stakeholders consulted.

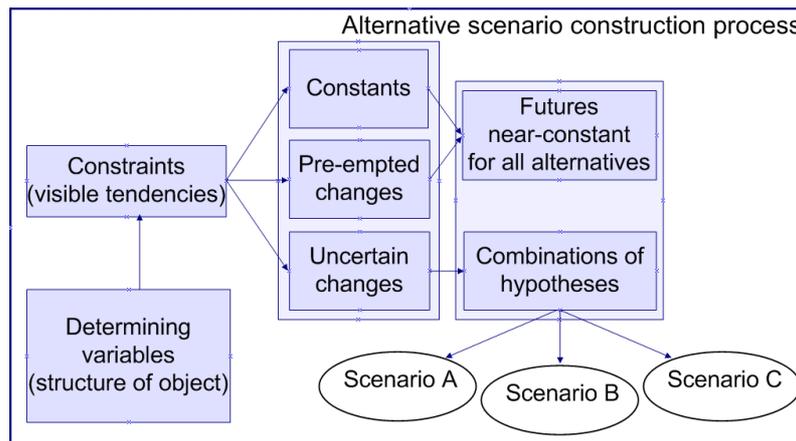


Figure 3 – Alternative scenario construction process  
Source: Buarque (2003)

The process of alternative scenarios construction (Figure 3) begins with an assessment of the systemic functioning of the “object of analysis” which aims to draw in the future. Identify the determining variables from the current reality, to define the factors responsible for the future, and classify the most relevant and of greater uncertainty. Classify then by degrees of uncertainty the relevant trends (visible tendencies) to future performance on constant elements, predetermined changes and changes uncertain. Uncertain changes (or critical) are the most relevant and critical to the system on the basis of future performance (are the basis for

defining the various alternative futures); lead to the formulation of plausible and probable hypotheses, which describe the formulation of the future for situations of high uncertainty.

## **5. Why to apply normative scenarios in transboundary water basins management?**

A key obstacle to successful implementation of IWRM is the difficulty in communicating with various stakeholders on quantitative, qualitative, uncertain and ambiguous results, and subsequently to negotiate water resources management plans between these stakeholders with divergent interests and values (Samuels et al. 2006; Medema et al., 2008). This situation is even more delicate in transboundary river basins, for which water resources management plans should be developed nationally and, preferably, be coordinated internationally (Mostert, 2003). This requires governance aspects for national and international political cooperation between stakeholders, facilitated by (inter) national legislation of water on the basis of treaties, conventions and custom (Kliot et al., 2001).

Under the management aspect, introduces a greater number of factors to consider in the process, and when considering water basins and use of local knowledge, a larger number of parameters will be involved. Aspects of spatial order to meet contemporary geopolitics that go beyond the tension on their own territory, and possibilities and impossibilities of use. "The territory understood as the source and stock of natural capital. Capital of actual or future realization, serving as an energy source for contemporary science, since the geographic distribution of technology and resources is unequal" (Becker, 1995). Aspects of stakeholder multifaceted views who tend to be potentiated by the increase of cultural diversity, due to the jurisdiction area expansion of water resource management, whether national or international.

To consider such different perceptions of reality through a participatory planning is necessary create a common language and direct, a negotiation platform. Employing a scenario approach with the participation of all stakeholders will allow designing future realities in terms of decision making in the present by a consensus view. Consensus i) understood how to find a common denominator, a comfortable expectation, not refutable, plausible to a desired future, ii) that requires create and reprocess this image of future, until to reach a comfort zone acceptable to the imagined scenario, iii) that is achieved by combining aspects of socio-economic and environmental development, in the discussions to reprocess such image of future. Thus, involving stakeholders on scenarios development is possible build a negotiation platform, gaining credibility of the stakeholders. Furthermore, the participation of different stakeholders helps enhance not only the credibility but the legitimacy of the scenarios among potential target groups (Volkery et. al., 2008).

The literature on natural resource management indirectly reinforces this need, when arguing that sustainable management of natural resources requires a process to facilitate understanding through the exchange of experience and validation by the parties involved to reach a common denominator (Rist et al., 2007) that meets the sustainable development principles. Thus is possible transpose boundaries within as well as outside different sectors of water management by cooperation, so that involved stakeholders reaching effective solutions to everyone's advantage. Experiences like social learning approach, "a frame for analyzing and promoting collaboration", are needed to ascertain its effectiveness as compared to other frameworks, and refine it as to make it more effective through action-research (Mostert et al., 2008).

The management of water resources in transboundary river basins poses new managerial and scientific challenges, as benefactors and beneficiaries of improved water quality are not one and the same (Dirksen, 2002; Ward, 2007). It is therefore vital to explore how scenarios can be developed and adapted to management issues of transboundary water resources, to support decision-making which creates a desired and plausible future for the international river basin in question. The dialogue should be extended to all those who have a stake in the issue, through participatory planning for development and evaluation of scenarios (Nassauer and Corry, 2004; Santelmann et al., 2004) and by establishing a niche for additional science in developing these scenarios (Nassauer and Corry, 2004).

The complexity and speed, with which transformations take place in the world today, are highly conducive to the creation of long-term scenarios for management support. Hence, it is necessary to correct paths in a continuous dynamic process that leads to the desired future. Normative scenarios, particularly, serves to encourage stakeholders to reflect on actual reality and future possibilities (Buarque, 2003; Amigo, 2009) and provides a realistic description of the desired future – certain set of assumptions plausible and consistent, consonant with the desires of society in relation to its future (Buarque, 2003; Nassauer and Corry, 2004).

Most current scenario studies have a descriptive or normative maximum implicitly. Normative scenarios are mentioned as future scenarios, strategy, policy or intervention, depending on interpretation. Explore paths that need to be taken to achieve desired future situations. These scenarios serve as a starting point for

scenarios that explore strategies for achieving goals (van Notten, 2003). The desired future, can be understood as concepts of sustainability, and are thus the product of social learning construction process that is inherently open and unpredictable (Robinson, 2003). While learning is a process which could go in any direction, social learning in the context of sustainable development has a normative dimension (Garmendia, 2010).

## 6. Final Considerations

As a synopsis of a film in a planning context, scenarios can be considered as stories of possible futures, which can be played in reality. They design a holistic view that combines the social, economic, environmental, technological and political, is qualitative or quantitative. Stimulate the thinking more creatively and productively about the future, ensuring better-informed decisions on alternative possible futures but not exempt from uncertainties.

The normative scenario (desired) is a description of the future reality, consistent and plausible assumptions that converge strongly to the desires of society relative to their future. It should be like any scenario, plausible and consistent. Unlike the alternative scenarios, the normative scenario begins with the aspirations and interests to define the plausible future (Buarque, 2003). But it is necessary that these scenarios may have credibility. The fundamental problem is that, although attractive, these scenarios may be disregarded as a basis for action, if those who use them are not the same people who designed them. The scenarios should be constructed not by planners but by all stakeholders and decision makers, that are those who will perform scenes that comprise this normative scenario.

If a normative scenario i) is a kind of scenario that can be classified as a participatory scenario ii) whether the stakeholder analysis by itself does not create a negotiation platform for the success of participatory management approaches, iii) and whether the normative scenario approach combines participatory approaches that support stakeholder discussions on trade-offs between the current situation and future to converge towards a shared vision of a common future, iv) then the approach to normative scenarios described by Buarque, and presented in this article, may be one of the way to create a type of negotiation platform for the sustainable management of natural resources. According (Volkery, 2008), if quantitative and qualitative stakeholder information is in the same approach enhances the development of these scenarios because it brings together good quality data, scientific rigor as well as imagination and experience from different perspectives.

The use of such negotiation platform could therefore facilitate more informed decisions, equitable and sustainable for the future management of water resources, generating trust and understanding between the parties concerned to allow the legitimacy of alternative views, which for transboundary river basins is even more critical in the lack of a single plan (international) to transboundary river basins — particularly in the case study underway for the river Minho basin, shared by Portugal and Spain.

## References

- Amigo, N. A., 2009. Perspectivas de interferências geradas pelo comércio da água na gestão de recursos hídricos na comunidade Europeia e América Latina. 1º Seminário sobre Gestão de Bacias Hidrográficas /FEUP-APRH, Porto.
- Becker, B., 1995. A geopolítica na virada do milênio: logística e desenvolvimento sustentável, em Castro, I. E., P. C. C. Gomes e R. L. Corrêa (orgs.), Geografia: conceitos e temas, Bertrand, Rio de Janeiro.
- Bohnet I, Smith D, M., 2007. Planning future landscapes in the Wet Tropics of Australia: A social-ecological framework. *Landscape Urban Plann.* 80, 137-152.
- Borjeson, L., Hojer, M., Dreborg, K., Ekvall, T., & Finnveden, G., 2006. Scenario types and techniques: Towards a user's guide. *Futures*, 38(7), 723-739.
- Braga, B.P.F., 2001. Integrated Urban Water Resources Management: a challenge Into the 21st Century. *International Journal of Water Resources Development*, 17(4), 581-599.
- Buarque, S. C., 2003. Metodologia e Técnicas de Construção de Cenários Globais e Regionais, IPEA-Texto Para Discussão, Fev., Nº 939, p71. ISSN 1415-4765.

- WFD, 2000. Directiva 2000/60/CE do Parlamento Europeu e do Conselho de 23 de Outubro de 2000 que estabelece um quadro de ação comunitária no domínio da política da água. Jornal Oficial das Comunidades Europeias. 22.12.2000. L 327/1.
- Dirksen, W., 2002. Water management structures in Europe. *Irrigation and Drainage*, 51(3), 199-211.
- Dougill, A.J., Fraser, E.D.G., Holden, J., Hubacek, K., Prell, C.S., Reed, M.S., Stagl, S. and Stringer, L.C. , 2006. Learning from doing participatory rural research: Lessons from the Peak District National Park. *Journal of Agricultural Economics* 57 (2), 259-275.
- Duinker, P. N., Greig, L. A. , 2007. Scenario analysis in environmental impact assessment: Improving explorations of the future. *Environmental Impact Assessment, Review*, 27, 206–219.
- Garmendia, E., Stagl, S., 2010. Public participation for sustainability and social learning: Concepts and lessons from three case studies in Europe. *Ecological Economics* 69 (2010) 1712–1722.
- Godet, M. and Roubelat, F., 1996. Creating the Future: The Use and Misuse of Scenarios Long Range Planning, 29, (2), 164-171.
- Godet, M., 2000. The Art of Scenarios and Strategic Planning: Tools and Pitfalls Technological Forecasting and Social Change, 65, 3–22.
- Global Water Partnership – Technical Advisory Committee (GWP-TAC), 1999. The Dublin Principles for Water as Reflected in a Comparative Assessment of Institutional and Legal Arrangements for Integrated Water Resources Management. TAC Background Paper No. 3. GWP, Stockholm, Sweden.
- Global Water Partnership – Technical Advisory Committee (GWP-TAC), 2000. Integrated water resources management. TAC Background Paper No. 4. GWP, Stockholm, Sweden.
- Kliot, N., Shmueli, D., Shamir, U., 2001. Institutions for management of transboundary water resources: their nature, characteristics and shortcomings. *Water Policy* 3, 229-255.
- Medema, W., McIntosh, B. S., Jeffrey, P. J., 2008. From Premise to Practice: a Critical Assessment of Integrated Water Resources Management and Adaptive Management Approaches in the Water Sector. *Ecology and Society* 13(2), 29.
- Mostert, E., 2003. The European Water Framework Directive and water management research. *Physics and Chemistry of the Earth*, 28, 523-527.
- Nassauer JI, Corry, R.C., 2004. Using normative scenarios in landscape ecology. *Landscape Ecology* 19, 343-356.
- Raadgever, G. T., Mostert, E., Kranz, N., Interwies, E., Timmerman, J. G., 2008. Assessing management regimes in transboundary river basins: do they support adaptive management? *Ecology and Society* 13(1), 14.
- Reed M. S., Graves, A., Dandy, N., Posthumus H., Hubacek K., Morris, J., Prell, C., Quinn, C. H., Stringer, L. C., 2009. Who's in and why? A typology of stakeholder analysis methods for natural resource management. *Journal of Environmental Management* 90, 1933-1949.
- Reed, M. S., A. C. Evely, G. Cundill, I. Fazey, J. Glass, A. Laing, J. Newig, B. Parrish, C. Prell, C. Raymond, and L. C. Stringer. 2010. What is social learning? *Ecology and Society* XX(YY): rZZ. [online] URL: <http://www.ecologyandsociety.org/volXX/issYY/artZZ/>
- Rist S., Chidambaranathan M., Escobar C., Wiesmann U., Zimmermann A., 2007. Moving from sustainable management to sustainable governance of natural resources: The role of social learning processes in rural India, Bolivia and Mali. *Journal of Rural Studies* 23, 23–37.
- Robinson, J., 2003. Future subjunctive: backcasting as social learning, *Futures* 35, 839–856.
- Rotmans, J., 2000. Visions for a sustainable Europe. *Futures* 32 (9-10), 809–831.

Samuels, P., B. Woods, C. Hutchings, J. Felgate, P. Mobs, 2006. Sustainable water management in land-use planning. Construction Industry Research and Information Association (CIRIA), London, UK.

Santelmann, M.V., White, D., Freemark, K., Nassauer, J.I., Eilers, J.M., Vache, K.B., Danielson, B.J., Corry, R.C., Clark, M.E., Polasky, S., Cruse, R.M., Sifneos, J., Rustigian, H., Coiner, C., Wu, J., Debinski, D., 2004. Assessing alternative futures for agriculture in Iowa, USA. *Landscape Ecol.* 19, 357-374.

van Notten P, Rotmans J, van Asselt MBA, Rothman DS (2003) An updated scenario typology. *Futures* 35:425–443

Volkery, A.; Ribeiro, T.; Henrichs, T. Hoogeveen, Y., 2008. Your Vision or My Model? Lessons from Participatory Land Use Scenario Development on a European Scale. *Syst Pract Action Res*, 21, 459–477.

Ward, F. A., 2007. Decision Support for Water Policy: a Review of Economic Concepts and Tools. *Water Policy*, 9, 1-31.

Ward, F. A., 2009. Economics in integrated water management. *Environmental Modelling and Software* 24, 948-958.

Wright, J. T. C., and Spers, R. G., 2006. O país no futuro: aspectos metodológicos e cenários. *Estudos Avançados*, 20 (56), 13-28.