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THE ROLE OF DSS TOOLS

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Table of Contents

1. Introduction	3
<hr/>	
1.1. Participatory approach to environmental decision-making	3
1.2. Participatory governance & empowerment	7
2. Public Participation in the Mediterranean basin	9
<hr/>	
2.1. Introduction	9
2.2. PP within NOSTRUM-DSS	11
2.3. Main issues	16
3. Tools and approaches to apply PP for IWRM	17
<hr/>	
3.1. The role of public participation in IWRM	17
3.2. Integration of public participation in IWRM	18
3.3. The NetSyMoD approach	19
3.3.1. The Actors Analysis	20
3.3.2. The Problem Analysis and Creative System Modelling	21
3.3.3. DSS Design and the Analysis of alternative options	22
4. Conclusion	23
5. References	25
6. Relevant guidelines to implement PP in practice	29
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1. Introduction

‘Participation in government is, in theory, the cornerstone of democracy – a revered idea that is vigorously applauded by virtually everyone’ (Arnstein, 1969, p. 216). Indeed, public participation (PP) is by no means a new concept but it is only in recent years that people have started to attach considerable significance to its application in the environmental decision-making and, more importantly, taken positive steps towards this goal. It is particularly evident within the European Union where public concern over the global deterioration of environment and the depletion of natural resources has grown greater than ever, and sustainable development initiatives have been pushed high on governments’ agenda. It is felt that lack of public participation in the decision-making processes has been one of the major reason for the ineffectiveness or even failure of environmental policies and projects. Addressing environmental issues and natural resource management is a tricky field as it involves complex dynamics and interests. Furthermore the decisions taken in this respect will inevitably affect the long-term well-being of all people including those directly involved by their economic or political interests. It is therefore crucial that the public is able to participate as much as possible in the various stages of the decision-making processes so that the issues can be adequately addressed and sound decisions can be taken.

Now most of the government actions, institutional research and academic discussions surrounding public participation are no longer focused on *why* this approach is to be advocated, but *how* as stated by Byrne & Davis (1998): ‘*How should the rights of majorities and minorities be balanced? This is the judgement at the heart of participative process*’ at page.9.

As part of the NOSTRUM-Dss Co-ordinated Action, the present report will discuss the issue of Public Participation (PP) for water management in the in the Mediterranean basin and its relevance for the decision making process with particular emphasis on the Role Decision Support Systems (DSS) can play in this respect. Drawing on past theories and recent thinking on the subject, it aims to provide the necessary insights into the key aspects of public participation as well as on the *State-of-the-art* of its application in the Mediterranean countries.

After the following general introduction on PP for IWRM and its legal setting in the International and European context, chapter 1 will look at the reasons for which PP should be used by policy makers to implement their strategies. Then, chapter 2 will analyse the current state-of-the-art of PP practices in the Mediterranean countries, thanks to the experiences gained during the projects implementation. On the basis of these findings, current strengths and weaknesses of the area of study will be summarised and main issues to address will then be addressed. Chapter 3 will have a look at some of the existing tools and approaches to apply PP for IWRM in practice. More particularly, the NetSyMoD approach will be shortly reviewed together with the available tools and tutorials available on the world wide web for each of its phases: Actor Analysis, Problem Analysis and Creative System Modelling, DSS design and Analysis of Alternative Options. Chapter 4 will be dedicated to the conclusions, chapter 5 to the references quoted in this report and lastly chapter 6 to the relevant guidelines already existing to implement PP in practice.

1.1. Participatory approach to environmental decision-making

‘Sustainability’ has undoubtedly become the key issue in all approaches to environmental policies and natural resource management in recent decades while ‘Participation’ is a central concept in the sustainability debate as it enhances diversity, effectiveness and equity in meeting human needs and sustaining the environment (Pimbert, 2004; Schanz, 1999). The Conference on the Human Environment held in Stockholm in 1972 served to generate the first major discussion of

environmental issues within the international community, then the United Conference on Environment and Development (UNCED) held in Rio de Janeiro, 1992 can be viewed as a milestone as it emphasised integrated strategies to promote human development through economic growth based on sustainable management of the natural resource base (Report of the Secretary-General, UN 1997). One of the most important documents arising out of the UNCED, *Agenda 21* clearly identifies ‘information’, ‘integration’ and ‘participation’ as the essential elements in sustainable development. As Chapter 8.3 states: ‘The overall objective is to improve or restructure the decision-making process so that consideration of socio-economic and environmental issues is fully integrated and a broader range of public participation assured’. The document further points out:

One of the fundamental prerequisites for the achievement of sustainable development is broad public participation in decision-making. Furthermore, in the more specific context of environment and development, the need for new forms of participation has emerged. This includes the need of individuals, groups and organisations to participate in environmental impact assessment procedures and to know about and participate in decisions... (chap. 23 Preamble)

As shown, Agenda 21 recognises the great significance of public participation in sustainable environmental decision-making and opens to the new way for its development in intergovernmental communications. It is without doubt the *Aarhus Convention* (Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, UNECE 1998) which elaborates for the first time the subject of public participation and clearly formulates the main concepts, the objectives and the requirements necessary to its application to Decision Making for Natural Resource Management. Most significantly, it established a number of rights of the public which governments and public authorities must allow to become effective. These rights comprise the so-called three ‘pillars’: *access to environmental information*, *public participation in the environmental decision-making*, and *access to justice*. These are the essential points from which subsequent legal documents as well as political and academic discourse on public participation derive.

A fundamental dimension we have to consider when discussing this subject is the relevant legislation. *Public participation rests on the principles of free speech, and rights to a healthy environment and secure livelihood. A clear legal framework is needed within which to exercise such rights* (Dalal-Clayton & Bass, 2002, p. 202). Since the EC Directive n° 11 on Environmental Impact Assessment in 1997 (Establishing procedures for involving the public in the decision process concerning the Environmental Impact Assessment - Art 3 a, art 9 par 1.) in the past decade the EU has introduced a number of important laws (mostly in the form of Directives) to address the issue of public participation. Summarised below are the relevant legal documents which, together with the Aarhus Convention mentioned before, form the legal framework for public participation with regard to the environmental decision making, including in the water sector.

BOX 1: International legal framework for PP

Type of Instrument	Year of issuing	General content related to PP and articles of reference
The Biological Diversity Convention	1992	<i>Recognising</i> also the vital role that women play in the conservation and sustainable use of biological diversity and affirming the need for the full participation of women at all levels of policymaking and implementation for biological diversity conservation. art 8, j); art 14, par 1, a).
United Nations Convention to Combat Desertification	1994	<i>Stressing</i> the importance of ensuring the full participation of both men and women at all levels in programmes to combat desertification and mitigate the effects of drought. Art 3, a); art 5, d); art 9, par1; art 10, f); art 13, par1, c); art 17, par 1, d) and f); art 18), par 2, a); art 19, par 1, a) and c); art 19, par 2, b); art 19, par 3, b) and f); art 21, par 1, d); art 21, par 3.
The Convention on Transboundary Effects of Industrial Accidents	1992	<i>Ensuring</i> the provision of adequate information to the public in the areas capable of being affected by an industrial accident arising out of a hazardous activity and its participation to in relevant procedures with the aim of making known its views and concerns on prevention and prepared measures Art 9.
The Framework Convention on Climate Change (known as Kyoto Protocol)	1997	<i>Facilitating</i> at the national level public awareness of, and public access to information on, climate change. Art 10, e); Art 12, par 9.
The UN Aarhus Convention	1998	<i>Guaranteeing</i> the rights of access to information, public participation in decision-making, and access to justice in environmental matters. Linking environmental rights and human rights, the Convention establishes that sustainable development can be achieved only through the involvement of all stakeholders.

BOX 2: EU legal framework for PP

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (Water Framework Directive)

This is a document of vital importance and a milestone in the development of EU water policy. It establishes a framework for the protection of all waters (including inland surface waters, transitional waters, coastal waters and groundwater) based on the key principles of modern water management. Article 14 of the Directive specifies that Member States shall encourage the active involvement of all interested parties in the implementation of the Directive and development of river basin management plans. Furthermore, the central concept in the Water Framework Directive is the concept of 'integration' which is seen as key to the management of water protection within the river basin district. It includes 'integration of stakeholders and the civil society in decision-making', by promoting transparency and information to the public, and by offering a unique opportunity for involving stakeholders in the development of river basin management plans (*Guidance*, 2002, p. 13).

Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment (SEA Directive)

The SEA Directive is to ensure that environmental consequences of certain plans and programmes are identified and assessed during their preparation and before their adoption. The public and environmental authorities can give their opinion and all results are integrated and taken into account in the course of the planning procedure. After the adoption of the plan or programme the public is informed about the decision and the way in which it was made. In the case of likely transboundary significant effects the affected Member State and its public are informed and have the possibility to make comments which are also integrated into the national decision-making process (Europa, 2004).

Directive 2003/4/EC of the European Parliament and of the Council of 28 January 2003 on public access to environmental information and repealing Council Directive 90/313/EC

Community legislation on public access to environmental information was already in place from 1993 (Directive 90/313/EEC). This new Directive 2003/4/EC replaces the former and, compared to it, imposes some stricter obligations on Member States, notably as regards the active dissemination of environmental information by public authorities and extending the right of access to information from citizens of the EU to any person, regardless of his or her residence. The new Directive also obliges the Member States to provide for an administrative 'appeal' (optional in the Aarhus Convention), which is a procedure that has the advantage of being rapid and free of charge (Europa, 2005).

Directive 2003/35/EC of the European Parliament and of the Council of 26 May 2003 providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC

This Directive is the main instrument to align Community legislation with the provisions of the Aarhus Convention on public participation. It updates provisions on public participation in the permitting procedures at national level under legislation on environmental impact assessment and integrated pollution prevention and control, and it introduces rules on access to justice. Furthermore, it contains rules on public participation in the preparation of a number of environmental plans and programmes under Directives on waste, air pollution and protection of waters against nitrate pollution (Europa, 2005).

1.2. Participatory governance & empowerment

The concept of PP is intrinsically part of the broader participatory governance paradigm: basic concepts and points aimed at facilitating the understanding of policymakers' role in relation to the transforming institution of decision-making will therefore here be briefly explained. Schmitter (2002) defines governance as: *...A method/mechanism for dealing with a broad range of problems/conflicts in which actors regularly arrive at mutually satisfactory and binding decisions by negotiating with each other and cooperating in the implementation of these decisions* (p. 5).

Some common and distinctive features of governance have also been noted:

- Horizontal interaction among presumptive equal participants without distinction between their public or private status
- Regular, iterative exchanges among a fixed set of independent but interdependent actors
- Guaranteed (but possibly selective) access, preferably as early as possible in the decision-making cycle
- Organised participants that represent categories of actors, not individuals

Participatory governance thus consists of horizontal interaction, regular and guaranteed presence of those who will be affected by the policy adopted (Schmitter, 2002). In the Mediterranean water policy context, this implies a significant shift from conventional state-based, top-down form of regulation and policy making to a governance system based on 'horizontal, network, and interactive relations between independent but interdependent actors' – stakeholders (Swyngedouw, et al., 2002).

Administrations and public bodies in charge of water management must decentralise their actions and enable a real participation of stakeholders in the decision-making (INBO, 2002). This is essentially the subsidiarity principle which requires that powers and functions of governance be delegated to the lowest possible level at which they can be exercised satisfactorily. The implementation of the legal framework for public participation requires reinforcing or establishing sub-national forms of governance (at river basin level). Nevertheless, as national states constitute the level that has to comply with the Directives, the subsidiarity principle points to the national states as the arena through which the form and content of sub-national forms of governance should be decided (Swyngedouw et al., 2002). Indeed, participatory water governance presents a greater challenge to policymakers.

What must be noted is that policymakers should not be seen as losing their importance or simply giving away their powers by engaging stakeholders from outside in the decision-making; rather, policymakers are assuming a more critical role with even greater responsibilities: in addition to guiding and managing the entire participatory decision-making, they must ensure that the participation process 'empowers' stakeholders. This point has been emphasised by Allen et al. (2002) too as they explain: 'Empowerment in this sense differs from common usage of the term. It does not mean power-balancing or redistribution, but rather, increasing the skills of individuals, groups and communities to make better decisions for themselves' (p. 27). Folger and Bush (1996) have argued that through empowerment groups gain 'greater clarity about their goals, resources, options and preferences' and that they use this information to make their own 'clear and deliberate decisions' (p. 264).

BOX 3: Why use PP?

Improving democracy

Above all, public participation in the decision-making is a natural and logical requirement of the democratic system. 'The voice of the people' is always held important and essentially, anyone who is affected by a decision in any way should have their say. Particularly in the case of environmental issues, decisions which are taken by policymakers without the participation or even knowledge of stakeholders¹, yet which may have a major impact on society, are certainly unfair and unjustified. From this perspective, public participation is in effect a course of democratic legitimisation of the decisions.

Ensuring sustainability

This point has already been noted in Agenda 21. Prevailing systems for decision-making tend to separate economic, social and environmental factors at the policy, planning and management levels. This influences the actions of all groups in society, and has important implications for the efficiency and sustainability of development. (chap. 8.2) Sustainable environmental policies cannot possibly be achieved without integrating the knowledge, experience, opinions and initiatives from all the people and sectors related.

Enhancing decision quality, project effectiveness & efficiency

The quality of the decisions is enhanced by pooling informational, technical, intellectual and other resources from all participants in the processes. A project is more effective when beneficiaries play a role in deciding what type of project should be implemented as they know what they do and do not need better than any outsider (Narayan, 1995; World Bank, 1996). In addition, if people are involved in a project they are more likely to feel ownership, support it and work to make it succeed. Efficiency results when resources are used less wastefully by focusing only on those projects that people genuinely want and need. Thus, participatory projects are seen as being more cost-effective (Narayan, 1995; Oakley, 1991).

Generating solutions & resolving conflicts

Public participation is also an essential means of facilitating the interaction and communication among various stakeholders. In complex environmental issues, policymakers inevitably have to deal with the conflicting interests of different stakeholder groups. Discussions and negotiations during the participation processes are crucial to finding sound, equitable solutions which are acceptable to all sides.

Fostering social learning

Social learning refers to the group learning by system stakeholders of the complexity of the system as well as the sharing of management perspectives (Harte & Gough, 2001). For collective actions people must recognise their interdependence and their differences and learn to deal with them constructively. Many intricate problems in the environmental spheres, such as water resource management, require that social groups start to communicate and processes of social learning and collaborative governance will help to overcome the fragmentation in responsibilities (HarmoniCOP, 2003).

Finally, the actual goal of the participation process (e.g. problem identification, decision support tool development) also has a critical role to play in determining stakeholder selection, and participatory methods employed (Hare et al., 2002).

¹ Stakeholders are those who have an interest in the decision, either as individuals or representatives of a group. For details, see Chapter 2.2.

2. Public Participation in the Mediterranean basin

Countries and regions round the Mediterranean basin share a series of environmental and sustainable development related problems, particularly in respect of the management of water resources and control of pollution. Within each same problem however, conditions can be contrasting from one country or region to another. For instance, it is observed that water abundance and water scarcity coexist in the Mediterranean region. The Northern coast (including Turkey) is backed by temperate areas which supply relatively abundant water resources, whereas the Southern and South-Eastern coasts, adjacent to dry and desert areas, have very limited resources. Water distribution at domestic level, i.e. among different regions of each country, is also very uneven (Margat & Vallée, 2000). Moreover, the periodical occurrence of droughts in almost all the basin seriously affects the water resources which are already limited, fragile and threatened.

All this calls for an integrated approach to water resource management, as emphasised by EU and International initiatives (and directives) where Public participation appears to be both a primary objective and a fundamental strategy in this regard. Taking into account the complex and challenging nature of the policy-making contexts and the paramount necessity of information, cooperation and action from all the interested parties should lastly ensure the successful implementation of the policies and plans.

2.1. Introduction

Dalal-Clayton & Bass (2002) have noted that the precise participation methodology or structure to be used depends on the specific strategy task (information collection, analysis, decision-making, implementation, monitoring, etc.), on the maturity of the strategy (the number of cycles or revisions the strategy has been through) and on the nature of horizontal/vertical links and the actors involved, as summarised in the table below.

Table 1 Examples of participatory methodologies for strategy tasks

Tasks	Methodologies
Survey, analysis and monitoring	Participatory enquiry, including participatory resource surveys and 'green' audits
Decision-making	Consensus-building, negotiations and traditional methods, e.g. of conflict resolution
Implementation	Voluntary agreements (e.g. covenants) and joint management
Communications, information, education and monitoring	Seminars, workshops, interviews, phone-ins, websites, e-mail networks, and monitoring exhibitions and plays

(Dalal-Clayton & Bass, 2002, p. 206)

Specific methods for participation in strategies include:²

- **Participatory learning and action (PLA)**
- **Community-based resource planning and management**
- **Participation in decentralised planning systems**
- **Multi-stakeholder partnerships**
- **Focusing on consensus, negotiations and conflict resolution**
- **Working in groups**
- **Market research, electronic media and other remote methods**

² For a comprehensive insight into these methods please refer to Dalal-Clayton et al., 2002, pp. 207-225.

There have been a number of attempts to **define the different levels** of involving people and to develop participation typology. An early example can be found in Arnstein's (1969) 'ladder of citizen participation' which consists of eight levels, from the lowest 'manipulation' up to the highest 'citizen control'. More recently, Pretty (1995) proposed a seven-level continuum based on Arnstein's model, as summarised by Allen et al. in Table 1. Underlying these definitions is the principle of balance of control between outsiders and the community, particularly in relation to decision-making, and information and resources (Allen et al., 2002).

Table 2 Participation continuum (Pretty, 1995; Allen et al., 2002)

Types of engagement	Description
1. Manipulative participation (Cooption)	Community participation is simply a pretence, with people's representatives on official boards who are unelected and have no power.
2. Passive participation (Compliance)	Communities participate by being told what has been decided or already happened. Involves unilateral announcements by an administration or project management without listening to people's responses. The information belongs only to external professionals.
3. Participation by consultation	Communities participate by being consulted or by answering questions. External agents define problems and information-gathering processes, and so control analysis. Such a consultative process does not concede any share in decision-making, and professionals are under no obligation to take on board people's views.
4. Participation for material incentives	Communities participate by contributing resources such as labour, in return for material incentives (e.g. food, cash). It is very common to see this called participation, yet people have no stake in prolonging practices when the incentives end.
5. Functional participation (Cooperation)	Community participation is seen by external agencies as a means to achieve project goals. People participate by forming groups to meet predetermined project objectives; they may be involved in decision-making, but only after major decisions have already been made by external agents.
6. Interactive participation (Co-learning)	People participate in joint analysis, development of action plans and formation or strengthening of local institutions. Participation is seen as a right, not just the means to achieve project goals. The process involves interdisciplinary methodologies that seek multiple perspectives and make use of systemic and structured learning processes. As groups take control over local decisions and determine how available resources are used, so they have a stake in maintaining structures or practices.
7. Self-mobilisation (Collective action and empowerment)	People participate by taking initiatives independently of external institutions to change systems. They develop contacts with external institutions for resources and technical advice they need, but retain control over how resources are used. Self-mobilisation can spread if governments and NGOs provide an enabling framework of support. Such self-initiated mobilisation may or may not challenge existing distributions of wealth and power.

Nevertheless, not all these levels are necessarily applicable in the prevailing contexts of environmental decision-making. Hare et al. (2002) therefore have adopted a simplified, revised categorisation from Mostert (2003):

- **Information** (simply receiving information): Some point out that information is no real participation but ‘a prerequisite for any empowerment of citizens’ (HarmoniCOP, 2003); it is crucial to allowing different interest groups and the broad public to participate in environmental decision-making.
- **Consultation** (providing information): Some also observe that ‘consultation does not constitute participation, but is merely an exercise in seeking advice before proceeding with the current plan of management without an assurance that community concerns and ideas will be taken into account’ (Byrne & Davis, 1998; Lee, 2000).
- **Co-designing** (regular involvement in the analysis of problem and the design of potential policy)
- **Co-deciding** (jointly deciding policy or activity)

The first level, *information* level, is comparable to Pretty’s Level 2. *Consultation* is comparable to Level 3. *Co-designing* and *co-deciding* are also known as *active involvement*. These two do not closely match the levels in the table although they can probably be placed around Level 5-6, and Level 6 respectively. The above-mentioned four levels of participation can also be applied to judge the role stakeholders play in the decision-making process, as will be dealt with in the next chapter.

In any case, it should be borne in mind that participation typology is only to serve as a reference point for analysing the nature of participation processes and the extent to which they may develop. In practice there are often cases which do not fit neatly into a certain category (level) but rather fall between two, or are a mixture of several. The different types of participation are appropriate in different situations, and can be useful at different stages (*Guidance on public participation in relation to the Water Framework Directive: active involvement, consultation, and public access to information, 2002*³).

Participation processes do not necessarily follow structural, predetermined and linear direction (Allen et al., 2002). It is particularly interesting to understand its progress in the actual context of the Mediterranean basin on the basis of the experience gained during the implementation of the Nostrum-dss CA thanks to the other analysis completed so far as well as through the analysis of the 15 case studies (CS) described in the National Reports.⁴

2.2. PP within NOSTRUM-DSS

Almost all countries described river basins scaled decision making processes, some satisfactorily concluded, others currently under discussion. For the ones which include some kind of participative approach (applied or desired), the **scale of involvements** of the social actors (individuals, groups or institutions) that are actual or potential users of water resources for different purposes (agriculture, industry, domestic consumption, recreational, communication, etc.) ranges from national (including ministries, councils, administrations, governmental agencies, etc.) and regional (regional authorities, basin authorities, etc.) to the local level (municipals, rural settlements, etc.).

In the **9 case studies** where PP was (or is) effectively applied, the whole set of actors is represented, with their different level of interest in the decision: the **primary stakeholders** (those ultimately

³ Concerning the rather extensive Article 14 of WFD, specific guidelines named "Guidance on public participation in relation to the Water Framework Directive: active involvement, consultation, and public access to information." were developed under the Common Implementation Strategy for WFD. The Guidance is a horizontal document, which means that it is also of relevance for other guidance documents, designed to guide and steer the implementation of the WFD. Now in the text reported as (Guidance, 2002)

⁴ http://www.feem-web.it/nostrum/presentation_index.php

affected by the decision, either positively or negatively), the **secondary** stakeholders (intermediaries in the process of decision-making and implementation) and the **key** stakeholders (those who can significantly influence, or are important to the success/failure, of the decision taken). The list of involved actors in each of the CS appears to be both *relevant* and *complete* but at a closer look some shortcomings did occur because of the biased introduced in this early stage of the decision making process: the actors' identification.

In fact, the careful selection of key stakeholders is important to keep public participation manageable for the authorities. Moreover, different stakeholders will make different contributions. Thus for every phase of the project, it should be reviewed if the different stakeholders have the same 'right' of voice in the matter. Moreover, public participation process should be **interactive and iterative** among the different scales within a river basin district. However this might prompt questions about the combination of scale. In principle any level of public participation can be applied at any scale, and the main issue is to find the right combination of scale, stakeholders, public participation levels and methods. Stakeholder analysis can be very helpful for this (Guidance, p. 27).

Only in the Caia catchment in **Portugal**, a true **Social Network Analysis** has been implemented to consolidate the list and number of actors to be involved in the participative approach. The problem to solve concerned the scarcity and irregularity of the water resources available to supply, mainly, the irrigated agriculture and the domestic consumption particularly during periods of low rainfall. On the other hand, focus of diffuse pollution result from spilling and infiltration of waters from soils with an intense agricultural activity and some shortcomings can also be noticed in the treatment systems for urban and industrial wastewater. Due to the geographic situation of the catchment under analysis, the trans-boundary question is also particularly relevant because of the usage of water by Spanish farmers.

This kind of early analysis, in addition to allow to tailor the dimension of the group of actors to be involved, also permits to clearly identify the **shortcoming in the relationships** among the actors involved in. In the Southeast of **Tunisia** for instance, in the plain of Djefara, the rural population don't accept to be deprived of "their" water and don't understand why they have to pay to obtain limited volume of water for their agricultural activities when they can directly abstract all water needed by a simple well located on their parcel, a clear cut between national (governorate), regional (CRDA) authorities and end users of water (Association of Collective Interest : ACI) is noticeable. The relationship connecting regional and end user are denser but mainly axed on technical support. However, relationships within end users are well developed thanks to the ACI and frequent meeting are organised where different problems related to water management are discussed. The presence of a **regional responsible** now allows progressively to make the decision more accepted by the farmers.

The **interaction** enables stakeholders to build communities and commit themselves to each other (Allen et al., 2002). It augments significant social capital by fostering mutual trust and group identity among stakeholders. In fact, an active participation of stakeholders through which they exchange information, ideas, opinions, etc. is the best way to resolve possible conflicts on water use: 'Dialogue is the beginning of wisdom' (International Network of Basin Organisations [INBO], 2002).

The **form (means, techniques) of participation** adopted in the partner's countries covers almost the whole range of *Public participation techniques* listed by Creighton, with their respective advantages and limitations.

BOX 4: Means and techniques of participation

- Information session
- Mail exchange
- E-mail/e-conference
- Advisory group (including task force)
- Workshop
- Focus group
- Interview (including telephone)
- Working group (large group/small group format)
- Direct voting for the final decisions (plebiscite)

Adapted from Creighton (2001)

Focus group meeting appears however to be the mean preferred in most of the CS. As in the Dead Sea Case study (Israel/Palestine) or in Greece, namely in the island of Paros, where the three stakeholder groups described above were involved in a series of consultation and awareness meetings in the form of personal **interviews** and **focus groups**.

Opinions, wishes and expectations are successfully expressed and discussed during these events, but they often appear to be taken into account only in **isolated stages** among the five ones identified by Hare et al. (2002) for participation:

- **Problem formulation**
- **System understanding**
- **Action** (during the implementation of pilot scheme)
- **Evaluation**
- **Updating** (final decision/scheme revamping)

This can not guarantee the successful implementation of society concerns as some of these phases appeared to be completely in the hand of the traditional decision makers. Considering the stage of stakeholder participation in combination with the **level of participation**, it is possible to determine that the role of the different stakeholders involved is almost limited to **only one of the different roles**, among the whole set described by Mostert (see chapter 2.1).

In **Algeria** for instance, where the “Great Sebkhia of Oran”, is a global system (lake and catchment), heart of a problem linking between local development and ecological preservation. In 2002, the Ministry of Water Resources (MRE) entrusted a French engineering private company to undertake a global study leading to an adequate solution for the Sebkhia problem and the process was initiated through a participative approach. It included different actors (decision-makers, local representatives, municipalities, civil society, industrials, agriculture, universities, etc..) but at the end, it appears that the MRE played the major role in the participative approach while the other actors often had a **marginal position** (local communities, specialized agencies, scientists, NGOs..).

This is not the case in the Greek, Lebanese and Portuguese CS for instance, where **primary stakeholders** actively contributed to the co-designing phase. In **Greece**, they proposed several alternatives to water resources management that were used during the strategy formulation as scenarios. In **Lebanon**, in the Damour area, these actors also proposed elements for conflict resolution including coordination and negotiation between the municipality and the water authority to control over exploitation of the groundwater resources in the area such as installation of metering

systems to control the utilization of water, the monitoring of the water losses and the establishment of a River Basin committee

As all **stages and roles** are clearly related to each another (consultation implies information supply and active involvement implies consultation), eventual cuts appears to be one the main problem for the successful implementation of widely known principles in the real life decision making processes. Lynam, Hare et al. call this wide category of shortcomings the **scale of action mismatch**; for example in the case of co-designing, if not all decision-makers are represented and the policy/scheme may not be fully considered or endorsed in the final decision.

Moreover, the decision-making contexts are often necessarily **formal** and as this may substantially influence stakeholders' perception of the participation process and of policymakers' commitment to the participatory decision-making (Hare et al., 2002), we can understand one of the reason because the **direction** of the process is still often *top-down* rather than the widely claimed *bottom-up* approach in the Mediterranean area.

However, formality of the process does not always necessarily involves *top-down* approaches, as shown in several Nostrum-dss CS. Not surprisingly in **Italian** and **Spanish** CS, efficient participative decision making processes are successfully implemented in iterative ways also thanks to the support of information tools at basin and sub-basin level. Also in one of the oldest irrigated perimeter of **Morocco**, the Tadla plain, the annual plan for agricultural water allocation is subject to a similar decision making process since the heavy investments in infrastructures of the late 90's.

BOX 5: Strengths and weaknesses for PP in the Mediterranean countries

<i>Strengths</i>	<i>Weaknesses</i>
<ul style="list-style-type: none"> • Democracy and civil rights are generally embraced and upheld in the region • Political and social systems are relatively stable, allowing large-scale PP programmes to take place • European Union acts as a vital and powerful driving force for PP, in both political and economic terms • Sustainable environmental policy and PP are high on the governments' agenda • Level of public awareness of environmental issues is high compared to most other regions in the world • Academic resources are abundant; advanced research and rich discourse lays a firm theoretic basis for PP • Years of experience in PP development and implementation has already been accumulated • Distinctive peoples, societies and cultures also represent a mass of resources 	<ul style="list-style-type: none"> • Disparity in economic, social and political conditions leads to substantial difficulty in policy making and project design • PP programmes of such a large scale may prove extremely difficult to manage and coordinate • Vastly different water conditions among regions lead to divergent perceptions and views on the problems • Conflicting interests are very delicate issues to tackle which make great demands on decision-makers' skills • Diverse cultures and languages give rise to problems of communication, especially among participants from different countries • PP approaches and practices have yet to be institutionalised (this, however, is not specific to the Mediterranean basin but rather a general issue)

Despite the variety of forms of participation described, and beside the few CS studies quoted unfortunately, these processes often remain merely a formality, and stakeholders' concerns, wishes and propositions expressed are not efficiently integrated in the final decision. In fact, we should ultimately look at the **effectiveness** and **level of acceptance** by stakeholders of the final decision, avoiding a *tokenistic exercise with the final report already having been written* pointing at the *genuine attempt to institute meaningful and purposeful participation' of stakeholders in the decision-making process* (Lee, 2000). Allen et al. (2002) have noted that the approach to evaluating effectiveness should not merely involve measuring performance against preset indicators; **qualitative and quantitative dimensions** of stakeholder participation must be equally emphasised. Similarly, the Guidance argues that any PP process undertaken should be evaluated thanks to the following **criteria** which may not provide high scores for some of the CS presented so far:

- Role of participation
- Aims of the activity
- Effect of contribution made
- Effect of the activity on physical environment, local economy and organisations
- Worthiness of the activity
- Ideas for improvements
- Advice to others holding similar events

Moreover, as shown by Pimbert (2004) by analysing several articles related to participation methodologies applied to Natural Resources Management⁵ and here confirmed by the 9 CS brief presentation, the participatory efforts have mostly been restricted to the **local level**. *Yet more recently, he observes, there has been a growing trend towards a focus on their applications on a large, macro scale. For instance, many large agencies, including government departments, development agencies, nongovernmental and civil society organisations, and research institutes, now seek to spread, scale up and mainstream participation in both rural and urban contexts* (p. 2).

As the *Guidance* (2002) points out, 'Public participation in general is however a process of which no blueprint exists and which needs to be designed according to the needs with the available means and tools' (p.17). The widely differing understandings, values and agendas of various social groups concerning participation, as well as the rapid yet often ill-considered applications of participation methodologies, are now posing new challenges. This could lead to widespread disillusionment with participatory approaches and result in the discrediting of the very concept of 'participation' (Pimbert, 2004). To help ensure that participation does not become yet more 'passing fads', there is clearly a need for what Pimbert calls 'institutionalising participatory approaches' (p. 9). Indeed, this is also what Swyngedouw et al. (2002) have repeatedly stressed in their paper: 'The EU and its member states have an urgent and important task ahead...of formalising, codifying, and regulating the practices of participation'.

⁵ Village-based planning and watershed management to action research and farmer-led, participatory research and technology development (Chambers, 1997; PLA Notes, 1991; Hinchcliffe et al., 1999; Van Veldhuizen et al., 1997). The adaptive management of ecosystems and the co-management of natural resources (Berkes & Folke, 1998; Borrini-Feyerabend et al., 2004; Pimbert & Pretty, 1998). Participatory policy processes, agenda setting and risk assessments based on the use of deliberative and inclusionary processes (DIPs) (Holmes & Scoones, 1999; Pimbert & Wakeford, 2001; Stirling, 2001). The monitoring and evaluation of development and conservation programmes (Guijt, 1998; Abbot & Guijt, 1998; PLA Notes, 1998)

2.3. Main issues

According to the CS review and as confirmed by several authors, PP is still an ongoing discourse rather than a mature theory and many of its methodologies are still being experimented and developed. Nevertheless the same authors do point out that some important issues - also pertinent to our area of study - need to be addressed as summarised here below⁶.

Representation: According to Swyngedouw et al. (2002), the notion of stakeholder representation in the participatory decision-making is far from clearly defined, and there have been no specific mechanisms for determining which groups or individuals among all the potential stakeholders are entitled to participate in the decision-making process. They argue that it is not sufficient to leave this to either the autonomous forces of pressure groups from civil society or the selective randomness of current 'invitation to participate' as practised by many, because it opens up a space of power for those who decide on the participation list and those who participate. 'It is an opportunity for which there is no check'. They suggest that this is one of the urgent tasks ahead for the EU and member states.

Social learning: Lee (2000) raises an important point as regards the meaning of 'real learning' in participation. This 'learning' process can occur among anyone involved (agency representatives, technical experts, or stakeholders), and she emphasises that it is a 'reciprocal' process: 'Stakeholders learn from the experts, the experts learn from the stakeholders, and individuals learn from other individuals indiscriminate of whether they are an experts or a stakeholder'. Additionally, Lee has noted the problem of accessibility (suitability) of data provided to stakeholders: She rightly points out that the reports prepared by external experts and presented to stakeholders are often inaccessible as they are filled with technical jargon and complex tables and graphs. 'In this context, it is impossible for social change to occur because "learning" does not occur.' How to gear the information towards the specific level and needs of stakeholders is a significant issue to consider in public participation.

Stakeholder community: Lavigne et al. (2001) argue that stakeholder community is highly heterogeneous and riddled with cleavage in status and conflicting interests, thus it is risky to idealise it as a 'harmonious' community and underestimate its dynamics, differentiations, and internal power struggles. Stakeholders' approaches to their interests are determined by their social and economic conditions. Therefore 'no choice of action can be considered to be consensual a priori' (p. 9).

Empowerment: Lavigne et al. (2001) have questioned the assumption which underlies many of the writings on empowerment, that is, communication and negotiation alone are enough for stakeholders to advance their interests, without the need for arbitration and political mediation. 'Yet experience has shown that, however well thought out they are, communication strategies are not enough to convert all individuals to the idea of participation' (p. 15). They hold the view that empowerment is more about changing the present power structure than it is about 'giving' a particular group power to speak.

Knowledge and action: Lavigne et al. (2001) have also mentioned the difficult move from knowledge to action: 'One does not go straight from knowledge to action. There are necessarily choices to be made when moving from appraisal to decision-making... Is it realistic to ask populations to make long-term, binding choices right after presentation of findings without allowing

⁶ This brief review intends to be a starting point for readers who can further explore the subject by referring to the relevant literature.

them time to digest results and reflect on priorities? How can one set priorities between the diverse, often contradictory, interests of different groups? How to deal with the contradictions brought to light by appraisals?’ (p. 14)

Costs: When assessing the case for greater public participation, we have also to take into consideration the associated costs. There have been concerns that PP costs are ‘prohibitively high’ in terms of both resources and time. For instance the World Bank (1996) has observed that two present myths existing about community-based programmes are that they cost more than conventional programmes and that they take longer (p. 247). Nevertheless, the World Bank has also noted that the effect of PP programmes on the costs of developing and implementing policy largely depends on the setting. ‘These costs, however, are significant only when community-level organisations have been so eroded that substantial time and resources have to be devoted to capacity building.’ As evidence increasingly indicates, ‘When the institutional framework is right, participatory community-based programmes actually cost less and are quicker to implement’ (p. 247). Dalal-Clayton & Bass (2002) have expressed similar view: ‘The more well developed and regularly used the existing participation structures and mechanisms, the more cost-effective they are likely to be’ (p. 201). Marshall (1999) thus concludes that the planning horizon of the project is a significant factor. The longer it is, the more favourable the benefit-cost comparison for PP will become. This also explains why PP features so strongly in Agenda 21 and other strategies for sustainable development (p.12).

Dialogue: Röling et al. (2001) have called special attention to the co-ordination between two levels of dialogues (national level and basin level). Decentralisation is important as there is evidence that it is much easier to work bottom-up, from basin level to the national level, than to start among the major institutions at the national level. However the national level has a crucial role to play in creating the conditions for basin-level dialogues; unresolved issues at the national level unavoidably express themselves at the regional level (pp. 21-22). It is therefore a matter of criteria for deciding on the level of initial dialogue projects.

3. Tools and approaches to apply PP for IWRM

3.1. The role of public participation in IWRM

In a decision making process, it is therefore possible to identify people, groups or institutions that can play a meaningful role in the final decision. As seen, we can classify these main actors as decision makers, people and groups affected, and analysts and not all of these actors are always involved in the decision making process.

The **decision maker** is situated in the centre of the decision making process and is the one who has the institutional power and responsibility to select and implement a solution for a specific problem. **People** affected are all those whom will be influenced by the consequences of the solution adopted and implemented by the decision maker. The **analyst** is the person/group that helps and guides the decision maker to analyse and represent his or her preference structures, as well as those of other interested groups.

One of the main issues in the field of environmental decision making is the need, sometimes the obligation imposed by the legislation, to **communicate** the decision process and make it more comprehensible and transparent. As emphasized in the first chapter of this report, there is no doubt that public participation has become a major issue in IWRM. In order to facilitate the active involvement of all the stakeholders in water decision problems there is a challenge that has to be faced: the integration of scientific knowledge and public participation. This is not an easy task.

Facing water problems, decision makers find public participation important for various reasons, first of all because it is required by legislation (e.g. the WFD). Moreover, decision makers are

responsible of the selected decision and also its acceptance, for which public participation is essential. Nevertheless, major problems in IWRM like the lack of available information, the uncertainty about future effects or the incomplete knowledge of experts, create more difficulties on attaining these goals. Decision makers have in general, little experience in sustainable water management. Because of this **inexperience and the uncertainty** inherent to these decision problems, **public preferences need to be included** in a more direct way by sharing part of the responsibility and trying to find compromise solutions that facilitate acceptance.

Another reason for public participation is the role that water plays in our society. Water can be considered an important primary good, and is closely related to social and economic development. In addition, environmental sustainability is critical. One possibility to better understand and implement common interests is public participation.

In contrast, some disadvantages have to be also taken into account and to be solved. **Public administrations**, that normally have the responsibility to make decisions in IWRM, are **not always experienced applying public participation**. In addition, the public involvement could represent a problem to the restrictions in cost and time that normally guides administrative procedures.

3.2. Integration of public participation in IWRM

Once the crucial importance of public participation in the decision making process in IWRM has been recognized, the next step must be to clarify the way public participation, decision making and science knowledge can be integrated. For this to happen, all the **meaningful information** has to be collected, structured and presented in an understandable way to help decision makers integrate all the actors involved in the decision making process and all the scientific knowledge available. **Several decision support systems** have been developed in the last years to satisfy this need, for specific water resource planning activities such as prevention of water shortages (drought), surpluses (floods) and water impairment (pollution). Examples of such DSS are WATERWARE [Fedra, 1994], [Jamieson and Fedra, 1996a; Jamieson and Fedra, 1996b], AQUATOOL [Andreu et al., 1996], NELUP [O'Callaghan, 1995], [Dunn et al., 1996], FLOODSS [Catelli et al., 1998], DSSIPM [da Silva et al., 2001], STEEL-GDSS [Ostrowski, 1997].

A decision making process in a participatory context, may imply the following steps (Figure 1): identification of the actors involved; analysis of the relations within the social networks; identification of the alternatives that can solve the problem; collection of opinions; data collection, scenario and model building to provide information for supporting the decision; elicitation of preferences, analysis of conflicts and consensus building; and finally the decision or course of action. The whole process must be supported by **efficient communication systems**.

As described above, decision makers often do not have enough information about society's perceptions of the problems, due to the complexity of water problems themselves. At this level, the role of public participation could be to help identify the main relevant criteria for assessing alternatives in the decision process, and their target levels as preferred by society. However, the general public may also have problems in identifying these criteria, which normally represent physical, social and economic issues, out of specific and comprehensive data. In such situations, indicators available from scientific knowledge can provide crucial guidance for decision-making. They can translate physical and social science knowledge into manageable units of information that can facilitate public participation in the decision-making process. Indicators may also provide a means of measuring, monitoring and reporting on progress towards societal goals (e.g. quality of life, welfare, etc.). It may thus be possible to assess effectiveness of policy measures by analysing the causal link between a policy and its impacts in terms of changes in indicator values. Still, getting the public to understand such scientific information is daunting.

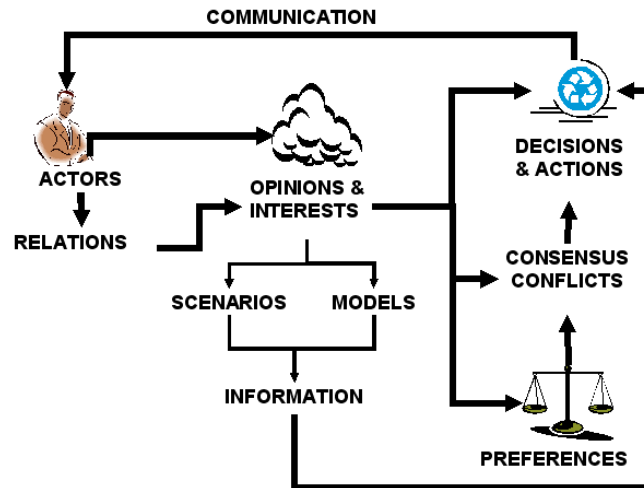


Figure 1: Knowledge, communication and decision making for IWRM.

3.3. The NetSyMoD approach

The NetSyMoD methodology is a flexible but comprehensive methodological framework developed, after several years of research, by the Natural Resources Management Research (NRM) Programme at FEEM. A methodological approach and a DSS tool have been developed within the MULINO Project [Giupponi et al., 2004] for integrating the MCA methods, in the context of decision making in IWRM. The tool (mDSS) has been adopted in several cases in research projects and used for training purposes.

The positive experience of a DSS tool being operationally implemented, also outside and after the original research project, provided momentum for building upon the MULINO experience and developing a more comprehensive approach: NetSyMoD (Network Analysis – Creative System Modelling – Decision Support). The main assumption behind the development of the NetSyMoD framework is that the development of mDSS demonstrated the feasibility of developing a relatively flexible and operational tool, ready for use by researchers in different countries and therefore, with more targeted efforts there will be chances in the future for a wider adoption also by the targeted end users, i.e. competent authorities in the field of water management.

The analysis of the state of the art of current practices and available methods and tools suggested to focus on the development of a methodological framework that could be adopted with flexibility in decision processes of the real world. Such framework should facilitate a theoretically sound and robust implementation of public participation, by adopting mDSS (a new release, mDSS4 has been distributed in the last weeks) as a software tool for managing the decision process.

With NetSyMoD, the problem itself, the information and the judgement are defined with the contribution of different actors, who may be represented by different experts in the disciplines involved in the solution of a certain problem, or they may be the stakeholders and the decision makers that are formally or informally involved in a decision of a participatory process, for instance during the development of a local plan.

It is clearly out of the ambition of NetSyMod to provide a single methodological approach for such a broad application context, while the interest is instead in developing a general framework to be adapted in diverse applications for which concrete approaches should be identified case by case. The greatest emphasis is oriented to the integration and implementation in the framework of state-of-the-art approaches in the field of modelling: from the more traditional approaches of bringing simulation models in the decision process through the development of *ad hoc* decision support

systems, to the more innovative creative thinking approaches for participatory modelling.

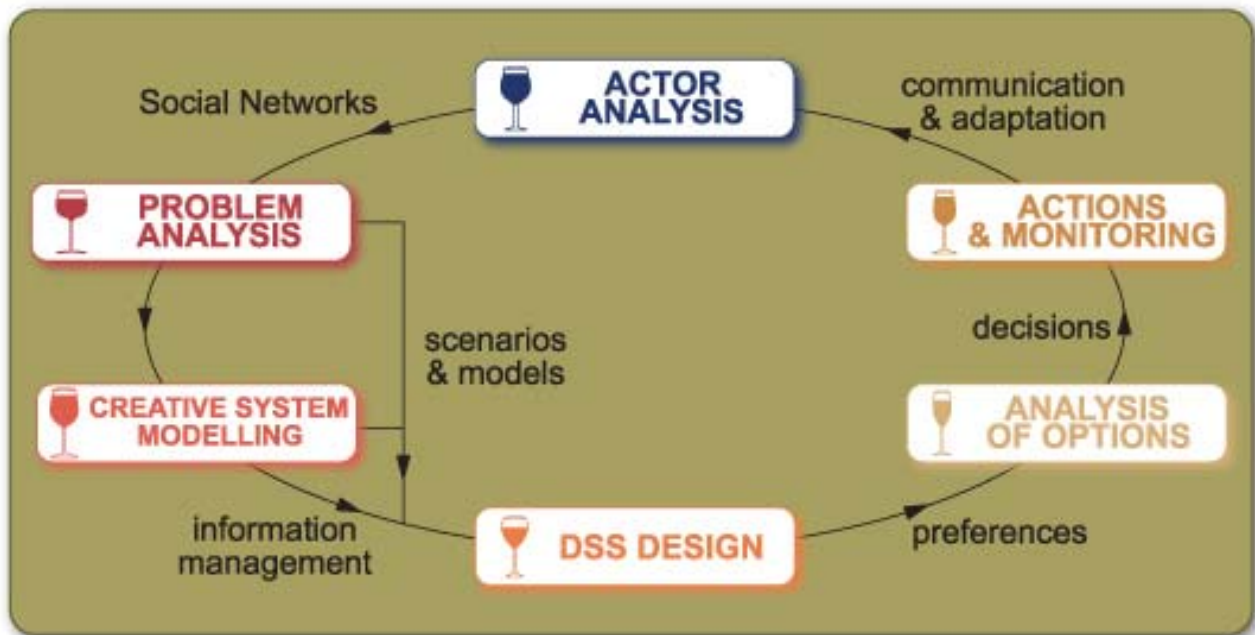


Figure 2: The main phases of the NetSyMoD approach

To facilitate practical application of the framework and to disseminate information about projects, events, publications, case studies, and, in particular tools available to potential end users at low cost or freely available, a web portal was designed. This resource⁷ provides the needed material for the 6 phases to be implemented within this framework and already tested in the context of several European projects: Actors Analysis, Problem Analysis, Creative System Modelling, DSS Design, Analysis of Option, Action and Monitoring.

3.3.1. The Actors Analysis

This phase allows the identification of actors (i.e. all potential stakeholders experts involved or affected by the decision under investigation), their relationships with the local social context and singles out those who should take active part in the decision making process.

The first step of the identification process is suggested by different sources and consists in forming an ad-hoc steering group, hereafter referred as **task force group** (TFG), involving a small number of people. The first task of the group is to take part in a **brainstorming meeting** (WS1) which has two main aims: on one hand to draft a list of all the potential stakeholders/experts with reference to the issue at stake, and on the other hand to compile their profile. A team approach is likely to be more effective than an individual doing the identification process alone. In fact, a team can compensate for and neutralise individual biases. It can provide a more objective perspective of stakeholders/experts position and interests. The *task force group* should be composed by insiders, outsiders, one facilitator⁸. Some literature suggests to involve a maximum of 10 persons in the

⁷ See <http://www.netsymod.eu/>

⁸ In the case of stakeholders identification *insiders* are people directly involved in the planning/decision process and/or familiar with the local environment and its main challenges, and people who are insiders to the cultural context but outsider to the issue at stake; whereas in case of experts identification *insiders* are considered people who have a sound expertise on the subject under consideration; the *facilitator* should support the working group of insiders and outsiders and analyse the outcomes of the brainstorming exercise; the *outsiders* are people not familiar with the issue/subject at

brainstorming exercise. However, the ideal number of members of the *task force group* should be decided according to the different situations, even though for the sake of efficiency in the management of the meeting it would be better not to involve a large number of participants, with a minimum of 4. During the meeting the first objective to be achieved is to clearly define the issue at stake (or decision context). Then, the *task force group* should be provided with a set of criteria for drafting the whole list of actors to be involved, (*ad hoc boundaries*) which has to be preliminarily defined.

Once a comprehensive list of actors has been drawn, NetSyMoD analyses the relations between the actors thanks to a **Social Network Analysis (SNA)**: a framework strategy for investigating social structures, a methodology which enables researchers to translate core concepts of social and behavioural theories into a formal language, based on relational terms. In this way, theories which would otherwise be fuzzy and difficult to analyse can be quantified and explored in a systematic and objective way. *SNA involves identifying a project's key stakeholders, assessing their interests, the ways in which these interests affect project riskiness and viability, as well as establishing the relationships between stakeholders* (Allen et al., 2002).

At the end of this phase, a list of **key stakeholders/experts to be involved** in the workshop will be drawn up as a result of the positional analysis of actors. This will both limit the number of participants to a manageable size, and ensure that no important actors are left out of the exercise. Secondly, the analysis of power will highlight **potentially problematic actors and relations**, which the facilitator will need to actively manage during the cognitive mapping workshop. Finally, a conflict analysis will emerge from **exploring value divides and value drivers**, while overall network analysis, coupled with information regarding stakeholders background and affiliations will support groups' identification⁹.

To perform proper actor's identification, several parameters need to be defined and similarly for the SNA phase several means different data collection and analysis can be chosen, depending on the particular context of application. For **concrete examples** on how to implement this phase of the approach with the support of free tools, see the tutorial prepared for the 1st NetSyMoD capacity building workshop within the BRAHMATWINN project (<http://www.netsymod.eu/>) as well as the selected guidelines reported in chapter 6.

3.3.2. The Problem Analysis and Creative System Modelling

This phase allows then that the problem (or conflict) at hand is scrutinised from various perspectives and viewpoints. The environment in which the problem is embedded is explored and the relevant factors identified. In NetSyMoD, this phase is also implemented through **Creative System Modelling** which allows to build a shared model of reality in order to correctly evaluate the options under analysis. Specifically, Creative System Modelling (CSM) techniques facilitate the process of participatory modelling and elicitation of knowledge and preferences from actors, thus building a common understanding of the problem.

The key actors chosen in the previous steps of the NetSyMod approach will take part in a workshop where they will apply the **Cognitive Mapping (CM)** technique most suitable for the specific case. Many alternative approaches are available, some of them presented in the following sections. For example, when dealing with experts for the elicitation of cognitive maps, techniques based on the

stake. The outsiders can provide more objectivity and the opportunity for insiders to gain insight into how their assumptions may be biasing the process. In fact the insider has the potential limitation of its pre-existing relationships with the stakeholders/experts and this can influence its responses. When NetSyMod is applied to consult experts, the usefulness of involving outsiders in the task force group is limited. In this case, therefore, the research team may wish not to involve outsiders in the process.

Hodgson's hexagons approach (Hodgson, 1992) or one of the many versions of the Delphi technique (Helmer O., Dalkey N., 1950) can be utilised. CM is a general term that applies to a series of methods for measuring mental representations (external representations of mental models according to Ford and Doyle (1997) and thus functional to the further development of simulation models. Most researchers treat cognitive maps as a tool that can usefully summarise and communicate information rather than as a literal description of mental images (Huff, 1990).

In the present case CM provides a means for facilitating the process of participatory modelling and, more specifically, for eliciting knowledge and preferences from actors. CM techniques attempt to describe mental images that subjects use to encode knowledge and information. These techniques aim to provide a tool for revealing peoples' subjective beliefs in a meaningful way, eliciting their preferences, as well as encouraging experts, stakeholders and decision-maker(s) to reveal and reflect on their own perceptions of the decision problem or opportunity. At the same time they are useful to gain insight into the problem from others' perspectives, and this may then facilitate the process of decision-making, as well as encourage negotiations and help to reduce conflicts. The next section is dedicated to the CM techniques.

For details on CM techniques see the FEEM working paper n°46 (Giupponi et al, 2006). For **concrete examples** on how to implement this phase of the approach, see the tutorial prepared for the 2nd NetSyMoD capacity building workshop within the BRAHMATWINN project and the Case studies description on <http://www.netsymod.eu/>.

3.3.3. DSS Design and the Analysis of alternative options

The successive **DSS Design** phase uses the knowledge developed so far for designing the toolbox of procedures and software tools capable of managing the data required for providing informed and robust decision in the following phase, as presented in the Case studies description under the corresponding phase.

This **Analysis of alternative options** phase consists of evaluating and choosing one (or more) solution to the problem (e.g. a policy measure, plan or project) from a set of mutually exclusive alternatives, or producing their complete ranking. When multi-criteria analysis (MCA) methods are adopted, and Multi-Attribute methods in particular [Hwang and Yoon, 1981], the decision process described above is normally implemented through (i) the selection of the criteria against which the alternative options are going to be compared; (ii) the estimation of the performances of the alternatives related to the criteria, compiled in the Analysis Matrix (AM); (iii) the development of utility functions to convert the multidimensional AM in a non-dimensional Evaluation Matrix (EM); (iv) the selection of the aggregation procedures of the information derived from performances and (v) the identification of the relative importance (weights) of the criteria in the final decision.

In order to obtain the EM, decision makers have to reflect their value judgements and preferences by the public utility functions. But the elicitation of such functions may be extended to involve all the interested actors. In this way, by public participation, asking directly all the actors involved in the decision process about their individual preferences, the general form of the public utility function for each criterion previously selected can be obtained.

Public participation is also concretely implemented in the MCA decision process in the assessment of weights to aggregate all the information. In this step, some conflict may arise because of the different interest of the actors involved in the process, thus EDSS tools may be needed to facilitate communication and consensus building. In this way, public participation could increase the acceptance of the final decisions, making clear the individual preferences and giving the basis for possible compromise solutions.

Apart from the elicitation of experts' and stakeholders' opinions and knowledge, the need remains for robust assessment procedures, providing quantitative descriptions of the decision indicators and criteria. The assessment should be based upon monitoring data, indicators, indices and in particular

integrated assessment modelling (IAM), which may find in the methodology proposed an interface for easier communication with the interested public.

The implementation of IAM is approached by focusing on the DPS part of the conceptual framework. These three elements are considered as explicit formalizations of driving variables, model parameters and outputs respectively. In the case of water pollution models, for instance, D's represent the forcing variables ruling the behaviour of the simulated system (e.g. the river basin). P's may be represented by parameters that express the rate of pollution processes and S's are the output variables quantifying the dynamic evolution of the human-environmental system, as affected by the considered pollution sources and processes. Integration of models may occur at various levels and in different ways and thus relationships along the chains could be expressed by parallel one-to-one flows, or one-to-many (e.g. one activity affecting various environmental compartments), or many-to-one (e.g. various sectors affecting the same environmental indicator), or even many-to-many, in the case of multi-sector integrated models.

In the context of environmental decision making, IAM can support the identification of the correct Responses by providing sets of indicator values. These values are derived from subsequent simulation runs in which model(s) are parameterised to represent the expected consequences of a set of possible alternative responses. The development of a set of evaluation indices is a crucial step. It should be targeted to evaluate Impacts deriving from the State indicators provided by IAM. Evaluation procedures may be implemented by focusing on the link between S and I and between I and R by adapting concepts and methods derived from MCA literature, as previously stated.

All these features are, as mentioned in the introduction, successfully implemented in mDSS, a computer tool originally developed in the context of the EU funded project MULINO. For details on the project, to download the **latest version of the tool mDSS4** as well as all the supporting material, visit <http://www.netsymod.eu/mdss>

The **Action and Monitoring** phase, lastly, allows to monitor the implementation of the decisions. This includes the progressive examination of the assumptions about the future development as well as the revision of the choices made upon these assumption.

4. Conclusion

There is a clear need for methodologies and tools to put IWRM principles into practice, in an application context in which decisions and choices are assessed in terms of their sustainability not only over the long term but also with regards to their day-to-day contribution to the perspective of sustainable development. Such need may also be described in terms of the implementation of an integrated methodological framework allowing decision makers to choose first, and then to monitor the process induced by their decisions.

Various methods and tools, such as modelling, environmental impact assessment and decision support, have shown to provide rational insight in the system's behaviour and the problems addressed. However, integration remains a difficult issue.

The conceptual framework briefly described in Chapter 4 may contribute to provide methodological support to cope with the general problem of IWRM implementation, by supporting in particular:

- the management of the complexity of decision contexts typical of IWRM;
- the management of large amounts of multi-sectoral and multidisciplinary information;
- the communication between the scientific and the policy sector and between decision makers and the involved stakeholders.

The main assumption of NetSyMoD is that creative system modelling can provide not only a

common ground for mutual understanding between the parties involved, but also a scientifically sound basis for the development of effective decision support systems.

The specific contributions that the Nostrum-Dss Project may provide to the development of improved IWRM approaches in the Mediterranean Basin are in the field of innovative methods and tools for the management of decision/planning processes. It is within this context that DSS tools may provide an essential contribution to facilitate the dissemination of knowledge and state-of-the-art approaches.

The involvement of stakeholders in the IWRM process stands as one of the most challenging task worldwide and particularly in the Mediterranean.

Evidences acquired in the Nostrum-Dss project so far for what concerns PP and DSS can be summarised as follows:

- There is a strong need for scientific and technical support for a meaningful involvement of stakeholders in IWRM;
- Recent research projects have made available many tools, including models and decision support systems and some of them have reached the stage of operational implementation;
- Putting PP in practice may be a challenge for competent administrations. Participatory modelling can provide robust and effective practical solutions;
- In order to bridge the gap with real-world decision processes, DSS tools must be developed with the involvement of end-users and stakeholders and adapted to local pre-established approaches;
- Competent administrations should be adequately motivated, for the required investment of time;
- Training and capacity building activities carefully embedded in the local institutional and social contexts are needed for effective implementations;
- Further efforts are needed to facilitate integration and long term development and dissemination of what has been produced and for capacity building.
- DSS tools should be seen as ICT components of a structured, modular and flexible approach for supporting the IWRM process, with fundamental role played by a trained task force including facilitators of PP;
- Transfer and re-use – of experiences, knowledge, methods, tools – is always challenging: efforts should be targeted to adapt methods and tools to local situations and not vice versa
- Without adequate implementation framework and trained people, the uptake of research outcomes is unlikely to happen

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6. Relevant guidelines to implement PP in practice

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- Social Learning in River Basin Management HarmoniCop_2003_2.pdf 2003 HarmoniCop Deliverable K.U.Leuven Cemagref Marc Craps & Pierre Maurel
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- Water management: Guidance on public participation and compliance with agreements UNECE_2000.pdf 2000 UNECE Outcome of the Meeting of the Parties to the Convention on the protection and use of Transboundary Watercourses and International Lakes Working Group on Water Management (WGWM) -

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