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**Network on Governance, Science and Technology for Sustainable Water
 Resource Management in the Mediterranean-The role of Dss tools**

European Commission, FP6, Specific measures in support of international co-operation
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NOSTRUM-DSS

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Executive Summary

This Report on Social Aspects of Conflicting Water Uses mainly relates to processes revealing competition dynamics involving different stakeholders groups (CBOs, NGOs, public institutions and private sector companies) and focusing on water as a main stake. Open conflicts are often avoided by processes of negotiation and policy dialogue among stakeholders. Therefore this matter is closely linked with governance issues, and with the means to empower weaker stakeholders to participate effectively in the negotiation dialogue. This consideration is valid either internally in specific local cases within a country, or internationally, in negotiations related to shared waters in a catchments system.

Conflicts arise when waters are perceived as scarce resources, both in absolute terms, as physical shortages, or in relative terms, compatible with the development expectations by a State, by a community or a water users group. Conflicts can also arise when resources are not scarce but some uses are penalised or some stakeholders have difficult access respect to their consumption needs. Questions on sustainability of water consumption patterns for the future generations are out of normal perspectives under this sectorial view. The interests are rather limited to the freedom to consume as much as needed, at the lowest cost, at the highest quality, with poor attention to the impacts caused for downstream uses.

Of all potential sectors forging the water demand, the irrigation sector is the most important one, while lower proportions go to industrial and municipal uses. Uses for tourism activities are not distinguished from other domestic uses. Ecological demand is residual and the interest for maintenance of a minimum vital level for the river ecosystem is not often expressed; this is the reason why the wetland areas have decreased dramatically.

Consumption of water can be controlled by various means, e.g. by water treatment and desalination, or by virtual water trade. These are potentially good solutions for cases where water resources are considered for their productive functions. In other cases, the demand for irrigation is not only justified for agricultural production increases, but also for strategic reasons, as the implementation of irrigation schemes are ways for the national governments, to occupy land and establish an institutional control over their territories. For these reasons, water is not only a commodity that can always be exchanged through alternative resources: the stakes are wider and political.

Issues have been grouped according to some clusters, which constitutes the central chapters:

- Conflicts among sectors using waters and among stakeholders groups; emerged risks and vulnerabilities for groups, sectors and also for areas increasing their marginality;
- Conflicts generated by water stress or water poverty; and by externally conceived innovations and development schemes, with no respect for the consolidated local knowledge; and conflicts between economic and non-economic values;
- Conflicts generated by public sectors strategies and weaknesses, including geopolitical issues and institutional conflicts;
- Tools for reversing conflicting situations, by international cooperation measures, allocation of alternative sources of water, use of mitigation and compensation measures, and participatory approaches enhancing good governance among the parties.

Decision support systems are seen as theoretically relevant for their potential to address particular areas of conflict, but are not yet applied.

1 Introduction

1.1 Context

The issue of conflict about water resources has a high relevance for an action aiming to integrate technical and scientific knowledge with policy and decision-making, as Nostrum-DSS CA is meant to be.

“Technical excellence remains necessary for creating sustainable water management decision [...]. However it is not sufficient in itself” [...] as it needs to be complemented by “skills that will help water resources decisions makers avert conflict, deal with conflict should it arise, and use water decisions as a venue for dialog” (Delli Priscoli 2002).

“Conflict” about water uses is a concept that will be used extensively in this report. We will mainly relate to a process revealing competition dynamics involving different stakeholders groups (CBOs, NGOs, public institutions and private sector companies) and focusing on water as a main stake. Open and violent conflicts are only extreme and rare facts; more commonly, they are avoided by processes of negotiation and policy dialogue among stakeholders.

Despite widespread perceptions that exploitation of international water basins is a delicate political issue and a trigger of conflict, there is historical evidence of water playing the role of a catalyst for cooperation. There are examples of workable accords on water reached even by States that were in conflict over other matters, including the cases of India and Pakistan, and Israel and Jordan.

Tony Allan (2000) has expressed some doubts about the real nature of some conflicts that have been recognised as “water wars”. His objection is, that in various cases, the question has been reversed, and that conflicts about water resources have not been the cause, but rather a consequence of conflicts of other nature.

The debate is however open, as other experts have instead recognised real conflicts originated by water. As an example, we can recall World Bank Vice President Serageldin’s prediction (1995): “the wars of the twenty first century will be fought over water”; various examples of current and past open conflicts are mentioned in Lorenz (2002) and Shiva (2002).

As for the Mediterranean region, there are only few cases, though important, of harsh competition for water resources in transboundary basins, but in general they have been overcome via political means and collaborative solutions. The competition between Portugal and Spain for their shared basins is governed by bilateral agreements. The conflicts over the Nile between Egypt, Sudan, Ethiopia and other seven countries of the basin, is being solved by the Nile Basin Initiative (NBI), supported by the World Bank and by various international agencies and donors, and proposing a large cooperation framework, involving various socio-economic, technological, information sectors: water is thus exchanged with other goods and services.

Different, particularly for the different political circumstances, is the situation between Palestine, Jordan and Israel, concerning the issues of sharing freshwater and groundwater resources.

What science and policy have to offer is the proposal of alternative solutions in order to get win-win situations instead of “win-lose” results of the “sum 0 games”. The lessons learnt from the NBI can be useful for other cases. Unfortunately, the general conflict involving Israeli and Palestine impede to enlarge the field of negotiation to find resolutions to the issue of equitable access to water for all. The result is that Israel, which suffers for “water stress” but not for “water poverty”, thanks to technological, financial, political and other assets (the definition of these terms will be given in chapter 5), is able to enforce its rights over the available resources, at the expenses of neighbouring countries’, who are “water poor”. Also for Israel a real cooperation would be the best solution, as it would not harm its current rights but rather enforce them, together with those of the

Palestinian counterpart, as other non-water elements could be put on the negotiation table and exchanged.

Allan (2002) shows that Israel has also resorted to a *virtual water trade* as an alternative solution. According to his analysis, virtual water trade has played the role of a “politically silent” tool to alleviate water deficits by economical policies for decreasing the risk of open conflict over the Jordan River.

The matter of open international conflicts will not be treated in detail in this report for two main reasons: for its delicate political nature and for the fact that international competitions have not been sufficiently presented in the National Reports compiled by the Project partners. Other types of conflicts, mainly internal in the observed countries, will be focussed on.

In this Report, we will mainly look at sources of competitions for water uses and among users. The observation will be devoted to identification of the stakes and the related stakeholders, the parties involved. Water users are not only clients, but primarily citizens.

Participatory processes are fundamental in this field, and “build on a classical notion in democratic theory: that those who are affected by decisions should have a say in them, because in doing so they will become better citizens. And it is often the physical and water infrastructure that citizens see directly affecting their lives” (Delli Priscoli 2002).

1.2 Methodology

The following Chapter 2 - The stakes of current water conflicts, introduces a geographical approach to pressures and conflicts for water as multi-dimensional resource, which provides functions and services to specific economic sectors and to ecosystems, but is also a key resource of territorial development for governments and policy makers. This brief presentation will be based on international literature on the subject.

The following chapters will then present the case studies. The development of the analysis will follow various entry-points. Each one will be developed by a brief theoretical introduction, from specialised publications, followed by the illustration of case studies taken from the National Reports submitted by the NOSTRUM project partners.

The Reports presented the following case studies:

- Algeria: Sebkha of Oran
- Croatia: Cetina River
- Cyprus: Tamassos Dam and Reservoir
- Egypt: Toshka project
- France: The National trend to Delegation
- Greece: Island of Paros
- Israel-Palestine: Dead Sea Basin
- Italy: Consorzio per la bonifica della Capitanata
- Lebanon: Damour
- Morocco: Tadla Plain
- Portugal: Caia River Catchment
- Spain: Tagus River Basin
- Syria: Asnober River Basin
- Tunisia: Djeffara aquifer
- Turkey: Gediz River Basin

In the Annex we present Summary Tables elaborated for each case study, in order to organise/summarise the information provided by the National Reports.

In fact all National Reports have presented a specific section where matters of conflicts could be elaborated. Some stakeholders were also invited, through questionnaires, to express particular

conflicts they had been interested in. Unfortunately, not much substantial information was gathered. This weakness can be explained for two main reasons:

- The wide scope of the National Reports, which had to provide a very comprehensive set of information on various topics in a relatively short time and in a compact format;
- Lack of shared methodology for coordinating the conduction of questionnaires. The large network of partners and hierarchical organisation made it difficult to follow substantially this exercise, and in particular, to understand the selection methods of involved stakeholders and to get satisfactory interpretation of their answers.

This report “Social aspects of conflicting water uses” presents a further elaboration of the case studies. Issues have been grouped according to some clusters, which constitutes the central chapters:

- 3 - Competition among sectors using waters and stakeholders groups, and emerged risks and vulnerabilities;
- 4 - Conflicts generated by poverty and by externally conceived innovations and development schemes;
- 5 - Conflicts generated by public sectors strategies and institutional weaknesses;
- 6 - Tools for reversing conflicting situations.

In some cases an effort for interpretation of local situations has occurred, as the conflicting issues were not always evident; for these, we would appreciate to receive any comments from the authors of the National Reports. In few cases, we introduced information from other sources.

As mentioned earlier, the analysis is based on data collected by the National Reports, regarding specific case studies, sometimes also complemented by the Sectorial Reports.

As for the theoretical part and introduction to the issues, some integration derive from other sources:

- International literature in the issue, which is quite extensive and produced either by academic scientists or by international organisations, particularly as a follow up to commitments made to contribute to the UN Millennium Goals.
- Information generated by some partner institutions and made available on internet as outputs of previous research projects;
- Results of previous/ongoing research projects conducted by the authors of this Report.

2 The stakes of current water conflicts

2.1 Localised stakes, uses and users

In the Mediterranean region, water is mainly utilised for irrigation, in general for 80% of available resources. Lower proportions go to industrial and municipal uses. A better efficiency of water allocation, minor losses on distribution networks, and increase of wastewater and desalination treatment would allow more volumes to satisfy the increasing demand expressed by all sectors. However, not all countries present the sufficient capabilities, financial conditions and enabling environment, to ameliorate their water balances.

Fig. 1 presents the composition of the water demand among sectors. For each sector there is an indication of some stakeholders that compete for improving their access and use rights.

Fig. 1: Demand composition between sectors and some related stakeholders

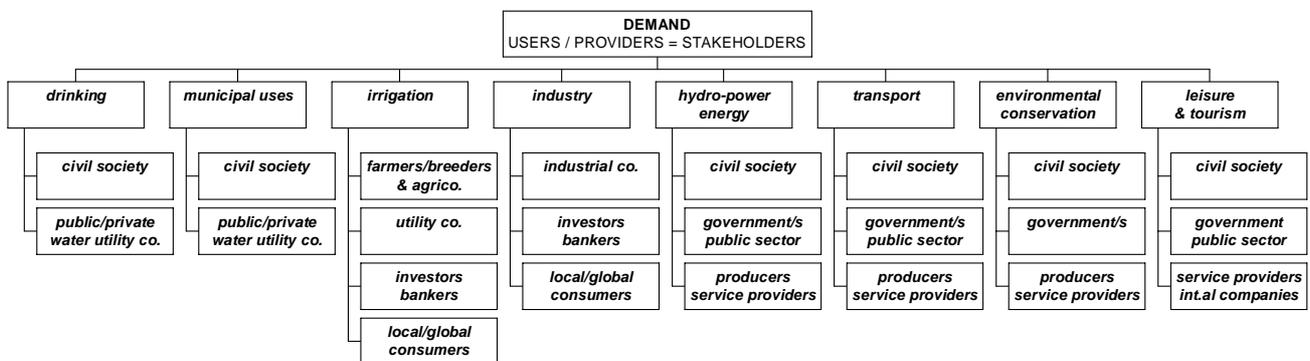
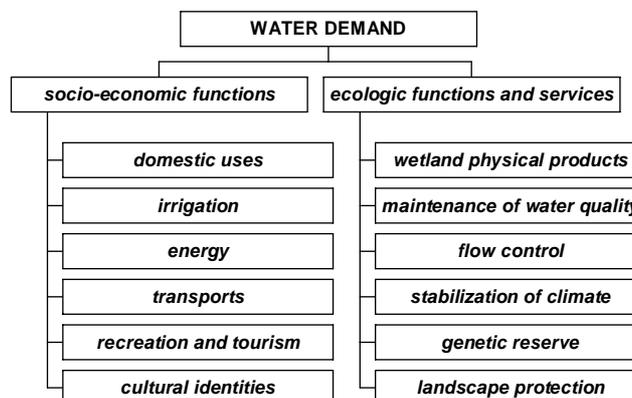


Fig. 2 shows that water resources do not only have to satisfy the socio-economic functions expressed by direct beneficiaries, but also need to guarantee a minimum vital quantity and quality of local catchments, to preserve ecological functions and services of living eco-systems. This demand is generally expressed by weaker stakeholders, mainly formed by groups of ecologists, and eventually joined by wider groups, if there is high public evidence of particular values related to a watercourse or a wetland, that need safeguard.

Figure 2. Composition of water demand based on functions and services for human communities and ecosystems



The approach of sectors/functions as a key to understand water conflicts appears, however, reductive. Water is not only a functional resource or a productive element; and simple substitution of waters with other goods cannot alleviate social contrasts. The analysis has to be integrated by a territorial assessment, including analysis of history and civilization of water. Considerations of past history and functions cannot be limited to the resource, but has also to consider the infrastructures and technologies (either traditional or modern) that have allowed recursive uses of the resource by a particular social and territorial organisation. Besides goods and services, water also produces “territories”.

Fig. 3 and 4 illustrate the model of territorial production elaborated by Bertoncin et al. (1995). The model has been elaborated with particular attention to the energy spent by the central authorities, to perform irrigation schemes. Their planning and implementation of schemes has allowed to increase agricultural production (*productive water*) and also to stabilize and control their lands (*strategic water*).

In some areas, the State has produced its “centralities”, to which resources and services have been drained from other areas, which have become peripheral. In the latter areas, water has been utilised for the minimal sustain of local livelihoods, while their main role is to “serve” the interests of the “core areas”.

Fig. 3: Productive/strategic hydraulics

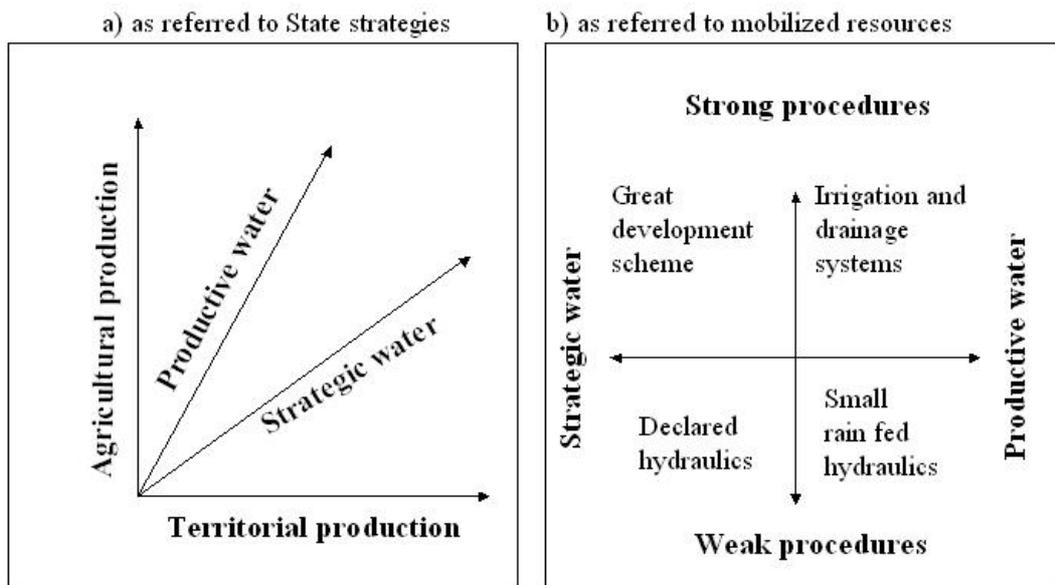
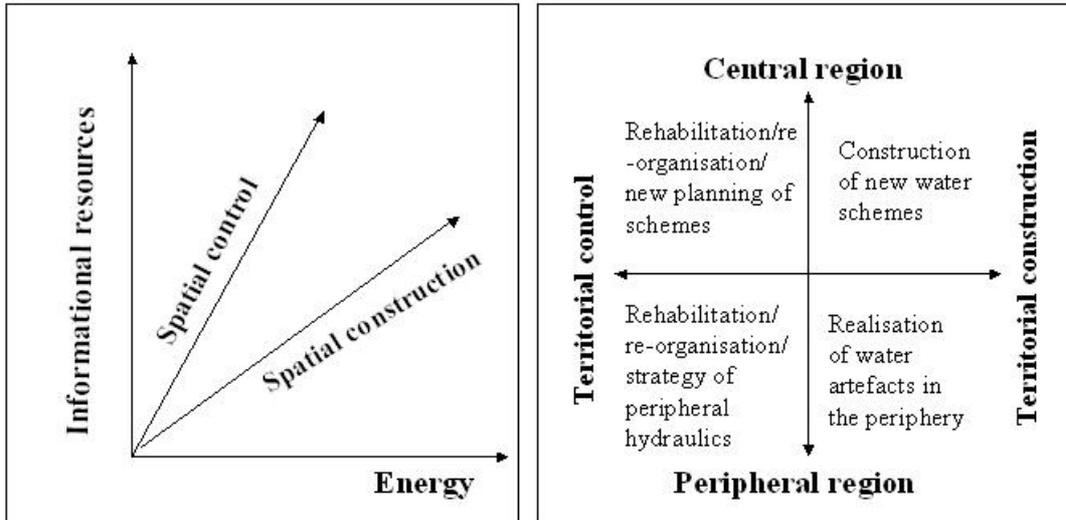


Fig. 4: Construction and territorial control and regionalisation of State strategies



Conflicts arise whenever there is a gap in governance relations within a community. But paradoxically, conflicts can only be expressed whenever social groups are aware of the inequalities that they are suffering, and have the means for declaring their rights. In various examples of the past, conflicts did not arise because the control over the resources allowed political powers to manipulate and fully control social organisations. Clear examples of “oriental despotism” based on water control, have been described by Wittfogel (1957).

The stake was/is not only the access and control of water, but the construction of new territorial forms, more coherent with the development planning decided by the government without previous consultation, and privileged *core areas* at the expenses of others, less strategic for purposes of national growth and thus become marginal (Bertoncin *et al.* 1995).

Recently, the international community has expressed strong criticism related to the traditional “supply management” and particularly to the construction of large dams, having caused wide damages to the traditional socio-territorial systems and negative environmental impacts, and having not met the foreseen water and hydro-power efficiency standards (WCD 2000).

Whenever possible, in case of locally based conflicts, the analysis of needs and constraints regarding stakeholders groups and sectors, is a pre-requisite to open a negotiation process, in order to avoid exacerbation of public relations, rigidities, non-cooperative behaviours and open conflicts. A wide participation from all relevant parties is fundamental to understand each one's position and activate negotiation processes. “Participation is far more than conflict resolutions. Participation seeks to help us discern public interest and community will, and to articulate preferred futures” (Delli Priscoli 2002).

The challenge is to find a facilitator that can effectively overcome the traditional mistrusted relation between the government and the public, and make use of scientific outputs. A constraint has been in the paternalistic attitude of both scientists and policy-makers towards the public stakeholders, which were considered as an audience to be informed and made aware, rather than

a group from which information could be gathered and to fully involve during the whole decision making process.

2.2 Local and “non-local” pressures over waters in the Mediterranean region

In the Mediterranean region the competition is caused by a scarcity and seasonality of water resources, and by an increased consumption rate, with highest peaks during the driest seasons, to respond to agricultural and tourist needs.

Analysis and scenarios usually highlight the cause-effect relation of the demographic growth to the water demand increase. Besides this, the UNDP Human Development Report 1998 dedicated to “Consumption” issues, demonstrates that a greater weight over the water balance is induced by the changing consumption patterns, that globalisation, by information networks and trade, has uniformed. Total consumption of goods is surely increased, but particularly concentrated on those having a stronger impact on water resources, at different steps of the productive process.

Various National Reports have highlighted “misuses and abuses of water arising from rapid urbanization, industrialization, uncontrolled agricultural practices and the overall economic pressures from rising standards of living” (statement taken from the Greek National Report).

The linkage between type of commodities produced and pressure over the water resources has been estimated in terms of volumes of water embedded in the specific production processes: the “virtual water” (Allan 1998). The virtual water has been calculated particularly for evaluating the agricultural productions and the diet compositions. According to the content of animal proteins rather than a percentage of vegetal staples consumed, a great difference is shown in terms of water pressures. According to Renault and Wallender (2000), the composition of the average diet in the United States determines a consumption of 5,4 m³/person/day: five times higher than a subsistence diet, most probably consumed in developing countries where higher demographic trends are observed.

Unequal access in economic wealth determines different constraints due to local water availabilities. Restricted elites have higher consumption of goods and services that are not in line with the restricted resources locally available and with the limited recharge systems of the water bodies.

In the arid North Africa and the Middle East it is not uncommon to see beautiful gardens and golf clubs watered with continuous irrigation, beside barren areas where deprived communities reside. Swimming pools are quite common facilities in tourist resorts everywhere in the Mediterranean, even in arid islands.

The economic wealth offers various opportunities of choice about alternative sources of water for meeting the human needs. One example is given by the expensive technologies offering alternative sources of *physical* water, such as the desalination plants utilised, in particular by Israel, Saudi Arabia and the Emirates, which can afford the high technological costs; or by adopting a strategy of *virtual water trade*, with importation of goods requiring huge amounts of water and that could be produced at lower costs in other countries. For rich economies, it is thus possible to maintain a high “water footprint” despite the conditions of national water stress (Hoekstra 2004). On the contrary, the financial constraints reduce the opportunities for accessing new technologies and developing alternative sources. In these cases only, the consumption of physical water locally available as well as restricted strategies for food security are the only chances to survive under water poverty conditions.

Post-modern geographies (Harvey 1990) present dissociation between the “positions” of resources respect to the “territoriality” of users. Referred to water issues, this argument poses major challenges to the application of the “catchment’s scale” proposed by the IWRM approach, as an operational level where to convey efficiently environmental and management issues. This was already believed by the deterministic approach of the “natural regions” proposed by Buache in 1752, and has been recently re-proposed by the international community.

Critics to the “catchments-level” model (Minoia 2006) are based on two main considerations: 1) that the ownership of a community respect to its water resources, facilities, landscape etc., can be

observed rather on “bio-regions”: issued by a regionalisation process, identifying a territory that has better allowed its autonomy and social resilience during the history (Minoia 1996 and 2005); and 2) that given the current globalisation trends, with increased people’s mobility and international trade of goods, it is more and more difficult to affirm “local” responsibilities for situations of “local” water scarcities.

As for in the Mediterranean region, greater pressures over local resources are caused by non-local consumers via the mentioned *virtual water trade* and via tourism flows.

The tourist development is an increasing source of revenue for Mediterranean countries, but also a growing factor of conflict with other sectors requiring water resources.

The intensive development of tourist resorts during the past decades has severely increased the water demand. Tourist flows are particularly concentrated on the coastal areas, with a presence of vulnerable water table: in fact, the pressures for water abstraction produce a marine ingression in the groundwater, causing a contamination for water salinity and for increasing wastewater discharges with no previous treatment. The long-term damages caused by unsustainable pressures from the tourist settlements are paid in terms of a worsening availability of safe drinking water and by an environmental degradation due to changes in chemical properties of water resources that sustain wet ecosystems. For these situations, particularly in the coastal areas of the Southern Mediterranean region, there are no effective regulations for monitoring and sanctioning the unsustainable pressures, nor mechanisms for compensation of the social and ecological damage, also because the needed assessment tools are hardly available.

3 Intersectoral competitions and risks

Competitions among sectors arise when some stakeholders perceived that their sectorial uses are endangered, either quantitatively or qualitatively, by abstractions done for other sectorial uses. Intersectoral competitions and risks regard both socio-economic uses and ecosystems functions, as some uses can harm the social and environmental health.

The National Reports mainly focus on water for irrigation, which is by large the most demanding sector, in some cases because other uses have not grown sufficiently (Molle and Berkoff 2006). Most cases of sectoral conflict regard irrigation versus potable water. In cities it is a common view to consider that shortages are caused by the excessive withdrawals by the agricultural sector; that farmers are the highest water waster; and that water has a low productivity in agriculture while in cities it has a higher social value. However, shortages in cities are due more to financial and development constraints than to real water stress.

The described cases have shown that various conflicts among stakeholders have arisen. However in some situations, conflicts do not appear so clearly; but this does not mean that the situation has no risks. Lack of conflict could in certain cases be a symptom of a lack of awareness about risks, or lack of fields for expression of stakeholders' needs and constraints. However, the collected information does not allow elaborating on this.

No much information is referred by the National Reports to a priority expressed by the Millennium Development Projects, related to the difficult access to potable water and sanitation by rural households, which still show comparatively low percentages, compared to access in towns.

Another relevant issue is the disappearance of wetlands for over expansion of irrigation: 50% of losses worldwide are denounced by UNESCO (2004).

The information produced in the National Reports have been organised in clusters of issues, where the responses given for each case study have been incorporated.

3.1 Conflicts among human uses and functions, and between economic and ecological functions

The issues presented in this section regard competitions between water-using sectors, as well as conflicts between human and ecological needs, as previously expressed by the figures 1 and 2 of the previous chapter. These are the most apparent conflicts, as it will be shown by the following presentation expressed on a country basis.

3.1.1 Algeria

The Algerian case study regards the Great Sebkhia of Oran, a salt lake, which is shared by 3 wilayas and 14 municipalities. The whole system (lake and catchment) is the heart of a conflict between local development and ecological preservation needs. The northern area of the Sebkhia is industrialised and urbanised, while the southern area is mainly agricultural, with little infrastructure. Already in 1858, for the first time, the idea to dry up the Sebkhia was introduced, to obtain 32.000 ha of land for agriculture.

Although the Sebkhia is a Ramsar site, it is mainly considered as a wastewater receiver and as an unproductive area, with no consideration of its ecological value.

So far, the Sebkhia has only been targeted by sectoral interests; this partial vision is a main constraint for any integrated development plan. The management needs of this area have been discussed several times, but nothing has ever been decided. Also recently, in 2002, the Ministry of

Water Resources addressed again the issue, and launched a comprehensive study to find an adequate solution to the Sebkha management problem.

3.1.2 Croatia

The Cetina watershed is shared between Croatia and Bosnia Herzegovina. Cetina River, for its morphological characteristics, is widely exploited for hydroelectric production. This case study in fact shows a particular example of conflict between hydro-energy exploitation and environmental conditions of the river.

Two big reservoirs have been built to supply five Hydroelectric Power Plants (HPPs). From the first (and smallest) HPP that was built in 1912, the river flow started to be “controlled”, but this caused strong impacts to river habitats, to biocenosis and to the sediment supply for the coast.

If a high regulation of the river flow could offer some advantages, like a flood control and more defined water availability for agriculture, domestic, and industrial uses but, clear impacts were produced on biodiversity, on sediment supply and also on the landscape, that affects tourism.

Moreover, Cetina watershed is used for water supply of Omis region and the islands of Brac, Solta and Hvar, and also for irrigation, although supplies are considered as unsatisfactory.

The river is also a wastewater collector. Most Croatian towns still do not have proper sewage systems and treatment plants, while the largest towns in Bosnia Herzegovina do not have them at all. That is why all run-offs from agriculture, industry, urban and polluted areas are discharged into the river.

3.1.3 Egypt

The case study presents the Toshka Mega Project at the south of the Nile Valley of Egypt. The project is not yet completed. The impact assessment identifies the following as possible negative impacts that may need to be further studied and mitigated for: decreasing annual discharge downstream the High Aswan Dam on water level for intakes of existing water uses downstream; impact on power generation and power use; impact on navigation; impact of decreasing river assimilation capacity (dilution effect) which may affect water quality downstream the High Aswan Dam; impact of the exploiting more natural water resources; impact of reduction in fresh water discharge to the sea on seawater intrusion in the delta, and biological life downstream.

3.1.4 Greece

The report presents the local case of Paros Island, and has highlighted the conflicts between tourism and agricultural sectors. The main water stress issue is the peak in demand during the summer months, due to the high tourist influx onto the island. The existing infrastructure capacity is stretched during that period and is often insufficient to cover demand at peak times, leading to temporary shortages that in return are damaging the tourism sector.

These uses lead to a reduction of available groundwater and to the water pollution due to the wide use of pesticides. It is to note that agriculture is also related to tourism, as the crops are selected according the request of the tourists, in particular vineyards for wine production. These crops require a lot of water (in competition with domestic and tourist use) and pesticides, also due to low efficiency in irrigation technologies.

3.1.5 Israel and Palestine

The case study regards the Dead sea Basin, having a size of about 44,000 km² and shared by Israel, Jordan and Palestine.

Current economic activities in the basin are industrial (mineral extraction and water bottling), tourism and agriculture. Besides its regional importance, it has global relevance as unique habitat wildlife and a global cultural heritage site.

Wastewaters from local domestic, agricultural, industrial and tourist activities flow directly into the Dead Sea. Raw sewage flows into the Dead Sea from Jerusalem-Bethlehem urban areas via the Wadi Nar. Water shortage and land degradation constitute the main problems all over the basin and are likely to exacerbate with population and economic growth.

The Dead Sea is suffering of declining water level because of decreasing freshwater inputs, due to a lower discharge from Jordan River and increasing water use from natural spring and aquifer. On the top of the reduced freshwater input, more than 200MCM/yr water is pumped out of the Dead Sea into evaporation ponds. As a result, the adjacent aquifers are seriously affected; sinkholes have been opened along the shoreline, caused by lowered water tables and groundwater over-exploitations. The decline of the sea level has already produced effects on tourism.

It is to remark that in all three countries development policies have disregarded impacts on environment, small farms and indigenous people.

3.1.6 *Morocco*

The local case study described in the National Report does not refer to any intersectorial conflict for the use of the available water resources. However, we would like to report another problematic case in Northern Morocco, in Zaio irrigated area, regarding the poor access to water supply for rural households. Gaps are often filled by private vendors, mostly without any licence and at high prices: "Together, water sellers would use their engine or a separate pump to lift 200,000-250,000 m³ of water out of the canals for the Zaio region annually. While the cost of irrigation water is some US\$ 0.1 for a 4 m³ tank, it is sold for US\$ 3 at a distance of 1-2 km from the canal. With the distance, the market value increases and the price of one tank could go up to US\$ 20 and more than 10 km away from the canal. In times of drought, the price may raise further and even double" (Boelee and Hammou 2003, p. 39).

3.1.7 *Portugal*

Within Caia catchments, most conflicts fundamentally arise during the periods of low rainfall. More than 95% of waters are used to supply the agricultural irrigated areas.

During the shortage periods, availabilities from the Guadiana River cannot satisfy the various sectors requiring water: thus a competition between domestic, tourist, agricultural, and ecological needs arise.

Local farmers can accept to receive less water if this has to be used for domestic uses. On the other hand, they are less keen to accept any reduction for ecological purposes or for urban uses. However, problems are not only caused by quantitative deficiencies, but also for the poor river quality, deriving from the intensive cultivation and for some shortcomings in the treatment systems of urban and industrial wastewaters.

3.1.8 *Turkey*

The Gediz Basin in Western Turkey has changed considerably in the past decade, moving from a comparatively water rich basin to one that is now closing.

Irrigation currently uses a large share of the surface water resources of the basin. The first modern developments occurred in 1945 with the construction of small barrages, which were enforced later on 1970 by the construction of reservoirs systems.

Until 1988, the basin was sufficient for irrigation needs, flood control and hydropower; but a serious drought of 1989-1994 caused a start of disputes between different sectors (power, irrigation, flood control, urban and domestic supply) and the onset of significant groundwater exploitation.

Current freshwater allocations are primarily aimed at providing reliable waters to the Irrigation Associations in the large irrigation systems. Hydropower generation has no priority and uses only water that is to be released for irrigation.

Few and poor quality surface water arrive in the wetland of Gediz delta. Heavily polluted wastewater discharges from urban areas and industries within the basin seriously degrade the

quality of surface water. Much of this water is discharged in surface water, with clear impacts in terms of colors and smell; in some areas, farmers have also accused health problems to their skin; however those freshwaters are used for commercial crops (cotton, grapes and fruits) as no alternative is seen, as the lower delta has only unusable saline water. 60 percent of surface water and 30 percent of groundwater are in IV class according to Turkish water quality classification (highly polluted).

Polluted waters also percolate to groundwater. Groundwater supplies a quarter of the overall local demand, especially for drinking water to the urban centers, including Izmir, and to supply industrial expansion in the Nif Valley. As for irrigation purposes, massive investments were made both by government and private individuals as a consequence to the drought. The same was done by the industries. The exact number of pumps and the volumes of abstractions are not known, but have been estimated, and the impact on groundwater level is a matter of concern, also for contamination of surface waters in the basin. The provincial and district governors (appointed by the ministry of interior) are unable to apply and enforce sanction and penalties on violators of wastewater discharge.

The irrigation demand from the river has decreased for the scarce releases of waters from the reservoirs and because of a change of cultures, and particularly an increase of grape cultivation, and the recent surge in interest in drip irrigation. But the non-agricultural demands grow rapidly.

Another particular conflict to note in the Gediz, is between irrigation demand and water requirements for a bird sanctuary of Kus Cenneti, a Ramsar site. Agricultural demand takes priority over the needs of this wetland, which continues to shrink.

3.2 Competition among stakeholders groups

Each competition or conflict among uses is directed by one or more stakeholders groups. They are competitors either for different uses or for the same sectorial use. In this section there is a description on the “actors on stage” and the ways in which their dynamics are expressed.

A gender-related analysis has not been possible, as the National Reports did not provide information on this topic.

A social-related analysis, considering social clusters differentiated by economic capacities, but also by cultural identities, including ethnic and religious aspects, has only been provided by the Israeli-Palestine report and not for other case studies.

3.2.1 Croatia

The Cetina River and the coastal spring fed by the river are highly polluted because of lack of treatment of the water reaching the river from cities, villages and industries. The problem could have wider diffusion because of the karstic environment, creating strong connection between several groundwater streams and the Cetina river. The Cetina watershed has been estimated as covering an area of about 4,000 km², of which at least 2,700 km² flow underground. Impacted population from river pollution include 500,000 residents and 200,000 tourists.

In the upper part of the watershed, the dominant economic activities have been related to industry, mining, electrical supply, trade, catering and agricultural production. In the lower part, in the coastal area, industry, trade and tourism are the dominant economic activities. However the main use is connected to the hydroelectric production; therefore, public opinion, green associations and downstream users have called for changes and improvement of the river conditions.

The key stakeholders in this sector are the Ministry of Agriculture, Forestry and Water Management, the Ministry for Environmental Protection, Physical Planning and Construction, and the electric public company Hrvatska elektroprivreda. They have authority, assigned by law, to make the final decision. But a strong role has also been played by the local authorities for two main reasons: because of their interest as they are owners of water supply companies, and because of their institutional role, to protect local communities and businesses that benefit from the river resources.

Studies on Environmental Impact Assessment have been developed along with Studies on Impact on Downstream Users. After public debate and agreement a new operating regime of the HPP on the most critical section of the river (from Prancevici storage to the sea) has been accepted. The minimum river flow is thus increased in the critical period, assuring a reduction of harmful effects on the river ecosystem and enabling the use of the river for other purposes than hydroelectric production; in particular, for irrigation provision which has been so far unsatisfactory.

3.2.2 *Egypt*

Regarding the development of Toshka project, although there is no conflict expressed, some could arise between the government and the farmers' communities, depending on people's willingness to emigrate from over-populated old lands to deep Southern and remote areas, far from their lands of origins. The project aims to establish new agricultural and agro-industrial communities in the project area, and reduction of expected chances of health diseases that may be associated with further increase in population density in old lands (neighboring areas). In fact a priority of the government is to expand the total inhabited area of Egypt to accommodate natural population growth, by redistribution in new equipped lands, which were previously deserted.

The absence of potentially interested farmers among the stakeholders groups is probably for the reason that the government has not precisely identified them yet. However the stakeholders mapping table shows that farmers' groups, considered as "youth", have little influence, while substantial influence is assigned to mass media, parliamentarians, national ministries and investors.

3.2.3 *Greece*

In Paros Island both agriculture and tourism have the request peak in the same period, thus they compete for water use. The Union of Agricultural Associations points out that the farmers would have more water at the same low price while the Union of Room Owners asks for more water, also for swimming pools, very appreciated by tourist, and higher quality.

3.2.4 *Italy*

The proposed case study concerns the water management under responsibility of the Consorzio per la Bonifica della Capitanata, in the Northern part of Apulia Region, Southern Italy. This is the most important Consortium in Apulia, in terms of irrigated area and crop water requirement. Since the available water is not sufficient to meet crop water demand, the Consortium has been obliged to act in different directions to save water and promote a more efficient and sustainable use of water resources.

However the imbalance between demand and supply remains a problem, caused by the incomplete execution of supply works, the continuous reductions in unit discharge due to an increasing municipal demand, and the change in the cropping pattern. Thus conflict for water uses arise among farmers and domestic users in the scarcity period.

A debate regarding the construction of new infrastructures, as new dams, has been another relevant source of conflicts: between the regional administration and the consortium, regarding the raising of funds for new investments; and between the Consortium and the environmentalists together with the Cultural Heritage Service, for the negative impacts that new infrastructures might have on the environment and on the archaeological heritage of the area.

The problem arises also because of a lack of communication and information: for example, municipal or provincial maps of archaeological sites do not exist. Probably, if information about archaeological sites and environmental values were available, greater awareness about their values and bigger involvement of local population would be enhanced.

3.2.5 *Lebanon*

The local case study concerns Damour River and Damour Village. The river constitutes a shared resource for several villages. This fact triggers conflicts among its upstream and downstream users, especially for the absence of a legislative framework that could ensure a fair water distribution among its users. In particular, upstream farmers are accused to overexploit and deteriorate the river quality. Their behavior has also consequences for the coastal agricultural plain suffering from lack of sufficient water.

A conflict about groundwater uses has arisen between the Municipality of Damour and the Beirut Water Authority (BWA), which has realized a transfer of water to supply the city of Beirut. This fact cannot be accepted by the local government of Damour, as groundwater resources are overexploited for the benefit of the capital city, while in a particular area of the Municipality, in Saadyat, poor populations are suffering for lack of access to piped water networks. The municipality is concerned with increasing salinity of groundwater but does not have even access to the records of BWA to monitor the water being pumped.

3.2.6 *Morocco*

The local case study considers Tadla irrigation scheme. This perimeter is part of the Oum Er Rbia basin and hence it is administrated by the irrigation agency of Tadla (ORMVAT) and by the Oum Er Rbia River Basin Agency. In line with the law on water management law of 1995, Municipalities and Farmers Representatives (109 cooperative institutions regrouping about 18,056 farmers) are also involved, to elaborate a participative decision on water management issues. The water distribution is decided yearly by ORMVAT on the basis of the water volume stored in the dams at the beginning of the season. This decision is announced to the water users association, at the beginning of agriculture season, however the allocations could be changed during the season, according to meteorological conditions. This fact practically impedes farmers to discuss the decision made by ORMVAT or to give any feedback in order to adjust the distributions.

Another weakness derives from the lack of information exchange between ORMVAT and the Municipalities about consumption rates expressed by different users. This fact actually reinforces a conflict for spatial distribution of water between upstream and downstream users. They show different pattern, either for access to water facilities, or for the dimension of cultivated surface and crops. Downstream are mainly small farmers (0.5-3 ha), using irrigation for auto-consumption, while upstream there are medium and large farmers cultivating cash crops. The problems arise especially during the shortage period. Although informal forum gathering all water users association was established by ORMVAT, no explicit discussions take place about the issues creating tensions between Large-Medium and Small farmers. This situation creates particular frustration among downstream users.

3.2.7 *Portugal*

The lack of adequate regulations concerning the transboundary uses of Caia river for farming and tourist sectors, leaves free ground for the occurrence of conflicts among Spanish and Portuguese farmers, and between various institutions: the National Institute for Water (INAG), responsible for the ordnance of the dam, the municipalities, which have to treat and distribute the water supply, and the Caia Irrigation board, which is responsible for the distribution of water in the dam. Among these stakeholders, environmental NGOs are not strong enough to obtain that the farmers accept to respect the environmental needs of the minimum vital flow.

3.2.8 *Spain*

Historically, two groups of users are in conflict over the water use in the Tagus basin, particularly during drought periods: the urban water supply companies and the irrigators.

3.2.9 Syria

The example presented by the Syrian report regards Asnober basin. Part of the water is used for domestic, agricultural and industrial purposes, a part interacts with groundwater and the remaining amount flows into the Mediterranean Sea. A main reservoir serves the irrigation demand, while a new one is planned for purposes of flood control. No information is provided on environmental values of the watershed.

In the report it is clearly stated that stakeholders preferences give the first priority to domestic users (that currently are using 10% of total water) and industrial (an other 10%) uses, as they are residual respect to the irrigation uses, that amount to the 80% of the water resources in Syria. The coalition between domestic and industries against farmers will be potential matter for conflicts.

Artificial water transportation in inter-sub-basin level, from the coastal basin to the Damascus area, has been assessed as "strictly required for fulfilling the serious water deficit in Damascus basin in near future". This might create conflicts between human and coastal ecosystems health.

3.2.10 Tunisia

The Tunisian case study concerns a zone of interdiction of groundwater exploitation.

Water resources of Djefara aquifer are essentially used for irrigation purposes. The intensive exploitation of the inshore aquifers of Djefara, in Gabes Governorate (South Eastern Tunisia) caused considerable resource decreases but also the deterioration of water quality. Based on several studies showing that intensive exploitation caused salinity increase and a serious marine intrusion in the aquifer, a protected area was created in 1985, which became an interdiction zone in 1987 due to a high proliferation of wells.

This decision has raised a conflict between the State management institutions and the farmers who where using the resource. The population of the region does not accept to be deprived of a resource for which they feel ownership. Therefore, the informal and uncontrolled exploitation of Djefara aquifer by private wells continues to hardly deteriorate the chemical quality of water.

For this reason, a tense relation has been developed between the Governorate and the Regional Commissariat for Agriculture Development (CRDA), and the final users, grouped in associations (AIC), and mainly limited to the control of water abstraction and infraction of the protected area decree. In some cases, technical assistance is also provided by CRDA to farmers, upon request by AIC.

3.2.11 Turkey

There is an increasingly apparent need for a unified coordinating mechanism to allocate water among irrigation, urban demand, industrial requirements and environmental protection. The main problems regard a continuing struggle between older established institutions dealing with water resource development and water allocation, and emerging institutions concerned primarily with water quality and environmental issues.

In reality, the need for protection of the Gediz Delta ecology is not adequately represented or protected.

The Irrigation Associations, established during the past five years to assume Operation & Management responsibility for 110,000 hectares of large-scale irrigation systems in the area, call for a real involvement within the wider debate of water resources allocation and management.

There is a need for clear rules assigning responsibility for setting water quality and quantity standards and to monitor actual conditions, and for sufficient political power and will to sanction violators of the standards.

3.3 Risks and vulnerabilities over sectors/territories/actors

After having described the factors of competition or conflicts and the stakeholders groups who have expressed them, this section aims to assess the resulting impacts, in terms of increased vulnerability for specific sectors, groups and/or areas.

3.3.1 Algeria

The Great Sebkhha of Oran has been fully marginalized as it has been considered only for its function as discharge area for urban activities. The dominant idea was to grow urban extensions and infrastructures, in contrast with any preservation opportunity as sustainable planning has been lacking.

Another factor of degradation derives from the unsustainable development of the urban, industrial and the agricultural sectors, which have caused a heavy deterioration of soil and water, with a particular high salinization.

The concerned populations are normally out of the decision process. Although the Government officially called for a public participation for decision-making regarding the Sebkhha planning, in reality the contribution of both civil society and scientific community has been weak, if compared to the weight that public institutions have kept.

3.3.2 Croatia

The Cetina river case shows an experience of successful involvement of stakeholders at several levels that would solve, at least partially, a situation of risk for the environment and public health. The commissioned environmental Studies, the debates and consultations have induced the HPP authority to accept the other users requirements.

However, the influence of the electric company remains strong: as the reduced utilisation of the flow at Zakucac HPP would reduce the energy production, the erection of a new small hydroelectric power plant, at the point where water is diverted, is foreseen.

As for the pollution issues, unfortunately from the report it appears that they have only been addressed by a greater dilution of the wastewaters arriving to the river. Thus the risk is still present, even if lower, as no solution has faced the problems at the source. A more comprehensive Water Resource Management Plan is thus necessary.

3.3.3 Israel

As for Israel, the report mentions the effect of social dynamics among ethnic groups in terms of their relative access to water resources, in the same way they are expressed for access to wealth.

Arab Israeli farmers, who cultivated over 10% of Israeli's crop area during the Seventies, received only 2% of water allocated to agriculture, while the allocations mainly favoured Jewish farmers. This disparity has been reduced since then, but Jewish per capita utilisation of water remains almost 3 times greater than that of the Arab sector today.

The ultra-orthodox (Haredi) community also has relatively low per-capita water consumption rates. In general, income is positively linked to water consumption in Israel.

As for non-productive consumptions, lawns and gardens ultimately remain the key factor behind the higher per capita consumption rates among higher middle and upper class Jewish households.

3.3.4 Lebanon

The conflict for exploitation of water resources in Damour has increased the risks for the displaced communities residing in illegal dwellings of Saadiyat area. They have not enough money to buy the water from the aqueduct and therefore recur to private wells, with the result to further contribute to erosion of the aquifer, which in fact suffers for a severe marine intrusion.

Furthermore, the entire Municipality is at risk for the groundwater deterioration caused by the Beirut Water Authority's exploitation. The conflict worsens the marginality of Damour Municipality, which has no opportunity either to control or to limit this external use.

The lack of suitable regulation framework does not allow the local government to control water pollution, both from localised sources, e.g. from the olive oil industry, and from diffused sources, generated by agricultural fields.

3.3.5 Morocco

In Tadla irrigation scheme, the lack of real coordination among stakeholders about water allocations and uses, despite formally foreseen by the 1995 law, results in a weaker condition of access for small farmers allocated downstream. Their poor economic conditions impede their access to technological solution that could allow saving water, as it is already the case for upstream farmers, who already use drip irrigation. Thus downstream area of the scheme is less developed and equipped than upstream area.

It is worth mentioning another example emerged in a parallel study conducted by the authors in the Sebou basin in Morocco (Minoia, Brusarosco 2006), where the development of a region, the Gharb Plain, has been developed at the expenses of another one, the Idriss I^{er} area, from which local water resources have been collected and canalised in order to serve the core area. This type of development derives by a national policy that concentrates water facilities and other infrastructures in some core areas, by transferring and capitalising resources originated in other areas, becoming peripheral and weaker.

Moreover, Doukkali (2005) shows that both Sebou and Oum Er Rbia basins (in which Tadla is located) are subject to interbasin transfers to expand irrigated areas in dry regions, and towards the highly populated basin of Bou Regreg, where big cities like Rabat and Casablanca are located.

3.3.6 Palestine

The critical situation in Palestine shows its marginalized condition if confronted to the Israeli neighbour. Official figures show much lower water availabilities per capita for Palestinians than Israelis, respectively 100 M³/year and 350 m³/year. Agriculture is a far smaller consumer of water in both Jordan and Palestine than in Israel. In many cases, untreated sewage water is used as a source of irrigation despite certain regulations on the use and treatment of such water.

During periods of curfew, water delivery becomes a critical issue for all Palestinian citizens, regardless of socio-economic class. Basic access to drinking water becomes the primary focus of households. Showers and personal hygiene are delayed so as not to waste valuable water. As bottled water is too expensive for most of the population, tap water (or delivery in trucks for the 200 villages that remain without running water) is the critical resource, and during summer months, supply is sometimes interrupted.

Palestinian communities without access to running water are typically more indigent and rural. They are more vulnerable to contamination of springs, which provide a sole source of water for the 200,000 people in these villages. There are growing number of reports of utilization of polluted streams by Palestinians, notwithstanding their classification as a resource unfit for consumption.

3.3.7 Syria

Marginalized groups are poor urban dwellers. Apparently because of inefficient irrigation uses, some community groups have no access to safe water, which they have to buy from private vendors, bringing fresh water by tanks on car. This problem will not be solved by farmers, who would not decrease their consumption rates as they already consider receiving poor allocations.

To solve this problem, there is a plan to realize intra-basin transfer of water from the coastal basin to Damascus; however this could engage erosive processes on the coastal watershed.

3.3.8 *Tunisia*

Despite the establishment of an interdiction zone for limiting the erosion of Djeffara aquifer, new illegal wells are continuously created. These actions do not only constitute a legal matter, but are creating a substantial problem, as they increase the risk for the final users. By this way, farmers become more and more vulnerable, because of the increased salinization and marine intrusion in the aquifer.

3.3.9 *Turkey*

The sectors and areas at risk for effects of water pollution are: public health, affordability of increasing water costs (because of treatment), and wetland ecosystems.

Public pressure and support for reforms are limited because of a low public awareness of the problem and its impacts. For this case study, it is evident that the interest for the environmental health of the basin is not represented.

Except for large-scale irrigation schemes, current and future water demand is not forecasted, either in terms of quantity, timing or quality requirement, and this makes allocation decisions more difficult.

The extension of possible groundwater contamination is unknown, as well as the real amount of extracted water. It is foreseen that, if these conditions do not change, conflicts could increase, due to the rudimentary water rights system and the lack of integrate planning, since assessment of resource is still made separately for surface and groundwater sources.

4 Conflicts generated by poverty and non-adapted modernization processes

This chapter analyses some basic elements causing inadequate and unsustainable exploitation of water resources by local communities.

Conflicts can arise from a competition among scarce resources. In some cases, water resources could be substituted by alternative sources (water treatment and reuse, desalinization, water imports, *virtual water trade* etc.), according to the available opportunities and capacities to pay for each alternative choice. Some richer countries, which suffer from *water stress*, have covered part of the gaps by these means, while in poorer situations, scarcity persists.

Despite declarations expressed by National Authorities, in line with the current global conventions, to favour demand management options in order to allocate water rationally and to save water, in many countries, also within the Mediterranean area, it is still visible the old-style approach that prefers to rely on supply management policies by establishment of large infrastructures. Declarations of water strategy goals in Morocco during the past decades, like "Irrigation of one million of hectares by the year 2000" (1973), or "Building a dam every year until the year 2000", show that the aim is to ensure water availability between the cyclic periods of drought and to expand the farming districts; but unfortunately no sufficient attention is paid to the related impacts on local communities, their livelihoods and local ecosystems (Minoia and Brusarosco 2006).

4.1 Conflicts generated by water stress or water poverty

The water scarcity issue cannot only be reduced to a problem of *physical scarcity*. The problem of equal access for all in many countries around the world is not only significant in conditions of water stress (a ratio between the total volume of water, theoretically available in a country, and the total internal population), as below the threshold value of 1000 m³/year/per capita), but also in situation of theoretical abundance. Thus the problem is also caused by an *instrumental scarcity*, meaning that financial resources, adequate facilities, effective access to the resource, institutional response to community demands, monitoring and control of contamination processes, etc., are missing. The lack of sufficient water resources for the development of all human beings reflects the asymmetric social relations among groups using those resources for their productive and reproductive needs (Raffestin 1981).

An interesting indicator, more complex than the *water stress index*, is the *water poverty index* elaborated by Sullivan and Lawrence (2002), as it relates various elements (resource availability, access, local capabilities, sectoral development, and the environment conditions) that can either impede or enforce the capacity of a community to access water and use it efficiently for the purposes of local sustainable development.

Moreover, the concept of *access to water* has been focused (Scanlon *et al.* 2004), as constituted by three elements: *effective access* to a physical source by a reasonable distance, at a reasonable cost, and ensured by legal and physical access; *adequate quality* and *sufficient quantity*, that for domestic consumption has been calculated of 50 l per day (Gleick 1996).

In line with this approach, this section will focus on some information provided by the National Reports, in order to recognise situations of physical scarcity from others of instrumental scarcity or water poverty.

4.1.1 Croatia

The insufficient availability from the Cetina River to meet the farmers' need is not due to a physical scarcity, as the river has a minimum flow capacity of 4.5 m³/s, but from excessive exploitation for

hydroelectric purposes, and an insufficient network for water distribution into the fields. In 1988, a partial improvement of canalization in Croatia allowed irrigating 2,000 ha. In Bosnia Herzegovina the irrigation systems remain undeveloped and rely on local resources, while waiting for adequate facilities, which have been planned, but not yet implemented.

4.1.2 Greece

The island of Paros is characterized by a temperate Mediterranean climate with an average rainfall of 480mm. The main reason for stress is given by seasonal shortages during the summer months, when precipitations do not exceed 5 mm/month, but tourist presences are at their highest level. In the summer period there are 54,000 presences against the 10,000 resident people. The development of the tourism took place without planning and control, therefore the seasonal water stress is also related to an infrastructure deficiency.

4.1.3 Israel

In Israel water scarcity is only felt as a matter of physical scarcity, which can be overcome by other options. The Report states: "Better educated people are invariably better off economically and are inclined to use water more wastefully, because they have the means to do it"! Technological equipment to save and treat waters is not an issue in Israel, which can rely on capital-intensive drip or micro-sprinkler systems and desalination.

4.1.4 Italy

The imbalance between water demand and supply is one of the major reasons for a constant conflict among users, both within the agricultural sector, and between the agricultural *versus* the domestic sectors. Farmers have been asking for a new dam, but since the selected area is also an archaeological site, the procedure for the new construction has been suspended.

4.1.5 Lebanon

The national situation points out water losses in the aqueduct network (25-50% in winter and 45-61% in summer) for lack of maintenance, and inefficient water use in agriculture, with a large amount of water wasted in surface irrigation. It is important to note also that the political instability in Lebanon during the Eighties led to the displacement of the majority of the Damour population. This caused the loss of the human and financial resources that were essential for the development of the area. The National Report says that the relatively more stable situation could induce displaced population to return to Damour leading to large increases in water demand levels in the area; but unfortunately the current war is producing new and more serious constraints.

4.1.6 Palestine

In a number of documented cases, in Palestine there is an enormous quantity of wasted water for leakages in the delivery systems, with 30% loss of local waters attributed to leaky pipes. Jordan suffers from similar problems. Official statistics regarding the Palestinian Water Supply distribution for 2003 show that in Jenin and Tobas districts the average supply per capita does not reach sufficient quantity per capita (Issa 2005).

4.1.7 Portugal

The shortage periods deprive Guadiana from sufficient waters, and water stress causes conflicts between social (domestic uses), economic (irrigated agriculture) and environmental needs.

4.2 Conflicts about traditional wisdom and conventional modernization

This section introduces another particular type of conflict, for which a long-term historical view is necessary. Conflicts can derive from a transfer of technologies, mainly imposed over the used indigenous tools. These are usually abandoned as considered as obsolete; while the new ones are directly introduced, without any tentative or progressive adaptation within the local contexts. Together with the technologies, also traditional knowledge and social organisation systems, although supporting local livelihoods, automatically became obsolete and with no doubt, they are simply substituted by “modern” ones.

In all Mediterranean region and the Middle East, various technologies were used for water leverage and distribution, like the *saqia* or water-wheel in Egypt, lifting water and pouring it in irrigation channels, or like underground tunnels bringing water from aquifers by gravity to cultivable soils in depressions, like *qanats* in Syria and Jordan, *foggara* in Algeria, *khattara* in Morocco, *galerias* in Spain etc. (Laureano 2001). These systems were introduced in ancient times (archaeological evidences date *qanats* from Roman times, Wessels 2002) and persisted for centuries, but have recently become marginal (though some are still utilised), respect to technologies and big infrastructures introduced during the colonial times, like mechanical pumps, dams and large irrigation networks, then inherited and enforced by the new independent states. The new technologies have caused a great discontinuity in the social organisations of rural communities and have increased their vulnerability to external factors, creating a particular dependency on energy sources, fertilizers, credit etc. The problems derive from the absence of basic economic and social services and networks, which are consolidated in market economies but not in subsistence economies. Changes have then occurred within social organisations, and local systems became less resilient.

Besides the social and economic changes, the new technologies have caused relevant environmental impacts. For their increased capacity to lift volumes of water, the new tools (pumps, water pipes etc.) have induced greater pressures on local resources, particularly on non-renewable groundwater, without consideration of the recharging time. The local communities have lost capacity to deal and care their environment, which is shocked by external and greater forces.

Their traditional hierarchies (chiefs, institutions, customary laws) cannot adequately respond to these dramatic changes, and are mainly substituted for these tasks. If for instance, it was the head of the village to make decisions regarding a *khattara* and deriving channels, with the event of large irrigation schemes, new regulations intervene and decisions implemented by administrations that are far away from the water users.

Until late Eighties, the predominant central governments had to deal with any question related to water, according to their agenda and planning schedule. During the last decades, the tendency is to decentralise powers, also on water issues, due to objective difficulties for the States to maintain real control over all networks. Therefore, the State irrigation schemes and Water Utilities, also due to incentives from the World Bank, are more and more privatised (Ahmad 2000). But some peripheries are not self-sufficient and does not attract any investors, and rather need assistance. The reality also sees a great migration pressure from the rural areas, which makes young people giving up their efforts to maintain and develop their lands.

For those who remain, social conflicts have arisen, in particular between the management board of the water providers for irrigated areas, and the rural communities, in some cases grouped in farmers' associations. These are clearly conflicts related to a lack of means to ensure local *governance*.

4.2.1 Greece

The change into the economy of the island has led to change in the traditional system of storage to save rainwater. Reservoirs have been abandoned both for the greater richness of people, thanks to tourist economy, and for the use of all available space to build rooms to rent.

The tourist operators have asked for more water availability and since the State did not plan reservoirs, citizens made pressure to obtain new public drills, from where water was intensely pumped. Such activities led to aquifer depletion or salinization.

4.2.2 Morocco

Morocco still has several *khattaras*. A research implemented by our team is focusing on the Tafilalt area, where they decreased their importance from 1971 as changes in water distribution occurred after the construction of a new dam; however some are still active (Lightfoot 1996).

In May 2006 a disastrous storm event happened in the oasis of Hassilabiad. There were national and international calls for assistance, in order to re-establish the situation before the damages, and particularly to solve a water emergency, as the event destroyed part of a *khattara* and the deriving canals that are used for irrigation of local fields. However the real constraints seem to be more related to human resources than to financial capacities. Local labour could have solved the situation, as in the past; but there is a clear difficulty related to the young generations' lack of willingness to work for rehabilitation of the networks. The reason is that they do not consider their intervention as cost-effective, respect to their work that is not anymore related to farming. This is seen as a residual activity for basic livelihood, but not providing interesting revenues, compared to the tourism development that is more and more promoted in the oasis. Moreover there is a weak sense of ownership of the oasis, due to the orientation of young people towards migration, particularly towards European countries.

4.2.3 Palestine

The traditional Palestinian reliance on rainfall and streams, instead of irrigation-based agricultural sector, is motivated by a poor infrastructure capacity; however Palestinian experts consider this to be an ecological advantage. This makes possible a local water control still to be performed, and water allocation for agriculture to be socially determined. Unfortunately, these systems are under threat, as centralised authorities, such as the Palestinian Water Authority, begin to assume control.

4.2.4 Tunisia

The report mentions that the decision about sites and features for construction of new infrastructures, and for the related social organization, is imposed by the public state to the impacted populations, which have lost a relevant part of their hydraulic ability. There is a real difficulty in finding a general consistency of their development pattern, which explains the current difficulties to finalize the decentralization phase initiated by the State, which has lower capacity of capillary intervention.

4.3 Conflicts between economic and non-economic values

This last section presents local cases showing another implication of the current modernisation trend, and related to the consideration of water resources for their economic functions (as productive input) and their related monetary value. In line with the Dublin Statement (1992), "Water is an economic good", which has highlighted the commodity rather than the patrimonial aspects, policies for privatisation of water services have been widely introduced, with new systems of tariffs to recover the management costs of the utilities.

This approach has not been fully accepted in all Mediterranean countries, and some stakeholders seem to suffer for increase of prices without any improvement of the provided services.

Other conflicts have also been caused by the extraction of excessive volumes of water for economic uses, while other non-economic values, e.g. environmental and health values, are not sufficiently protected.

4.3.1 *Algeria*

In the case of the Great Sebkhah of Oran, no global vision regarding the ecosystem, or any integrated management plan, have been seen. Water is exploited intensively and without careful attention to the effects on water quality or more generally to the environment.

The expansion of the city of Oran has been made at the expenses of the Sebkhah, by massive rejections of solid and liquid waste in this area.

4.3.2 *France*

This national report does not present a local case study referred to a specific watershed area, but proposes a thematic focus on water management in France.

The issue is relevant also because the bigger international water providers have their origin in France, thus it is interesting to analyze this system.

Nowadays more than 80% of national population is served by privately managed water systems. These private water companies are currently international multi-services industry and their activities go beyond the water management issue. By having acquired skills and know-how for more than a century, French water companies have gained great comparative advantage and settled a true oligopoly power.

In the report, four main options of contract delegation are described. They vary according to the following aspects: the degree of involvement of the private company, the risk sharing between the Commune and the private company, the degree of the private operator's autonomy and responsibility, the required capital investment, the contract duration and the contractual relationship with the costumers.

In any delegation case, the asset remains as property of the Commune, while the right to use it becomes private.

The growing delegation trend has to be related to several conditions: 1. Liability of the mayors has been constantly increasing due specifically to the 1982 Decentralization Act; 2. Firms have increased their technological know-how and may perform better than the local authority in injecting technologically, financial and managerial resource; 3. Private companies are more accurate in taking preventive measures about drinking water quality and wastewater; and 4. EU and National legislation standard, which are financially and technically difficult to meet, have led local municipalities to delegate their services.

Reaching this point, it could appear that this on-going privatization scheme cannot be controlled and can grow up without any bound. The counterpart of the private firm efficiency in the water management is detrimental to the public welfare, especially for pricing.

Water management lays on a natural monopoly basis, allocating freely to the private sector lead to unavoidable market failure. Once delegated, the public utility cannot turn back to direct management anymore. The report proposes that majors must maximize the welfare of the community in the delegation, but thus need a clear definition from a normative point of view; the contract formation has to be clearly understood; and the foregoing allocation of delegation to private firm has to be built in real competition.

This matter seems to deal with conflicts indirectly, however it clearly points out how the privatization process could be a way of no- or difficult return. A consequence of the current trend is a loss of a direct local public management of the resource, which is managed by external companies. A large public opinion has arisen in order to contrast this process, to defend the principle of water as a common good.

4.3.3 Greece

In the Island of Paros the demand grew significantly because of the tourism development. The central administration delayed the construction of new and large-scale infrastructures to increase the water supply, thus people of Paros made private and public drills, to satisfy tourism and agriculture needs. This new unsustainable pressure led to salinisation or aquifer complete depletion. The Municipal Office of Water Supply and Sewerage of Paros have started to intervene on the issues of management of water, in order to solve this problem.

4.3.4 Israel

Water policies in Israel have some elements of inconsistency with economic and environmental issues, for a priority given to religious and cultural aspects. An example is the logics behind the price subsidies to agriculture (farmers pay a low-base price for the first 50% of their water allotment; then the price increases for the next 30% and 20% respectively), which can be explained by the local culture and the Zionism ideology.

Zionism always elevated agricultural pursuit, encouraging "pioneer" immigrants to establish new settlements. The merits traditionally attributed to agriculture are justified, as they are a means of food security, and because of its role in stymieing land claims by Arabs, particularly Bedouins, establishing territorial claims in the periphery of the country and in the past, socialising immigrants and reducing unemployment.

Part of the reason can of course be attributed to the political elites, who dominate government decision-makers, and to the fact that, although agriculture is a declining sector (economic contribution of 3% of GNP and 2% of overall employment), it still relates to a rural lifestyle, that holds an central place in national aesthetics psyche. Therefore it is well accepted that agriculture still drains at least 60% of total water availabilities.

4.3.5 Palestine

Water prices are set at an artificially low level in Palestine in order to ensure universal access, regardless of economic capabilities. Bottled water, although widely available in stores, is only utilized by a small percentage of the local population due to the high (relative to income) associated costs. Tap water is sufficiently expensive, and unavailable to justify a variety of "collection" activities by local populations in both Jordan and Palestine, where individuals drive to springs or private treatment centres and fill up containers.

4.3.6 Syria

All water resources in Syria belong to the Government as public owner, and are managed by the Ministry of irrigation, unless special laws regulate the water supply for domestic or other uses.

A minimum vital flow is fixed in any stream.

Water tariffs are fixed on use. For domestic use, charges are fixed on the basis of the house size, while the presence of a garden or the number of people living in the house is not considered.

Price for industrial uses is fixed, based on the size of the plant and content of discharges, or, in case of public presence in the water service, on the basis of the personal revenues as contribution to the basic national service.

Agricultures charges are based on the size of the field and type of the crops

4.3.7 Tunisia

According to national legislation, the *Code des Eaux* (1975), water is a Hydraulic Public Domain and its utilization must respect rules of rational management of a National Natural Heritage. This makes it evident that at least theoretically, the public sector is keen not to release this natural resource according to the economic principles only.

It is interesting to make a confrontation of this principle with others proposed by international stakeholders, e.g. through a Report commissioned by the National Government to Bechtel, which

suggested to introduce the principle of water as a commodity: “It is necessary that Tunisia arrives to a truth of prices by an appropriate water tariffs policy, in order to progressively reach a total recovery of costs, including investment costs. Only by this policy it can be possible to effectively incentive all users to an optimal valorization of the resource and to ensure its conservation” (Bechtel 1999, p. 20, our translation).

4.3.8 Turkey

In the elaboration of drinking water and wastewater tariffs, the O&M, amortization, rehabilitation and expanding costs are generally considered. The profit rate is not less than 10% of all expenditures: this indicates that the water in Turkey is not being considered as a common good and basic need, but priced as a commodity, as a result of the recently introduced liberal policies.

However the system of pricing for irrigation is critical. Currently, a farmer who irrigates 1 ha of land pays the same fee as another who irrigates 100 ha. Fee collection should be based on the amount of water actually used by the farmers.

As for domestic uses, Ankara Metropolitan Municipality has introduced the system of “pre-paid metering”, allowing only those who pay in advance, to have access to the services.

5 Conflicts generated by public sectors strategies and institutional weakness

This chapter considers the territorial and geo-strategic nature of water. A theoretical framework for this issue has already been introduced: section 1.1. has focused on water as stake for international relations, while section 2.1 has focused on water as a stake for national development.

In the Mediterranean most situations have the State Governments as the main stakeholders, as water resources are considered as public properties. This is expressly mentioned in the National Reports for the cases of Morocco, Tunisia, Syria, Turkey, Israel and Palestine, but this principle is valid also for other countries, with an exception regarding France.

The international literature presents various cases of current or potential conflicts in the Mediterranean countries, either international or inter-regional within the national frontiers (e.g. Ward 1997); or the way how water facilities could be protected under international law as water facilities have been often targeted among the first casualties of violence, during war conflicts (Lorenz 2002); but only few of them have been reported by the National Reports as related to the local cases.

For instance, in Turkey the important interventions of the great Southeastern Anatolia Project for regional development by a capital investment including a system of dams (including the large Ataturk dam), increase of agricultural superficies and electrification, has caused reactions by Syria and Iraq, for the decrease of the Euphrates flow downstream. Moreover, the construction of Ilisu dam over the Tigris has caused international concern for the damage caused to a relevant archeological area.

As for Egypt, a Mediterranean country mainly depending from the African waters of the Nile, examples could be mentioned as consequences of its water strategy to solve its water stress by increase of water supply. The potential conflicts that could derive among the ten water-sharing countries have induced the creation of a cooperation network, the Nile Basin Initiative, already presented in section 1.1. A concrete case regards the Jonglei project in Southern Sudan, for drainage and canalization of waters from the Sudd wetland that is part of the White Nile ecosystem. The construction of the large canal was already stopped by Southern Sudanese groups, when the second Sudan war started in 1983; but recently, after the end of the conflict, the works have started again. The environmental impacts will be great, as denounced by international environmental organizations: the Sudd is considered as a unique habitat with high biodiversity value for plants, birds and big mammals; traditional livelihoods derived from grazing practices are also endangered.

As for national cases, are there competitions among regions? Is any region getting benefit from exploitation of water resources to the expenses of others? This seems to be the case in some of the National Reports. This is very clear for Lebanon, where the increasing water demand for Beirut is causing the drying up of Damour sources; and this is potentially happening in Syria, as waters will be drained from the coastal wetland of Asnober to increase supply for Damascus.

5.1 Geopolitical issues

This part will mainly treat the shortcomings and the critical aspects related to management of internationally shared catchments.

5.1.1 Croatia and Bosnia Herzegovina

The Cetina River is an example of transnational watershed. The geographical extension of the problems and impacts are wider than perceived, because of the large extension of the underground river, due to the karstic environment. Almost the entire "direct" part of the watershed,

meaning the upstream river flow extending until the Prancevici dam, belongs to the territory of the republic of Croatia, while the “indirect” sub-watershed, channeled by several underground karstic channels, is mainly located in the territory of the Republic of Bosnia Herzegovina (BIH).

Conflicts are expected because the two states have different interests: BIH is promoting an economic growth by increase of industrial production, and pays low attention to the environmental impacts; differently, also for Croatia’s interest to become a EU member, the country shows a stronger willingness to meet quality standards, in line with the EC directives on water pollution, and to guarantee the shares also for domestic, agriculture and tourist sectors, as clearly expressed by National and local stakeholders.

5.1.2 Israel and Palestine

The Report mentions a complaint from the Palestinian side, as expressed during two focus groups with Palestinian NGOs, denouncing the fact that the fast reduction of the Dead Sea waters is due to the unsustainable consumption rates by the other two riparian countries, Israel and Jordan. It is mentioned that in cooperation agreements, Palestine is considered by the other two States as a beneficiary but not a real partner; therefore Palestine has never signed any agreement. The same concern has been raised for the proposed project of Red-Dead canal, for canalization of waters from the Red Sea to the Dead Sea, followed by desalination plants to increase water availabilities for human consumptions; again, Palestine would like to enter fully in the agreements process. The same focus groups have expressed the need for an equal groundwater distribution between Israel and Palestine, while Israel is mining the resource.

Due to the strategic importance of this issue, and the conflict circumstances, the legislative systems in both countries are traditionally extremely centralized with little room for direct stakeholder input, although civil society in Israel, particularly through NGOs, is now starting having a role in most public issues.

The report indicates that Israelis are vaguely aware of geopolitical conflict in the area as a source of tensions regarding water allocations, while on the contrary these issues are extremely high in the perceptions of Palestinian communities, as demonstrated by the mentioned focus groups.

As for Israel, the Report clearly shows that the great support to agriculture, in terms of water consumption and subsidies (that keep prices very low for this sector), is highly political, as this sector does not contribute proportionally to the population livelihoods. Agriculture is a sector that has allowed land occupation. Recent survey data gathered for kibbutzim in the southern Arava reveal a strong attachment to ideological favoritism for agriculture despite the high usage of water and the minimal economic returns.

5.1.3 Lebanon and Syria

Bilateral agreements relating to surface water sources exist only for El-Kabeer and Aasi Rivers (and do not regard the study case) between Lebanon and Syria. They were signed by Lebanon and already ratified by the national legislation. However, the main part of these laws is not yet being implemented since: a) the responsibilities are not assigned to the concerned parties, b) the enforcement mechanisms are not developed, and c) the financial, human, and technological resources are limited. Besides, many of the prevailing laws lack the environmental standards and criteria, and are technically outdated and sometimes contradict the stated international legislations.

5.1.4 Portugal and Spain

Due to the geographic situation of the Caia river, the trans-boundary issue is particularly relevant in the Portuguese case study. Upstream farmers in Spain, especially during drought periods, are considered as responsible for excessive withdrawals, using most of available water: therefore the river arrives in Portugal almost dried. The Portuguese farmers have pointed out that their national authorities do not protect them against Spanish farmers pressures.

Another high pressure felt by the Portuguese stakeholders is due to hiker tourists that from Badajoz (Spain) come to Albufeira de Caia. They also strongly contribute to the water consumption and pollution, because some shortcoming in the treatment systems.

The Spanish Report deals with another transboundary river, the Tagus, whose importance is due because it provides the largest share of water to other basins; therefore the volumes in the basin are regulated in Spain, in line with the National Hydrological Plan. For instance, it supplies water to the Segura basin, a water scarce basin in the eastern Mediterranean area of Spain. Drought occurrence in the Tagus basin is relevant, because water resources usage is close to sustainability levels in several important regions, like, for instance, the urban water supply for the city of Madrid. The Tagus is located in the central part of the Iberian Peninsula, with the main river running on east-west direction, and covering an area of 83,678 km², of which 55,870 km² are located in Spain and the rest Portugal. A certain amount of water has to reach the river in Portugal, determined by the Albufeira regulation. This is a cause for conflict particularly during periods of drought.

Although bilateral economic agreements with Portugal are in place to share water resources, the management of transboundary rivers at times lacks transparency, and the exchange of information relating to biodiversity status is not sufficient.

5.2 Institutional conflicts

This section will refer to the institutional and regulative frameworks that have been put in place by the States in order to manage their water resources, but revealing shortcomings, duplications of roles and other weaknesses.

Institutional conflicts are in some cases caused by strong customary laws that are still followed and that formal laws are not able to fully substitute. Doukkali has well expressed this type of conflict, which referred to Morocco, but could be generalized: "The conflicts and tensions between the formal rules introduced by the state and the informal and customary rules that influence tribal communities and rural areas have continued since colonial times. But in many cases, formal institutions and even religious interpretations have tried to accommodate customary rules and practices as much as possible. Instances of that include the recognition of customary rights and free access to water even within the perimeters of publicly managed large-scale irrigation systems as well as the inability of the state to regulate groundwater withdrawals in privately managed irrigation systems. The private exploitation of underground water for irrigation is another example of the lack of capacity of the state to implement new regulations or to modify the prevailing regulations" (Doukkali 2005, p. 86).

5.2.1 Algeria

The Code des Eaux has addressed in several articles the protection of water resources in a general manner and referred to proper regulation through application decrees. Until now very few application decrees have been issued and as a result, several legal dispositions cannot be properly implemented. For instance, the only available standards are those related to industrial effluents, but they do not differentiate between the various types of industries and do not give alternative options to industries. With respect to the monitoring and the legal enforcement, other constraints are due to the fact that the inspectors in the Wilaya do not have the technical or financial capabilities to test all listed standards, hence monitoring have been limited to the most polluting industries. The limited equipment only allows monitoring of few water quality parameters, namely BOD, COD and suspended solids. As industries are not required to conduct monitoring and self-compliance, then only limited data is available regarding the quality of industrial discharges.

5.2.2 Croatia

Several laws are related to water and most of them are implemented but there are not efficient water management plans, either at national or at basin level. Moreover, the existing Master plan against pollution is not applied because of a lack of financial resources.

5.2.3 Cyprus

In Cyprus legal power on water related issues is spread between several Ministries and Departments, with some institutional difficulties. For instance, the Water Development Department and the District Offices execute overlapping jurisdiction and sometimes one authority takes decision without “tuning” with the other. The consequences are conflicting resolutions that do not contribute to an integrate management of water. Furthermore, there is no overarching “National Water Authority” that will resolve dispute arising among Government Departments.

Another matter of confusion is the recently introduced EU Water Framework Directive, that has just been translated into Greek and has become Cyprus law without any harmonization with the already existing legal framework. This will further contribute to create problems of overlapping functions and responsibilities and lack of efficient and integrated management.

5.2.4 Greece

In Greece the current legislation on water resources is in accordance to the European legislation. However the water law system is still old fashioned and widely scattered, thus permitting overlapping functions and insufficiently decentralized management responsibilities through regional organizations.

Since 1999 the jurisdiction over Paros water resources has been taken in charge by the administration of the Municipal Office of Water Supply and Sewerage.

The law shows relevant deficiencies in the capacity to face pollution cases; clear, systematic, uniform and enforceable pollution sanctions are not foreseen.

5.2.5 Israel and Palestine

During the occupation of West Bank and Gaza (1967-1994), Israel deemed all water resources in the Occupied Palestinian Territories as State property. In 1994, as an outcome of the Oslo Accords, the Palestinian Authority was created and in 1995 the Palestinian Water Authority (PWA) was established, having the mandate to manage the water sector, prepare and execute a national water policy, supervise and monitor water projects and enhance cooperation among stakeholders. A complicating factor in the functioning of the PWA is the issue of sovereignty over water resources. This issue has not been successfully dealt with between Israel and Palestine.

5.2.6 Lebanon

The Lebanese law governing the water sector dates back to the Ottoman and the French regimes. The archaic law and the “political instability” brought to a mismanagement of the water sector.

The law 221/2000 aimed at inducing institutional changes and assigning the responsibility to parties governing the water sector, but resulted in several drawbacks as generation of conflicting rather than complementary roles among the institutions.

For example, the Ministry of Energy and Water (MEW) is responsible for setting the National Master Plan for the water projects and has to supervise and coordinate all activities concerning water sector. However, such activities are not implemented because of lack of resources within MEW and because the law does not regulate any cooperation and coordination mechanisms.

The institutional conflict is present also in the specific case study, since the local authority (Damour Municipality) has no opportunity to control its groundwater resources, exploited by the Beirut Water Agency.

5.2.7 Morocco

As for Tadla irrigation scheme, the lack of communication could raise frustration among stakeholders, which officially are called to intervene in the decision process for water allocations; this weakness also generates other problems, related to overlapping of functions. For instance, stakeholders separately monitor water quantity and quality without coordination; no unified databases have been established, or other mechanisms for sharing information among users. This results in low efficiency and duplicates efforts.

Another example from Morocco, in Zebra irrigated area in the North of the country (Boelee and Laamrani 2003), illustrates how the state cooperates silently with informal/unauthorized situations, in order to distress potential causes of conflict for lack of rural drinking water supply: "More equivocal is the situation, when seasonal workers employed by the Ministry of Health, who normally treat wells in the rural area, provide chlorine and limestone to the users of *Jboub*" (water storage facilities usually filled with irrigation water; quot. p. 42).

5.2.8 Portugal

In Portugal there is a tradition of centralized administration, but in theory the water resource planning should be approached in an integrated manner and with a strong role of the Regional Directorates for the Environment and Natural Resources (DRARN). In practice, these Directorates have a lack of human and financial resources, thus the central structures and the sectoral agency (particularly the Institute for Water) keep playing a very relevant role, also at the regional level.

5.2.9 Syria

In Syria, some inefficiency derives from a practical difficulty to maintain a strict monitoring and control of water uses and abuses. Under the principle (accepted among the stakeholders and defined by national law) that most of water resources shall be the public property, the usage of public water is subject to approval by MOI, which acts, licenses and controls water uses through the Mohafazat office. The Mohafazats have a mandate to control illegal water use, like illegal digging wells and unapproved water use, by policing. However, the actual situation of increasing water use reveals that the Mohafazat office is not capable to ensure a real control of water uses.

5.2.10 Tunisia

In the report institutional weaknesses are evident, and show the difficulty to maintain a low level of groundwater exploitation. In general, although the national law foresees the involvement of the Associations of Collective Interest (AIC) at the local level, for this particular case study the main problems derive from the lack of their adequate involvement in the application of the decision related to the interdiction. The execution of the decision is highly dependent on the degree of agreement of the different members of the AIC. This shortcoming creates various effects.

First of all, there is no real control about water uses and particularly on new wells. The number of wells has increased from 45 in 1986 to 285 in 1996. The control of this activity shows a main difficulty related to the opposition of the owners to let the government officers to access their wells, and therefore they hide this exploitation, by covering the wells, and by limiting their utilisation mainly at night or weekends and public holidays (Brahim 1999).

Secondly, although the "Code des Eaux" presents some restrictions, in order to fight against water pollution and protect drinking water supply, public health, human activities of general interest and conservation of water out-flow, the articles 139 and 158 of the same law, regarding the sanctions in case of infringements to the mentioned restrictions, have not been implemented yet. The only administrative penalties that the government can apply against construction of new wells are considered as ridiculous and lengthy, and have not limited but rather amplified non-compliant behaviors.

Thirdly, the potential disincentives of large and inefficient uses, given by a recent elaboration of tariffs based on consumption rates, is made ineffective because of other national priorities, that compete with the saving water goals. One factor is the policy to support financially strategic

projects that contribute to the national economy, despite their impacts on water resources. As for the industrial sector, which is highly subsidised, the increase of water prices does not have any effect on used quantities of the resource or on quality impacts.

5.2.11 Turkey

The report denounce that institutional and legal deficiencies are great constraints for the solution of water allocation and environmental pollution problems. Legislation used in current management practices is too old and cannot meet current demand, which is growing fast.

Moreover, access to data is restricted and the debate on water quality is poorly informed and emotional, rather than scientific, making development of acceptable remedial measures difficult and contentious.

Water and land are considered public goods in Turkey. Shallow groundwater is an open access resource (it is only necessary the notification of use), while deeper (more than 10 m) aquifers are subject to some controls. In term of water rights, authorization prior to water use is not required and registration of water use does not exist.

Conflicts over water use are governed by local customary rules and regulation. If a dispute cannot be settled in this way, rights are settled by court decision.

In large basins, where impacts of new diversions are widespread, this system is generally unable to prevent or to solve conflicts by claimed prior rights, and this is leading to serious problems of over allocation in some basins. Rights to groundwater or surface water uses are not formalized.

Also for Gediz case study, problems derive from a large confusion and overlapping of rights, authorities and responsibilities of the actors involved in water planning. The poor coordination and cooperation among the three responsible agencies for surface water monitoring, wastewater discharge and enforcement of the standards, impede a true public participation, and has a huge responsibility over the deterioration of the surface water quality.

6 Tools for transforming conflicting views into cooperation

The previous overview shows that various conflicting elements of water management derive from inadequate systems of governance either at the local or at the international levels.

The “Report on Social Issues in Water Management”, also delivered under Nostrum-DSS project, mentions in fact that the “Global Water Crisis is also frequently a crisis of governance, resulting from the failure on determining the roles and responsibilities of public, civil and private interests, as well as of integrating policies and practices in the effective management of water resources and development”.

An issue for debate could be about the utility of DSS to solve matters of conflicts. Only few cases presented in the National Reports show that these tools could be concretely applied, for instance in Syria, where the WEAP River Basin Model software package was adapted for management of the Asnobar basin. This could help the decision makers to understand and identify the potential conflicts in managing and operating the existing infrastructures. In the case of Palestine, it was mentioned that, according to the focus groups, the current conflicts could only be solved by political means and direct negotiation, while there is a doubt about the effectiveness of technological tools.

International negotiation is the way to solve potentials for international conflicts; however dynamics of power are still expressed, thus some countries need empowerment in order to enter equally in the exchange; external support could then enter in the game, as for the mentioned case of the Nile Basin Initiatives.

Virtual water trade could also be seen as a way to solve physical water stress, and various countries of the Mediterranean basin are *de facto* using it by importation of agricultural products. For this, international agreements, peaceful relations and financial support for poorer economies, are needed.

6.1 International Cooperation

This section will present few cases that have been reported in the National Reports as international conflicts could be solved through international agreements. As for the case of Palestine, however, there is a basic problem of sovereignty that causes a main constraint for application of diplomatic tools.

6.1.1 *Palestine and Israel*

The Palestinian case calls for a need of international cooperation. The report is based on the findings of a national workshop in the West Bank (2005) that gathered all Palestinian governmental and non-governmental organizations to discuss issues relevant to the management of Jordan River Basin, including the Dead Sea and the proposed Canal connecting the Red Sea to the Dead Sea (Red-Dead Canal).

The Dead Sea is part of the Jordan River Basin and shall be managed by all riparian countries in order to promote, coordinate, supervise and control the planning, investigation and implementation of water resources development in the basin. This means that Palestinians must be recognized as a full riparian in the Jordan River Basin, have their rights in utilizing this shared water resource and be compensated for denying them the right to utilize all the natural resources in the Dead Sea Basin. As regards to the groundwater resources, the above-mentioned basin wide management must also be applied to the West Bank Aquifer and the Israelis must provide the Palestinians with their equitable water allocation of the shared groundwater basins.

Furthermore, the Israeli-Palestinian Joint Water Committee must be transformed into a “basin wide regional institution” in which all riparian countries be involved to manage the transboundary and shared water resources to ensure their sustainability.

6.1.2 Portugal and Spain

The two countries share five international rivers: Minho, Lima, Douro, Tejo and Guadiana, with two-thirds of their borders established by those rivers or tributaries. In general, watershed Spanish territory is upstream; Guadiana river is the singular case, its lower reaches and estuary bordering the two countries, with the river flowing in Portuguese territory after a first bordering stretch. The total basin area of these rivers is 268 500 km², with each country's share corresponding to 41% and 65%, respectively, of the Spanish and of the Portuguese territory. The two countries maintain bilateral cooperation focused on the sharing of superficial water resources of the international rivers crossing their national territories and in the joint management of the common protected areas, e.g. International Douro and Tagus areas.

6.2 Alternative Sources

Alternatives to conventional sources of water help mitigating the risk related to water shortages and to distress competition. These results can be achieved by utilization of technologies, either to help rationalizing water for irrigation or for providing extra water supply, like through desalination of saline water. Experiences of water treatment are presented for various national cases, however we will only report few ones, which seem particularly relevant to distress potentials for conflict: either international, as for the case of Israel respect to the other riparian countries, Palestine and Jordan, or inter-regional within a country, as in the case of Spain, which has recurred extensively to inter-basin transfers. This policy has produced heavy territorial and environmental impacts, as expressed by reaction of public opinion and particularly environmentalists, and has also caused conflicting views from communities living in the catchments areas, who perceive as being deprived from their "own" resources.

6.2.1 Israel

Israel copes with its water scarcity by a high technological investment, to increase efficiency in water use and to exploit saline and low-qualitative water sources. Regarding the former issue, it is reported that farmers started the transition to drip irrigation in 1970's, and such change allowed them to maintain productivity even when allocations suffered for periodical cuts.

As for the latter problem, wastewater treatment is providing a growing percentage of water needs for agriculture, amounting at present to 30% of Israeli water for irrigation. This quota could be increased by an upgrading of present sewage treatment levels, in order to increase water utilization by agriculture while freeing up fresh water for alternative uses.

In fact, cultural resistance to wastewater, that has been an obstacle to its utilization in certain Arab societies, constitutes less of a barrier among Israeli communities. Although the use of wastewater for domestic purposes has been shown to be unpopular also in Israel.

6.2.2 Spain

The re-use of treated wastewater is becoming increasingly significant, especially for uses, which do not require high quality levels such as agriculture. Current estimates indicate that about 230 Mm³/yr of wastewater are re-used: 89% of this is allocated to agriculture, 6% is used for recreational use, 2% for municipal use, 2% to satisfy environmental requirements, and finally 1% is re-used in the industrial sector. Water runoff in irrigated areas is also efficiently re-used in irrigated areas, to irrigate fields at lower levels. This practice is common, for instance, in the Segura plains, where water has always been scarce. Spain is the European country that uses the highest amount of desalinated waters from sea and brackish water sources: in fact, this source of water is estimated to contribute approximately 200 Mm³/yr to total water supply. Desalinated water from the sea is allocated to urban uses (90 Mm³/yr) and agricultural irrigation (5 Mm³/yr). Desalinated water from brackish water sources is mostly used in agriculture for irrigation purposes (58 Mm³/yr) and industry (40 Mm³/yr), while domestic and tourist uses consume 29 Mm³/yr.

6.3 Mitigation and compensation measures

This section is aimed to focus on measures to anticipate or repay users that have been shocked by drought events or penalized by policies for the benefit of other uses or other stakeholders. Measures could be either monetary, which is the most common tool for compensation for losses, or non-monetary, as in cases of intrasectoral allocations in order to provide water to particular categories. Other measures are also established as a disincentive for detrimental behaviors respect to the resource, and to cover the costs for damages to water or to the facilities.

6.3.1 Cyprus

The construction of the Tamassos dam and reservoir destroyed a chain of wells in the area of Pera Orinis community. Thus the community has been allowed to draw always the water from the dam instead of only occasionally, as the other villages near the dam. Nevertheless the Pera Orinis farmers are complaining that now they have less water at their disposal than before the construction of the dam.

6.3.2 Egypt

In the presented case study there are no apparent conflicts. The project theoretically foresees mitigation measures to potential environmental impacts, particularly in relation to wastewaters and control of water uses by various means, including an accurate choice of crops and a control of groundwater abstractions. As regarding social groups, measures appear as following a top-down approach.

6.3.3 Greece

The regional authorities use the annual increases in sewerage bills as a measure towards demand reductions. This is for compensation of the higher costs beard by the public institutions for treating water.

6.3.4 Israel

Israel's water management system has been designed to subsidize agricultural production. Water price for water with high concentration of salinity or effluent can be as much as 100% cheaper. The negative effect is that it provides a free use and disincentives water conservation, as low-grade saline water is cheap to use.

Israel's agricultural community is highly responsive to price change, while this is not the case for domestic uses. The urban sector can be charged 8 times more than the agricultural sector. However water bills for most citizens remain a trivial part of overall household expenses, while Municipalities, the largest domestic users, frequently suffer for considerable budget deficits and are not particularly sensitive to price changes.

6.3.5 Italy

Since the available water is not sufficient to meet crop water demand, the Consorzio per la Bonifica della Capitanata has been obliged to act in different directions to save water and promote a more efficient and sustainable use of water resources. This action has been particularly significant since the beginning of the eighties, when the price of water started to increase and water saving practices have become increasingly popular in compliance with the Regional law 54/80.

As for the definition of water price, the associate members have to contribute only to the expenses borne for management. Such contribution is proportional to the direct benefit each user receives from the activity carried out by the Consortium. However if the estate falls within the irrigation scheme, the farmers has to pay an additional rate on irrigation (a fixed and a variable charge). The

variable charge depends on the water volume delivered by the hydrant that tanks to new flow-meters can register also the volume used by different farmers from the same hydrant.

Besides the control of water use the Consortium prepared also technical data sheets on crop water requirements, structural interventions on the water distribution network and a web site presenting real-time and historical data on water available in the four reservoirs, irrigation scheduling, etc.

This attention on the transparency in the allocation mechanism and the farmers full awareness of the water scarcity, contribute to reduce conflict among farmers.

6.3.6 *Morocco*

The water Law (10-1995) is a key step in the rationalisation and optimisation of water management issues for the country. In fact this law introduces the needed legislative, economic and organizational instruments for institution of a decentralized and participative water resources management and use program. Thanks to the law, a High Water and Climate Council has been installed and seven River Basin Agency were created. The organisation of the sector shows a participative exchange between Regional Offices for Water and River Basin Agencies, with Local Communities and Water Users Associations. At local level, many Water Users Associations were created because the trend is to transfer irrigation management responsibility from the state to "communities" or local user groups.

The law has also established a National and River Basin Master Plan, and introduced mechanisms for cost recovery, through charges for water abstraction.

A taxation system for impeding water pollution was introduced, based on the "user-pays" and "polluter-pays" principles, but this legal instrument is not yet accomplished, particularly related to the sanctions issues, as the articles of the law related to this theme have not been implemented yet.

6.3.7 *Palestine*

Water prices in Palestine are maintained at an artificial low level, in order to ensure universal access, regardless of economic capabilities. Farmers typically do not pay for water at all. Stream-supplied irrigation is received free of charge, due to persistence of historical rights. In many cases untreated sewage water is used as a source of irrigation, despite certain regulations on the use and treatment of wastewater.

Rather than the administration, it is mainly the social pressures that regulate agricultural utilization of water resources; for instance, wasting of water is considered as an inappropriate behavior that brings social repercussions.

6.3.8 *Spain*

Experience from a 1991-93 drought, having caused a serious deficit on the regulated water storage systems that serve Madrid metropolitan area, showed that a rapid and efficient response to the situation was made by the public authorities through a series of actions, including agreements between irrigators and the water supply service provider for Madrid (Canal de Isabel II - CYII), economic compensation for hydropower companies for their losses in favor of domestic water supply, to be paid by CYII, provision of treatment plants and other emergency works for the new supply network.

Besides this local case presented in the National Report, other intrasectorial allocations from agricultural to municipal uses have been experienced in Spain. The same option has been used for Seville: in the drought years of 1976 and 1994, waters from the Pintado dam, normally allocated to the Viar irrigation scheme, have been diverted to Seville after much confrontation with farmers, and paying due compensation to them (Molle and Berkoff 2006 p. 39). These transfers are normally of temporary nature, allowing a return of diverted waters to the previous sectors of use, at the end of the drought period.

6.3.9 Syria

In Syria water tariffs are fixed on the basis of the use: domestic (0.01 USD/m³, the price is increased for big consumers as Hotel), industrial (0.12-0.16 USD/m³) or agricultural uses (3600SP/ha per year). The tourist sector is rather new, thus assimilated to the domestic use; but now the authorities are willing to set new prices, according to the kind of tourism. The water price for domestic users is defined to recover the capital cost through 30 years and to recover all the operations, maintenance and exploitation costs.

The Syrian laws impose to construct treatment plants for any farm or factory in order to remove the pollution. A Presidential Decree of 1971 fixed the principle of "polluter pays", and the obligation that the damage shall be recovered by removing the pollution source within one week. On the contrary, the government will remove the pollution by closing the farms or the factories, and establishing administrative or penal sanctions, depending on the damage.

6.4 Participatory approaches

One of the most significant steps for managing water resources is to involve the scientific community and the community of stakeholders, decision-makers and civil society representatives in the discussion of water management experiences towards the definition of sustainable water management strategies and policy options. Some experiences have been reported in the case studies, with different results.

6.4.1 Algeria

Unfortunately in this case study, cooperative decision-making appears rather weak. A trial was done by the Ministry of Water Resources in 2002, when it took the decision to elaborate a global study to find a solution to the Sebkhah problem, and also promoted a wide stakeholders participation, including decision-makers, local representatives, municipalities, civil society representatives, industrials, agricultural sector, universities etc. However in practice the Ministry of Water Resources played the major role, deciding the calendar and most of the objectives. Moreover the study was assigned to an external engineering private institution, based in France. A debate only took place during the presentation of the phases of the project, therefore appears as a fake participation approach.

6.4.2 Croatia

In the presented case study, the participation of several level stakeholders and the public pressures, have lead to a first attempt of solution of Cetina River problems. According to the Croatian system, any stakeholder may be formally involved in decision-making processes upon application to the Water Inspection Authorities or to the State Water Directorate, justifying being an interesting party in the problem. Although there is a record of case-to-case stakeholders consultation, rarely their opinion dominates. Public and experts are seriously consulted only in conflict situations or very bad conditions of the environment, as it is the case for Cetina River.

6.4.3 Cyprus

The presented case study is related to the construction of Tamassos Dam and Reservoir. It is relevant to note that the initiative of the construction of the dam rose from the Community Boards of villages besides the dam.

The Water Development Department (WDD) undertook a Technical Feasibility Study to determine whether the dam was necessary to enrich the deep aquifer, but also to increase the quantity of drinking water, alleviate occasional flooding. The study determined that the dam should be of "enrichment" type, and that its sole purpose would be the collection of rainwater for the enrichment of the deep aquifer. Nevertheless, the WDD decided to favor its acceptance within the local communities. Therefore they visited the interested villages and explained in detail the

characteristics and cost/benefits arising from the construction of the dam, as well as the conditions how the farmers would be able to draw water from the dam. The stakeholders since then remained formally involved and their contribution is considered an important enhancement of the quality of the final decision taken.

The decision-making process followed for the construction of the Tamassos Dam/Reservoir, as well as most dams in Cyprus, can be described as an interactive process, with every effort made to reach a consensus by all stakeholders.

6.4.4 Greece

During the Nostrum project, representatives from the main decision making bodies and end users in the area of Paros have been contacted. From the series of consultation and awareness meetings with the selected stakeholders, several alternatives to water resource management emerged. The stakeholders' suggestions included: supply enhancement through structural intervention like domestic reservoirs, more efficient water resources' use and, as suggested by room owners and farmers, improvement of technologies and facilities, like desalination plants, and demand reduction through water savings and conservation methods. But also Water Utility personnel have been involved in consultations, and their perception has shown some differences from those of the Paros end-users. Paros Water Utility suggested that appropriate solutions would involve the combined use of supply enhancement measures, demand reduction measures and some socio-economic interventions, such as increased pricing.

6.4.5 Israel

When the Israelis became convinced that the water shortage was acute and real, they responded by reducing their consumption. During wet periods however there is less than an actual appeal for restraint and conservation, and the issue of demand management remains tucked far away from public consciousness.

In general, education to the public regarding water saving needs and options, seems to be limited to situations of drought emergency, and does not establish new behaviours that people show to have absorbed for the long term.

Farmers are mainly men, while women generally run households. Therefore some specific campaigns for domestic water saving particularly target women, and are promoted by women associations. Data show that women are more motivated than men to positively react to water protection measures.

6.4.6 Lebanon

In order to face the problems related to management of Damour waters, various workshops were organised with different stakeholders, including central and local government representatives, users organisations and private companies (such as ELARD), universities (AUB), experts, international organizations (e.g. ESCWA) and media, in order to elaborate recommendations for appropriate management. However in case they could not find an agreement, decisions were made by representatives of Ministry of Water and by the Beirut Water Authority, which was a party in cause, while local users did not effectively influence the final decisions. At the end of the process, decision were made to solve problems respect the groundwater use and also respect the amount and quality of freshwaters, including actions to strengthening the capacity of the municipality of Damour to control groundwater overexploitation and pollution, and the institution of a Damour River Basin committee with responsibilities over allocations, cooperation mechanisms among stakeholders, monitoring and control of quantity and quality matters related to the freshwaters' use.

6.4.7 Portugal

As for Portugal, the last strategies and plans indicate some transformation of traditional centralization decision making process to the creation of a regional and local entities with power to manage water resources, i.e.: Águas do Norte Alentejano, for urban water consumptions; and Conselho de Bacia do Guadiana that is the first step to create a Regional authority to manage the water resources at the river basin level, as proposed in the Water Framework Directive.

Thus participatory processes involving the different stakeholders are proposed. However the report reveals a weak internal cohesion within the local social networks which might show difficulties respect to a smooth decision making process.

6.4.8 Tunisia

In the middle of the years 1990, in the setting of the application of the Agricultural Structural adjustment Plan elaborated in 1986, the State tried to decentralize some tasks. The old services being a matter for the central administration are transformed on autonomous public establishments. Thus, the distribution of water to farmers has been confided to regional institutions; the regional commissions of agricultural development (CRDA), responsible of public perimeters of irrigated agriculture. A national Agenda 21 program was also launched in 1995, to define the objectives for rational management and sustainable utilization of water resources.

The application of laws edited in the "Code des eaux" is performed in two main ways: by direct measures of regulation of the water utilization, and by indirect measures, which aim to create incentives to voluntary behaviors, like financial tools, programs for public awareness raising (particularly through TV spots), etc.

As for the local case of Djeffara aquifer, it seems however that the institutions created for enhancing closer relations between national public decision makers and end users, namely the CRDA and the Associations of Collective Interest (AIC), later renamed Grouping of Collective Interest (GIC), have not been able to bridge the main stakeholders groups, in order to promote a more responsible use of water, for instance by water saving technologies.

6.4.9 Turkey

Although the problems faced in the Gediz basin are difficult to be solved, efforts should be paid to build effective governance by creation of public awareness. An opportunity could derive from a proactive role of DSI, the major agency responsible for water allocations in the country, which is responsible for both ground and surface water, and thus could enforce integrated treatment for the future.

Other opportunities are seen on various other facts, like the new water legislation that is under elaboration, or a strengthened capacity of the University-based scientific community to provide research for applied problem solving research, and the establishment of closer linkages with international institutions for cooperation in this field.

7 Conclusions and Recommendations

This Report on Social Aspects of Conflicting Water Uses has highlighted some factors of conflicts arisen from the case studies of the National Reports Parts II. Some have in fact well presented some factors of competitions and tensions, or causes for potential conflict that have been solved by agreements among the concerned parties.

According to Attia (2003), "Two main groups/institutions are expected to respond to water scarcity, the water resources agency and water users. Responses of water resources agency would include: (i) provision of alternative water supplies (e.g. desalination, deep groundwater, recycling of effluent, water transfer, etc.); (ii) reduction of supplies to sectors that are less vulnerable to water stress (e.g. agriculture); (iii) enforcement of legislation for the control of supplies; and (iv) increasing water tariff aiming at reducing water use. Responses of water users, on the other hand, depend on the user sector. For example, industries would: (i) increase water use efficiency; and (ii) recycle, internally, their water supply. Farmers would: (i) change the cropping pattern, shifting to low-water consumption crops; and (ii) reuse effluent (agricultural drainage and domestic drainage water). However, domestic water supplies are not generally expected to be reduced, unless new technologies (from industries) are made available".

The initial chapters have presented a theoretical framework for conflict analysis, and proposed a thematic subdivision of different typologies of conflicts, on which basis the following chapters have treated the specific national cases, depending on their characteristics and information provided by the National Reports.

It is to mention that the French Report does not regard any local case, but a national process, and that the Egyptian case regards a project that is still to be implemented, therefore conflicts are still at hypothetical level.

Conflicts arise when resources are perceived as scarce respect to the expectations of the different actors on stage; thus, it is the unequal access for different stakeholders groups to determine competitions. Consumption patterns mainly depend on economic wealth, offering various opportunities of choice about alternative sources of water; while in poorer situations, choices appear rather restricted to residual resources.

Intersectorial competitions arise when some stakeholders perceive that their uses are endangered, either quantitatively or qualitatively, by abstractions done for other uses. Competitions and risks regard mainly socio-economic uses, and also ecosystems functions, as some uses can harm the social and environmental health.

Water is considered, case-by-case, as a commodity and a common good, but also as a territorial resource, being a stake for international relations and also for regional development within the national States. In the Mediterranean most situations have the State Governments as the main stakeholders, as water resources are considered as public properties. This strategic view is clearly represented in the Israeli case study, showing that the high water consumption for irrigation uses are justified by the strong symbolic value of agriculture as a means to occupy land, despite the low number of farmers and the poor relative contribution of agricultural production to the national GDP. The Toshka project represents another example, as one of the reasons for establishment of a large irrigation scheme in the South Western desert of Egypt is to reallocate people from the old lands of the Nile delta to the new areas, in order to achieve a controlled, wider and less dense distribution of people within the State.

The cases presented in the National Reports mainly focus on water for irrigation. Agriculture has a high importance compared to other sectors, either objectively or subjectively. With exception of Croatia and France, all other countries shows that agriculture is the most water consuming sector.

Within the agricultural sector, the Reports present some cases where farmers of large irrigation schemes show a higher capacity to consume water for their cash crops, respect to small farmers mainly engaged in farming for self-consumption.

Most cases of sectoral conflict regard irrigation versus potable water. In cities it is a common view to consider that shortages are caused by the excessive withdrawals by the agricultural sector; that farmers are the highest water waster; and that water has a low productivity in agriculture while in cities it has a higher social value. However, shortages in cities are due more to financial and development constraints than to real water stress. In relatively rich economies, like in Spain, temporary shortages have been addressed by contingency planning: withdrawals to the city from resources normally dedicated to agriculture were regulated during specific dry periods, and then the situation return to the previous sectoral allocations, once the drought was overcome. In other situations, like in Morocco, withdrawals from irrigation canals to water vendors for households consumption are done illegally, but tolerated by the institutions, as a way to distress potential social conflicts by solving specific deficiencies. As for the Tunisia case, where local farmers continue to dig boreholes, in opposition to the legal interdictions to use groundwater from the Djeffara aquifer, the reactions by the public authorities are rather weak, showing the priority of alleviating potential social conflicts rather than existing environmental problems.

Not sufficient information was provided by the reports on the issues of difficult access to potable water and sanitation by rural households, which still show comparatively low percentages, compared to access in towns.

Another represented conflict is between the agricultural and the energy sectors; while not sufficiently represented are the environmental uses. The only case where an issue was raised respect to the landscape value is the one regarding the Cetina river management in Croatia; in this case, a change was promoted since it was a tourist resource to be endangered. There is never an open interest for ecosystem values, or a management along sustainable lines for the long term.

In fact, a relevant issue is the disappearance of wetlands for over expansion of irrigation; but this is still seen as a minor cost respect to the benefits that water resources have to provide for human consumptions and economic development.

The water demand management is almost absent from the water sector in almost all involved countries. The supply-side management is still the most common way to provide water to the strategic sectors. Unfortunately the problems of non-rational allocation and water losses are not sufficiently addressed; cheap water prices for all sectors' uses encourage wastes, shortage of conservation and lack of knowledge among users of methods and techniques to use efficiently the resources. Uses of water bodies as sewage receptors are presented for the study case of the Great Sebkhia in Algeria, but have seen as general problems, and treatment plants are not sufficiently disseminated, leading to serious environmental and health hazards for impacted areas and populations. However, none of the presented local cases have targeted sanitation or treatment management issues.

From the French report it is made very clear that privatisation is a process difficult to reverse; private sector's development has been promoted during the last decades in all Mediterranean countries, but from the Reports it is not yet considered as a specific target group. Private farmers are rather described like social groups, interlinked with local communities, thus considered as community-based organisations. Examples are the Associations of Collective Interest in Tunisia.

In various cases treated by the Reports there is a common feature of a loss of traditional direct management of water, and a general growing de-responsibility of local communities respect to their resources protection needs. The case of Paros Island is emblematic, as the traditional rainwater storage system is in disuse, while the water needs, increased by the tourist demand for swimming pools, are addressed through increased groundwater pumping.

Greater pressures over local resources in the Mediterranean region are caused by external consumers, by importation of water-intensive goods and by tourism flows, particularly in coastal

areas. However tourism is not perceived as a matter of conflict for draining water resources at unsustainable rates, but rather as an opportunity for the economic growth, despite other sectors pay for the produced externalities.

In some situations, conflicts do not appear so clearly; but this does not mean that the situation has no risks. Lack of conflict could in certain cases be a symptom of a lack of awareness about risks, or lack of fields for expression of stakeholders' needs and constraints.

A gender-related analysis has not been possible, as the National Reports did not provide information on this topic.

A social-related analysis, considering social clusters differentiated by economic capacities, but also by cultural identities, including ethnic and religious aspects, has only been provided by the Israeli-Palestine report and not for other case studies.

Another missing information regard the land rights, playing a relevant role to regulate the access to water resources for irrigation uses. In the Southern and South-Eastern Mediterranean countries, rules based on Islamic law are followed to regulate property rights, particularly for family lands, which are subject to progressive subdivisions by inheritance. This causes two types of problems: the first is of economic nature, related to the small dimensions of the plots, posing constraints to creation of scale-economies, sufficient revenues and surpluses; the second is of social nature, as the inheritance transfer of property rights has created an ethnic selection: those who do not belong to the lineage are considered as outsiders and cannot access the lands closer to the catchments, e.g. the so-called "arabs" (mentioned in the Israel and Palestine Report) that have abandoned, already some generations ago, their traditional pastoral livelihoods, to settle in towns and agricultural areas.

A recommendation could be related to the need to enhance local knowledge. Each local case could present a richness in terms of cultural dynamics and territorial relations, that have not been properly addressed, perhaps as the reports were lacking an anthropological and geographical focus. Deeper description of territorial structures of the local cases would have facilitated identifying and characterizing the various actors to understand their functions, levels of intervention, types of relationships, stakes and potential conflicts. Territorial structures cannot be found as entire or sections of catchments, but as based on consolidated irrigation networks, like the traditional ones, deriving by e.g. a *khattara* (groundwater channel) or a *saqia* (water wheel), or seasonal patterns of a *wadi* (seasonal stream) in a *dar* (nomadic land), or by modern water facilities, provided that are uniformly and structurally managed. *Bio-regions* are territories of recognizable identity, in terms of hierarchies and recognized management, also respected by the central administrations, as they have a consolidated knowledge in their operational space.

This is a relevant issue, and in fact some institutional weaknesses are sometimes caused by strong customary laws that are still followed and that formal laws are not able to fully substitute.

The modern States have abandoned the initial "command and control" principle, and have adhered to principles of delegation of powers to decentralized authorities. Regarding water issues, regulatory framework have been changed by new laws and institution of new public bodies, but shortcomings are frequent in relation to sanctions for non-compliant behaviors, like illegal abstraction and pollution of water resources.

Finally, a chapter of this report has focused on tools to overcome ongoing or potential conflicts. Diplomatic agreements for international management of transboundary basins, international cooperation and trade relations can alleviate sources of conflict related to shared waters. Alternative sources can also help mitigating the risks related to water shortages and to distress competition. Treated wastewaters or desalinized waters can offer a great opportunity to increase dramatically the available resources, and in fact it is already used in some cases, like Israel, while in other countries, constraints are posed by lack of technical and financial capacities and also by cultural resistance to consume "non-pure" waters. Moreover, mitigation and compensation measures are established to address sectors penalized by drought or other causes for decreased water availabilities. Other solutions are proposed by integration of all interested parties through participatory decision-making.

Decision support systems could theoretically provide means to reach agreed solutions with expert advice, but unfortunately the reported cases have shown that they have not been yet concretely implemented. The only report that has mentioned some doubts respect to the effective potential of a DSS regards the Palestinian view, reflecting thoughts that it would be difficult to find technical means capable to solve controversies that are mainly of political nature.

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ANNEX1: Conflicts summary tables by country

ALGERIA

WATER USES	<ul style="list-style-type: none"> • Domestic use • Urban use • Agricultural (southern side of Sebkha) • Industrial (northern side of Sebkha)
CONFLICTS AMONG GROUPS	<ul style="list-style-type: none"> • There is a great disparity between Sebkha north and south side because the different development and uses. • The most crucial conflict was between the idea to transform the region and the preservation of the global ecosystem: that means conflict between the local government and environmentalist groups
CONFLICTS AMONG USES	<ul style="list-style-type: none"> • Urban extension and development of Oran versus protection of the Sebkha system • Development of the agriculture versus salinization of water • Water resources and soils use versus protection of ecosystems
STAKEHOLDERS INVOLVED	Farmers; Environmentalists; Urban and rural dwellers; Regional and National authorities. Concerned populations are often out of the game
MITIGATIONS TOOLS	Not described

CROATIA

WATER USES	<ul style="list-style-type: none"> • Hydro-electric applications • Agricultural irrigation • Water supply • River as recipient of wastewater • Ecological • Tourist use
CONFLICTS AMONG GROUPS	<ul style="list-style-type: none"> • Ecological and productive aims are opposed • Downstream users receive very polluted water because of a lack of wastewater treatment
CONFLICTS AMONG USES	The main conflict described is between hydro-energy production and other water uses, mainly for tourism, and ecological functions.

STAKEHOLDERS INVOLVED	Water authorities of Dalmatia, Hydroenergy Company, local NGOs (environmentalists), water supply companies, other water users and municipalities, tourist enterprises
MITIGATIONS TOOLS	EIA study, stakeholders consultation, economical compensation to the Hydroenergy Company because of lower production due to the greater water release.

CYPRUS

WATER USES	<ul style="list-style-type: none"> • Agriculture • Domestic use
CONFLICTS AMONG GROUPS	<p>There are no conflicts among groups, nevertheless:</p> <ul style="list-style-type: none"> • Pera Orinis farmers are complaining that they have less water at their disposal than before the construction of the Dam • Farmers from other villages in the vicinity of the Dam complain as receiving water only when WDD releases some for irrigation, thus benefiting from the operation of the Dam occasionally and not on a continuous basis, as for Pera Orinis farmers. • Environmentalists criticised strongly the WDD's decision to release water from the dam at the start of its operation, without taking adequate measures to prevent the flooding and probable irreversible destruction of a canyon of exceptional natural beauty.
CONFLICTS AMONG USES	There are no conflicts among sectors. Farmers and non-farmers residing in the case study area are satisfied with the water services and their pricing.
STAKEHOLDERS INVOLVED	Farmers, town dwellers, environmentalists. Participation in the Nostrum Consortium's events of some representatives of the stakeholders' groups: one from WDD and one from the local farmers Irrigation Division/ Associations.
MITIGATIONS TOOLS	<ul style="list-style-type: none"> • Local communities involvement before building the dam/reservoir • The installation of gauges to obtain accurate measurements with regard to the enrichment of the aquifer • The preparation of a detailed Operation Manual for the Dam, so the misdirection of rainwater away from the aquifer is avoided and a steady flow of water into the aquifer is achieved

EGYPT

WATER USES	<ul style="list-style-type: none"> • Agriculture • Power generation • Domestic uses in the new residential areas
CONFLICTS AMONG GROUPS	<ul style="list-style-type: none"> • Not yet expressed as the project has not been implemented yet • However conflicts will depend on people's willingness to emigrate from over-populated lands to the remote Toshka area.
CONFLICTS AMONG USES	<ul style="list-style-type: none"> • Not yet expressed as the project has not been implemented yet
STAKEHOLDERS INVOLVED	Mass media, parliamentarians, national ministries and investors, while farmers groups have little influence.
MITIGATIONS TOOLS	New lands will be assigned, houses and other facilities

FRANCE

WATER USES	<ul style="list-style-type: none"> • Domestic uses
CONFLICTS AMONG GROUPS	<p>The on-going privatization in France cannot be controlled and can grow up without any bound. French water companies have gained great comparative advantage and settled a true oligopoly power.</p> <p>Once delegated by local authorities, the public utility cannot turn back to direct management anymore.</p> <p>The counterpart of the private firm efficiency in the water management is detrimental to the public welfare.</p>
CONFLICTS AMONG USES	There are no conflicts among sectors
STAKEHOLDERS INVOLVED	<p>No specific stakeholders have been mentioned, as the report does not present a local case but a process of privatisation that has occurred at the national level. Stakeholders categories are the following ones:</p> <ul style="list-style-type: none"> • Private water companies • Local authorities (Communes) • Public consumers
MITIGATIONS TOOLS	Not reported

GREECE

WATER USES	<ol style="list-style-type: none"> 1. Agricultural irrigation 2. Tourism 3. Domestic use 4. Urban use
CONFLICTS AMONG GROUPS	Competition among room owners and farmers
CONFLICTS AMONG USES	Tourism and irrigation demand reach their peak in the same season, creating conflicts between uses and problems with water supply adequacy during peak consumption.
STAKEHOLDERS INVOLVED	Municipality of Paros; Municipal Office of Water Supply and Sewerage of Paros; Union of Agricultural Associations; Union of Room/Hotel Owners
MITIGATIONS TOOLS	Participation methodology of all the stakeholders

ISRAEL AND PALESTINE

WATER USES	<ol style="list-style-type: none"> 1) Domestic use 2) Urban use 3) Agricultural irrigation 4) Industrial (Israel) 5) Tourism (Israel) 6) Biodiversity and Cultural heritage
CONFLICTS AMONG GROUPS	Conflicts between ethnic groups for different access to the resources
CONFLICTS AMONG USES	<p>Conflicts between sectorial uses are not reported.</p> <p>Conflicts regard the different distribution of water, as there are much lower water availabilities per capita for Palestinians than Israelis.</p> <p>Agriculture is a far smaller consumer in both Jordan and Palestine than in Israel.</p> <p>During periods of curfew, water delivery becomes a critical issue for all Palestinian citizens, regardless of socio-economic class.</p>
STAKEHOLDERS INVOLVED	Local, regional and national authorities; NGOs, farmers
MITIGATIONS TOOLS	No mitigations tools have been implemented

ITALY

<p>WATER USES</p>	<ul style="list-style-type: none"> • Domestic sector • Agricultural sector • Industrial sector
<p>CONFLICT AMONG GROUPS</p>	<ul style="list-style-type: none"> • Between farmers and Consortium in period of low water availability for the fixed fees and for the definition of water schedules. • Among agricultural and domestic sectors • Between Regional Administration and the Consortium for public fund raising • Between Consortium, on one hand, and Environmentalists and the Cultural Heritage Service on the other.
<p>CONFLICTS AMONG USES</p>	<p>The imbalance between water demand and supply is one of the major reasons for a constant conflict among users both in the agricultural sector and the agricultural versus domestic sectors</p>
<p>STAKEHOLDERS INVOLVED</p>	<p>Associated farmers; domestic sector (Acquedotto Pugliese); Governing Board; Regional Administration; Consortium Capitanata; environmentalists and the Cultural Heritage Service</p>
<p>MITIGATIONS TOOLS</p>	<p>It is proposed that the use of a DSS could improve the performance of the Consortium for management decisions, but in the area it seems that there is not a long-term strategy for the integrated management of water resources nor a permanent table involving the different stakeholders from which this strategy could stem.</p>

LEBANON

<p>WATER USES</p>	<ul style="list-style-type: none"> • Domestic use (also for external supply by the Beirut Water Authority) • Industrial use • Agricultural: bananas and vegetables are the main type of crops cultivated • Sewage and industrial wastes are discharged in the Damour River
<p>CONFLICT AMONG GROUPS</p>	<ul style="list-style-type: none"> • Conflicts among the users upstream and downstream, especially with the absence of a legislative framework that ensures the fair water distribution • between the Damour Municipality and the upstream users • between the Damour Municipality and Beirut Water Authority
<p>CONFLICTS AMONG USES</p>	<ul style="list-style-type: none"> • Between Agricultural sectors upstream and downstream • Between domestic use downstream and agricultural use upstream • Despite the environmental impacts for the excessive abstractions and pollution, no conflicts are reported regarding ecosystems functions.

STAKEHOLDERS INVOLVED	Beirut Water Authority, Damour Municipality, farmers, upstream users
MITIGATIONS TOOLS	<p>The stakeholders proposed the following elements for conflicts resolution:</p> <ul style="list-style-type: none"> • For groundwater resources: coordination and negotiation between the municipality and the water authority to control over exploitation of the groundwater resources; installation of metering systems to control the utilization of water and to monitor the water losses • For surface water resources: institution of a Damour River Basin responsible for: <ul style="list-style-type: none"> - conducting a water allocation study to ensure the fair distribution among its upstream and downstream users (DSS) - establishing cooperation mechanisms between different water users - monitoring the water quantities provided the agricultural sector - monitoring the quality of the river water - monitoring and controlling environmental offences along the river - promoting awareness and capacity building

MOROCCO

WATER USES	<ul style="list-style-type: none"> • Agricultural irrigation • Industrial uses • Domestic uses • Urban uses
CONFLICTS AMONG GROUPS	The most determinant conflict is the spatial distribution of allocated water volumes between upstream large farms and downstream small farms.
CONFLICTS AMONG USES	Competition between auto-consumption agriculture and large farms.
STAKEHOLDERS INVOLVED	Water Users Association: small, medium and large farmers; Municipalities; Regional Irrigation Agencies
MITIGATIONS TOOLS	No mitigation tools have been implemented but it is proposed to set a mechanism to share information among users.

PORTUGAL

WATER USES	<ul style="list-style-type: none"> • Domestic use • Urban use • Agricultural irrigation • Tourist use
CONFLICTS AMONG GROUPS	<ul style="list-style-type: none"> • Among farmers and users of water for domestic/industrial consumption • Among Portuguese and Spanish population • Among the responsible entity for the ordinance of the dam (Institute for Water), the Municipalities and the Caia Irrigation Board
CONFLICTS AMONG USES	Social (domestic consumption), economic (irrigated agriculture) and environmental values often conflict as competition for scarce water resources intensifies.
STAKEHOLDERS INVOLVED	Institute for Water; the Municipalities; the Caia Irrigation Board
MITIGATIONS TOOLS	Participation methodology

SPAIN

WATER USES	<ul style="list-style-type: none"> • Agricultural irrigation • Industrial use • Urban use • Domestic use
CONFLICTS AMONG GROUPS	Between the urban water supply companies and the irrigators.
CONFLICTS AMONG USES	There is no description of conflicts among uses.
STAKEHOLDERS INVOLVED	Water supply companies and the irrigators.
MITIGATIONS TOOLS	During the meteorological drought from 1991 to 1993 some emergency measures were taken, especially structural works.

SYRIA

WATER USES	<ul style="list-style-type: none"> • Domestic use • Industrial use • Agricultural use
CONFLICTS AMONG GROUPS	Coalition between domestic and industries against farmers could be potential matter for conflicts.
CONFLICTS AMONG USES	Between domestic/industrial and agricultural uses
STAKEHOLDERS INVOLVED	Environmentalists; Farmers Association local government; urban and rural dwellers
MITIGATIONS TOOLS	<p>It is proposed that in order to determine the appropriateness of the technical issues, these activities could be implemented:</p> <ol style="list-style-type: none"> 1) Stakeholders' workshops to create awareness on water management. 2) Methodological approach to identify decision makers and stakeholders

TUNISIA

WATER USES	<ul style="list-style-type: none"> • Agricultural irrigation • Industrial use • Domestic use • Urban use
CONFLICTS AMONG GROUPS	Between Associations of Collective Interest and the State manager.
CONFLICTS AMONG USES	No traditional conflict among water uses, the only sector concerned by the interdiction is irrigated agriculture.
STAKEHOLDERS INVOLVED	Associations of Collective Interest and the State manager.
MITIGATIONS TOOLS	A DSS tool could increase awareness about the risks related to the excessive groundwater abstractions, and facilitate relations between the State and the users. Compensations should be foreseen for those farmers who respect the interdiction.

TURKEY

<p style="text-align: center;">WATER USES</p>	<ul style="list-style-type: none"> • Agricultural irrigation • Urban use • Industrial use • Domestic use • Hydropower generation • Ecological (Gediz delta wetland is a Ramsar site)
<p style="text-align: center;">CONFLICTS AMONG GROUPS</p>	<ul style="list-style-type: none"> • Between water users and water suppliers • Between farmers and environmentalists • Between farmers and urban/rural dwellers
<p style="text-align: center;">CONFLICTS AMONG USES</p>	<p>Between agriculture irrigation and other uses, especially water supply. Hydropower generation has no priority. Only few and poor quality water arrives to the Gediz delta wetlands.</p>
<p style="text-align: center;">STAKEHOLDERS INVOLVED</p>	<p>Irrigation associations of Gediz River Basin NGOs: Gediz Basin Erosion Control, Reforestation and Environment Foundation. Local administrations: Izmir, Manisa, Usak and Kutahya</p>
<p style="text-align: center;">MITIGATIONS TOOLS</p>	<p>In the Gediz River Basin the major problems stem from lack of proper management practices; it is believed that the efficient use of DSS tools by the decision-making agencies and provision of participatory management practises are required to alleviate the growing problems of the basin.</p>