45th Congress of the European Regional Science Association
23-27 August 2005, Vrije Universiteit Amsterdam
Land Use and Water Management in a Sustainable Network Society

Sustainability of the water sector in Portugal -an outlook on strategies, dynamics and common practices

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Abstract

To understand the conjunction of human and natural systems and the nature of their interactions has been more and more crucial. The integrated response to the human management of natural systems is nowadays based on "sustainable development" concept which emphasizes the need to make compatible social, economic and environmental systems. But, what does it mean when we consider such a specific resource has it is water, with very essential life-support functions?

The design and rhythms of natural and social systems are compatible in a way that they guarantee the supply of this resource with the quality required for the human needs in the future? To what extend common practices and natural dynamics are forward-looking sustainable water resources development?

This paper aims to provide a reflection about these subjects. It mainly addresses issues concerning water from the Portuguese perspective, and highlights the linkages between water resources management and sustainable development. The purpose is to analyse the adequacy of Portuguese water institutions, planning and management to the requirements of the sustainability concept in the context of water resources and also pointing out research needed for improvement of strategies concerning the approach to the problem of water scarcity.

Keywords: environmental regulation, water resources management, sustainable development, economic institutions.

I-Introduction

Long term survival is dependent on the protection of environmental systems and particularly, the availability of adequate quantity of good quality water is a prerequisite for the maintenance of human wealth and welfare.

Principle three of the Rio Declaration (Agenda 21) states that "the right to development must be fulfilled so as to equitably meet developmental and environmental needs of the present and future generations". This right to development is not necessarily compatible with the protection of specific environments or habitats and otherwise this protection and the maximization of the net benefits from the environmental stock need not promote an equitable distribution of the welfare and wealth between current and future generations. Besides, translating sustainability concepts into management goals has to be made considering the relevant special scale over which the concepts are applied. It has also to tackle with conflicts over water.

Conflict over water is a recurring phenomenon reflecting its functional diversity and the dynamics of water values relative to economic potential, sociocultural forces and technological change.

Given its inherent functional diversity and the contrasting attitudes which go with it, it should not be surprising that conflict arises between those who assess the worth of water in ecological and aesthetic terms, and those whose attitudes are shaped by more materialistic motives. The interactive and sometimes conflicting relation with the human social system has been evident, with negative impact in ecological systems, where biodiversity is an essential component for sustainability. The basis for much of the conflict is in the value put on the same resource at the same time for contrasting purposes: economic, sociocultural and ecological.

The key strategy is to integrate water into other policy areas, as a driving force for a rationale and a sustainable use of this natural resource and to avoid depletion, pricing having a determinant role in the context.

European Water Framework Directive (WFD-Directive 2000/60/CE) includes for the first time and in an explicit way, economic concepts in water management and although being very flexible about specific methodologies of implementation in each member state, it gives a special importance to the economic analysis of the water sector. Even so each member state can adapt the principles concerning this matter to their own law, they

have to try to comply with the idea of Polluters Pay Principle and full cost recovery of water services.

The guiding document for the implementation of the Water Directive in what concerns water economics (WATECO, 2002) reinforces the importance of these economic aspects in order to achieve the environmental goals and further studies (Palma,2002, Gonçalves and West) have been carried out to study the implementation of economic analysis of the Portuguese water sector.

Recently the Portuguese Government approved the Water Law [1] which intends to be the transposition of the Water Directive and which has given rise to much controversy as it seems to reinforce clearly the lobby of the water industry besides other limitations whether of conceptual or methodological nature (Sereno, 2002; Aguapública, 2004; Tovar 2004; CNA 2004).

The purpose of this paper is to analyse to what extent common practices in Portugal are forward –looking sustainable water resources development and the adequacy of Portuguese water institutions, planning and management to the requirements of the sustainability concept in the context of water resources. It enhances the need to deal with water in a holistic fashion, taking into account the various sectors affecting water use, including political, economic, social, technological and environmental considerations.

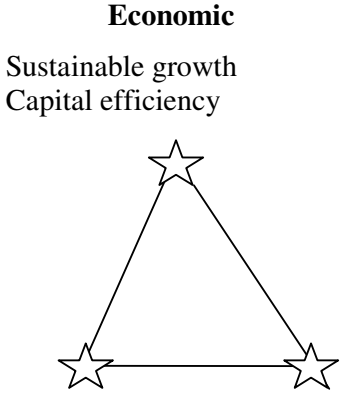
This article highlights that water prices in Portugal do not reflect marginal economic values because they are largely determined by the Government rather than by the operation of free market. Although there is a wide interest in treating water as an economic good, the role of water with its multiple uses- as a basic need, a social, economic and environmental resource, a merit good- and the traditional rights and uses of the resource make the selection of an appropriate set of prices exceptionally difficult. Further, it concludes that the application of price-based policy instruments, is particularly difficult in the water case, because the flow of water through a basin is complex, and provides wide scope for externalities, market failure and high transaction costs. Efficient application of market tools will ensure benefits, but especially defined and enforced water rights are not yet in place in Portugal. Without such preconditions the implementation of water policies towards sustainable development will be threatened.

[1] Last 2005-06-05 the Portuguese Cabinet approved the Water Law, but not yet the economic and financial regime for the water sector. Nevertheless, it is missing Parliament approval and public consultation.

II- Water Resources and Sustainability: Dimensions of the Global Change

Sustainable development is a multifaceted concept whose first definition was suggested in 1987 by the World Commission of Environment and Development in its report to the Governing Council of UNEP[2], "Our Common Future", known as the *Brundtland Report:* It is economic development that meets the needs of the present without compromising the ability of future generations to meet their own needs, which means fairness between generations. Problems arise with the application of the concept and its translation into policies. Indeed, as referred in Kooten and Folmer(2004), this definition is vague, because it provides no guidance about what would be sustainable and how concretely sustainability must be measured or put into practice. Nevertheless, it highlights the political nature of the conflict between economic growth and the environment and allows many interpretations, as Daly and Cobb (1994) enhance.

Figure 1- The World Bank Environmentally Sustainable Development Triangle
Source: Serageldin and Steer (1994)



Although there is consensus that the keynote must be on intergenerational transfer of natural resources, there are differing approaches about what this really implies.

[2] United Nations Environment Program

Serageldin and Steer (1994) enlightened the concept with a diagram as shown in fig 1, with the integration of economic, social and environmental dimensions of sustainability. The primary issue is providing balance between the forces of development that threaten environmental resources and the social value of preservation. Difficulties arise in quantifying both sides of this equation. As economies develop and the nature of the human dependence evolves, views of the human-nature tend to change (Gadgil 1991), and dynamics must be integrated in the analyses.

Unpredictability of the future needs makes this concept very controversial as argued in Gilpin (1999).The actions of the present generation may reduce the endowment of resources to future generations, but there is no way of knowing whether future generations could be compensated in some way, for their need are not predictable. This is true except for a resource with life-support functions as water. Water is a natural capital, with chemical, thermal, hydraulic, ecological, recreational and biological functions, constituent of alive organisms and it has not and we do not think it will have a perfect man made substitute in the future.

As Daly (1986) observes, it is believed that because of technology and trade, human carrying capacity is infinitely expandable, but according to Rees (1990), humankind remains in a state of "obligate dependence" on the productivity and life support services of the ecosphere. In this light, Rees (1996) refers that "a fundamental question for ecological economics, therefore, is whether the physical output of remaining species population, ecosystems and related biophysical processes and the waste assimilation capacity of the ecosphere, are adequate to sustain the anticipated load of the human economy into the next century, while simultaneously maintaining the general life support functions of the ecosphere. This fundamental question is at the art of ecological carrying capacity, but is virtually ignored by mainstream analyses."

Neumayer (2003) enhances that the outstanding value of natural capital is that nature enables the very existence of human life, as fresh air, water, a bearable climate and food. They are really non-substitutable, are unique in that they cannot be rebuilt. The only way to cope with risk, ignorance and uncertainty in this context, is the precautionary principle (O´Riordan and Jordan 1995, Neumayer 2003) which stands for preventive measures to be undertaken before irreversible environmental destruction and for favouring environmental preservation over economic activity. The need of safe minimum standard , a variant of that principle, is stressed in Veeman and Politylo 2003),

in order to achieving sustainable development, insuring intergenerational equity and conserving natural capital.

The Water Framework Directive contemplates the precautionary principle; the polluter pays principle and the corrective principle of environmental damage at the source besides safe minimum standards.

The human – water relationship vary with culture, religion, ethics, economic conditions and climate and embodies various ideas about ownership and property. The role of the State is very important in the design of management institutions to guarantee water conservation; property- right regimes tied to responsibilities are integral to the role that the State plays in resource use, because it is the way that a sovereign power shall rule the relationship between the human and natural systems, leading to a efficient allocations of resources even if it fail to account for the human complexities that exist in social and economic spheres. Open access provides powerful incentives for over-exploitation (Hardin 1968).

The environmental dimension of sustainability concerning water, calls for conservation, efficient water and effluent management. Pricing policies contribute to meeting the environmental objectives in a cost effective way (COM 2000).

Considering the economic dimension of sustainable development, the emphasis must be on the efficient long-term use of water resources, which involves two interrelated aspects:

-The allocation of available water resources between competing users and uses in a way to maximize the total welfare derived from the resource.

-The development of least cost supply schemes. This means that the benefits from additional supply flows must exceed the costs involved including all externality costs associated.

Due to the manipulation of the natural water cycle in many regions of the World during last century, namely with the intensification of large hydraulic buildings, relation between man and water had been altered in an unprecedented way. It was the era of big water systems aiming to satisfy the increasing demand needed by the economic development even if those projects were not financially sustainable. The interactive relation with the human social system has been evident, through the technology they use, the labor they perform, their institutions -which coordinate their behavior- with negative impact in ecological systems, where biodiversity is an essential component for sustainability.

At the beginning of the 21st century, relation of man with water seems about to be modified as now demand is also conditioned by territory planning and scarcity, not really in quantity, but in the quality needed for the different uses. There is a strong need for a sustainable use and economic pricing. The role and function of water, and hence its value have to be reviewed dynamically in keeping with fluctuations over time as a reaction to changes in economic, social and technological conditions. The dichotomy between economic and environmental values of water underlines the need to quantify trade-offs involved in allocating water to satisfy societal values associated with non-consumptive functions of the resource as outdoor recreation, tourism, nature conservation, navigation route, source of hydropower.

The use of demand management techniques is essential to ensure that available supplies are allocated to the highest value uses as well as productive resources like land, labor capital are only allocated to increase supplies, when users are willing to pay the full costs concerned. Nevertheless, it is difficult to establish the real value of water in different uses once there are many uses which are not marketable. Being the case, additional techniques must be applied to fix value, as there are no prices representing their value. Besides, sustainability involves placing higher priority and maintaining specific items of natural capital through time, even if this requires foregoing high value uses as already enhanced.

As there are so many elements involving the sustainability of water resources, there is no single development pathway and no set of management strategies which provides the fulfillment of the sustainability objectives. Besides, strategies concerning sustainable water management must be developed considering other environmental and social systems as a pathway for water can result in inefficiencies in the allocation of dependent resources as labor and land.

We also have to consider the way water uses react to concrete management strategies. Shifts in water uses may exacerbate pollution problems and encouraging the development of systems that might not be sustainable over time.

Social and ethic dimension of water sustainability stands for intra and intergenerational equity, universality of pricing policies without relevant regional asymmetries and socially acceptable.

Sustainable resources management necessary involves the identification of the utmost sustainability dimensions, the role of different management strategies towards reaching the sustainability goals and the appraisal either of the trade-off between the various

sustainable development goals or the adequate balance that can be reached amongst such goals. Sustainability also requires a new type of relations amongst authorities, operators and citizens whose right to use water must be based on usership rather than ownership. As stayed in Barraqué(1995), if water is part of the environmental domain, it belongs to a common heritage and there must be devise mechanisms of control to manage these "commons" at an appropriated level.

III- Water Framework Directive and the Portuguese Water Law: Pathways to a More Sustainable Water Future

The European Water Framework Directive (WFD) requires progressive protection and enhancement to rivers, lakes, estuaries, coastal waters and wetlands by the year 2015. The WFD is progressively implemented in EU Member States. European Union (E.U) penalized Portugal for the delay in transcription the WFD for national law, but last June the Portuguese Cabinet approved the Water Law (WL)[3] which is very similar to the WFD, but there is no guarantee that it remains unchanged, as it is missing Parliament approval and public consultation. The main subject of the WFD is that the use of water by humans should be sustainable and not impact unduly on flow, volume and storage and the physical, chemical or ecological quality of the natural water environment. This requires a need for management of human interventions in the water cycle at a river basin scale. River basin planning and management is central to the WFD and consequently, to the WL.

The attainment of an ecological quality -not dependent of the uses- and not only physic and biochemical quality concerning human consumption is a very handsome progress towards sustainability (Formigo 2005). It means the enhancement of the rights of future generations, but mainly, the rights and interests of non human nature.

WFD foresees a framework for sustainable water use and protection of superficial waters and establishes management and planning at a river basin scale in order to take into account externalities and transaction costs. These effects arising from using water, either in industry, agriculture or in domestic uses were long ignored. Recently increasing demand for water has brought the costs of externalities to notice. It is recognised that

[3] Parliament voting is planned to 1st July and we are not sure that public consultation will be held.

downstream users are stakeholders in all proposals and that negative effects of water use must be considered against the benefit of each proposed scheme.

This Directive created basic conditions for a greater rationality in the water sector and consequently an improvement in efficiency. The idea is that the full recovery of financial, environmental and scarcity costs and the integration of environmental concerns are the favorite way to use efficiently water. The goal is to get a closer relation between uses and prices, a closer relation among price, economic value and marginal costs to supply water. In a sense, water pricing policies has a key role in managing water demand and augmenting water supply, creating incentives to allocate water efficiently as it signals the opportunity costs and the scarcity value of water. Nevertheless, market based instruments as pricing are efficient and least cost as Economic Theory makes proof, but this may not work concerning shared waters, as non user values are not marketable and water is a strategic issue, calling for a different approach to the allocation problem, one which considers the strategic behaviour of actors and their motivation as argues Carraro et al(2005).

Make sense that WFD also establishes the need of public information and consultation concerning water resource management; methodologies for participation must be robust enough to tackle the challenge of building common understandings. Active public involvement in the planning and decision process can contribute to achieving the "good ecologic status" objective for water in 2015.

Public participation is seen as providing a valuable source of knowledge about causes and remedies for many environmental problems. It also may increase the effectiveness of measures in environmental planning and enhances public support for the implementation of decisions, and consequently, their acceptance would improve as they share responsibility for the decisions (Brans 2002; Omann and Spangenberg 2002).

In summary, WFD has an innovative approach in many decisive features for the sustainability of water sector:

-Water management fulfilled at a river basin scale in order to better valuing environmental impacts.

-Integrated approach concerning pollution control, adopting standard emission limits and quality standards of water.

-The target to attain an ecological quality of water -not dependent of the uses-. The idea is that all EU Member States could succeed in getting the "good ecological status" of their water until 2015. Weaker goals and amendments must be well justified.

- Full cost recovery in order that users can pay real cost of water.

-Public participation in water management.

If public and local authorities with responsibilities concerning the water sector strengthen their enforcement powers and become more effective in implementing the law, we believe that are fulfilled the conditions for the sustainability of water sector. It is still early to assess and predict all the impact of the new legal framework and the real effectiveness of enforcement of such policies.

IV- Common practices concerning water resources in Portugal

Portugal has some regional asymmetries concerning availability of water resources for coping with demand mainly in quality requirements. This is worrying at southern and northwestern parts of the country.

Portugal has insufficient level services of public water supply although the impressive evolution in these field in recent years (figures 2, 3). Public sewage treatment plants is also behind with scheduled, with unsatisfactory level services (figure 5);We still have untreated domestic and industrial effluents running directly to the rivers which is an huge attempt on the sustainability of water resources.

Old industrial units are related with the most serious problems of industrial pollution because many of them don't have clean technologies (Sereno, 2002).

Control and monitoring of water quality in rivers, groundwater and coastal waters is insufficient, as there are some institutional deadlocks, and the proliferation of mining practices make very hard the task.

Agriculture related pollution is outstanding and difficult to overtake, as farmers attitudes and practices are far from environmental friendly. Investment effort to ensure a long term sustainability of the system is needed for the development of backstage technical capabilities and adequate planning procedures.

The tradition of free water for agricultural irrigation and heavily subsidized water for household use has placed heavy constraints on water management.

It is very difficult to enforce the legislation concerning licensing and paying charges as there is a well established tradition of free water appropriation and enforcement requires an efficient administration, which is very far from the current situation. The registration of all users is indeed an enormous task

At the local level, municipalities although sharing responsibilities in defining water policies and applying national legislation, tend to concentrate on the problems of water supply and waste water disposal, as they are the responsible entities for these jobs. They have an important role in public health as supervisors of the quality of drinking water.

Recycled water for domestic purposes is far from feasible. For example, for public and private greeneries, toilet flushing, and other less quality water demanding, drinkable water is used. This is a constraint in water management systems.

Household livelihood strategies has to change in order to save water, which calls for educational programmes that are in the political agenda, but are late in implementation.

Management of ground waters has traditionally been developed using private rights of ownership and use which has given way to serous problems of pollution, salinization and overdrawing of aquifers (Ferreira 2005).

Inefficient water use results also from network leakages and inappropriate irrigation. Lack of enough strategic reservoirs causes relevant water losses (Valente 2005).

This view of some Portuguese practices makes clear the urgent need of changing mentalities, management arrangements and institutional arrangements in order to carry out strategies in response to water policies that are already outlined but indefinitely procrastinated.

The key strategy is to integrate the environment into other policy areas, as a driving force for a rationale and a sustainable use of natural resources and to avoid depletion. Pricing water policies and educational, training and research planning have a determinant role in environmental policies as enabling factors.

A comprehensive integration is the goal of EU policies itself as they promote the adoption of integrated strategies.

Integrated water resources management must be viewed considering all physical aspects and societal interests considered simultaneously, while taking a long term perspective and creating an enabling environment of good neighborliness that makes inter- sectoral and international cooperation and planning succeed.

We hope that the deadlines of WFD contribute decisively for the fulfillment of these water sector requirements. Portuguese Water Institute (INAG) is the institution with responsibilities concerning national water policies for waters under its jurisdiction. It has enough powers to licensing and guarantee quality and rational use of the resource, towards sustainability of the water sector. Enforcement of such powers is expected.

Figures on Portuguese water data Source: Avillez(2005)

Fig 2- Public water supply(A) and service level (B)

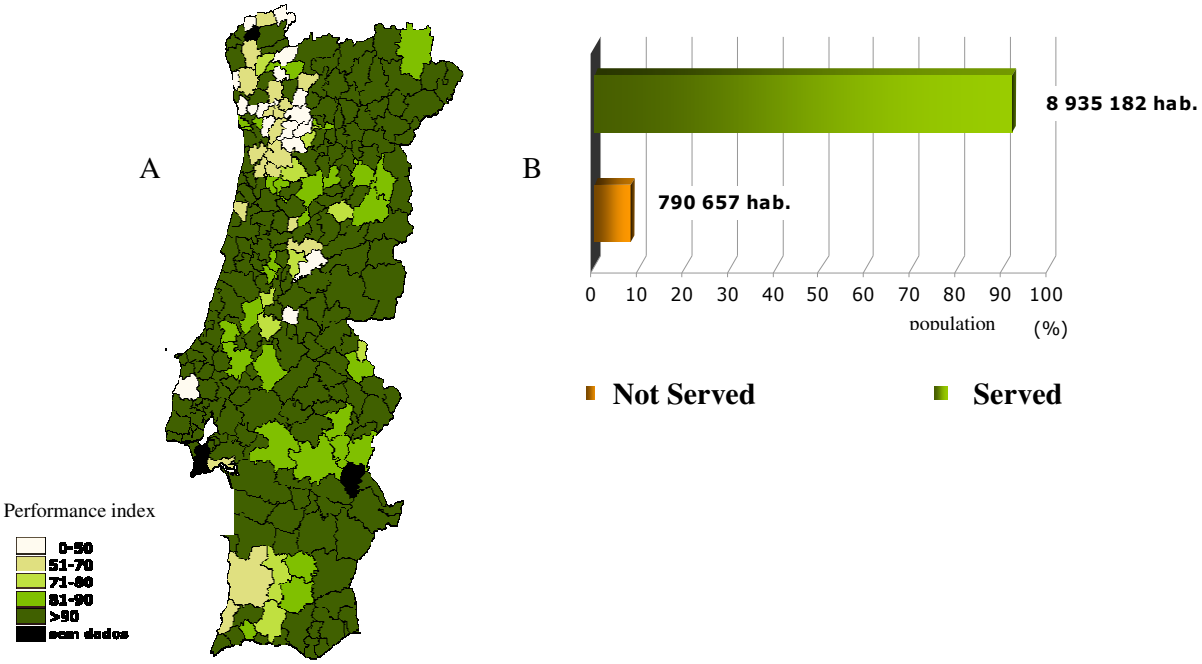


Figure 3- Service level of performance of public water supply

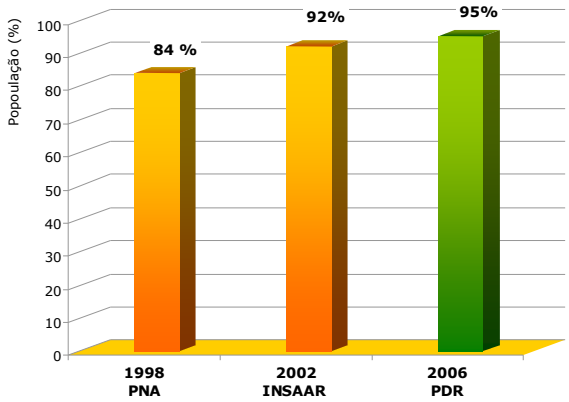


Figure 4- Water abstraction (hm^3)

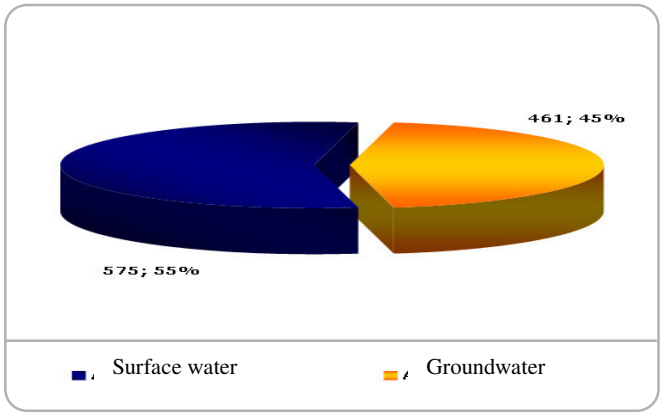


Figure 5-Service level of performance of public sewage treatment plants

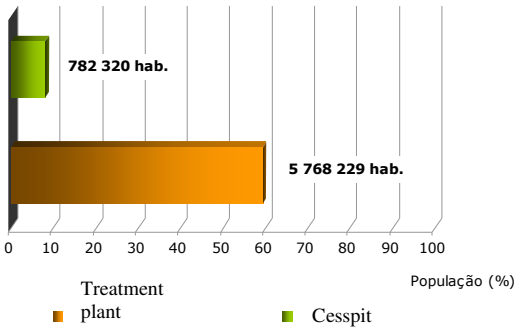
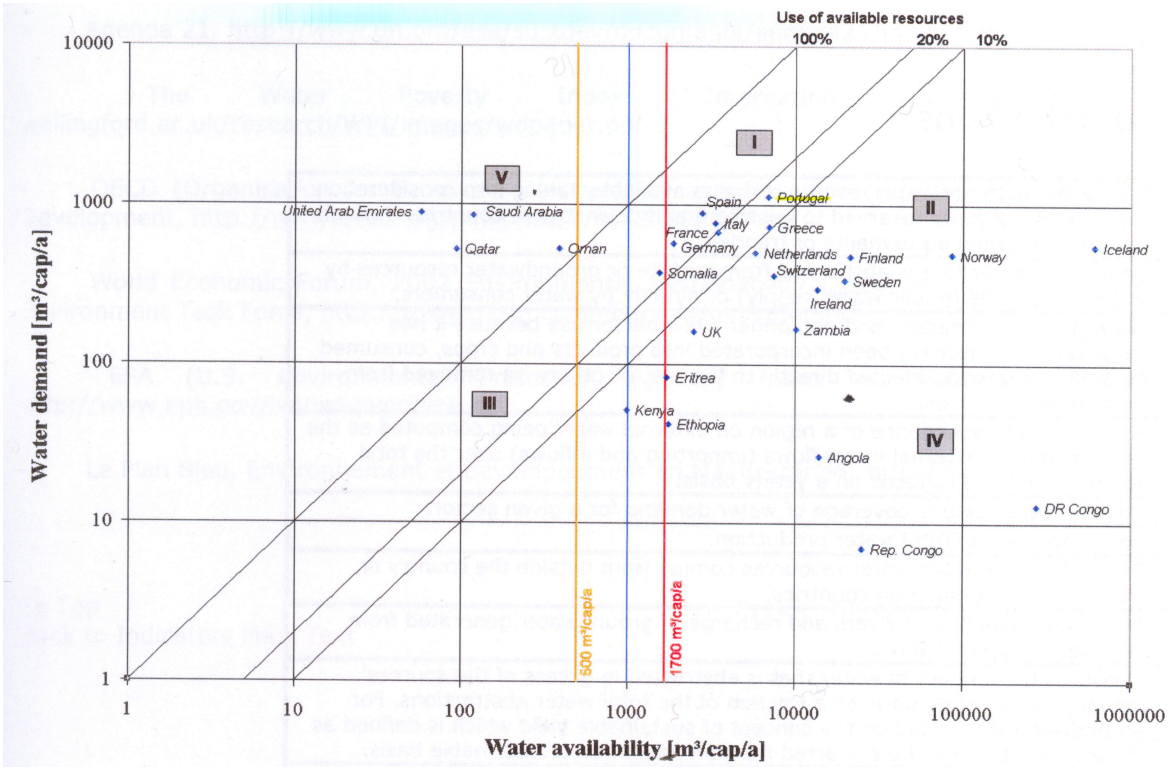


Figure 6-Compared water demand and availability



V- Further research for improvement of strategies in water sector

In water resources management we are dealing with a good with very special properties that have long made it very "special" in legal, religious, symbolic and economic terms.

Water sector, as other sectors, must be effective in the delivery of its services to its consumers and efficient in the use of its resources (Alaerts et al 1991).

Aiming for long term sustainability, these are prerequisites to develop through adequate environmental policies, institutional arrangements that can convert financial resources into sustainable projects and actions, by using appropriate technologies.

Policy makers should engage in improving their knowledge concerning new technologies with long term benefits in order to learning more about the economic and environmental costs, technical feasibility and social acceptance of the political options.

Relation between firms and the scientific community appear important as cleaner technologies require multiple set of complementary technical developments, which go beyond the scope of the generally of the firms.

Networking and R&D cooperation can facilitate the development of clean technologies leading to a reduction of uncertainty in the adoption of clean technologies(Lahaye and Llerena 1996).

We also have to enhance the crucial role that the water industry plays in the provision of essential infrastructure. Industrial, commercial and housing developments are clearly dependent on both level of capital invested in new storage, treatment and reticulation facilities and the level of revenue expenditure for repairing and maintaining the existing systems in operating order.

Nevertheless the State continues to play an important role in laying down and enforcement rules, and because of natural monopoly and public good aspects of water supply.

Institutional arrangements require also recognizing the limits of markets and planning. Sustainability involves placing higher priority and maintaining specific items of natural capital through time, even if this requires foregoing high value using.

To improve household livelihood and irrigation strategies is also a very important task, as inefficient water losses can be avoided.

Policies should be developed at various levels of the river basins, that consciously influence the demand, and recycling policies must be undertaken.

Best management practices should be based on clear and transparent objectives which must be implemented through modalities of community and user groups' participation.

We believe that a more efficient use of water is not incompatible with the ecological imperative.

Between the EU countries are large differences in climate and the availability of natural resources, including water. Economic cooperation has enabled countries to no longer strive for self-sufficiency in food, energy or production of essentials. Now, products can be produced where resources are available and where the climate is favourable. In this sense, the UE countries exchange "virtual water" (Winpenny, J.1997) in the form of food, energy and industrial products. Improving the trade of these products implies increase virtual water trading, which guarantee stability and sustainability of water supply.

VI- Concluding Remarks

In this paper what we have actually been dealing with, is the nuances of the sustainability path for water resources sector.

Integrated water resources management must be viewed considering all physical aspects and societal interests considered simultaneously, while taking a long term perspective and creating an enabling environment of good neighborliness that makes inter- sectoral and international cooperation and planning succeed.

Social and ethic dimension of water sustainability stands for intra and intergenerational equity, universality of pricing policies without relevant regional asymmetries and socially acceptable.

Best management practices should be based on clear and transparent objectives which must be implemented through modalities of community and user groups' participation. Its legitimacy is important for enforcement.

Water management authorities will have to prove their capacity in providing water services in a more efficient way than before, with a wiser management of their responsibilities in relation to the consumers and to the environment.

The tradition of free water for agricultural irrigation and heavily subsidized water for household use has placed heavy constraints on water management in Portugal. Low water pricing not cost recovery lead to declining funds available for investment in water infrastructure, inefficient water allocation, and weak conservation of existing projects.

Even with privatization and provision for cost recovery, sustainability depends on the quality of institutions and the power of the enforcement they are embodied. Agricultural interests is a dominant power in water resources management not only in Portugal, despites the fact that in general the market value of water in urban use is considerably greater than in agricultural use (Okun and Lauria 1991).

Sustainable resources management necessary involves the identification of the utmost sustainability dimensions, the role of different management strategies towards reaching the sustainability goals and also requires a new type of relations amongst authorities, operators and citizens whose right to use water must be based on usership rather than ownership.

Networking and R&D cooperation can facilitate the development of clean technologies leading to a reduction of uncertainty in the adoption of clean technologies as Lahaye and Llerena (1996) suggest.

The main objective of EU concerning water policies is well established in COM, (2000) where it is clear that the development of water pricing policies enhancing the sustainability of water resources is crucial. The idea is that the full recovery of financial costs and the integration of environmental concerns are the favorite way to use efficiently water. European WFD has an innovative approach in many decisive features for the sustainability of water sector. Nevertheless, institutional arrangements require also recognizing the limits of markets and planning. Sustainability involves placing higher priority and maintaining specific items of natural capital through time, even if this requires foregoing high value using. Economic incentives to regulate resource use are not necessarily consistent with sustainability of the resource and biological conservation. State governance serves an essential purpose in situations in which the general public good is involved and other property rights regimes cannot be relied upon to provide sufficient protection for the specific resource conservation, as watersheds for drinking water supplies.

Research is needed for improvement of strategies concerning the approach to the problem of water scarcity in its three dimensions: quantity, quality and institutional and managerial capacity for water governance.

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