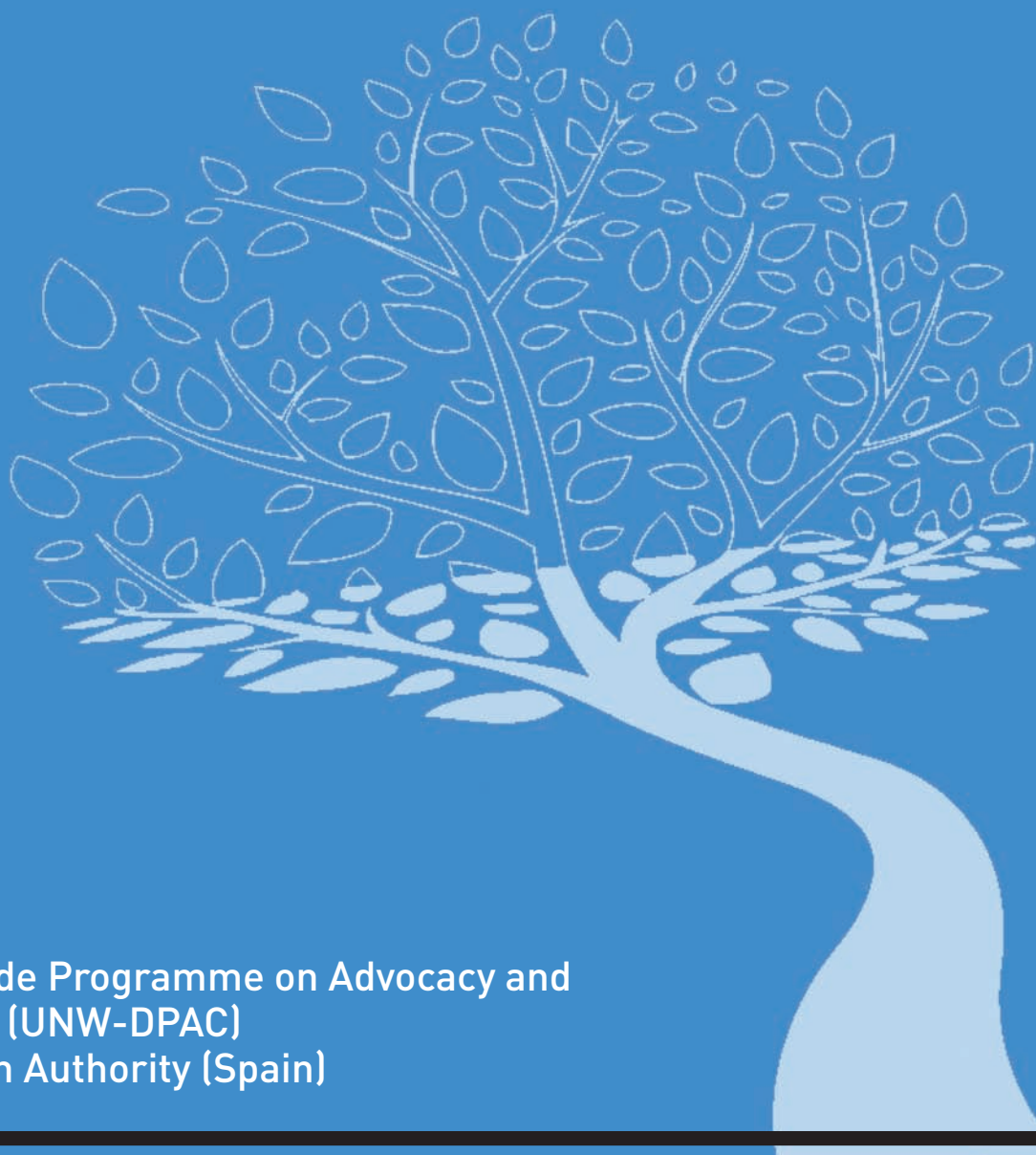


Water planning in the transition to a green economy



UN-Water Decade Programme on Advocacy and Communication (UNW-DPAC)
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PREFACE:

Water and the Green Economy: expectations for Rio+20



Momentum has been building on water as a priority issue for Rio+20. In the preparatory process, Brazil supported the idea of water being a key emerging issue to be addressed at the conference. Member States, major groups and civil society have become increasingly engaged in making proposals on water as a central theme in Rio. The UN agencies, the Secretariat and UN-Water have provided support and substantive inputs to the process.

Rio is providing an opportunity for assessing progress on international commitments in water. There are three global reports that provide the basis to do so: the 2012 Joint Monitoring Programme Report on access to safe drinking water and sanitation services, the Water Resources Management Report that will be launched at Rio and the March 2012 UN World Water Development Report 4. Internationally goals in access to water and sanitation services and in water resources management have been agreed in Agenda 21 (1992), MDGs (2000), JPOI (2002), and the Dushanbe Water Appeal (2003).

There is good news in relation to the achievement of the Millennium Development Goals on access to basic safe drinking water services. In sanitation the situation is a major concern since although 1800 million have obtained access to improved sanitation there are still 2500 million people without improved basic sanitation services. The UN-Water global survey of 122 countries on the status in the 'application on integrated approaches to the development, management and use of water resources' will be delivered to Rio+20. Preliminary findings from the survey indicate that most governments have made progress with water sector reform; but that the implementation process which sees principles turned into policy, laws, strategies and plans is slow.

The poverty agenda, and the concern with equity and planetary boundaries are very much at the center of Rio preparatory discussions. If there is an issue in which inequities "in the access to water and sanitation services" and the planetary limits "of water resources", are compelling, this is water. Rio represents a unique opportunity not only to assess progress but also to boost commitment from governments and stakeholders to implement actions to address these. Actions that many consider need to focus on how to provide basic services to the bottom billion and on environmental degradation.

The preparatory process for water in Rio has been long, with many proposals ranging from concrete targets for improving efficiency of water use and reducing pollution to improving cooperation, coordination and policy coherence and improving water resources allocation and management. Not all of these proposals have been incorporated in the negotiated outcome document and there may be still a disconnection

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in the discussion on water and the green economy. The expectation is that there will be advances in the water agenda on access to basic water and sanitation services, Integrated Water Resources Management and Cooperation. This includes a call for improving efficiency and reduce pollution, improve wastewater treatment, and use of treated wastewater and other non-conventional water resources.

An important landmark in the preparatory process has been the UN-Water conference “Water and the Green Economy in Practice: Towards Rio+20” on 3-5 October 2011 in Zaragoza, Spain, focused on tools for the transition to a green economy. It identified four priority water-related loci where change needs to take place in the transition to a green economy: agriculture, industry, cities and watersheds. Six tools were proposed which can be used to facilitate change and support the transition towards a green economy: (1) economic instruments; (2) green jobs; (3) cost recovery and financing; (4) investments in biodiversity; (5) technology; and (6) water planning. These tools can enable us to ‘do more with less’, overcome barriers, harness opportunities and change behaviours in order to achieve a green economy.

As stated by the World Bank Water Brief for Rio (2012), “the growing complexity and global nature of water challenges calls for more sophisticated planning that successfully addresses the linkages of water across all economic sectors.... Such an approach would give decision makers a bird’s-eye view of the way water is used at the moment, and allow them to identify those water assets with economic potential and those that are liabilities in need of careful management. The latter might include falling water tables, climate change impacts, and the opportunity costs of using water in one way rather than another. Opening such a portfolio to public debate would quickly identify gaps in behavior and social norms, financing, infrastructure, data, knowledge, governance and policy, productivity, and services, and help the development community and investors to target financial and technical support more efficiently”. The session on water planning in Zaragoza presented in this publication has provided key insights and examples on water planning and how to overcome implementation challenges.

Josefina Maestu
UN-Water

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FOREWORD:



Thanks to the incessant and profound work of the United Nations Office to Support the International Decade for Action "Water for Life" 2005-2015, was held the International Conference "Water in the Green Economy in Practice: Toward Rio +20", that took place in Zaragoza (Spain), on 3, 4 and 5 October 2011, and we had the pleasure of hosting this event in our premises of the Confederación Hidrográfica del Ebro, the Ebro River Basin Authority.

Reconciling economy and the environment remains the great challenge of our time. In this context, water is perhaps the element that makes more manifest this apparent dichotomy, as it stands as the fundamental core of the functioning of the ecosystems of our planet and, at the same time, as the foundation of human development.

Without doubt, we will find in the green economy the answer for this long-awaited compatibility, and water should be inserted in this new economy in transition as a true engine for sustainable human development. In order to reach that objective, proper water planning is essential, allowing a clear diagnosis of the situation, setting achievable but ambitious goals, establishing consistent measures to face the present challenges, promoting active participation of all stakeholders, and within the natural frame of watersheds. Only this will allow meeting the growing water demands in an environmentally sustainable way, preventing further deterioration and recovering the good condition of rivers and aquifers.

As a result of that Conference, session of "water planning to support the transition towards green growth", are the contributions which are included in this document. They point out how water planning can contribute effectively in different parts of the world in the necessary transition to a green economy in a integrated manner by addressing the various interrelated factors.

In the Ebro basin (Spain) we are prudently proud of the path we are taking to meet the challenge and make water to be a key element in the transition to green economy.

*Xavier de Pedro Bonet
President of the Confederación Hidrográfica del Ebro*

Setting the Scene: Water in the Green Economy:

Abstract:

The International Conference “Water in the Green Economy in Practice: Towards Rio +20” took place in Zaragoza, Spain, 3-5 October 2011. The objective of the conference was to position the water agenda as a key element for advancing towards a green economy, and to demonstrate how different tools can promote change. This was illustrated through specific practical examples of the use of these tools to facilitate change in different regions of the world.

This document compiles the background, the illustrative experiences and the main lessons learnt over the critical importance of water planning for the transition towards the world economy. Although the services of water to the economy and those services provided by the water ecosystems can affect anyone individual welfare, its continuing provision as well as the proper balance between water use and water conservation requires managing water as a collective asset. Water planning is institutional setting to agree upon and to carry on with the collective decisions that any society needs to make, for instance, to find the balance between the use and the conservation of water resources, between the current benefits derived from water use and the preservation of the options for the generations to come and between making water an integral part of a progressive strategy of economic development.

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In addition to showing the different institutional responses to the above mentioned challenges of water planning, the three Case Studies presented in this document allow making the contrast between countries with an advanced water institutional setting (Spain), transition economies building a sustainable water management institutional set-up (Korea) and other still trying to make water part of a strategy to break up the poverty trap and start a path towards economic progress (Lao PDR).



*Welcome address by the former President of the Ebro River Basin Authority
(Confederación Hidrográfica del Ebro)*

Water planning in the transition towards a green economy

*Rafael Romeo, Manuel Omedas, Rogelio Galvan
Ebro River Basin Authority
Carlos Mario Gomez
University of Alcalá and IMDEA Water Foundation*

Freshwater is a finite and vulnerable resource, essential to sustain life, development and the environment;

Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels;

Women play a central part in the provision, management, and safeguarding of water;

Water has an economic value in all its competing uses, and should be recognised as an economic good.

The Dublin Principles

The opportunity to improve governance arrangements is one of the biggest opportunities to speed transition to a greener economy. In any area where there is water scarcity, it is critical that governance arrangements are put in place to prevent over-use and overdevelopment of the available water resources.

UNEP (2011)

1. The challenge for planning

Water is not only essential for the production of single commodities, goods and services and for meeting individuals' drinking water and sanitation needs. Water is also fundamental for the maintenance of the entire economy. Development prospects in any nation are propelled or constrained depending on the way water resources are managed. Welfare advances and economic progress in poor and rich nations are more or less vulnerable, depending on the state of conservation of water resources and water infrastructures. Personal development opportunities depend on the access people have to basic drinking water and sanitation services. The fragile border between social peace and civil conflict often depends on how the benefits and costs of water use are shared amongst individuals and countries. Ultimately, the future of humanity depends on the conservation of the earth's ecosystems and their ability to provide the critical environmental and water services the economy and the entire global society depend upon.

For all the aforementioned reasons, decision making on how and how much water to use in the economy or to conserve in nature cannot be simply left to individual interest. Water needs to be governed. But water planning is not only concerned with building the infrastructures to satisfy rising water demand as a result of economic and population growth. This is not possible in the long term because, firstly, water resources have a limited capacity to cope with water abstractions and effluent discharges, and secondly, because the benefits we obtain from using and transforming water ecosystems (by abstracting, diverting, degrading water sources, etc.) enter in conflict with other important economic benefits whose provision depends on the conservation of water sources and their associated ecosystems. The last services include, for example, security in the face of droughts and future uncertain water supply due to climate change, flood control, self-treatment and depuration, biodiversity support, navigation, landscape and recreational opportunities and also the regulation of the water cycle which the provision of water depends on.

The transition towards the green economy requires improvements the water environment without harming prospects for economic development. This implies not only making welfare and social improvements compatible with the preservation of water resources but also finding new and innovative opportunities for economic growth and social development through sustainable water management. Water plays a key role in economic development and water planning is a powerful social instrument for optimising growth, poverty reduction and environmental benefits. This is the case in advanced, transition and poor economies as the cases of Spain, Korea and Laos show.

Water planning has a distinct role to play in less developed countries. The benefits of providing basic water and sanitation services in this early stage of development are of paramount importance for lifting people out of the poverty trap. Gains in health and education opportunities mean increased prospects for personal and social progress if revenue raising opportunities are also available (e.g. food pro-

duction in rural economies). Water planning is important to start and sustain the development process. But water development can be challenging if water is scarce, requiring substantial investments in public infrastructure or the development of alternative water sources (such as water harvesting or desalination).

Climate change will increase the uncertainty and variability of water availability and will reduce the security of water services. Increasing water scarcity and variability (occurrence of droughts and floods) will affect rain-fed agriculture and water supply for domestic use, energy, industry and agriculture, and will likely generate pressures for increasing irrigation and cultivating marginal lands. Water planning must provide the institutional space to build a collective response to the climate change challenge and build the resilience of water management.



Session on water planning at the conference “Water in the Green Economy in Practice: Towards Rio+20”

The alternative to water planning is allowing the spontaneous, unplanned and uncoordinated actions of anyone affected by water stress; actions that could lead to increased vulnerabilities. Spontaneous responses from people, businesses, and farmers in rural communities depend on their perception of value and risk, the options available to them and their individual economic incentives. These responses may not necessarily produce the most sustainable outcomes. For example, they may add more pressure to cultivate marginal land, or unsustainable cultivation practices may be adopted when yields are reduced because of erratic rainfall. The end result may be increased water scarcity, land degradation and the endangerment of biodiversity, thus increasing vulnerability and reducing capacity to respond to climate change and other risks later on.

Planned and anticipated responses are needed to ensure the provision of water

services which underpin the economic system. Water planning is also necessary to cope with environmental challenges such as water scarcity, water quality degradation and climate change risks.

2. The key elements of planning

• **Reaching a social agreement on the desired balance between water use and water resource conservation**

The first purpose of water planning is reaching a social agreement on the desired balance between water use and water resource conservation, or in other words, agreeing on the balance between water use and pressures on the one hand, and conserving water on the other. This basic but politically challenging agreement is a necessary condition for successful water planning. For example, since 2002, the Water Framework Directive of the European Union has set the objective for water planning as making economic progress compatible with the improvement and protection of the status of the affected water bodies (any exception to this principle requiring a special justification in terms of improvements in economic welfare).

In an international river basin, this basic agreement on the balance between water use and water resources conservation might only be driven by the need to cooperate in sharing the benefits derived from the river. By specifying the responsibilities of each country and by enforcing the agreement among them, all the countries ensure their contribution to the benefits of preserving the international river basin. Successful cooperative agreements of this kind are based on the mutual responsibility to comply with some precisely defined and observable environmental standards. A practical way to implement this kind of cooperative agreement is to incorporate these standards in national and local water planning so that the fulfilment of the international agreement and the credibility of the national partners are reinforced and foster cooperation. This is the case for the Mekong River basin international agreement and its important influence on the goals and means of water planning in the Lao PDR.

• **Harnessing development opportunities and coping with water and development challenges**

In the Ebro River basin, water management has been a tool for development. Water underpins the powerful agro-food industry, based on the development of irrigation systems, and a dynamic energy complex, centred on hydropower along the main river and its tributaries but also relying on water to cool thermal fossil and nuclear power plants. The river valleys are also essential for transport, the manufacturing industry and population settlement. Water planning has undoubtedly played a role in the progressive economic development of the region, but the amount of water used has exceeded its sustainable limits and recent efforts have been made to reduce water pressures and increase conservation of water resources. Modernising irrigation systems is now a priority for guaranteeing water supply and increasing the resilience of agriculture to droughts.

The existing dams in the Ebro basin are able to provide a reliable supply of water for urban areas and for irrigation as well as flood control services, but some efforts are required to avoid negative impacts on sediment balances, river bed encroachment and saline intrusion in the lower Ebro. Water development has been able to provide enough water of the desired quality for a variety of water uses, but increased use has reduced the amount of water stored and the potential for hydropower, thus reducing the value of the installed power generation capital. All this has reduced environmental flows and altered the habitat conditions, making river restoration one of the main objectives of recent water planning. The main objective of water planning in the Ebro today is recovering the balance between the status of water resources and their critical environmental services, and the gains already achieved in economic development.

The case of Laos is distinct because the country has abundant water resources (in fact most of the runoff of the lower Mekong comes from Laos). Moreover, in the Mekong river basin, Laos is a late comer to economic development and water resources are affected by water regulation in the upper basin, and in particular the significant hydropower projects already built or under construction in China. The transboundary nature of the river basin also means that intensive water use in Laos might have detrimental impacts on the already developed irrigation fields and populated areas of Vietnam and Cambodia in its delta. The development of Laos is only possible if water planning is able to address potential conflicts between water users and uses, and able to transform competition over scarce resources into mutual cooperation to conserve and share the benefits of improved water resources. Adapting hydropower dams in China in order to meet irrigation needs in Laos, and water uses in Laos to help maintain environmental flows required in the Vietnamese Mekong delta, are examples of such mutually beneficial arrangements.

In contrast to the Ebro, Korea is a transition economy where there are still opportunities for the construction or the expansion of dams and weirs as a central element of water planning. Nevertheless, environmental objectives are still important as public demand for recreation and well preserved water landscapes increases with income levels. Moreover, there is a commitment to preventing further deterioration of water quality and water landscapes due to the perceived importance of water security and the need to meet water demand in the long term.

- **Building governance and institutional capabilities**

Building governance and institutional capabilities is essential for agreeing on, designing and effectively implementing long-term integrated water management plans in order to support the transition towards green growth. The Laos experience illustrates a progressive strategy of improving water governance, by developing technical abilities, creating river basin management institutions, improving information systems and promoting stakeholder engagement.

• **Coordinating public policies**

Water planning can only contribute to green growth if water is not perceived as a simple policy area (e.g. agricultural, energy or industrial policy). In the transition to the green economy, water planning needs to be converted into a cross-cutting policy, in order to guarantee that all other policies and projects – from urban planning to agricultural policy – are coherent with the collectively agreed objectives of water planning.

Policy coherence is critical because of the limited ability of water ecosystems to meet all the increasing and competing demands for water in the economy. Global water demand is increasing due to population growth, rising living standards, and expanding production of agriculture, hydroelectricity, and the many goods and services for which water is an essential input. Water requirements today and in the future cannot be met unless all these uses of water are coordinated and water sources are conserved. Water planning enables the coordination and alignment of the many public policies (such as land use, urban and rural development, manufacturing and energy policies) and public policy objectives (such as economic efficiency, equity, basic needs coverage or cost recovery) which influence and are influenced by water management. Instead of being another public sector action, water planning makes water policy a horizontal axis connecting and coordinating many individual areas of public policy.

Green growth means increasing economic wealth and welfare without further deterioration of the water environment, and this is impossible without more efficient water allocation. But efficiency arguments are not valid when used to oppose the legitimate option of charging less than full cost recovery prices to provide basic water services in order to reduce poverty. Even in this case, there is a dilemma between subsidising water services and sustaining the provision of these services in the long term, for which self-financing is required. Cost effectiveness and budget constraints might also lead to excessive focus on the urban poor, offering them the lower cost alternative rather than providing water services to scattered populations in the rural areas. Deciding on the objectives for a river basin is a political and not a technical exercise. Identifying tradeoffs between different objectives and decision criteria in water management (such as efficiency, fairness, financial and environmental sustainability) is key to the planning process and provides the basis for political decisions to be made over what actions to take. A transparent planning process with stakeholder participation at all stages is essential and ensures that all voices are heard.

• **Stakeholder engagement and public participation**

Effective water planning requires the cooperation and engagement of a wide range of stakeholders. Public participation helps construct a shared vision of the objectives, opportunities, challenges and collective and individual responsibilities involved in the management of water resources. It helps foster the perception of water as a collective asset to be preserved by mutual cooperation rather than a common pool resource to be depleted by open access and competition.

When people are aware of the benefits of cooperation through, they have incentives to build a reputation of good behaviour and social responsibility, fines can be perceived as fair and the threat of moral sanctions can deter misbehaviour. But this collective action can only be based on the common perception that water benefits are distributed fairly. This requires trust that the water authorities represent the common interest and follow transparent rules instead of their own discretion. Cooperation also requires that individual behaviour is observable in such a way that deviations are detected and pay a cost. Building effective participatory water planning therefore requires proper incentives, and must ensure that decisions are perceived as fair, rules are enforced, and there is transparent and adequate information available to all.

• **Aligning private decisions with collectively agreed goals**

Within limits any water user has the option to decide how much water to use, for what purpose, in combination with what other inputs. These decisions depend on many factors such as income generated by the productive activity, water prices, and installed water use technologies. For water planning, it is essential that all the decisions taken by water users are compatible with the different objectives of water policy. Incentives and regulations are then an important part of the package of measures in water plans. Charges for water services are one instrument to consider. If, for example, water is charged for with a flat rate, productive uses might have an incentive to use more water than their legally authorised water use rights, neglecting the needs of other downstream users and causing negative environmental impacts. These external impacts are not taken spontaneously into account in private decisions unless there are adequate incentives in the form of tariffs or penalties, controlled by a regulator. Energy subsidies, yield-linked agricultural subsidies and even water flat fees are all examples of incentives that may not be compatible with the objectives of water plans, including environmental goals. Water planning needs to address the compatibility of incentives transparently, identifying situations where these incentives are justified, and where they are not.

• **Establishing collective responses to scarcity and risk**

Poor and water-scarce societies that are now trying to develop their water resources and provide basic water and sanitation services are faced with the potential adverse effects of climate change, constituting a real threat to development (World Bank 2010). Water planning is the proper institutional framework for coping with the challenge of adapting to climate change and for developing resilient and adaptive responses to drought, floods and other water related risks. Increasing uncertainty and competition for reliable water supplies makes devising water policy difficult and requires adaptive responses. Water allocation decisions and water demand management are especially crucial in the context of increasing competition and scarcity.

The options that may need to be considered in water planning include, as proposed by the IPCC, no regret strategies and climate justified strategies. No regrets strategies are measures that are worth taking anyway, regardless of climate

change. Water storage schemes and infrastructures, water conservation programmes, and improvements in efficiency are examples of the kinds of measures already considered as beneficial but that are even more valuable in a climate stressed context (see Korea's four rivers programme). Climate justified strategies are measures which need only be considered in the face of uncertainty, for example, diversification of water sources (such as desalination or non-conventional sources), the upgrading of storm water systems, the reversal of coastal developments to reduce exposure, the recovery of floodplains for flood protection, and the recovery of aquifers for buffering security stocks. Achieving water security requires agreeing on a combination of the available options.

3. Summary of the elements of the approach

- **Obtaining consensus of the population.** Not only are the goals and instruments of water planning important but also the procedural aspects of how these goals and instruments are chosen with the participation of all the potential stakeholders. Participation can promote the vision of water as a social and economic asset that needs to be properly preserved instead of only as a provider of services. This way water planning promotes a common and shared vision of water assets such as aquifers and river basins.
- **Providing guidelines for economic activities and cities to make decisions on water use.** Once the goals and instruments of water policy are agreed upon, many practical recommendations are given to individuals, firms and institutions so that they can adapt their actions in order to improve their contribution to water conservation and green growth.
- **Making sustained welfare improvements and economic growth compatible with the recovery and adequate protection of water providing ecosystems.** This is the essence of sustainable green growth.
- **Coordinating individual actions with collectively agreed goals in terms of water use and water resources conservation.** Water planning can be a powerful instrument to ensure that the actions of individual water users are not in contradiction with the common social goal of protecting water resources, making growth sustainable, and ensuring intra- and intergenerational justice.
- **Avoiding the negative impact of individual, spontaneous and uncoordinated responses to natural disasters and climate change.** These kind of responses can lead to water scarcity, impair water related ecosystems and increase inequalities and social exclusion. Water planning can foster collective, anticipated and planned responses to climate change, water scarcity, floods, droughts and other water related risks.
- **Conflict resolution and management of the many social conflicts associated with the distribution of water among people, economic uses, time and regions.** Planning is a means to foster collective agreements,

public participation and consensus building which are basic elements to promote a common vision of the river basin as a collective asset.

- **Promoting social justice** by guaranteeing basic human needs are met, despite the lack of market incentives to provide basic water and sanitation services. Planning can also promote equitable distribution of water use rights and water development opportunities among potential water users.
- **Helping preserve water resources and water providing ecosystems.** Instead of adapting water resources to the needs and demands of the economic system, the focus of IWRM is to ensure that economy expansion is not obtained at the expense of further degradation of water providing ecosystems, but on their improvement and adequate protection.

4. Lessons learnt from implementation of planning processes

The approach	Lessons learnt from implementation
<p><i>Reaching a social agreement on the desired balance between water use and water resource conservation</i></p>	<p>Setting the achievement of a good or fair ecological status of the water bodies as the main objective of River Basin Management Plans in the European Union has been an important element of water planning in the Ebro River Basin in Spain and has helped make economic development compatible with environmental objectives.</p> <p>Adopting a set of international commitments regarding the environmental status of the Mekong River Basin in Laos has been a central element of the coordination of water planning with national development policies.</p> <p>In Korea, clear objectives for the recovery of river ecosystems has been a critical element for increasing legitimacy and gaining public approval of an extended programme of water works and infrastructure development in Korea that is critical for sustaining economic growth.</p>

<p><i>Harnessing development opportunities and coping with water and development challenges</i></p>	<p>Water planning has played an essential role in the development of the agro food and energy complex that now represents a competitive advantage and a defining characteristic of the Ebro River Basin in Spain.</p> <p>In Laos, water policy has been the cornerstone the country's success in progress with the Millennium Development Goals and in the ongoing transition from a rural to a urban economy.</p> <p>In Korea, water planning has been developed as an anticipatory strategy to foster economic growth, preserve the welfare gains already achieved and provide water security in the future.</p>
<p><i>Building governance and institutional capabilities</i></p>	<p>An ambitious programme of building water governance structures is already in place in Laos. Transparency, regulation and enforcement, and building technical competences are key elements for this strategy to succeed, as seen in the Ebro river basin.</p>
<p><i>Coordinating public policies</i></p>	<p>The simultaneous development of the energy, the agro food industry as well as urbanisation and the expansion of the manufacturing industry have been possible within the capacity of the limited water resources available in the Ebro river basin.</p> <p>The agreed commitments of the international Mekong agreement have been a central element in the National Development Plan of the Lao PDR and have contributed to the coherence between objectives in the different economic sectors and the general objectives of water policy.</p>
<p><i>Stakeholder engagement and public participation</i></p>	<p>Active participatory mechanisms have contributed to the design of water management plans in the Ebro River, are being used in Laos and are an integral part in the management of water at local scales in Korea.</p>

<i>Establishing collective responses to scarcity and risk</i>	The Water Framework Directive and the Mekong Agreement are promising examples of collective responses that have served to develop systematic efforts at a national and local level to respond to water challenges.
<i>Monitoring progress and compliance</i>	<p>The acquisition of technical skills, the development of information systems, the building up of reporting strategies, etc. are all elements that have contributed to the reputation and credibility of river basin authorities in the Ebro and in the case of Korea.</p> <p>The capacity of the Lao PDR to manage its own water challenges have given credibility to its commitments in the Mekong agreement and has allowed Laos, in spite of being a LDC, to improve its position with respect to other national partners.</p>

5. Lessons learnt from the specific cases

Cases	Lessons learnt from implementation of planning processes
Laos	<p>Water planning needs to be based on and accompanied by institutional development. It is important to foster water governance structures such as the establishment of River Basin Authorities.</p> <p>Investment in the appropriate technical skills and the information technology is essential for assessing the status and the potential of water resources for development, verifying the actual outcomes of water policy and for monitoring and enforcing the compliance of water regulations.</p> <p>Specific attention has to be given to the development of participatory decision frameworks and to favour stakeholders' engagement in the policy making process.</p> <p>Focused efforts to improve the ability of stakeholders to manage information, compare complex water management options and also to agree on the objectives and instruments of water management are paying off.</p> <p>Fostering transparency of water allocation decisions and the gradual replacement of discretionary decisions by rules and the application of norms is proving key to the avoidance of conflicts.</p> <p>Improving reporting and communication skills can foster the ability of water management to fulfil international agreements in the framework of the Mekong river agreement.</p>

Korea	<p>Establishing clear objectives: The Four Major Rivers Restoration Project of South Korea is to restore the Han River, Nakdong River, Geum River and Yeongsan River in order to provide water security, flood control and ecosystem vitality. It has five key objectives: 1) securing abundant water resources against water scarcity; 2) implementing comprehensive flood control; 3) improving water quality and restoring ecosystems; 4) creation of multipurpose spaces for local residents; 5) regional development centred on rivers. More than 929 km of national streams will be restored as part of the Four Major River Restoration Project.</p> <p>Linking it with national policy: This project was first announced as part of the “Green New Deal” policy launched in January 2009. It was later included in Korea’s five-year national plan released in July 2009.</p> <p>Coordination of sectoral Ministries: The Four Major Rivers Restoration Project systematically approaches its objectives of restoring the rivers. As a comprehensive public project, the program includes a variety of plans submitted by several ministries, but coordinated by the Office of National River Restoration under the Ministry of Land, Transport and Maritime Affairs. The overall project consists of three sets of projects: 1) Main projects: the Han, Nakdong, Geum and Yeongsan rivers revitalization projects; 2) projects on the 14 tributaries of the four major rivers; 3) refurbishment for other smaller-sized streams.</p>
Spain	<p>Establishing social development objectives: The Ebro Water Plan is a social opportunity to build a system of water management which is ethical, efficient and sustainable within the Ebro River Basin in Spain. Under the principles of Integrated Water Resources Management it includes ambitious environmental objectives (at least 85% of river water bodies will achieve good status by 2015), and also contributes to sustainable growth, strengthening the agro-food complex in the Ebro valley and the role of water as an energy source in a future which relies on energy from mostly renewable sources, and encourages the inclusion of new uses of water, such as recreational uses.</p> <p>Implementing key measures: The commitment to reduce pollution and the efforts to increase water efficiency are cornerstones of a process contributing to green growth. In particular, technologies for modernisation of irrigation in Ebro basin are necessary for efficient water management and the reduction of diffuse pollution, whilst simultaneously facilitating higher productivity. On the other hand, reducing pollution from point sources implies the creation of many green jobs. All in all, 56% of all the investments considered in the Ebro Water Plan are to improve water environmental status.</p>

The Four Major Rivers Restoration Project (Korea)

*Yoon Jung Cha, Myung-Pil Shim and Seung Kyum Kim
Office of National River Restoration*

1. Challenges

The project is designed to address the significant environmental challenges faced by the Han, Nakdong, Geum and Yeongsan rivers in Korea. Repeated flooding and droughts have caused human casualties, ecosystem loss and habitat degradation, property damage and forced displacement of riverine residents. Extreme weather events that lead to flooding and droughts are expected to worsen in frequency and intensity due to climate change impacts. In the case of the Yeongsan River, toxic contamination from domestic and industrial waste disposal has resulted in water quality levels unfit even for agriculture and industrial use. These environmental challenges have dramatic economic consequences.

In Korea, cases of torrential rainfall over 100 mm in a day have increased by 1.7 times during the last 10 years. In 2002, Typhoon Rusa brought record-breaking rainfall of 870 mm a day in Korea. Moreover, torrential rainfall is expected to increase by 2.7 times and droughts are expected to become 3.4 times more frequent in the near future.

The annual average precipitation of Korea is 40% greater than the world average. However, the amount of water available per capita in a year is only about 12% greater, because two-thirds of the annual rainfall occurs during the rainy season from June to September, and almost no rain occurs in the dry season. As a result, disasters caused by repeated floods and droughts used to be commonplace. In addition, the river reaches in Korea are relatively short and channel slopes are steep. Therefore, flooding occurs quickly, peak flood discharges are great, and flow variations are comparatively large.

2. Objectives

The goal of the Four Major Rivers Restoration Project of South Korea is to restore the Han, Nakdong, Geum and Yeongsan Rivers and to provide water security, flood control and ecosystem vitality. The project will prevent natural disasters such as floods and droughts, protect the environment and promote historical and cultural tourism. The project will result in the creation of many new jobs, furthering economic growth and broadening the horizon of Korea's green growth initiative.

The Four Major River Restoration Project consists of three sets of projects: (1) Main projects – the Han, Nakdong, Geum and Yeongsan rivers revitalisation projects; (2) projects on the 14 tributaries of the four major rivers; and (3) refurbishment for other smaller-sized streams. The project has five key objectives: (1) securing abundant water resources against water scarcity; (2) implementing comprehensive flood control; (3) improving water quality and restoring ecosystems; (4) creation of multipurpose spaces for local residents; and 5) regional development centred on rivers.

This project was first announced as part of the “Green New Deal” policy launched in January 2009. It was later included in Korea's five-year national plan released in July 2009. The Four Major Rivers Restoration Project systematically approaches its objectives of restoring the rivers. As a comprehensive public project, the programme includes a variety of plans submitted by several ministries, but coordinated by the Office of National River Restoration under the Ministry of Land, Transport and Maritime Affairs.

3. Drivers of change and project initiation

The Four Major Rivers Restoration Project is a comprehensive, pan-governmental project, representing the planning commitment of several Korean governmental ministries to work together to restore the Han, Nakdong, Geum and Yeongsan rivers.

The roles of each Ministry in subsequent projects are as follows:

- The Ministry of Land, Transport and Maritime Affairs: Restoration of the four rivers and local tributaries
- The Ministry of Culture, Sports and Tourism: The “Rivers of Culture” project
- The Ministry of Knowledge Economy & Korea Communications Commission: Production of new and renewable energy and information technologies
- The Ministry for Food, Agriculture, Forestry and Fisheries: The “City of Beautiful Scenery” project, known in Korean as “Geum-Su-Gang-Chon,” and maintenance of forests in the upstream watersheds of the four rivers
- The Ministry of Public Administration and Security: Restoration of small branch streams flowing into the four rivers.

At the level of planning and even during project implementation, the government set expert advisory groups from seven different fields: senior committee meeting, policy advisory meeting, water resources, water quality, ecology and environment, landscape, culture and tourism, and local development. The advisory groups consist of professors, specialists, academics, and local representatives. In addition to the operation of the expert advisory group, the government gathers NGOs such as religious groups, environment groups, local citizens associations, etc. on a regular basis to discuss and gauge opinions.

From these participatory processes, twelve cities and provinces submitted 836 recommendations worth 98.3 trillion KRW. 213 river-related cases worth 6.9 trillion KRW that were coherent with the master plan were incorporated into the Four Major Rivers Restoration Project at the beginning. Examples are dredging sediments, fortifying existing levees, and restoring ecological rivers.

The government has taken the following steps toward implementation:

1. Dec. 2008. The Project was commenced at the Presidential Committee on Regional Development as part of the “Green New Deal Project.” A master plan was drafted by the Korea Institute of Construction Technology and the Korea Culture and Tourism Institute. The first projects were launched: December 2008 in Andong and Naju, February 2009 in Chungju, and March 2009 in Busan.
2. Feb. 2009. The Ministry of Land, Transport and Maritime Affairs established a joint task force comprised of several ministries to supervise the restoration as a comprehensive pan-governmental project. The Project has since developed as follows:
 - In April 2009, the task force, which had operated at the directorate level, became the Office of National River Restoration at the ministerial level to improve relations and communications among the participating ministries.
 - The Association for Government Support at the Office of the Prime Minister began operations, along with the Local Government Association of the Four Rivers, which collects input from local communities.
3. April 2009. A joint briefing was convened with three committees and the four participating ministries and government agencies.
4. May 2009. A series of regional conferences and forums were held with public officials, experts and distinguished guests.
5. June 2009. The Master Plan for the Four Major Rivers Restoration Project was published.
6. Dec. 2009. Ground-breaking ceremonies were held.

4. How the Four Major Rivers Restoration Project addresses the challenges

The Four Major Rivers Restoration Project comprises the following activities to achieve its five objectives:

- **Water storage.** The project will aim to secure sufficient water quantities by building waterways and 16 weirs. These 16 weirs are expected to secure 800 million cubic metres of water. The project will increase peak water levels of 96 agricultural reservoirs so as to secure 250 million cubic metres of water. Additionally, the construction of three small and medium size multipurpose dams is expected to yield another 250 million cubic metres of water. These infrastructures will enable the storage of water needed during the dry season. By dredging riverbeds, the flood water level will decrease, and the water flow capacity will increase significantly. This will significantly reduce annual floods and the damage they cause.
- **Flood control.** Flood control measures involve an expansion of the water gates of tributaries, allowing a quick water level decline and fast draining of flood. In addition, two flood-control areas and three underflow areas of riversides will together expand the flood control capacity up to 920 million cubic metres of water.
- **Water quality and ecological restoration.** By 2012, the water quality of the mainstream will be improved to an average of level two (Biochemical Oxygen Demand less than 3ppm) by expanding sewage treatment facilities and establishing green algae reduction facilities. Moreover, the ministry is trying to restore ecological rivers, create wetlands, and relocate farmlands in the rivers to rehabilitate the river ecosystem.
- **Creation of multipurpose spaces for local residents.** To create the riverfront as a multipurpose area for improving lifestyle, leisure, tourism, cultural activities, and green growth, bicycle lanes (1,728km) will be developed, hands-on tour programmes will be promoted, and walkways and sports facilities will be expanded.
- **River-oriented community development.** The project will also contribute to regional development through various plans that utilise the infrastructure planned in the project and the scenery. The examples are 'our major rivers that flow with culture' of the Ministry of Culture, Sports, and Tourism, and 'Creating a vivid land of beautiful scenery' of the Ministry for Food, Agriculture, Forestry, and Fisheries.

The implementation of the project follows three phases. In phase 1, approximately KRW 16.9 trillion will be spent on the 'main project' dredging operations, and building dams and reservoirs on the four major rivers. Most of the main projects are planned to be completed by 2011; projects for dams and reservoirs for irri-

gation will be completed by 2012. In phase 2, another KRW 5.3 trillion will be invested on improving water flow and sewage systems of tributaries. Projects for the development of Sumjin River and other tributaries to the four rivers would be completed by 2012. Phase 3 includes restoring local and small rivers, and developing cultural and tourism attractions around the four major rivers. The Ministry of Culture, Sports and Tourism is involved in this phase.

The Office of National River Restoration under the Ministry of Land, Transport, and Maritime Affairs is the lead agency for the project. In the implementation of the project, the office will operate in cooperation with the Ministry of Culture, Sports and Tourism, the Ministry for Food, Agriculture, Forestry and Fisheries, the Ministry of Environment and the Ministry of Land, Transport and Maritime Affairs.

5. Assessing the environmental impact of the project

The Korean Government conducted an environmental impact assessment (EIA) of the Four Major River Restoration Project in order to assess the potential effects of the project and to devise response measures. The results of the EIA were announced on November 6, 2009.

The Environmental Impact Statement (EIS) was prepared by the Regional Construction Management Administration after collecting opinions from various stakeholders. The EIS includes the anticipated and assessed environmental impacts. The draft was shared with the local residents, environmental organisations, and relevant experts to gather diverse opinions for 20 days. The EIS was then submitted to the Regional Basic Environmental Offices, under the authority of the Ministry of Environment. To verify feasibilities of the EIS, Korea Environment Institute (KEI) and the Environmental Assessment Team comprised of independent experts were entrusted for review of the EIS. The final EIS agreement was set after the opinions of KEI were considered. The final EIS, agreed by the Regional Basic Environmental Offices and the Regional Construction Management Administration, covers four categories (ecosystem, natural environment, water quality, and others).

On ecosystems, the assessment identified around 68 legally designated protected species and natural treasures that may be affected by the Four Major River Restoration Project. The assessment concluded that direct impacts would be minimal if mitigation measures are implemented. Measures planned include an adjustment and reduction of the intensity of the construction work during the winter time when migratory birds arrive. Small size habitats such as small rivers corridors and food places will be created to provide sanctuaries and places for laying eggs. In addition, green belts will be constructed to provide additional habitats for animals to live in a natural environment.

With regard to the natural environment, the assessment mainly addressed potential risks to wetlands that surround the four rivers. It was found that out of 100 wetland sites located in the project area, 54 wetlands may be directly or indirectly

affected by the project. These 100 wetlands cover 12.5 per cent of the total area which will be affected by the project. Considering the ecological functions of the wetlands, the Korean Ministry of Environment decided to conserve wetlands that have high ecosystem value. Parts of the wetland areas that are likely to be affected are compensated for through the construction of man-made wetlands. As a result, after the four major rivers projects, a total of 84 alternative or new wetlands are expected to be created and ecological and environmental functions of the rivers are expected to be improved. In addition, lower river ways will be created with mild slopes of 1.5 ratio so as to lead to a natural creation of wetland areas after the completion of the projects.

Regarding water quality, Korea's National Institute of Environmental Research, which was entrusted with an assessment of water quality, concluded that water quality will generally be improved as a result of the project. It has been estimated that pollution from mud that may occur during the construction phase will not lead to weighted density (by standard of dry season) of more than 10 mg/litre. In the case that floating matters exceed 15 mg/litre, it is planned that the construction period and intensity will be adjusted and that additional pollution reduction facilities will be installed. As 570 million of cubic metres of dredged materials will result from the dredging of the rivers, there is a plan to create a sedimentation basin and a diversion waterway will be installed at the storage yards of the dredged material in order to prevent secondary water pollution. The Korean government is considering options for a differentiated use of the dredged material according to the grain size and the level of contamination.

The Korean Ministry of Environment has the responsibility to ensure follow-up and implementation of the conclusions of the IEA. In that process, the existing Environment Evaluation Board will be transformed into a Post-management Investigation Commission after a re-composition of its membership. The future Post-management Investigation Commission will be entrusted with monthly investigation, monitoring and inspection of the implementation of measures to mitigate identified environmental effects.

6. Main implementation barriers that were overcome

Political opposition was a major challenge faced by this project. The opposing political party utilised environmental groups and NGOs to voice opposition to the project. Continuous communication, education and public relations were the main tools used to overcome the barriers. More than often, opponents had wrong information about the project; providing the correct information with project briefing and data helped to gain understanding and acceptance. Establishing a project advisory group with regional citizens, professionals, and academics has provided a means to gather the views of stakeholders.

A dispute started to arise when environmental societies asserted that the rare wild plant 'Danyang aster helophyllus' only found around the Southern Han River

was threatened with extinction because of project constructions. The ecoactivists have called for the closure of the project. The wild plant is classified as the 'Endangered Species Plant 2nd Grade', being the biennial plants of Asteraceae Class. However, the Office of National River Restoration officially announced on 2 May 2010 that there was no founded danger of extinction even for 'the Danyang aster helophyllus' (Danyang Ssukbujjaengi) due to implementation of the project.

The Gangcheon Isle, Gangcheon-myeon, Yeosu-gun, Gyeonggi-do (province) is located inside of the construction area of 'the 6 Sector' of the Project. There is a plan to create a 'Nature Ecological Experience Park' with protected wild species including 'the Danyang aster helophyllus'. The government also announced an official plan for their preservation in all the habitats except the area that will be inevitably damaged in the creation of an artificial stream. This indicates that both government and constructors have environmental values, recognising the importance of protecting endangered species like 'the Danyang aster helophyllus'. The government and constructors designated the habitat bed as 'reservation area' so that with visible boundaries, damage from construction activities is minimised. Presently 'the Danyang aster helophyllus' is waiting mass proliferation due to the successful research for proliferation by the authorised institutes of 'Hwanghak Mount Arboretum', 'Pyeonggang Botanical Garden', 'the Botanical Garden of Shingu University', 'Danyang Technical Center of Agriculture', and a private farm in Danyang county (all the spots have the permissions from the Ministry of Environment under the Clause 14 of the Endangered Species Act). Provided that soil condition meets the standards level, this plant can grow well.

At the end of 2010, Buyeo County conducted a survey with approximately 12,000 residents to gather their views on the appropriateness of the project. The survey revealed that 70% voted in favour of the project. Also 70% answered that they were aware of the project, suggesting that those who knew about the project voted in favour of it. It seemed that the remaining 30% did not have appropriate information on the project.

7. Effective contribution expected or already delivered to green growth

The project seeks to achieve, by 2012, a 90 percent increase in water quality (BOD less than 3ppm) by expanding sewage treatment facilities and establishing green algae reduction facilities. In terms of adaptation strategies to climate change and sea level rise, federal and local governments are bound to maintain an adequate level of salinity concentration to protect drinking water supply and other water usages. In order to monitor water quality, Korea's Ministry of Environment is expanding the existing Tele-Monitoring System (TMS) to 586 sewerage and waste water treatment facilities by the end of 2009. This includes 323 sewerage facilities, 58 waste water treatment facilities, and 205 operating sites.

On ecosystem restoration, an Eco-river Restoration Program (ERP) initiated in 2008 is being implemented in the context of the Four Major River Restoration Project. One of the ultimate goals of the program is to restore indigenous and endangered aquatic species and maintain the quality of water and ecosystems. The other national program to restore freshwater ecosystems is to develop an aquatic ecosystem-monitoring network. Since 2007, preliminary field surveys have been conducted at more than 540 locations. More than 929 km of national streams will be restored as part of the Four Major River Restoration Project. A follow-up project will be planned by 2010 to restore more than 10,000 km of local streams. More than 35 riparian wetlands will also be reconstructed. Riparian areas will be afforested or reforested, and will also be used for biomass production.

Finally, the project seeks to support regional economic development. This is pursued through the creation of multipurpose spaces for cultural and touristic activities near rivers which are expected to contribute to job creation and local economic revitalisation. Overall, it is expected that the project will create 340,000 jobs and generate an estimated KRW 40 trillion of economic benefits.

- 340 thousand (340,000) jobs created by the project is calculated from the project as a whole including major projects by several ministries (MLTM, ME, MA, Etc). The number includes direct and indirect employment inducement effect. In addition, Korean government is expecting that there will be more new jobs created in leisure, tourism, cultural industries, etc by this project.
- The number is calculated based on the Construction Employment Induction Factor from the Bank of Korea (2006) which provides the most objective data.
- The Ministry of Land, Transport and Maritime Affairs, initially in the presentation of the master plan, estimated job creation in the whole industrial field to be 340,000 (Ministry of Land, Transport and Maritime Affairs: 231,142 / Ministry of Environment: 67,236 / Ministry of Agriculture: 40,098) with application of 'the coefficient of employment induction' (17.3 per 1000 million people) of 'Korea Bank'.

8. Evaluation of benefits already delivered

A typhoon in June proved the Four Rivers 'flood-proof'. It was predicted that this year's summer would have more frequent torrential rainfall with a larger amount of rain than average. As the first 'attack', the Typhoon Meari in June and the subsequent rainy season were enough to make those involved with the project tense and nervous. Paradoxically, this torrential rainfall became a good opportunity to demonstrate the effect of the project. From June 22 to 27, it rained a total national average of 207.7 mm. This is equivalent to 20 billion ton reaching 17% of annual rainfall. Despite the concerns about safety on the sites of the Four Rivers, damage turned out to be meagre. Particularly, the northern area of Gyeongbuk Province, Daejeon and some areas of Chungcheong region had no considerable damages.

This is due to the effect of lowered flood level achieved from dredging.

The sites have already experienced lowered flood levels from dredging 420 million m³ soils. According to a survey of Ministry of Land, overall water levels have been lowered: 2.55 m in Yeosu (the Han River), 3.5 m near Sangju (the Nakdong), 0.84 m in a vicinity of the Buyeo Weir, and 1.12 m near the Seungchon Weir of the Yeongsan River. The construction of weirs will be completed by late June or July, so the condition of flood prevention can be said to be improved. As for devastating flood damage, the safety level has been dramatically elevated. Before the typhoon and rainy season came, the sites were fully prepared. Cofferdams and construction roads were taken away. Meanwhile, riverbed maintenance structures (structures for preventing erosion of the riverbed) were completed to be installed. Waterfront parks under construction were accelerated in its final touch. By late June, dredged soils piled up on the terrace land of the river were moved outside of the riverside area in order to prevent them from crumbling and also to secure more space for water flow.

There have been significant economic benefits derived from the project due to job creation. According to the Ministry of Labour (at an employment policy inquiry commission, Press Center, Seoul, 30 June), an analysis shows employment effects to be equivalent to KRW 7.37 trillion from 2009 to 2010 for 2 years, creating job opportunities for 88,400 workers. Those were fewer amounts (11,852 – 11.8%) than the 10,252 released from the master plan of the Ministry of Land. However, since the Four Major Rivers Restoration Project consists of complex processes including civil engineering, construction, landscape architecture and more technologies, the employment induction effect in other fields might compensate the gap. In addition, the Korean government is expecting that there will be more new jobs created in leisure, tourism, cultural industries, and so on, by this project.

We have been making the participation of local construction companies mandatory, and advising the clean allocation of constructions for the local subcontractors. This will ultimately provide support to local economies.

The Korean Government has identified several policy tools to maximise local development potential through the river restoration initiative. The Master Plan mandates that local companies should account for at least 40% of all joint ventures (with the exception of turn-key projects, which require 20% participation of local companies). Currently, 187 of 338 companies (55%) are implicated in the project. Specific lots have been consigned to the local government; as of March 2011, local governments are coordinating nearly a quarter of the lots associated with the project.

Water planning in LAO PDR

*Chanthanet Boualapha and Oudomsack Philavong Office
Department of Water Resources, Ministry of Natural Resources and Environment*

1. The challenge and aims: water and growth in LAO PDR

Although it still is one of the poorest countries in South East Asia, Lao People's Democratic Republic might actually be one of the most dynamic and rapidly transforming poor economies in the world. The economic reforms carried out since 1986 – when the transition from a centrally planned to a market economy started – represent in many ways the breaking free from the low income and poverty situation in which its rural and traditional society was trapped. The first decade of the new century was marked by rapid economic transformation with rates of economic growth that averaged 9% annually. In spite of rapid population growth that averaged 2.8% in the eighties and nineties, the economy was able to grow enough to improve the per capita gross national product in such a way that the real purchasing power parity per inhabitant in 2009 was more than four times that of 1970 while the population increased from 2.8 to 6.4 million in the same period¹. These favourable trends and the current macroeconomic equilibrium make the prospect of becoming a middle income country before 2020 likely, as intended in the National Socio-Economic Development Plan.

Advances were not only significant in terms of the scale of the economic activity but also in some relevant aspects of human development. Life expectancy at birth improved from below 50 years in 1980 to more than 65 in 2010 and the average years of schooling more than doubled in the same time averaging 4.6

¹These figures were obtained from using the Penn World Tables (Heston, A., Summers, R and Aten, B. (2011) Penn World Table Version 7.0. Center for International Comparisons of Production Income and Prices. University of Pennsylvania May.

in 2010. When compared with other countries Lao PDR was ranked sixth in the list of countries showing greatest improvements in the 20 years since the Human Development Index making assessments.

Successful economic growth is behind the steady decline in poverty indices which, as measured by the Millennium Development Goals Assessment Criteria, passed from 46% to 33% between 1992 and 2002. While the number of those below the poverty line is diminishing and they are becoming less poor on average, economic growth is also increasing economic inequality and the share of the poorest quintile in national consumption also fell from 9.6 to 8 percent. Net enrolment rates in primary also rose from 58% of primary school-age children in 1991 to 84% in 2005, although progress in retaining students is still low at this level. Significant advances have been made in gender equality (the number of girls for 100 students rose from 77 to 86 in primary school between 1991 and 2006 and these advances are lower but still significant in secondary and higher education). Advances in the MDGs are completed with relevant improvements in child mortality, maternal health, steps against malaria, HIV and other diseases and the country is considered to be on a relatively safe track to reach the MDGs by 2015².

2. The challenges for water planning

The significant increase in the number of people with access to safe water, rising from 30% to 60% of the total population between 1990 and 2003, is associated with relevant reductions in the time required to meet basic water needs for many households, freeing time that is now available for education, child care and income earning activities with important benefits also in terms of gender equality. Apart from its undeniable relevance for the many concerned households, in a context of economic growth, these benefits lead to an increase in the labour supply and therefore the productive potential of the entire economy.

In addition to that, the increased coverage of improved sanitation facilities (from 11% to 45% between 1990 and 2003) means an effective reduction in water related diseases. This is association with significant improvements in the effectiveness of education, the productivity of labour and in life expectancy at birth which all contribute to increased and improved human capital, a crucial production factor in any growing economy.

Subsistence agriculture still accounts for nearly half of the gross domestic product and provides 80% of the employment as 69% of the population still live in rural areas. Nevertheless, low lands suitable for agriculture are relatively scarce in Laos (no more than 13% of the watershed, compared with 72% in Cambodia and 65% in Thailand) and without modern techniques and appropriate soil preparation, Laos' arable land is mostly suitable for rice cultivation. As a consequence, cropping still follows the natural supply of rain, being at its peak during the mon-

²See *Government of Lao PRD and the United Nations (2010) Millennium development Goals: Progress report Lao PRD 2008*.

soon season and declining to less than 10% in the dry season. Food security is still heavily dependent on water supply. Improvements in health, water supply and sanitation, as well as some irrigation development, are responsible for the substantial reduction in rice shortages in most of the lowland cultivated areas of Laos. Rice pads also provide fish which is the other important protein source in rural Laos³.

Growth in population and income levels leads to an increased demand of agricultural products that, without the development of competitive products to be exchanged in the international markets, can only be satisfied by increasing local production of food. This is possible with both the above mentioned improvements in human capital as well as the existence of abundant water resources. The increase in rice yields per hectare, due to mechanisation and irrigation development, has led to higher amounts of stubble available for grazing and feeding more pigs, chickens and ducks. In terms of growth and development, this productive transformation allows food production to increase, even when part of the rural workforce are migrating to expanding urban areas. It also serves to diversify the rural economy beyond traditional subsistence, allowing for the production of market and income earning goods and integrating the rural economy into the local and international economy.

Development also comes with and is supported by an increase in energy consumption. Although Laos has only developed about 4% of its potential for hydropower, it is already recognising the value of expanding power generation capacity and distribution networks in order to foster economic development both in rural and urban areas. It is estimated that 26 hydropower projects are under construction in the lower Mekong basin and at least 12 mainstream projects and 30 tributary dams are planned for the next 20 years, mostly in Lao PDR. Although hydropower is the main purpose, the water storage capacity that comes with it is important for promoting development in other critical areas and particularly for providing reliable water supply for new irrigation developments (covering between 100 to 300 thousand hectares in Laos in the next 20 years), providing flood control, aquaculture, and an opportunity to develop tourism.

3. The drivers of planning

Although access to water and sanitation services has been extended rapidly, further advances require reaching populations in upland regions and scattered rural areas. Providing these services in hard to reach areas where crop yields are often lower and more uncertain (due to poor soil and traditional practices) is still financially challenging, due to both provision costs and low capacity to pay in the receiving communities.

³See also: *Nessbitt, H. Johnston, R. and Solien, M. (2004) Mekong River water: Will river flows meet future agriculture needs in the Lower Mekong Basin? In. Seng, V.; Craswell, E.; Fukay, S. and Fischer, K. Water in Agriculture. ACIAR Proceedings 116e.*

In the years to come, economic growth is expected to continue to be based on economic diversification, integration in the regional and international markets, and progressive advances in infrastructure and human capital development. Expanding populations with improved living standards will lead to the demand for agricultural products and electricity that will become the main driver of the transformation of the rural economy. In spite of its relative abundance, water development needs to consider the compatibility between the multiple uses of water. For example, hydropower might result in alterations of river flows and sediment balances with consequences for fishing, biodiversity, and the water supply for irrigation. The changes required to increase crop yields might also alter water quality with significant impacts on biodiversity. The expansion of agriculture and livestock in uplands might result in significant losses in forest and biodiversity with impacts on runoff and erosion.

All countries in the Mekong River basin are dynamic transition economies and compared with China in the upper basin, and Vietnam and Thailand in the lower basin, Laos is in the relatively early stages of water development. This means that development strategies need to be coordinated in order to avoid water conflicts and to guarantee the sustainability of social improvements. Laos provides at least 35% of the renewable water resources of the Mekong River basin and has well preserved water ecosystems whose services can be harnessed for economic development. But water development in Laos might have significant consequences for the water resources in Cambodia and Vietnam, particularly for their extended irrigation systems. Developments in Laos could potentially aggravate saline intrusion problems already present in the river delta, just as hydroelectric development in China has had impacts on the lower basin.

4. Main barriers to planning

The main barrier is the lack of institutional development, the limited information available and in general the short history of water governance in the country. All this makes reaching the required consensus, involving relevant stakeholders, defining a set of measures, selecting projects, and implementing and monitoring them a difficult task.

5. The approach to water planning in Lao PDR and the green economy

Water management has played a crucial role in starting and sustaining growth as well as in the advances made so far in human development. The development of water resources represents a mix of opportunities and challenges for the transformation of the Lao PDR's economy. Water policy plays an essential role in a progressive economic development strategy with already proven benefits in terms of poverty reduction, gender, and equity. Despite the multiple challenges faced, a development strategy based on an integrated water resource management fra-

mework has the potential to make the transition of the economy compatible with conservation of the water resources. Water planning requires the development of an institutional framework and the social and technical capacity to implement development strategies agreed on through a participatory and transparent decision-making process. The building of these institutional abilities is already in progress.

Water development can make a real contribution to economic growth and socio-economic development in the whole river basin, but decisions need to be coordinated to avoid conflicts between competing water development priorities both at a national level, between water users, and at an international level. Coordination is also required to guarantee the welfare gains of economic development are preserved in the long term.

- **The Agreement for Cooperation**

By subscribing to the Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin in 1995, the governments of Cambodia, Laos, Thailand and Vietnam agreed to jointly manage the basin's water resources and to coordinate decisions concerning the use of these resources for economic development. The Mekong River Commission (MRC) was formed for this purpose and in 1996 China and Myanmar became dialogue partners of the agreement and they are now working together within a common cooperation framework.

- **Developing a shared understanding of the opportunities and risks: creating a shared strategy and defining priorities and objectives**

For the first time since the Mekong agreement was signed in 1995, the member countries have developed a shared understanding of the opportunities and risks of the national plans for water resources development and agreed in 2010 on an integrated water resource management based basin development strategy for the Lower Mekong basin. This strategy is based, first on the identification of a set of "strategic priorities to optimise the development opportunities and minimise uncertainty and risks associated with them"; second on the agreement on the "urgent priority to develop and agree on basin-wide environmental and social objectives and baseline indicators, against which to apply future developments"; and third on the understanding of the "critical importance of strengthened basin management and in particular a strong programme of institutional, technical, organisational and human resource capacity building for sustainable basin development"⁴.

- **Coordination of national water development**

Provided the institutional framework is already in place, international cooperation can be a powerful instrument to coordinate national water development, transforming potential conflicts into mutually beneficial agreements. Advances have

⁴See *Mekong River Commission (2010) IWRM Based Basin Development Strategy for the Lower Mekong Basin*.

also been made in translating river basin priorities to national basin development plans⁵ and in particular, for the case of Laos, to integrate them into the economic development strategies⁶.

Water planning at the basin level enables an assessment of the costs and benefits of the different development options from a social perspective, rather than only on the basis of private and individual interest. Some examples in the Mekong River show how, for example, existing and planned hydropower development in the upper basin in China can be adapted to provide sufficient dry season flows to meet all consumptive demands in the lower basin as projected in the national development plans for the next 20 years while maintaining the baseline water flows.

Besides the VII NESDP, some other National Policies and Strategies should be taken into account, such as the National Water Resources Policy and the Strategy and Action Plan. The main objectives and challenges were agreed to be the following:

- Institutional strengthening and cooperation
- Legislative and detailed strategies
- River basin and sub-basin water resource planning
- Data collections and analysis
- Water allocation
- Protection of water quality and natural health
- Management of water resources risk
- Financial aspect of water resource management
- Awareness, participation and capacity building

• **Considering all potential benefits and costs of different development alternatives**

Water planning at the river basin level allows for the consideration of all the potential benefits of hydropower development, for example, fishery or tourism potential in the reservoirs and the reduction of flood damage and salinity intrusion downstream. However, costs and environmental impacts also need to be recognised, in particular when these impacts are unavoidable and irreversible. Hydropower development, for example, can result in changes in sediment flows causing irreversible river bed incision and bank erosion with some predictable impacts such as wetlands losses, impaired agricultural productivities, reduced potential of freshwater fisheries and potential impacts on marine fisheries depending on the river's nutrients loads. Understanding all costs and benefits and the associated

⁵See *Mekong River commission (2011) Planning for BDP 2011-2015 Bridging Period*.

⁶See: *Lao People's democratic Republic. Ministry of Planning and Investment (2011) The Seventh National Socio-Economic Development Plan (2011-2015)*.

risks of different development options is essential for agreeing on which options to adopt, the distribution of the costs and benefits, and the necessary measures to compensate or mitigate potential damages and minimise the risks⁷.

• **Creating institutional capacity and generating hydrological information**

Institutional capacity development is critical in all member countries for the effective implementation of surface and groundwater monitoring, water use permitting, compliance assurance of permit conditions and regulations, and maintaining a water information system. Most of the procedures to be implemented have been developed and adopted in the framework of the Mekong River Committee and others are under study.

- A number of government bodies are involved in water resources management in some way:
- The Lao National Mekong Committee (LNMC): responsible for coordination with the Mekong River Commission and for supervising the planning and the management of river basins in Lao PDR consistent with the Mekong Agreement and its plans and strategies. It works as the national water resources apex body.
- The Ministry of Agriculture and Forestry (MAF): deals with issues related to cultivation, irrigation, livestock, fisheries and forestry.
- Ministry of Communication, Transport, Post and Construction: responsible for urban water supplies and inland waterways.
- The Ministry of Energy and Mines: responsible for electricity, hydropower and mining.
- The Ministry of Health: responsible for safe drinking water.
- The Prime Minister's Office.
- The Science Technology and Environment Agency (STEA)
- The Water Resources and Environment Administration (WREA), including a Department of Water Resources, Department of Meteorology and Hydrology and environment responsibilities. It has a mandate for management of water resources, the environment, meteorology and hydrological activities throughout the country.
- The National Tourism Authority
- Lao PDR has the following levels of administration:
 - The National Government
 - 16 Provinces and Vientiane Municipality
 - 142 districts
 - About 11,400 villages

⁷See *Mekong River Commission (2010) Assessment of Basin Wide Development Scenarios. Technical Note 13: Economic Benefits and Costs.*

One of the most important aspects of this scheme is that a body of 17 Provincial Water and Environment Offices are represented. These Provincial organisations will work in close cooperation with the River Basin Committees (RBCs). As a matter of fact, WREA works mainly as the technical support organisation for the RBCs. The RBC is a non-permanent organisation. It has a mandate to act as a water resources executive in the river basin under the direction of the Lao National Mekong Committee for the management, development, conservation, rehabilitation and utilisation of water resources in the river basin area.

The RBC will be chaired by a Provincial Governor, elected on a five-year basis by the Riparian provinces, along with a supporting Secretariat. The Secretariat acts as a technical advisory body to assist the RBC in facilitating and monitoring all its activities. The RBC consists of government and individual representatives and other related sectors who are nominated by the Prime Minister of Lao PDR based on the proposal of the Prime Minister's Office, the Head of the WREA. The chairperson takes initial action based on the agreement of provincial river basin representatives.

The very first RBC was the Nam Ngum River Basin Committee. The NNRBC was established by the Prime Minister's Decree 293 on June 15th, 2010 as the first of several such organisations in the country. The importance of this particular RBC is strategic because it was the first IWRM plan and will serve as template for River Basin Committees elsewhere in the Lao PDR.

The following main objectives and plans for the future of the NNRBC have the highest importance for the future of water management in the country:

Task 1: Building the capacity to manage the NNRBC

Task 2: Encouraging sustainable water use

Task 3: Optimising hydropower outcomes

Task 4: Developing the sustainable potential of the basin

Task 5: River sub-basin management

Task 6: Reducing risks and impacts from water related disasters

The main tasks for the NNRBC are clearly closely related to the goals of the VII NSEDP.

Developing the legal framework

The main legal documents are the following:

Decree on the Establishment and Activities of Water Resources and Environment Administration, No. 149/PM, dated May, 10th, 2007.

Decree on the Establishment and Activities of Lao National Mekong Committee, No. 197/PM.

Decree on the Establishment and Activities of the River Basin Committees, N°

293/PM, dated 15 June 2010.

The last of the aforementioned Decrees, Decree 293, puts into place an inter-governmental and multi-sectoral body to sustainably manage the priority river basins and sub-basins of the country. The Decree is a significant milestone for implementing several water resource management programmes and projects in Lao PDR.

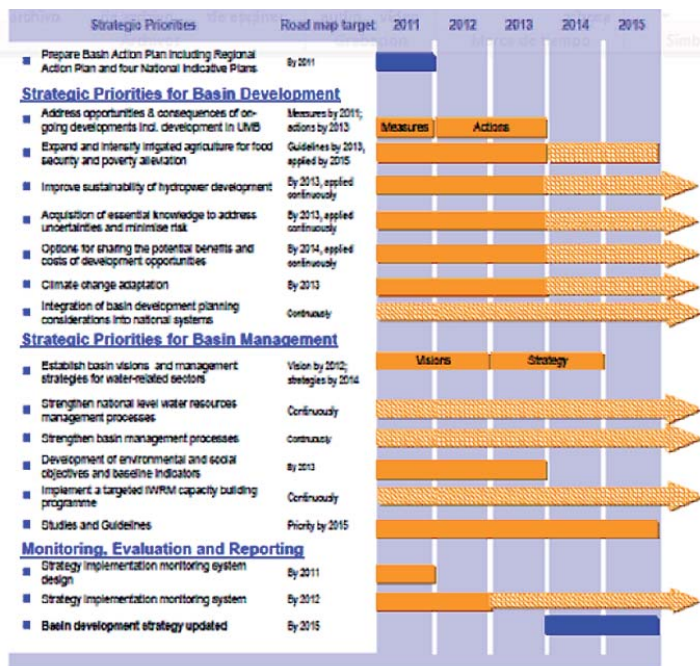
Decree 293 outlines the responsibilities, duties, jurisdictions, organisational structure and working methodology of the River Basin Committee to promote water resource management through systematic planning and implementation. The objective of the RBC is the achievement of the following goals:

- Supply sustainable water resources to water sectors through systematic planning and implementation
- Reduce socio-economic and environmental impact from water related disasters
- Manage water quality in the country
- Improve livelihoods
- Contribute to the national socio-economic development plan

• Agreeing on a roadmap and ensuring national ownership

The whole strategy is outlined on a road map which guides its implementation until the end of 2015. The strategy is owned and implemented by each member country.

The Road Map of IWRM: 2011-2015



6. Evaluation

Considerable progress has been made so far in the development of an institutional framework for water planning. These advances are more evident at an international level and they provide the basis for developing water planning institutions at national and local levels.

The Nam Ngum River is a main tributary to the Mekong River in the Lao PDR. The area of its basin is 16,841 km² (7% of the country) with a population of some 550,000 people (8% of the country). With a rainfall of 2,200 mm per year and a discharge of 22,000 million m³ per year, the basin contributes 14% of the flow of the Mekong River at the confluence, and 5% of the total discharge to the sea.

The benefits of a functional RBC to coordinate the many agencies and levels of government became clear during the preparation of the Nam Ngum River Basin Development Sector Project (2004-2010). This project developed the approach and capacity for river basin management including the development of a comprehensive knowledge base, the preparation of a basin development plan, and the generation of human skills and capacity.

The NNRBC now operates under the umbrella of the Lao National Mekong Committee for national water resources management as well as in compliance with the Mekong Basin Agreement and in collaboration with the Mekong River Commission.

7. Main lessons learnt

The approach	Lessons learnt from implementation
<i>Reaching a social agreement on the desired balance between water use and water resource conservation</i>	Adopting a set of international commitments regarding the environmental status of the Mekong River Basin in Laos has been a central element of the coordination of water planning with national development policies.
<i>Harnessing development opportunities and coping with water and development challenges</i>	Water policy has been the cornerstone in Laos' success regarding the Millennium Development Goals and in the ongoing transition from a rural to an urban economy.
<i>Building governance and institutional capabilities</i>	An ambitious programme of building water governance structures is already in place in Laos. Transparency, regulation and enforcement, and building technical competences are key elements for this strategy to succeed.

<i>Coordinating public policies</i>	The agreed commitments of the international Mekong agreement have been a central element in the National Development Plan of the Lao PDR and have contributed to the coherence between objectives in the different economic sectors and the general objectives of water policy.
<i>Stakeholder engagement and public participation</i>	Active participatory mechanisms are being used in Lao PDR and are an integral part of water management at local scales throughout the whole country.
<i>Monitoring progress and compliance</i>	<p>There have been advances in the acquisition of technical skills, the development of information systems and of reporting strategies.</p> <p>The capacity of the Lao PDR to manage its own water challenges have given credibility to its commitments in the Mekong agreement and has allowed Laos, in spite of being a least developed country, to improve its position with respect to other national partners.</p>

Water planning in the Ebro River Basin (Spain)

Manuel Omedas and Rogelio Galván

Ebro River Basin Authority

Carlos Mario Gómez

University of Alcalá and IMDEA Water Foundation

1. The challenges for water planning and the green economy in the Ebro

Spain is a pioneering country for water management at a basin level. Since its foundation in 1926 as a partnership of private users and public authorities to promote and exploit common interest public works, the Hydrographic Confederacy of the Ebro (CHE by its name in Spanish) was the first water authority created to coordinate water policy in a river basin in Spain. During the last century water and water management have played a central role in the process of economic development and particularly in transforming the pre-existing semiarid Ebro Valley and its influence area into a prosperous economy. Demography, agricultural expansion, energy and manufacturing development are all growth processes that cannot be properly understood without recognising the critical role played by water management.

The role of water management has gradually evolved through several stages. Its initial objective was to promote and coordinate the building and operation of water infrastructures to support productive transformation, initially based on the agricultural development. An intermediate stage saw water policy being used as an instrument to meet water demands stemming from economic growth. Today, the primary objective of water management is reconciling economic growth with the protection and improvement of the water resources which are critical to sustaining economic welfare in the long term. By focusing on the last two decades and ongoing innovative water planning processes, this case study illustrates the transition towards green water planning in the Ebro River basin.

WATER PLANNING IN THE TRANSITION TO A GREEN ECONOMY

Located in the North East of the Iberian Peninsula, the Ebro river basin covers 85,700 square kilometres (17.3% of the Spanish soil). The average rainfall of 622 mm/year is unevenly distributed both in time and space. The spatial distribution can vary from 3,800 mm/year up in the Pyrenees to just 100 mm/year down in the central river valley where the main economic activities are located. A Mediterranean river basin rainfall is variable through time and may range between 800 and 450 mm in wet and dry years.



From the first irrigation works carried out by the Ebro River Basin Authority in 1927...



...to a nowadays highly technified and water efficient irrigated agriculture

Meeting the challenge of governing this uneven and uncertain supply of water lies at the heart of both the relative success and the current challenges of economic development in the Ebro River basin. To adapt the available water resources to the times, locations and quantities of services demanded by the economy, the Ebro has been gradually transformed into one of the most regulated river basins in the world. The 108 big dams built provide a storage capacity of 7,580 million cubic metres, equivalent to more than half of the average long-term renewable water supply of the river basin (estimated at 14,623 million cubic metres).

By building collective facilities to support the accumulation of capital in agriculture, manufacturing, energy and drinking water provision industries, water policy has played a role as an engine of growth in the region. Indeed the availability of water infrastructures has so far been perceived as the critical factor underlying both the constraints and the opportunities of economic growth in the region.

The complex agro food system which gives the economy of the Ebro River basin its main competitive advantage now accounts for one fifth of the agrarian production and about one third of the meat supply in Spain. The decline in agriculture in the upper ranges of the Pyrenees is accompanied by the modernisation and transformation of agriculture in the lower valleys.

Irrigated agriculture, covering an area of 700,000 hectares in the valleys of the Ebro and its main tributaries, is the basis of the agro food system. Apart from the financial support provided in the past by the Common Agricultural Policy of the European Union, the market advantages are based on the availability of land, a relatively cheap labour supply, the proximity to markets in Spain and central Europe and also on the capacity of using crops as inputs for livestock activity in the upper river basin and the low Pyrenees. The viability, profitability and success of agriculture in the region relied on the development of water-related infrastructure for storage, transport, distribution and irrigation.

Water development has also played an essential role in the emergence of a highly competitive power generation sector in the river basin. Currently the basin produces about one third of the nuclear power of the country, it has one fifth of the installed capacity of hydropower of the country shared between 360 plants across the basin, and one tenth of the country's thermal generation capacity. This important contribution to the generation of electricity is based on a heavily engineered hydrological system, providing a convenient supply of stored and running water, turbinating 38,000 million cubic metres per year (four times the average water runoff in the basin) and using more than three thousand million cubic metres to refrigerate nuclear and thermal power plants.

Although the amount of water used in the manufacturing sector represents a minor fraction of the total water used in the basin, the sector depends on raw materials produced by the agricultural sector (for food production) and the local demand of inputs for that activity (agrochemicals, equipment, etc.). The Ebro valley is an industrial corridor and the sector provides almost 30% of the value added in the basin economy (compared with a contribution of less than 23% of the same sector to the entire Spanish economy).

Water development is also important factor influencing the dynamic of population trends in the basin, both directly through the provision of drinking water and sanitation, and indirectly through the development of employment and production opportunities as above mentioned. The Ebro River basin has only 34 inhabitants per square kilometre, less than one fifth of the average in the European Union and only two fifths of the Spanish population density. However, thanks in part to water development the Ebro valley has become an important settlement axis linking the rich industrial economies of the north of Spain, from the Basque Country to Catalonia, along an economic corridor.

2. The drivers of change

The collective success in making water an integral part of economic development in the Ebro River basin has been accompanied by the emergence of new problems, requiring changes to traditional water policy in order to cope with them. New challenges include the limited ability to cope with increasing water demand as the population and the size of the economy grow, the limited ability to meet these new demands with the traditional means of new infrastructures and subsidised water facilities, the difficulty of meeting competing demands from different sectors and reconciling these demands with the available supply of resources, and increased vulnerability to droughts as water withdrawals increase.

The emergence of new challenges is the main driver of the gradual transformation of water planning and policy in the basin, from the early focus on building water infrastructures, to meeting the needs of an expanding economy and population, to the introduction of integrated water management to ensure water use is compatible with the preservation of the ecosystems and the ongoing provision of services underpinning economic growth. It is in this context that the connection between this new kind of water planning and green growth can clearly be established. Before showing how water planning is coping with emergent water problems, the following insights about the interlinkages between water and economic growth in the Ebro River basin can illustrate the current challenges for water planning.

The consumptive use of water in the river basin each year already represents more than 34% of the average long term renewable resources of the basin (5 billion cubic metres of 14.6). According to the European Environmental Agency, the water Exploitation Index of the Ebro, although high when compared with other central European river basins, is lower than in other southern Spanish river basins, such as the Guadalquivir and the Segura where the water used every year exceeds 50% of the long term renewable resources and where, due to a competitive agricultural sector and higher water scarcity and drought vulnerability, water is perceived as more valuable than in the Ebro.

Apart from regional disagreements, water development is also a growing source of potential conflict between the different economic sectors and water users within the river basin. Although the figures mentioned in the previous paragraph indicate that available resources are sufficient to cover all the existing demands, water demand and supply vary in space and time and in fact deficits and vulnerabilities have increased over time. For example 200,000 out of the 700,000 potentially irrigable hectares (mainly in the right margin of the Ebro River) suffer from structural deficits meaning that their needs cannot be met in all years.

In the new European water policy framework, the main long-term objective of water policy is making the maintenance and expansion of economic uses of water compatible with the improvement and adequate protection of water providing ecosystems. Thanks to this development, the environmental objectives, which were already considered in the hydrological plans legislation of 1985, are

not only more stringent and more precisely defined but are the dominant criterion to judge the success or failure of water policy in the years to come. The setup of the Water Framework Directive has allowed for a systematic analysis of the detrimental impacts caused by the pressures of the economy on water bodies. The prospective analysis of water use and its pressures and impacts resulted in the identification of surface and ground water bodies in risk of non-compliance with the good status requirements for the years 2015 and 2021.

3. The challenges for change

Motivated by the importance of promoting rural development, all public authorities are reluctant to give up ambitious plans for developing new irrigation areas, despite the lack of water regulation infrastructures and decreased guarantee of supply. The number of projects approved or under study for the years to come is still considerable and new provisions are required to coordinate this effort with the existing water resources and the other actions required in order to make them viable in economic and financial terms (see CHE, 2008 ETI, p. 92).

Given the priority given by national policy to drinking water, the irrigated sector supports the risk associated with the variability of water supply in the river basin. Although the average long-term resources are about 14.6 cubic kilometres per year, they may range from 24 on wet years to only 8.4 cubic kilometres during meteorological droughts. In spite of the stabilising effect of the 7.6 cubic kilometres of storage capacity, the expansion of the agricultural sector is associated with an increasing insecurity in the water supply which affects the profitability of existing and new irrigation developments. This has contributed a shift in focus from increasing irrigation capacity to growing concerns over the guarantee of supply.

Meeting the increasing demand for water means diverting greater amounts of the resource, resulting in a reduction in river flows and in the water effectively stored in the system. Aside from the environmental impacts, this represents another source of potential conflict as there is less water available for non-consumptive uses (particularly for the more than 360 hydropower plants along the river network). In fact due reduced water availability, the hydropower system delivers a volume of energy every year which falls short of its installed capacity (no more than 50% even in rainy years and falling to only 11% in dry years). These stylised facts show the importance of coordinating the investments in infrastructure in the different sectors such as irrigation and hydropower as well as the potential gains from improving the conservation of water resources.

An analysis of the factors driving water demand in the river basin shows, in the business-as-usual scenario, a trend towards a significant increase in water demand for drinking water (fostered by population growth, better living standards and urban growth), irrigation water (from new developments despite the considerable gains from current programmes for modernising and improving irrigation technology) and for power generation (from existing hydropower and thermal pro-

jects). Without actions to reduce water demand or improve water use efficiency, these new developments are generally feasible within the range of the existing resources nor compatible with the improvement of the ecological status of the water bodies in the basin.

All the above mentioned factors are also associated with an increased risk of hydrological droughts (distinct from meteorological droughts which are associated with natural causes, these refer to the ability of the system, given a natural rainfall, to cope with existing water demands). Furthermore, simulation and statistical models shows some evidence of a likely reduction in water runoff attributable to climate change. A reduction of 5% flow in the Ebro River basin is projected by 2027, based on studies carried out by CEDEX on assessing the potential impact of climate change on water resources. The combination of increased scarcity, higher drought risk and uncertain supply due to climate change is a powerful argument for prioritising water resilience and security in the water policy agenda.

4. The planning approach for transitioning to a green economy in the Ebro River basin

Water planning has played a key role in the productive transformation and economic development in the Ebro River basin. The perceived role of water planning has changed through time as new challenges have emerged. The transition towards integrated water resource management in the last decades shows how water planning can make a real contribution to sustainable development and green growth. Water planning has responded to the aforementioned challenges in many different ways that can be summarised as follows:

- **The setting of an institutional framework for transparent stakeholder involvement and public participation**

There has been a long tradition of public participation in the Ebro basin since the foundation of the Hydrographic Confederacy of the Ebro: regions, municipalities, central government agencies and civil society are represented in several participatory bodies of the Ebro Water Authority and take part in the decision making process.

The Water Framework Directive has demanded even more active public participation. An extensive public participation network was created reaching all the sub-basins in the river basin. This network has proven successful in providing a forum to share information and fostering a common understanding of water challenges and measures to be taken. Public participation has also provided a means to pursue the coherence of water policy with other public policies (e.g. land use, urban and rural development, energy). Public participation is a learning-by-doing process and substantial advances are expected as information and skills improve over time.

Public participation is also a proven institutional framework for agreeing on practical, observable and enforceable environmental objectives. This has been demonstrated in the Ebro River basin, for example through the setting of targets

for the status of water bodies and minimum flows, as well as drought indicators. Since 1998 thousands of initiatives (public and private projects) have been studied by the river basin authority in order to determine their compatibility with the environmental objectives of the river basin management plan.

• **Establishing ambitious environmental objectives**

In the Ebro River basin, the institutional decision has been made to give primary importance to the environmental objectives of water planning. This has resulted in the setting of precise environmental objectives in terms of the quality of water bodies. It is against these objectives that competing demands of water users and other stakeholders must be accommodated. Once these objectives are set, they become the criteria that the water authority adopts to allow new water uses.

The new water policy framework allows for the actions and measures that guarantee the achievement of environmental objectives and that generate minimum economic losses (i.e. cost effective analysis used to choose the set of measures in the river basin management plan) or maximum welfare gains (e.g. from more efficient water provisioning systems or alternative water supply sources).

So far the still ongoing public consultation is addressing the objective of achieving good status in 85% of the water bodies by 2015. By comparing information on the current status of water flows with that of the natural conditions, an agreement is expected to be reached on the minimum environmental flows needed to be maintained in the different rivers. This agreement must consider the uses affected by minimum flows and the potential benefits of improving the habitat conditions. The minimum environmental flows decided upon will be verifiable and enforceable through the monitoring network of gauging stations.

The allocation of water resources needs to be balanced in such a way that by 2015, total water consumption will not exceed 34% of the long term available resources.

• **Creating opportunities for productive uses whilst respecting environmental standards**

Water policy is an instrument to advance sustainable development. In the Ebro basin, water has a particularly important role in strengthening the agro food complex, as a source of renewable energy, and increasingly for new uses such as recreation and tourism services.

Without discarding current plans to expand water using activities (such as existing urban or irrigation developments) the plan conditions their implementation to the proven existence of available resources. This way the emphasis is placed on an ambitious programme to modernise the irrigation systems as a necessary condition for increasing water efficiency and reducing diffuse pollution.

- **Building a strategy to manage uncertainty including drought management and flood control**

So far the institutional response to drought has been reactive and usually late reactive actions. Recent institutional changes have been aimed at replacing unplanned emergency management responses with new anticipated, preventive and planned responses.

The Special Action Plan in Situations of Alert and Temporary Drought for the Ebro Basin has been approved and incorporated as an integral part of the river basin management plan. The drought contingency plan defines a set of observable indicators to classify the drought situation (as normal, pre-alert, alert and emergency) and outlines a clear set of actions to be taken in each case, including the reduction of water use rights. The replacement of discretion by decision rules is considered a positive step forward in water governance.

- **The identification, assessment and selection of projects to restore the water environment**

The water planning process for the Ebro River basin has contributed to the selection of a combination of projects aimed at restoring the water environment. They include an ambitious programme for water quality improvement through a mix of effluents treatment and water reuse projects combined with a zero tolerance programme to monitor and control pollution discharges.

A set of water saving measures have also been identified, combining intake, transport, treatment, distribution and efficiency projects throughout the entire river basin. These programmes are accompanied by a set of projects focused on the restoration of rivers and river banks, the recovery of wetlands, the restoration of sediment balances and hydrological regimes, the removal of polluted sediments, the control of invasive species and other measures aimed at improving the ecological status of the river basin ecosystem.



The “Cañizar de Villarquemado” wetland was drained in the XVIII century. Now it is being restored

• **The twelve key elements of the Ebro River Basin Management Plan 2010-2015:**

- * **A social opportunity** to build a management system that is ethical, efficient and sustainable within the whole framework of the basin, creating a symbolic reference point for the Ebro.
- * **Integrated management**, under innovative principles of public participation and a historical cooperative model that includes all stakeholders within the shared authority of the watershed organisation.
- * **Ambitious environmental objectives.** At least 85.3% of river water bodies will attain good status by 2015.
- * **A firm commitment to reducing pollution**, both from diffuse agricultural sources and other sources, such as urban centres and industry.
- * **A proposal for realistic environmental flow regimes**, set for the main gauging stations, allowing habitat conditions according to prescribed methodologies. These should be enforceable and verifiable.
- * **Sustainable development** that contributes to strengthening the agro-food complex in the Ebro valley, strengthens the role of water as an energy source in a future which relies on energy from mostly renewable sources, and encourages the inclusion of new water uses, such as recreational uses.
- * **The modernisation of irrigation** as a necessary action for efficient water management and the reduction of diffuse pollution.
- * **Balanced allocation of resources.** By 2015, water consumption will be around 34% of the available natural water resources.
- * **Participation** is the cornerstone, from start to finish and from bottom to top. The Water Council of the River Basin leads the project, but with a participatory network that reaches throughout all the sub-basins of the main basin.
- * **A financial effort** shared by all administrative bodies.
- * **A commitment to cost recovery** through the prism of socioeconomic territorial balance and targeted rural development programmes.
- * **Vigilant and adaptive monitoring.** Implementation of extensive monitoring networks and procedures to verify the adoption of measures and achievement of objectives.

5. Evaluation: economic, social and environmental benefits

Social

Public participation has been particularly important for increasing understanding of the tradeoffs between the environmental, economic and social objectives that

need to be considered in water policy. Water has been key rural development, for example by providing alternative development opportunities such as rural tourism. These ambitions sometimes conflict with the limited capacity of rural areas to finance their own water management projects or even to pay for the entire cost of the water services they receive. For this reason, with the support of public participation processes, the development of the river basin plan focused on identifying actions with the highest potential for promoting local development in sensitive rural areas. The planning process also assessed and identified low income areas where social objectives should be prioritised and exceptions to full cost recovery of water prices permitted.

Economic

Although significant progress has been made, the coordination of agricultural, land use, energy and other sector policies in the water policy framework is still to be achieved. Around 70% of the new irrigation areas proposed in the 1998-2008 planning period were carried out. Many irrigation expansion projects are still pending for implementation or under study, and some of them have been implemented but unable to achieve their objectives due to a lack of sufficient water resources. The importance of sustainable water management and environmental conservation is increasingly being recognised and accepted, in contrast to the sole promotion of local development.

Environmental

Significant advances have been made in controlling diffuse pollution, mainly through changes in agricultural practices and also through the management of pollution from scattered livestock in the upper reaches of the river basin. In 2008, already 74% of the water bodies assessed were of a good ecological status.



Public participation. The Ebro River Basin Council where different stakeholders are represented.

6. Lessons learnt

The approach	Lessons learnt from implementation
<i>Reaching a social agreement on the desired balance between water use and water resource conservation</i>	Setting the achievement of a good or fair ecological status of the water bodies as the main objective of River Basin Management Plans in the European Union has been an important element of water planning in the Ebro River basin in Spain and has helped make economic development compatible with environmental objectives.
<i>Harnessing development opportunities and coping with water and development challenges</i>	Water planning has played an essential role in the development of the agro food and energy complex that now represents a competitive advantage and a defining characteristic of the Ebro River basin in Spain.
<i>Building governance and institutional capabilities</i>	Transparency, regulation and enforcement, and building technical competences have been key to successfully building governance capabilities in the Ebro River basin.
Improving the information and analysis base	The Ebro River basin boasts an efficient hydrological information system open to stakeholders, researchers and private and public institutions.
<i>Coordinating public policies</i>	The simultaneous development of the energy, the agro food industry as well as urbanisation and the expansion of the manufacturing industry have been possible within the capacity of the limited water resources available in the Ebro river basin.
<i>Stakeholder engagement and public participation</i>	Active participatory mechanisms have contributed to the design of water management plans in the Ebro River basin.
<i>Aligning private decisions with collectively agreed goals</i>	There are clear regulations for water abstraction and quality requirements, a transparent playing field and indicative planning for private investments.
<i>Establishing collective responses to scarcity and risk</i>	The Water Framework Directive is a promising example of a collective response that has served to develop and coordinate efforts at a national and local level to respond to water challenges.
<i>Monitoring progress and compliance</i>	The acquisition of technical skills, the development of information systems, the building up of reporting strategies, etc. are all elements that have contributed to the reputation and credibility of river basin authorities in the Ebro basin.

Interviews

Expert : Seung Kyum Kim MLTM Korea

Question 1: Some people say that public participation processes are incredibly effective for increasing understanding and gaining acceptance of water policy decisions that have already been made at a top level by the government or by the water authority.

What is your experience in the matter? Do you know any public participation processes that have brought about innovative solutions that had not already been considered during the water planning process? Did either politicians or technicians learn anything new in the process of developing the water management plan?

At the level of the planning and even during the project implementation, the government set expert advisory groups from seven different fields; senior committee meeting, policy advisory meeting, water resources, water quality, ecology & environment, landscape, culture & tourism, and local development. The advisory groups consist of professors, specialists, academics, and local representatives. In addition to the operation of the expert advisory group, the government runs NGOs such as religious group, environment group, local citizens association, etc in the regular basis to discuss and reflect their opinions.

The project discussions were held 126 times with 37,000 people in 2009 and 70 times with 23,000 people in 2010

From these processes, twelve cities and provinces submitted 836 recommendations worth 98.3 trillion KRW. River-related 213 cases worth 6.9 trillion KRW that were coherent with the master plan were reflected into the Four Major Rivers Restoration Project at the beginning. Examples are dredging sediments, fortifying existing levees, and restoring ecological rivers.

Question 2: We have seen that water planning can be a powerful social instrument, helping to take advantage of development opportunities and find useful ways to cope with water management challenges. But let us look at the other side of the coin.

Do you think water planning processes have also been effective in curbing pre-existing and undesirable development trends such as, for example, ambitious irrigation expansions, urban or tourism developments that were not in accordance with the carrying capacity of the water environment? How were the potential conflicts involved in this process managed?

Since the Four Major Rivers Restoration is multipurpose pan-government project, the Office of National River Restoration evaluated and tuned up potential conflicts from several projects by participated ministries. i.e., the Ministry of Land, Transport and Maritime Affairs; the Ministry of Culture, Sports and Tourism; the Ministry of Knowledge Economy & Korea Communications Commission; the Ministry for Food, Agriculture, Forestry and Fisheries; and the Ministry of Public Administration and Security

In addition to this organizational background, I would like to introduce one exemplary case. One of the most concerns about the potential conflicts is an urban sprawl of rural areas and to have unsustainable recreational facilities along the rivers after the project. Therefore, Korean government set a special law on waterfront area as a river guardian.

Special Law on Waterfront Area comes into effect in late April. It is a law for systematical development and management based on viability for rivers. The intent of this law can be largely arranged into four subcategories. First, it defines the area limitation of waterfront area up to 4 km inward in both sides. Second, developments under high pressure of profit return or concern of unsustainability would be phased in. Third, developments should be implemented mainly with public organizations so to recapture profits. Fourth, for project implementation, incumbent authority puts on 'Waterfront Area Mediation Committee' and supervises designation of sites to develop and implementation procedures.

For the environmental concerns, Korea has an Environmental Impact Assessment law not only to have before the project, but also, during and after the project as well.

Question 3: Water plans are complex combinations of some well selected but expensive measures designed to reach ambitious environmental objectives while promoting green growth. But so far there has not been much mention of how

water planning is actually funded and how it can be financed in the medium and long term?

What part of the overall cost is covered by water users? What is the importance given to water prices as incentives for responsible and sustainable water use? How is good or desirable behavior rewarded?

The total budget of implementation for the Four Major Rivers Restoration Project is KRW 22.2 trillion, or approximately USD 18.5 billion. This project was also included in the Korea's five-year national plan. Therefore, water user does not have to pay any part of the overall cost, because we count the project as a Social Overhead Capital. It does not reflect in the water prices as well.

However, the Four Major Rivers Restoration Project is being pursued according to due process stipulated in the relevant laws and regulations with the full consideration of its impact on neighboring environment, legitimacy of the project, and the compliance with the River Act.

- 1. National Finance Act: According to the National Finance Act and the Enforcement Decree of the Said Act, feasibility studies have been conducted for 12 projects including ecological river and bicycle path constructions. As for the bank revetment and dredging works, feasibility study for disaster prevention project is not mandated according to the Enforcement Decree of the said Act.*
- 2. River Act: 'Comprehensive Flood Control Plan' and 'Basic River Plan' were revised in Jul. 2009 by reflecting on the policy standards defined in the Four Major Rivers Restoration Master Plan. During the revisions, legal processes in the river-related acts were followed by collecting ideas and opinions in the relevant regions and receiving the consideration from the National River Management Committee.*

Question 4: Environmental objectives to improve water environments are often set at a very high level (e.g. the European Commission or the Mekong Agreement). As a result, stakeholders at a lower level - such as households, farms, companies, and even countries - might adopt reactive and passive attitudes to environmental regulation rather than the proactive attitudes required to foster a green economy.

Could you please comment on how water planning has led to a shift in individual and national attitudes towards the environment?

As like you said, environmental objectives to improve water environments in Korea are set by the government level. However, stakeholders at a lower level are not directly affected by such regulations, because the river basins are government properties. In other words, there is no economic activity allowed near the river basins.

Although the Ministry of Environment of Korea is supervising environmental objectives with environmental laws and acts, the project has advisory

committees in water quality, ecology and environment at a lower level due to address any possible indirect effects. The advisory committees consist of stakeholders as local people, companies, NGO, and experts groups.

Question 5: It seems that on-going water projects in Korea intend to cope with two general problems: Firstly, the rapid economic growth in the country, and secondly, the impacts of climate change, rainfall uncertainty, etc. Could you please comment on how important the climate change challenge has been and whether it has brought about any actions that would not have been considered in the absence of climate change?

The project is designed to address the significant environmental challenges faced by the rivers. Repeated flooding and droughts have caused human casualties, eco-system loss and habitat degradation, property damage and forced displacement of riverine residents. Extreme weather events that lead to flooding and droughts are expected to worsen in frequency and intensity as climate change impacts. These climate change challenges have implied dramatic economic consequences: over the past decade, the frequent flooding of the Nakdong River incurred KRW 67 trillion (USD 54.9 billion) in property damage and forced as many as 50 000 people from their homes (Office of National River Restoration, 2011).

Therefore, you may find out the validity of this project on the basis of national adaption against the pressure of natural selection named of 'climate change'.

In addition to the Climate Change, the Korean Green New Deal represents a policy for creating jobs and revitalizing the economy. In the short-term, it aims to respond to the recent economic downturn, and in the mid- and long-term, to boost green growth. The Green New Deal will run through 2012, while the long-term strategy will continue to be pursued through five-year green growth plans.

The Five-Year Plan encompasses a number of projects that were previously announced as part of the Green New Deal. For instance, the Five-Year Plan integrates the Four Major River Restoration Project previously designated as the main project in the Green New Deal, as well as the "Strategy for New Growth Engines", announced by the Korean Government on 13 January 2009.

Finally, the project seeks to support regional economic development. This is pursued through the creation of multipurpose spaces for cultural and touristic activities near rivers which are expected to contribute to job creation and local economic revitalization. Overall, it is expected that the project will create 340,000 jobs and generate an estimated 40 trillion won (Approx. US\$ 36 billion) of positive economic effects.

Experts: Miguel Solanes and Andrei Jouravlev

Insights on water planning from the Economic Commission for Latin America and the Caribbean

From Issue No. 28 of the Circular of the Network for Cooperation in Integrated Water Resource Management for Sustainable Development in Latin America and the Caribbean

The issue of planning is both crucial and complex, as it involves striking a balance between the security of the water rights of economic agents (so vital for promoting investment) and the ex-ante, and possibly ex-post, controls of private activity. Furthermore, if planning is not flexible, sticking to rigid plans in a global economy and amid changing conditions may lead to costly mistakes. Planning involves answering questions about: the resources subject to State control; how to manage quality and quantity; the extent of public control over water; the role of water planning and how this fits in with regional planning; and what process can facilitate a constant and dynamic review of plans.

Planning implies the need to integrate quality and quantity in water management, as well as surface water and groundwater, plus water supply and demand. Planning also implies supervising forms of use, including the cancellation of permits if there is inefficient use. In addition, planning includes identifying and correlating uses and extraction, so as to preserve sources, minimum flows and ecological demands.

Water rights must be able to be adjusted on the basis of planning objectives. Although the State may not functionally destroy rights, it can adjust them within certain limits, in accordance with requirements relating to the environment or the best use of water resources. In some systems, water-use permits are not permanent but rather are granted for a fixed period, which means they can be adjusted following a reasonable time for recovery of investment.

Planning also implies preparing emergency plans for extreme natural phenomena and disasters caused by humans. It includes the classification of users and the setting of priorities, based on the public interest. Some systems provide for analyses of projects and uses according to environmental, economic and social impact, as well as auditing, system rehabilitation, conservation, moratoria on the granting of new permits and possible suspension of certain uses.

Other important elements include the creation of specially managed areas and protected natural areas, establishing and maintaining ecological or mi-

nimum flows and managing competitive demands in a coordinated way. Certain systems demand that plans be drawn up before any substantial change to bodies of water and their banks can be approved.

Administrative fragmentation works against planning. Fragmentation often results from dividing water administration by different water uses, different manifestations of water in the hydrological cycle, and among the agencies involved in planning and day-to-day management. If administrative powers are not integrated, planning often leads to wasted resources. Many systems therefore have their plans approved in the form of a law, and the need to link them to the permit award system is also stressed.

There are some fundamental elements of planning processes. Although they offer no guarantee of success, planning is meaningless without them:

- Defining economic, environmental and social objectives.*
- Formulating indicators to assess how they tie in with each plan, and performance thresholds under which a plan cannot be approved.*
- Knowing how much water is available, who uses it, where and how. This implies the existence of administrative institutions, water rights, records, registers, and allocation and dispute settlement systems.*
- Knowledge of the economics of water and its services to make the best use of the economies of scale and scope, and to achieve equity through efficiency.*

In this way, planning can begin to build the foundations of an effective water resources management system.

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International Decade for Action 'Water for Life' 2005-2015

A Decade for Water, a Decade for Life

Towards the primary goal of the Water for Life Decade, Spain has agreed to provide resources to the United Nations to establish an Office to support the International Decade for Action. Located in Zaragoza, Spain, and led by the United Nations Department of Economic and Social Affairs (UNDESA), the Office implements the UN-Water Decade Programme on Advocacy and Communication (UNW-DPAC) aiming at sustaining the global attention and political momentum in favour of the water and sanitation agenda at all levels during the Decade.

Ebro River Basin Authority

The Ebro River Basin Authority (Confederación Hidrográfica del Ebro), created in 1926, is the Basin Organization, under the Ministry of Agriculture, Food and Environment of the Spanish Government, in charge of integrated water resources management within the Ebro River Basin. It hosted the UN-Water Conference "Water in the Green Economy in Practice: Towards Rio+20"

Compiled by the UN-Water Decade Programme on Advocacy and Communication (UNW-DPAC) with the collaboration of the Ebro River Basin Authority (Spain)

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**UN-Water Decade Programme
on Advocacy and Communication
(UNW-DPAC)**

Casa Solans
Avenida Cataluña, 60
50014 Zaragoza, Spain
Tel. + 34 976 478 346
Tel. + 34 976 478 347
Fax + 34 976 478 349
water-decade@un.org
www.un.org/waterforlifedecade

**Confederación Hidrográfica del Ebro
Ministry of Agriculture, Food and Environment**

Paseo Sagasta, 24-26
Zaragoza 50071
Spain
Tel. (34) 976 71 10 00
Fax (34) 976 23 43 06
chebro@chebro.es
www.chebro.es