

LINKING FRESH WATER RESOURCES MANAGEMENT AND COASTAL ZONE MANAGEMENT

General Issues Paper

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1 Introduction

1.1 Context

The terms Integrated Water Resources Management (IWRM) and Integrated Coastal Zone Management (ICZM) are increasingly appearing high on the international agenda, following the declarations from United Nations Conference on Development and Environment in Rio de Janeiro and Agenda 21 in 1992. The concepts and general principles within IWRM (based on the Chapter 18 of the Agenda 21 on freshwater) are now fairly well known and are being consistently promoted, for instance by the Global Water Partnership and its regional arms. The principles have been restated and elaborated at major international conferences in Harare and Paris, 1998 and by the UN Commission on Sustainable Development (CSD) at its Rio follow-up meeting in 1998. The World Water Forum in Hague in March 2000 further consolidated the principles, and a "ToolBox" on best practises and experiences is now being developed.

A parallel development is ongoing regarding approaches for coastal zone management which similarly has its offset in the Agenda 21 namely the chapter 17 on *Protection of the Oceans, all kind of Seas, including Enclosed and Semi-enclosed Seas, and Coastal Areas and the Protection, Rational Use and Development of their Living Resources*. In its recommendations, this chapter calls for the promotion of adaptable and flexible processes of integrated coastal and marine management (ICAM). However, there is still found a number of different perceptions, which ranges from ICZM in a purely hydrodynamic context to ICZM as the physical planning of the land allocation and use in a coastal fringe and to the management of the use, conservation and protection of the coastal eco-systems.

The development of modern approaches within these two natural resources management areas is taking place in basically different scientific environments, as freshwater and marine science and management traditionally are covered by different institutions. However, the freshwater resources play an important role in the coastal environment (and some opposite examples also exist). Thus, there is a need to clarify and harmonise resource management approaches taking account of this important interface.

UNEP's mission is to provide leadership and promote partnerships in caring for the environment. With respect to coastal ecosystems, the management constraints mentioned above have been addressed in the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA), in the Regional Seas Program and in the Global International Waters Assessment (GIWA). Realising the necessity of overcoming the gap between the freshwater and the coastal zone management, UNEP has been working with developing concepts and mechanisms for a linked management of the "continuum" from freshwater over the coastal zone to the ocean under the title "*Integrated Coastal Area and River Basin Management (ICARM)*". Thus, concepts and guidelines¹ are being developed based on a number of pilot and case studies. Substantial progress has been made in understanding – and even modelling – the hydrological, oceanographic and environmental processes in the coastal zone, including the links between rivers and coastal waters. But there is a substantial need for further efforts, particularly in relation to development of more integrated and effective management mechanisms.

The purpose of the present paper is to make a presentation of a number of concepts and issues within IWRM and ICZM and in particular focus on those dealing with the links and the interfaces between freshwater and coastal water.

1.2 Definitions

Water resources – or actually *freshwater* resources - are defined with reference to the topographic river catchment and its groundwater aquifers. The river management geographically ends where it

¹ UNEP/MAP/PAP: Conceptual Framework and Planning Guidelines for Integrated Coastal Area and River Basin Management. Split. Priority Action Programme, 1999.

joins the ocean at the coast. The notion of marine “water” resources – in traditional terms basically *fish* – is related to an ocean or sea and the limitation of such body by the coastline is also apparently clear.

But in between the freshwater catchment and the marine water, there is a “transition zone” which could be termed the coastal aquatic environment. In this context (without interfering with the longstanding debate on the delimitation of the coastal zone), it is proposed to define this coastal area as that geographical area where there is a *primary* interaction “land to sea” or “sea to land”, seen in the perspective of human activities and their impacts on the aquatic ecosystems.

2 Water Issues in River Basins and Coastal Zones

In order to examine the links between the management of river basins and coastal zones it is necessary to consider the major aspects and issues within each domain. Subsequently, the physical and causal links are the basis of the examination of the management links. In the following some major issues for IWRM and ICZM are summarised. It will be noted that there is a clear element of similarity between the issues as causes and effects are similar in nature, but relate to different settings.

2.1 Freshwater Issues

In the river basins, the main water issues comprise:

- Increased pressure on the freshwater resources. The growth in population, economic activity and standard of living pursued by countries around the world, lead to increased competition for and conflicts over the limited freshwater resources. Situations of extreme poverty do also increase pressure on water resources since the overexploitation of soil and forestry resources and the lack of pollution control measures have a negative impact on water quantity and quality.
- Proliferating water pollution. Pollution of freshwater is inherently connected with human activities. In addition to serving a basic consumptive requirement of biotic life and industrial processes, water also serves as a sink and transport mechanism for domestic, agricultural and industrial waste causing pollution. Deteriorating water quality caused by pollution threatens human health and the functioning of aquatic ecosystems and adds to the competition for water of adequate quality.
- Inadequate access to drinking water. Although all countries give first priority to satisfaction of basic human needs for water one quarter of the world's population is without access to safe drinking water and half of the population is without access to adequate sanitation.
- Provision of water for food for the growing populations. Irrigated agriculture is already responsible for more than 70% of all water withdrawals (more than 90% of all consumptive use of water). Even with a rather low estimated need of 15-20% additional irrigation water over the next 30 years serious conflicts are likely to arise between water for irrigated agriculture and water for other human and ecosystem uses.
- Maintaining productive eco-systems. Ecosystems provide a range of benefits including such products as timber, fuelwood and medicinal plants and constitutes wildlife habitats and spawning grounds. Approaches to management of water resources must ensure that vital ecosystems are maintained and that adverse effects on other natural resources are considered and where possible ameliorated.
- Variability in water availability. Almost all freshwater available for human use originates from precipitation which varies immensely in time and space. The tropical and sub-tropical regions of the world are characterised by huge seasonal variations in rainfall often compounded by dramatic annual variations as well. Such variability increases the demand for development of water resources infrastructure and management of the water resources manifold.
- Flood and drought management. Climatically determined variations in water flows and groundwater recharges are among the causes of potential catastrophic effects in terms of droughts and floods that may lead to large scale loss of human life and economic and environmental damage. Diseases caused by pollution of water is another set of risks, which also affects economic development.

2.2 Coastal Zone Issues

In the coastal zone typical issues comprise:

- Increased pressure on land and other natural resources. The growth in population, migration towards coastal areas and economic activities, lead to increased competition for and conflicts over the land and natural resources such as coastal fish and mangroves. Situations of extreme poverty do also aggravate the situation.
- Proliferating water pollution. Pollution of coastal waters is inherently connected with human activities. Although the assimilative capacity of the coastal waters is usually rather large compared to sewage discharges, adverse effects on eco-systems will often happen in cases where treatment and discharge points are deficient. In particular, inadequate sewage disposal can create serious problems for the tourist industry.
- Maintaining favourable shoreline morphology. Transport of coastal sediments along the shoreline, erosion and other changes can bring about serious effects on infrastructural elements and property. Harbours, navigation channels, landing sites and the associated activities and investments can be gravely affected.
- Maintaining productive eco-systems. Ecosystems provide a range of benefits including, fish, timber and fuelwood from mangroves and medicinal plants and constitutes wildlife habitats and spawning grounds. Ecosystems such as coral reefs are very important to for instance tourism. Approaches to management of coastal zone resources must ensure that vital ecosystems are maintained and that adverse effects on other natural resources are considered and where possible ameliorated.
- Natural hazards management. Meteorologically determined variations in coastal water level together with tidal variations are among the causes of potential catastrophic effects in terms of floods that may lead to large scale loss of human life and economic and environmental damage.

3 The Interface between Freshwater and Coastal Zone Management

The interfaces between the management of river basin issues and coastal zone issues will naturally be focussed in the areas surrounding river mouths, estuaries and delta areas. Impacts will occur in the coastal waters from the river and have an impact area the size of which will depend on the physical and biological characteristics. In the same way changes in coastal water levels and sediment deposition patterns will have an area of influence reaching upstream into the river. The following sections describe some typical examples of physical and biological links between a river basin and a downstream coastal zone.

The examples deal with two cases:

1. River basin impacts on coastal zone issues through changes in streamflow, water quality, sediment transport and floods, and
2. Coastal zone impacts on river basin issues through tides, storm surges and coastal sedimentation

3.1 River Basin impacts on Coastal Zones

3.1.1 River discharge

The regime of river discharges has a profound effect on the salinity conditions in the river mouths, estuaries, delta areas, lagoons, mangroves and coastal wetlands. Persistent alterations in low flows and flood situations may bring about significant changes and impacts on eco-systems.

Decrease of river flow due to river basin development or land use changes will affect the lower reaches and cause increased tidal reach inland along with increased saltwater intrusions. If the salinity increase persists permanent damage can be done to agricultural land, specialised ecosystems and wildlife habitats. This again negatively affects the livelihoods of communities in the affected areas. Also, intakes for water supply to the coastal population can become invaded by saline water.

3.1.2 Water quality

The quality of the river water in the lower reaches is a result of the basins soil quality, land cover, and – in particular - the human activities along the river. If river water is biologically or chemically contaminated it will have highly negative impacts on the health of coastal communities and ecosystems.

Deterioration of water quality can have multiple causes, most of which are related to human activity. Insufficient treatment of sewage water from urban communities, polluted discharge from industries, mining activities, oil extraction, injudicious use of pesticides and fertilisers are just some sources of freshwater water pollution. Often, persistent contaminants from sources far from the main stream may eventually end up in the downstream part of the river.

The nature and level of pollutants determine the harmful effects of the water. If the river is organically polluted it may not pose direct threats to coastal communities, but it can have serious effects on the coastal ecosystems, cause algal blooms in the coastal waters thereby destroying valuable marine resources.

3.1.3 Sediment transport

Often rivers carry heavy sediment loads, in particular if the basin is suffering from inappropriate land use and erosion. In the coastal zone the sediment will settle in the deltas and estuaries. Here the deposited material is the basis for productive ecosystems (mangroves, mudflats, seagrass beds). In many regions the finest silt, which is washed out to the sea supports very productive pelagic ecosystems. But excessive sediment load may also have detrimental effects through eutrophication and subsequent alteration of the coastal ecosystems.

In other areas sedimentation in the coastal areas tends to block estuaries and river mouths and cause relocation of the main river channel. This creates serious problems for coastal communities in terms of town locations, navigation, etc. and destroys productive ecosystems.

3.1.4 Floods

The effect of river floods on coastal areas is normally damage to urban housing, roads, bridges and other infrastructure in towns. They can give rise to serious health problems when sewage systems and water supplies are interrupted and when stagnant pools of heavily polluted water are formed. Floods often destroy the low-lying agricultural land in coastal areas by topsoil erosion or depositing unfertile sediments. And they may cause significant shocks to the coastal ecosystems.

3.2 Coastal Zone Impacts on River Basins

3.2.1 Increase in river water levels due to tides

The upstream effects of tides are related to flooding and saltwater intrusion in deltas. Saltwater penetrates into delta watercourses and may flood low-lying delta lands. The lower the upward gradient of the delta is, the more pronounced are these effects. The coastal ecosystems will have adjusted to this cyclical effect, but alterations of the coastal morphology may lead to saltwater intrusion further inland (accentuated at times where river flow is reduced due to drought or excessive consumptive use upstream). Such situations will have adverse effects on the near inland ecosystems.

3.2.2 Storm surges

Under storm surge conditions seawater often flood vast land areas, not only those adjacent to deltas or riverbanks. Seawater penetrates far inshore and often destroys crops, livestock, infrastructure, and housing and may cause numerous casualties. The effects are often long-term, as damages are sometimes not overcome before the next storm surge event and agriculture land is salinised. If storm surges occur at times of spring tides and coincides with heavy and persistent rainfall in the river basin very serious flooding and damages can be the result. In some regions, characterised by very flat and low relief will experience aggravated damages.

3.2.3 Material transport along coastlines

Transport of material i.e. erosion, transport, sedimentation, re-suspension phenomena along shorelines affect all coastal states. Enormous amounts of material take part of this process. Material, which sediments in estuaries and block these can cause flooding upstream in rivers and prevent or disturb navigation into these.

Harbour, pier constructions and other physical alterations may change these patterns and cause relocation of river mouths, severe land-losses etc. This can seriously disturb communities in delta areas, hamper migrations of fish into or out from rivers, impede navigation and thus gravely affect livelihoods of people living upstream.

4 Natural Resources Management Framework

Integrated River Basin and Coastal Area Management (ICARM) is a particular case of natural resources management. Accordingly, some common fundamentals apply.

Successful natural resources management is to a very large degree related to the proper management of people – the stakeholders - and their actions. As such, it is a field for political, legal, and social considerations, much more than for the natural sciences. An understanding of the hydrological and biological conditions is important, but only useful if it is combined with a similar understanding of the political and social conditions.

Generally speaking, there are three significant stakeholder groups:

1. The authorities – at national, regional and local level - who have the overall responsibility to mind the public interests of the resource
2. The users – local inhabitants, private business, etc. - , who extract personal benefits from the resources
3. The supporters – researchers, extension people, NGO's etc – who assist both authorities and users in specific tasks.

An efficient management system aims at involving the participation of these stakeholders in achieving a sustainable development of the natural resources through an integration of all the activities in the particular area:

4.1 Participation

Development, use and management of the water and coastal resources should be based on a participatory stakeholder approach, involving authorities, users and their supporting organisations at all levels. Participation only takes place when there is real involvement in the decision-making processes. Effective participation has to come about through an organised group that is part of this decision-making process.

Participation is an instrument that can be used to pursue an appropriate balance between a top-down and a bottom-up approach in ICARM. This is required because centralised, sectoral, and narrow approaches to resources management have often proved insufficient to address the fundamental issues.

4.2 Sustainability

Sustainability in this context means that the resources should be managed in a way that does not compromise future generations' use of the same resource. Management must be done in such a way that the various sectors' activities are controlled taking into account that the carrying capacity of the resources will not be exceeded and that the quality is not compromised. This implies that the management objectives should be guided by an ecosystem focus that allows economic and social development under sustainable conditions rather than by rigid environmental standards and regulations.

4.3 Integration.

Integration is a central concern in management of natural resources due to a range of characteristics:

- Resources are significantly affected by the cumulative impact of the decisions and actions taken by many local users and the concomitant decisions made by different levels of government and different governments of States.
- The management of a complex resource system almost always requires the involvement of many stakeholders at the local, provincial and national level. They are interconnected and no

single provincial or national level agency has total control over all, or even most, of the inputs and outputs from one system to the other.

- The resources exist in different, but inter-connected physical states and environments, which cannot be managed separately.

In the present context integration has several connotation:

- Horizontal integration of separate economic sectors, (such as water supply, agriculture, forestry, industry, fisheries, tourism, transportation).
- Vertical integration of all levels (national, province, municipality, community) of government and non-government organisations.
- A planning and management perspective which combines interactions between land, groundwater, surface water, and sea resources with respect to quality as well as quantity, and taking into account the requirements of the natural ecosystems.

4.4 The Five Management Planning Steps

Ideally, the management planning process comprises five steps:

1. Identification of key management issues and problems, and their root causes
2. Establishment of management objectives, goals and targets to address the problems and their causes
3. Identification of effective and affordable priority activities - from a multitude of possibilities – to reach the targets
4. Implementation of these activities
5. Monitoring of progress and revision of the management plan, if – or rather when – it is needed

Numerous global, regional and national assessments, reviews and state-of-environment reports have generally provided a multitude of input to the establishment of step 1. and 2. But there are still a need to identify promising experiences and to develop models for best practice, when it comes to step 3 – and in particular step 4 and 5 –

However, in the context of management systems for natural resources, environment and ecosystems, the management systems can conveniently be viewed as consisting of three complementary elements (or pillars). These elements are discussed and expanded below.

4.5 The Three Management Elements

- *The enabling environment* – the general framework of national legislation, strategies and policies, and the dissemination of information for natural resources management stakeholders. This framework constitute the "game board and the rules of the game" and enable all stakeholders to play their respective roles in the development and management of the resources.
- *The institutional roles* that allows effective interaction between various administrative levels and stakeholders. Collaborative mechanisms and "fora" are needed to facilitate the stakeholder participation
- *Management instruments*, including operational instruments for effective planning, regulation, implementation, monitoring and enforcement. With such instruments the decision-makers will be able to make informed choices between alternative actions. These choices are based on agreed policies, available resources, environmental impacts and the social and economic consequences.

4.6 The enabling environment

The Government authorities are responsible for creating the enabling environment. The enabling role of government implies that prescriptive, central approaches to the developments within the relevant sector shall be replaced by the creation of a framework within which the participatory, demand-driven sustainable development can take place. The performance of government functions is enhanced by Government authorities adopting a facilitating and arbitrating role, involving all actors having a stake in a particular issue and encouraging negotiations among actors themselves.

Policy-making, planning, resource allocation, monitoring, enforcement and conflict resolution still need to be the responsibility of government (with due participation of all stakeholders), whereas it is now recognised that it is beneficial to have government move away from the dual role as both a regulating entity and a service provider.

Legislation provides the basis for government intervention and action and establishes the context and framework for action by non-governmental entities and individuals and is thus an important element of the enabling environment. Specific laws relating to natural resources and environment have been enacted in a considerable number of countries.

In a situation of scarce resources, be it land or water, the more conflicts arise, the more important it is to have a coherent and comprehensive law in place. However, such legislation from an often fragmented and outdated legislative patchwork is a process requiring considerable time. In many cases the problem is not lack of adequate legislation but lack of political will, resources and means to enforce the existing legislation.

Access to reliable information is a key to making rational decisions. Without updated and reliable data on the state of the natural resources, the development pressures and the potential scenarios, it is not possible to induce the stakeholders to act proactively and efficiently.

4.7 The institutional framework

It is important to stress that there can be no blueprints for institutional frameworks valid for all cases. This is an area where stage of development, financial and human resources, traditional norms and other specific circumstances will play an important part in determining, what is most appropriate in a given context. It is, nevertheless, important to pay attention to institutional issues because the main difficulties faced in the formulation and implementation of policies and programmes are often the deficiency of institutional organisation and lack of co-ordination. These institutions have to be considered in various geographic settings taking into account the political structure of the country and the unity of the resource in a basin or an aquifer.

One of the key institutional issues is effective co-ordination mechanisms between different institutions. It should not be assumed that integration in the sense of institutional consolidation automatically leads to co-operation and co-ordination. Fragmented and shared responsibilities are a reality, but they may be addressed by effective co-ordination mechanisms. In some cases the establishment of a responsible body at the national level may be desirable for the accomplishment of natural resources management, where it could be responsible for developing policies and strategies, and for co-ordination and national planning. But regional variations and specific problems also creates the need for management coordination at State/Provincial/Regional level.

A critically important element is the integration of various sectoral views and interests in the decision-making process. The idea is to incorporate consultations and seek consensus with all relevant line ministries at all tiers of Government as well as with regional stakeholders located in different parts of a river basin or along a coastal fringe. Only this way is it possible to obtain equitable resource allocation. Putting forward, and transparent to all sectors and stakeholders, the combined demands for the resources and on the impacts on the environment, will help determine what is feasible in order to achieve sustainability.

Civil society should be encouraged to participate in operational resource management. For instance, community based organisations may be made responsible for operation and maintenance of local resource use, conservation and protection. This way, there is a better chance of establishing a sense of ownership, which often is a requirement for improved and more sustainable management of assets and resources.

It is also important to establish an efficient implementation support network in the form of training and extension, finance institutions, research and development. Here the NGO's and the private business sector has a major role to play in many countries to improve the technical and managerial capacity of the managing institutions and to provide essential capital investments to help solve financial resource gaps.

4.8 Institutional capacity building

Institutional capacity building is a means of enhancing performance. In the context of resource management, capacity building is the sum of efforts to nurture, enhance and utilise the skills and capabilities of people and institutions at all levels – locally, nationally, regionally and internationally – so that they can better progress towards the broader goal. At the basic conceptual level, building capacity involves empowering and equipping people and organisations with appropriate tools and sustainable resources to solve their problems, rather than attempting to solve those problems directly.

Human resources development through training and education is a key dimension of capacity building. But if the acquired training is not to become atrophied through lack of use, it needs to be accompanied by incentives that are consistent with the broader goals of the institutions concerned. The ability of an institution to adapt to changing demands depends to a large extent upon its ability to adapt its human potential – the knowledge, perspectives and skills of its staff.

Equally important for an institution's capacity to fulfil its mandate is the proper devolution of institutional responsibilities and mandates, and clearing of overlaps and competition with other institutions' mandates, as well as proper and sustainable financing mechanisms.

4.9 Management instruments

4.9.1 Management methods

The management instruments are the specific methods that enable and help decision-makers to make rational and informed choices between alternative actions. These choices should be based on agreed policies, available resources, environmental impacts and the social and economic consequences. A wide range of quantitative and qualitative methods is being offered by systems analysis, operations research and management theory. These methods, combined with a knowledge of economics, hydrology, hydraulics, environmental sciences, sociology and other disciplines pertinent to the problem in question are used for defining and evaluating alternative management plans and implementation schemes. The art of management is much about knowing the available elements of the "tool box" and selecting, adjusting and applying the mix of tools appropriate to the given circumstances.

4.9.2 Information systems

In many countries available information about the natural resource situation is scarce, fragmented, outdated or otherwise unsuitable for management purposes. This is particularly true for water resources. Without adequate access to scientific information concerning the natural resources and the associated ecosystems it is not possible to evaluate the resource and to balance it against demands. Hence, the development of a knowledge base is a precondition for effective management. It is necessary to take stock of the resource and establish the natural limits for management.

4.9.3 Risk management

Risks associated with natural resources come in different shapes – usually related to extreme climatic events, public health and environmental damage. It is never possible to eliminate risks. Well-established techniques are available to undertake hazard (frequency and magnitude of events) assessments. However, such assessments, which rely heavily on science, technology and economics, neglect the question of what levels and types of risks are acceptable within civil society. This is a perceptual cultural issue that can only be addressed within a participatory approach.

From an environmental point of view the precautionary principle in risk management may be warranted. The lesson learned is that actions to avoid potential irreversible environmental damage from hazardous substances should not be postponed on the ground that scientific research has not fully proved and quantified a causal link between causes and potential damages.

4.9.4 Stakeholder mobilization and participation

The principle of stakeholder participation in natural resources management requires a serious effort of awareness raising among politicians, decision-makers in the relevant sector, professionals, interest groups and the public at large. In attracting the attention and support to resource management from these groups, mechanisms of communications and quality and relevance of information will be determining factors of the success of this venture. Communications and information systems should address the question of opportunity cost and trade-offs between alternative resource uses and projects and other social investments.

Concrete strategies for communication with all actors and stakeholders need to be devised. In the area of Environmental Impact Assessment there has been attempts to institutionalise public participation through, for instance public information sessions, expert panel hearings and similar methods.

Some countries have little experience in conducting natural resources management in an open and transparent manner with full public access to information. Decision-making has often been left to professionals and scientific experts whereas other stakeholders have been excluded from the process. A continuation of this approach will be counterproductive to assuring broad participation and private sector investment in water management.

4.9.5 Resource allocation and conflict management

Market mechanisms may be exploited to the largest degree necessary possible, by including the true value of benefits and costs in the allocation process between competing users,

But in many cases, it is difficult to establish accepted values and prices, and then social and political mechanisms have to be used for allocation. A wide range of conflict management techniques, involving consensus building for conflict prevention as well as conflict resolution, is available to assist stakeholders in their negotiation.

4.9.6 Regulatory instruments in management

There is a need for management instructions and rules interpreting and detailing the water legislation. If sustained by enabling laws, containing both basic substantive principles and authorisation for delegation of authority and issuance of regulations, the usefulness of executive regulations lies in the fact that they - contrary to laws - can be made and amended at short notice, quickly responding to changing environmental, economic or social circumstances. It should be ensured that only executive regulations which are enforceable be implemented. If the existing enforcement capacity is deemed insufficient, regulations should be simplified or abandoned.

A multitude of regulatory instruments is at the disposal of authorities in setting up appropriate management structures and procedures. These fall into three main groups:

- Direct command and control approaches, which may function in highly regulated societies with efficient enforcement agencies
- Economic instruments, which may function if fair incentives or dis-incentive can be developed.
- Voluntary agreements and self-regulation, which may function if sufficient awareness is established, and if actions are feasible in the given socio-economic and cultural context.

Until now most Governments have relied primarily on regulatory instruments in natural resources management- often with very limited success in the field. However, innovative economic tools and voluntary agreements may offer promising alternatives.

5 Improved systems for Integrated Coastal Area and River Basin Management

The main objective of ICARM is to ensure the stability and the productivity of the aquatic ecosystems in a given coastal region through a sustainable economic and social development of the region and its associated river basin.

In this context it is important to acknowledge that the conceptual development of both IWRM and ICZM already to a large extent target the intentions of Agenda 21 towards sustainable management of natural resources (although implementation often lack behind). Thus, ICARM should not be considered a "new" or "alternative" way of management but rather a way to actively focus on the remaining issues or "the gap" which is appearing due to the history or heritage from former institutional division of responsibility. Therefore, the ICARM approach naturally promotes the introduction/implementation of both IWRM and ICZM, but adds a specific focus on promotion and facilitation of the dialogue between the freshwater and the ocean world as well as on the provision of specific solutions to the management issues of this interface.

The key constraints in IWRM and ICZM to implementation of the ICARM objective need to be further identified, and priority issues for further development of ICARM shall be established. To structure this discussion, the following table includes some initial issues and concerns as a first attempt and example. A more specific and operational listing can be made focusing on specific areas and case-stories, and detailing according to the items in Section 4 as well as possible further developments hereof.

Management element	IWRM constraints	ICZM constraints	ICARM issues
Enabling Environment	<ul style="list-style-type: none"> Lag of concern for coastal waters in river basin legislation, policies and strategies Lack of public and political awareness of the importance of coastal ecosystems and their links to riverbasins 	<ul style="list-style-type: none"> Inadequate concern for coastal ecosystems in coastal legislation and policy Lack of public and political awareness of the importance of coastal ecosystems 	<ul style="list-style-type: none"> Legislation reform Documentation of adverse impacts of river basin management Creation of awareness of politicians, authorities and coastal user groups
Institutional Framework	<ul style="list-style-type: none"> Institutional barriers exclude communication with coastal authorities Dominant sector bias Insufficient institutional capacity No access and participation for coastal stakeholders in IWRM 	<ul style="list-style-type: none"> Insufficient interaction between landuse planners and coastal water managers Dominant sector bias Insufficient institutional capacity 	<ul style="list-style-type: none"> Establishment of institutional coordination and cooperation mechanism Capacity development in integrated taskforces
Management Instruments	<ul style="list-style-type: none"> Lack of effective implementation and enforcement tools Lack of stakeholder involvement and responsibility Insufficient inclusion of the benefits of coastal ecosystems Lack of impact assessment and planning tools 	<ul style="list-style-type: none"> Lack of effective implementation and enforcement tools Lack of stakeholder involvement and responsibility Lack of impact assessment and planning tools 	<ul style="list-style-type: none"> Development of implementation tools Improved stakeholder involvement and responsibility Improved Valuation of coastal ecosystems Use of tools for integrated impact assessments