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WORKING PAPER

Fish Out of Water? Inter-sectoral Conflicts, Trade-offs and Synergies in Freshwater Resource and Coastal Zone Management

There are many interactions between fisheries and aquaculture and other users of freshwater and marine environments. Agriculture, flood control, power generation, tourism, mining, transportation, land development, and urban and industrial effluent disposal are amongst some of the most important of such competing demands. Fisheries and aquaculture in effect compete for space and resources in the most contested and fastest-developing geographical areas on earth. Coastal zones contain most of the world's major urban and industrial centers, and a growing proportion of the global population. River basins and major inland waters provide water resources for hydro-power generation, domestic and industrial uses, and intensive agriculture, including rice production and horticulture. Coastal zones and river basins also provide globally significant environmental goods and services, including flood and storm surge protection, waste disposal and pollutant dispersal, biodiversity conservation, recreation and tourism.

While many of the interactions within the fisheries sector and between the sector and other activities (e.g. agriculture, forestry and tourism) are of a competitive or antagonistic nature, a number of complementary or synergistic interactions may also exist. If the fisheries sector is to make an optimal contribution to economic and social welfare, these interactions must be taken into account and the development and management of fisheries integrated within the wider context of integrated coastal area and river basin management. Such integrated planning processes require investment in institutional capacity building and organizational development at all levels.

1. ISSUES IN FRESHWATER RESOURCE MANAGEMENT AND FISHERIES

Inland fish production will continue to face increasing competition for water from other uses. Fishery stakeholders alone cannot address the challenges, particularly since many of the problems are generated outside the fisheries sector.

Integration, better coordination of planning and management of resources shared by fisheries and other users, are required in order to facilitate sustainable inland fish production. An effort to resolve conflicts will require close liaison between user groups, full cost-benefit analysis, and transparency in the decision-making process. If this is to be successful it must involve cross-sector education of all user groups and recognition of stakeholder participation and needs.

An important focus is the evaluation and management of trade-offs associated with infrastructure such as hydropower dams, irrigation schemes, roads, dykes, and flood control structures. Inland fisheries are greatly undervalued in water management decisions at local, national and basin levels. Better valuation methods that pay more attention to non-formal values, particularly those concerning livelihoods, biodiversity and food security are urgently needed¹.

The ecosystem approach, with its focus on maintaining ecosystem functioning, is fundamental to managing water for inland fisheries and aquaculture. These fisheries face critical challenges from outside the fisheries sector and suffer greatly from environmental pressures. Maintaining environmental flows must include sustaining ecosystem service provision and broader ecosystem connectivity and functioning for conserving biodiversity.

Fisheries require particular water qualities, quantities, and seasonal timing of flows in rivers and their dependent habitats. Changes in flow and water quality can have major impacts on fisheries production in an aquatic ecosystem. Such changes may arise naturally due to climate variability, but often result from human modifications to the flow regime or from use of rivers and lakes to dispose

of and dilute by-products of other activities (fertilizer and pesticide runoff, domestic sewage, industrial waste) that alter the functioning of the ecosystem. Hydrological approaches to water management tend to focus on in-stream quantitative flows and often ignore the important impacts on quality and extent of adjacent floodplains and their associated wetlands².

Irrigation accounts for some 70% of all water abstraction from rivers. Trade-offs have to be made between this use of water for agriculture and provision of water for fish production and other aquatic ecosystem goods and services. The ecosystem approach to managing watersheds needs to consider land use practices as well as water needs for domestic and industrial use. Conflicts with agriculture are often highlighted, while potential synergies and complementarities are generally overlooked. These include the potential for integrating aquaculture into rice-based agricultural systems.

Fisheries and aquaculture can play an important role in effective water management across the continuum from rainfed to irrigated agriculture, and increase the resilience of poor communities dependent on such systems in the face of climate variability. A continuum of options between capture fisheries and integrated agriculture-aquaculture is available to satisfy the need for alternative aquatic resource production under different climate- and agro-ecological scenarios.

¹ Baran, E. et. al. 2007. Infrastructure and Tonle Sap fisheries: How to balance infrastructure development and fisheries livelihoods. Asian Development Bank, Cambodian Ministry of Environment, WorldFish Center.

² Dugan, P. et al. 2007. Inland Fisheries, Aquaculture and Water Productivity. In: Comprehensive Assessment of Water Management in Agriculture. 2007. Water for Food, Water for Life: A Comprehensive Assessment of Water Management in Agriculture. London: Earthscan, and Colombo: International Water Management Institute.

2. ISSUES IN INTEGRATED COASTAL MANAGEMENT, FISHERIES AND AQUACULTURE

The continued productivity of coastal resources and maintenance of environmental quality and services are very important to the economies of many developing countries. This is especially true in rural coastal areas, where local economies are typically less diversified than the national economy. The livelihood of residents in coastal areas is usually directly linked to coastal resource use, such as fisheries and aquaculture. As populations increase and pressures for economic and social development escalate in developing countries, a disproportionately heavy demand is placed on coastal resources. As a result, many coastal environments and habitats have become seriously degraded, many coastal resources, such as fisheries, are overexploited, and conflicts among competing users have heightened. Management needs to go beyond ineffective regulation of fishing effort and illegal fishing and address the interlinkages between poverty and natural resource degradation. Synergies need to be maintained between common pool resource fisheries and the generation of environmental services as national and global public goods, such as coastal protection and climate change mitigation.

The environments of coastal zones are influenced not only by human activity along the coastline and in adjoining seas, but also by activities inland and in associated watersheds. These issues are often complex and cross sectoral boundaries. They are difficult to resolve in a single-sector management regime. Integrated coastal management (ICM) employs an integrated, multisectoral strategic approach to resolve multiple use conflicts. In this context the development of fisheries and aquaculture must be conceived as part of wider local, regional and national economic development and resource use strategies. The "best use" of coastal resources will depend on these wider strategies, which condition the value attached to the impacts generated both by the sector and by other

sectors on the coastal environment (e.g. the type and degree of human-induced changes in the ecosystem that are acceptable). The entire process is closely linked to the institutional and organizational context in which the fisheries and aquaculture sector operates; a major challenge is to modify the existing context in order to achieve preferred patterns of coastal resource use.

Marine protected areas (MPAs) can be considered components of ICM programs because they protect the biodiversity and ecological processes on which human use of the coastal zone depends. A marine protected area is a spatially defined area in which part or all populations are free of exploitation. The primary purpose of MPAs is to protect target species from exploitation in order to allow their populations to recover. Perhaps more important, MPAs can protect entire ecosystems by conserving multiple species and critical habitats such as spawning areas and nursery beds. MPAs can also reduce conflicts between fishers and other users by providing areas where non-fishery users can pursue non-consumptive uses of the resources. MPAs can also play a role in helping to diversify the coastal economy through tourism and conservation work.

In some circles, MPAs have come to be advocated as the solution for all fisheries and ecosystem management problems. In reality, MPAs are not substitutes for fishery management, but are one of several tools in the toolbox. Marine protected area management must be coordinated and integrated with coastal and fisheries management activities outside the boundaries and linked to development programs that address the needs of local people. Key to success of MPAs includes stakeholder participation, understanding and local acceptability, and monitoring and enforcement. Goals for the scope and purpose of MPAs must reflect a balance between scientific and social and economic needs and realities.

3. GOVERNANCE, DECISIONS AND TRADE-OFFS

Existing policies and management strategies for freshwater and marine systems are, for the most part, insufficient and ineffective in arresting or reducing the rapid rate of aquatic resource degradation. To address this weakness improved governance processes are needed that facilitate compromise by stakeholders and favor integrated resource management.

Changes in water governance provide a vehicle for achieving the trade-offs required but bring both opportunities (e.g., transboundary fish stock management) and threats (e.g., when water privatization threatens access of the poor to aquatic commons). New institutional connections are needed to link decisions on upstream land use and water management to those for managing downstream fisheries – a need which highlights common gaps in policy and planning processes. Addressing these gaps is a key area for investment, to reconcile increasing pressure on water resources with requirements for sustaining and enhancing fisheries and aquaculture.

Governance reforms are often associated with improvements in public accountability, environmental sustainability and empowerment of poor and vulnerable groups. Decentralization that embraces legislative reform to support the rights and responsibilities of local communities to stewardship of resources is widely regarded as a promising avenue towards improving rural livelihoods and reducing poverty. However, decentralization reform raises a number of challenges for coastal and water resources management. In particular it provides little opportunity for management of transboundary resources such as water and migratory fish stocks. In addition, lack of human and financial capacity at local levels slows the pace of decentralization. Clearly-defined goals and responsibilities of government at all levels will be needed to deal with complex and potentially conflicting resource management issues emerging at different scales. Adaptive policy support mechanisms are required to ensure that reforms realize potential local economic development and improved food security.

4. PRINCIPLES FOR INVESTMENT IN INTEGRATED FRESHWATER RESOURCE AND COASTAL MANAGEMENT

Integrated management teaches us that management of competing resource uses and diverse stakeholder groups requires effective governance, active partnerships, practical coordination mechanisms, sustainable financial resources, and strengthened technical and institutional capacities. Principles for investment in integrated freshwater and coastal management include:

- i. [Support institutional and governance reforms that link decision-making across sectors and across multiple scales of intervention.](#) Ensure multi-sectoral and multi-level integration in decision making linking broad scale management to local level interventions. Three categories of integration are system (spatial and temporal dimensions), function (links programs and project management to goals and objectives), and policy (consistency between national and local government policies and economic development plans).
- ii. [Integrate an ecosystem-based approach into infrastructure planning.](#) This should take account of knowledge and uncertainties about and among living marine resources, their habitat, and human components of ecosystems, and strive to balance diverse societal objectives. The aim is to ensure

that, despite variability, uncertainty and likely natural changes in the ecosystem, the capacity of aquatic ecosystem health, both natural and human, is maintained indefinitely for the benefit of present and future generations.

- iii. [Adopt multi-criteria analysis for water allocation and use environmental flow assessment as a way to quantify the environmental criteria.](#) Environmental flow assessments are used to estimate the quantity and timing of flows to sustain identified aquatic values. The outputs from these assessments are used to recommend environmental water requirements and desired flow regimes required to maintain the ecosystem values.

- iv. [Strengthen watershed and coastal zone management bodies with strong civil society representation.](#) Allow for participation of all actors, particularly local populations, in the planning process to assure effective management. Co-management is a form of management whereby the government shares power and responsibility for decision-making with resource users.
- v. [Invest in local capacity to assess and weigh the livelihood implications of alternative resource management scenarios.](#) Adopt an integrated livelihood approach that shows how people adapt to reduce their risks, the incentives that drive resource users' decisions and behaviors, and the sources of vulnerability to stresses and shocks. This involves addressing fundamental social, economic and environmental reforms that affect individuals, households and communities. Approaches involve stronger linkages between coastal fishing communities and regional and national economies, and recognition that solutions are found both inside and outside the fishing community.

5. FURTHER READING

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