CHAPTER 1

Inter-Sectoral Governance of Inland Fisheries: Research Needs and Foci

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Abstract One of the defining characteristics of inland fisheries is their connection to other essential human activities, such as hydroelectricity generation, irrigated agriculture, and transportation, which rely on the same fresh or brackish water ecosystems. Starting with the premise that an understanding of fisheries' interactions with these non-fishery sectors is in itself critical for achieving fisheries sustainability, this introductory chapter explores the topic of inter-sectoral governance and outlines an approach to examining the intricate and often challenging sector relationships. It first highlights the importance of inland small-scale fisheries, which are ubiquitous but often forgotten, and draws on 11 case study chapters around the world to propose four key areas of research that can structure the learning of the inter-sectoral dynamics – i.e., 'system description', 'valuation', 'power relations' and 'high-level discourse'. Analyses of these research foci will often need to be combined to advance more rigorous (and transdisciplinary) science and also inform appropriate courses for the governance of inland fisheries. Given the typically marginal position of fisheries in inland water-use discussions, the aim of this chapter, and the volume, is to lead a more integrated understanding of inter-sectoral interactions and promote further research with a view to raising the sector's profile in the wider society.

1. Introduction: Why Study Inland (Small-Scale) Fisheries?

Where do inland fisheries stand in the world of small-scale fisheries? Both in terms of policy and research, this is a question often not explicitly pursued and therefore somewhat neglected. Yet, inland fisheries have a prehistoric origin and still abound in many different

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contexts and locations – both in the Global South and North, and for commercial, subsistence and recreational purposes. The public ownership or common-pool nature of many dispersed inland waterbodies as well as low investment and relatively simple gear technology required in catching fish have also contributed to their common occurrence through time. According to the Food and Agriculture Organization, inland fisheries production has steadily increased in the last decade, contributing over 30 percent of the total fisheries catch in 2012 (FAO 2014). It has also been suggested that inland fish production could rival that of marine when all bodies of fresh water (e.g., small streams, ponds, lakes, and rivers which are currently not assessed) are accounted for globally (Welcomme 2011). Inland fisheries are crucial sources of animal protein and micronutrients, such as omega-3 fatty acids, calcium, vitamin A, iron and zinc, particularly in developing countries and Low Income Food Deficit countries; they thus play an important role in promoting global food security (Craviari et al. 2008; Youn et al. 2014). The sector is an important contributor to people's livelihoods. It provides harvest and post-harvest employment to approximately 61 million people around the world, of which 50% are women (Bartley et al. 2015). Inland fisheries are also capable of generating large economic values, as demonstrated in the Lower Mekong Basin, for instance, whose total value was estimated to be US$7 billion per year with an annual total fish production of about 3.9 million tonnes (MRC 2010).

Many issues beset inland fisheries, however, including overfishing, biodiversity loss, habitat degradation and proliferation of invasive species as well as socio-political impacts arising from access rights and large-scale hydroelectric development (Allan et al. 2005; Welcomme et al. 2010; Orr et al. 2012). Furthermore, since nearly 60 percent of the world's freshwater falls within a transboundary basin, in which at least one of the tributaries crosses a political boundary (Wolf et al. 1999), governance of inland fisheries has been a particularly arduous endeavour.

Despite the inland fisheries' significant contributions and challenges, they have so far failed to capture adequate public attention and generate political will deemed necessary to sustain effective conservation and management efforts (Cooke et al. 2013, 2016). The exclusion of inland fisheries in preference to a sole focus on the marine domain in the 2030 Sustainable Development Goals is a stark reminder that inland fisheries occupy a peripheral position in the wider sustainability discussion. Are inland fisheries being forgotten even though they are also too big to ignore? What could focused research on inland small-scale fisheries tell us more about natural resource governance?

2. Broad Research Agenda

The Global Conference on Inland Fisheries (http://inlandfisheries.org/) held at the FAO headquarters in Rome in January 2015 was a landmark event that gave undiluted attention to inland fisheries from multiple angles. Through active participation of delegates from around the world, it aimed to deliberate a concerted statement on urgent research agenda and on-the-ground implementation needs. It also focused on raising political action required to

better incorporate the concerns of inland fisheries into policy. The conference resulted in several key messages, including:

1) Improving biological and production data assessment: Obtaining accurate and complete information about inland fisheries production is a difficult process because most inland fisheries activities are small-scale, highly scattered, wherein the harvest is for subsistence, or traded or consumed locally and generally unreported to governmental agencies. Similarly, considerable numbers of fish caught by recreational fishing are consumed but remain unreported. This points to a need to put efforts in developing standardized methods of biological assessment of inland fish populations and harvest, which would include data collection, database management, data sharing and reporting at the appropriate local, national and global scales.
2) Adequate valuing of economic, social and cultural dimensions: There has often been a lack of recognition of the cultural values, beliefs, knowledge, social organization and diverse livelihood practices of inland fishers, fish workers and their communities including indigenous people. This has often resulted in policies that exclude these groups and increase the vulnerability of fishing communities. Such exclusion deprived them of culturally and economically important connections and access to aquatic ecosystems and the services they deliver. A comprehensive "valuation" of inland fisheries' economic, nutritional, and cultural contributions to ecosystem health and human societal wellbeing is required to avoid underestimation of the true economic and social value of well-governed inland fisheries.
3) Negotiating external threats and seeking cross-sectoral integration: The production of inland fisheries is dependent upon the quantity and quality of freshwater and freshwater aquatic habitats and is predominantly influenced by factors external to the fisheries. Many of the competing uses of freshwater resources, such as agriculture, domestic use and power generation, and the lack of cross-sectoral integration among them are negatively impacting them. With the human population expected to exceed 9 billion by 2050, increasing demands for freshwater will further impact the productivity of inland waters. There is an urgent need to promote cross-sectoral fora to facilitate discussions about the trade-offs and synergies of inland freshwater development options that consider the fishery sector as an equitable partner in resource management.
4) Achieving transboundary and inter-jurisdictional coordination: Many international and transboundary inland water bodies do not have a governance structure that holistically governs the use and development of fishery resources. This often results in decisions being made in one location that adversely impact resources, food security, and livelihoods in another area. Establishing joint governance institutions, e.g., river or lake basin authorities, or expanding the mandate and capacity of existing institutions to address or incorporate inland fisheries in the multilateral decision making processes need to be considered. This is also to be accompanied by governments committing to implement internationally-agreed decisions through their national policies.

This volume engages with the theme 'negotiating external threats and seeking cross-sectoral integration', or inter-sectoral governance. It finds support in the outcome document called

"The Rome Declaration: Ten Steps to Responsible Inland Fisheries" (FAO and MSU 2016), which specifies the need to "Develop collaborative approaches to cross-sectoral integration in development agendas" as one of the steps. Comparatively speaking, however, inter-sectoral linkages have generally lacked dedicated research attention (for exceptions, see Arlinghaus 2005; Ratner et al. 2013; Lynch et al. 2016; Nguyen et al. 2016). There remain few systematic investigations that synthesize the details of fisheries' external conflicts, whose formation and impact are often poorly understood (Bennett et al. 2001). It, thus, forms a significant knowledge gap in the literature about the governance and utilization of fresh and brackish water fisheries resources.

3. Governing Inter-Sectoral Interactions

Arguably, the greatest risks to the governability of inland fisheries originate from outside the fishery sector (FAO 1997; Cowx 2002; Cowx et al. 2010; Beard et al. 2011). Important societal needs such as drinking water, irrigation for agriculture, power generation, navigation, and effluent disposal all rely on the waterbodies and aquatic resources in which inland fisheries are also based. Associated impacts, including habitat degradation, water pollution, and flow modification, serve as major constraints to the steering of inland fisheries, and to a greater degree, to the protection of aquatic biodiversity (Cowx 2002). 'Besieged' by these external pressures, inland fish are considered one of the most endangered groups of species in the world (Jenkins 2003; Dudgeon et al. 2006) and freshwater habitats among the most altered and threatened ecosystems (Brönmark and Hansson 2002; Malmqvist and Rundle 2002) with many experiencing a critical transition or a regime shift (Nayak et al. 2016).

Hence, there is an acute need to learn from the experiences of inland water systems around the world (e.g., lakes, rivers, wetlands, brackish lagoons) and bring forward a synthesis that discusses the conflicts and synergies between diverse sectors as well as organizes ways in which inter-sectoral influences can be studied. This volume offers the contribution of 11 case studies which engage with one or more of the following questions:

- Which external (internal) sectors do inland fisheries interact with?
- How do these relationships play out in each locale?
- Are there conflicting or cooperative interplays between different fishing interests or groups?
- What are the broad discursive mechanisms by which inter-sectoral influences are borne and inland fisheries impacted?

4. Case Studies

The case studies originate from three broad regions of the world – Europe (2 chapters), Africa (3) and South/Southeast Asia (6). They also comprise a wide range of inland water settings with 4 cases illustrating lake fisheries, 3 focusing on the river environment, 2 set in

deltaic/lagoon-based brackish waters and 2 describing wetland/flood plain fisheries. The time period featured in the cases span from historical to contemporary (see Table 1.1 for summary). While the chapters mostly rely on social sciences disciplines such as natural resources studies and environmental history, ecological data was also utilized in some cases to enrich the explanation of changing or reinforcing inter-sectoral relationships. Collectively, these 11 chapters represent a reasonably diverse array of relevant cases from which integrative insights about inter-sectoral dynamics and governance can be drawn.

5. Synthesis

Thematically, the cases generated a synthesized understanding of inter-sectoral interactions. This can be phrased as four research foci that are inter-related – 'system description', 'valuation', 'power relations' and 'high-level discourse'. 'System description' is likely the starting point of any inquiry, through which the resource environment, involved sectors and the history of interactions including any overt crises are identified. The other areas denote three broad discursive mechanisms by which inter-sectoral influences are borne and inland fisheries impacted. Valuing is an attempt to establish the relative worth of different sectors. It is sought to guide decision-making around water uses. There may also be ingrained or changing power differentials between sectors that manifest in the form of unequal resource access rights, lobbying power, or the strength of sector organization and economic capacity, which shape the water-food-energy nexus discussions. Finally, global or regional policy directives or prevailing political economy can create a far-reaching effect in local-level water decisions by framing resource problems, prioritizing certain sectoral needs and thus encouraging specific development strategies that may not be compatible with inland fisheries. Each of these key areas of understanding is explained in more detail below.

5.1. System description

The 'system description' research seeks a basic understanding of the governance history and the present regulatory setup (e.g., the legal mandate, the remit of different sectors and the diverse management objectives) as well as the prevailing social-ecological conditions and cultural characteristics that reside over the waterbody. It calls for a candid depiction of what can be observed in the interactions occurring at different scales and multiple fora, concentrating on what is visible, overt and therefore comparatively easy to assess and record. A vast range of possibilities exists for what should be described depending on the empirical reality of each locale. Principal questions would include which sectors are present at a waterbody and to what extent, and where each sector is positioned in the institutional structures that pertain to the governance of the aquatic system. Accounts of any contact or confrontations as well as synergistic solutions (i.e., "win-win" scenarios, see Beard et al. 2011; Lynch et al. 2016) would also form a pertinent knowledge. Forming a 'background container', this research strategy has been widely employed, and can foreground a description of more profound issues.

Table 1.1. Case studies at-a-glance (in the order of presentation in the volume).

Contributors	Environment	Sectors involved	Key narrative(s)	Time period covered	Featured discipline(s)
Islam, Shamsuzzaman, Sunny and Islam	Meghna and Padma Rivers (Bangladesh)	Mechanized and non-mechanized boat fishing groups, fish traders/ middlemen and NGOs, various government bureaus instituting or supporting a fishing ban	Examines the causes of conflicts and social tensions among various groups surrounding hilsa sanctuaries as they relate to increased competition over fishing space and irregularities in distribution of economic incentives	Present	Natural resources studies
Baer, Eckmann, Rösch, Arlinghaus and Brinker	Upper Lake Constance (Germany-Switzerland-Austria)	Commercial capture fishery; aquaculture; tourism; drinking water; nature conservation	Constructs a history of nutrient dynamics and lake water quality driven by factors external to fishery, and describes the varied impacts this has created on lake ecology and on different water-based sectors including capture fishery	Early 20th century to present	Lake and fish ecology
Nunan and Onyango	Lake Victoria (Tanzania-Kenya-Uganda)	Three main commercial fisheries – Nile perch, Nile tilapia and dagaa; agriculture; forestry	Outlines the history of fisheries governance, and discusses inter-sectoral conflicts and cooperation by taking into account the multi-level and trans-boundary setup of the lake	Late 20th century to present	Natural resources studies
Hettiarachchi and Morrison	Urban wetlands in Kolkata and Colombo (India and Sri Lanka)	Waste water-fed pond pisciculture; capture fisheries; agriculture (rain-fed rice cultivation); real-estate development; urban use of water	Compares the governance and fisheries/ecological outcomes in two urban wetlands in South Asia and analyses the factors that led to different trajectories	Colonial (late 19th and early 20th centuries) to post-colonial to present	Wetland ecology; environmental history; institutional analysis
Mhlanga and Nyikahadzoi	Lake Kariba (Zambia-Zimbabwe)	Inshore gillnet fishery; offshore kapenta fishery; cage aquaculture; recreational fishery; tourism and hospitality; wildlife management; hydropower generation	Discusses various intra-sectoral and inter-sectoral conflicts observed in Lake Kariba, and governance arrangements for the fisheries at national and bi-national levels	Late 20th century to present	Natural resources studies
Salmi and Sipponen	Finnish lakes (Finland)	Commercial fishery; recreational fishery; wildlife conservation	Describes how commercial fishery gets marginalized vis-à-vis recreational fishery and seal conservation, and discusses the importance of	Late 20th century to present	Natural resources studies

			local food movement and new governance arrangements for altering the power relations		
Bower, Raghavan, Mahesh, Danylchuk and Cooke	Cauvery River (India)	Subsistence fishery, recreational fishery, hydropower generation, sand mining	Introduces the fishery, management measures and governance structures, and describes conflicts between recreational and subsistence fisheries and other inter-sectoral issues	Present	Natural resources studies; fish ecology
Tezzo, Kura, Baran and Zi Za Wah	Ayeyarwady Delta (Myanmar)	Open-access fishery; leasable fishery (privately leased); rice cultivation	Describes the origin, evolution, limitations, prospects and estimated values of 'leasable' fisheries, and suggests research recommendations	Colonial (19th and 20th century) to present	Natural resources studies; institutional analysis
Singh and Gupta	The mid-Ganga basin in the Ganga River (India)	Capture fishery; colonial interests in revenue extraction and fish conservation	Describes the 'diara' ecology, and explains how the British colonial government established state control over waterbodies which led to privatization and loss of water access for river-dependent fishing communities	Colonial (18th and 19th century)	Environmental history
Akintola and Fakoya	Badagry Creek (Nigeria)	Capture fishery; water transportation; sand mining; eco-tourism	Provides a succinct yet comprehensive account of the fishery, social context and governance arrangements as well as inter-sectoral relationships with other lagoon-based activities	Pre-colonial to present	Natural resources studies; cultural history
Gurung and Sah	Koshi Tappu flood plains in Saptakoshi River (Nepal)	Capture fishery; wildlife conservation park; tourism; sport fishing	Describes fishery characteristics and conflicts between fishing and wildlife conservation, and proposes community-involved fishing tourism as a win-win solution	Present	Natural resources studies

Mhlanga and Nyikahadzoi (this volume) draw attention to spatial and historical struggles among different sectors that operate in Lake Kariba, among which are competition for overlapping littoral space between fishery and tourism industries (such as houseboats and lodges) and controversies surrounding big game poaching between fishers and the wildlife conservation authority. In these situations, both physical and perceived confrontations are possible, as poachers make an illicit entry into conservation areas through fishing camps and also fishing can intrude into a holiday-makers' pristine wilderness experience. The authors also report a case of post-colonial racial tension between the white-operated ring net-based *kapenta* (*Limnothrissa miodon*) fleets and black gillnet operators.

Nunan and Onyango (this volume) have highlighted the multi-scalar setup of inter-sectoral linkages in Lake Victoria. On the one hand, there are community-level interactions that occur between village committees or occupational groups that are largely based on personal relationships and informal encounters. On the other hand, supra-national cooperation is being encouraged through the Lake Victoria Basin Commission, which is tasked with the harmonization of policies and laws within the East African Community member countries for improving the collaborative management of transboundary natural resources, pollution and environmental degradation in the basin. Authors argue that coordination at the national level appears key, as both the effectiveness of decentralization and of upward ministerial involvement hinge on the sound oversight and financial capacity of the central government.

Islam et al. (this volume) write about *intra*-sectoral interactions and the *inter*-sectoral kind that take place among different fishery interests in Bangladesh. The authors catalogued cooperative and conflicting relationships that often simultaneously appear between various fishery-related actor groups, such as fishers, fish entrepreneurs, micro-finance non-governmental organizations, law enforcing agencies and the local government in charge of administering the Payment for Ecosystem Services scheme.

The inter- and intra-sectoral relationships most commonly observed in inland fisheries are summarized in Table 1.2. While the explicit focus of this volume is on *inter*-sectoral, there are also *intra*-sectoral interactions that can be instructive, as demonstrated by several chapters in the volume. Despite fish being the common denominator of all fishery-related sectors, various groups might still hold opposing interests and construct different meanings for the fisheries and the waterbodies, creating governance implications that are not entirely dissimilar to the inter-sectoral interactions.

5.2. Valuation

The 'valuation' research is about assessing 'assigned' values of different sectors. Using a wide range of valuation techniques, comparison of assessed values permits estimating how different sectors measure up in terms of the contributions they pose to the society, and

subsequently adjudicating any inter-sectoral trade-offs. Proper valuation is expected to bring more informed decision-making in favour of inland fisheries and garner greater public support within the context of wider economic development and sustainable livelihoods. With an implicit assumption of a zero-sum game, this approach ultimately seeks an instrumental explanation and has been given considerable attention in inland water resource research (e.g., Baran et al. 2007; Ziv et al. 2012).

Table 1.2. List of 'within-fishery' sectors that are part of an inland fishery system, and 'beyond-fishery' sectors that interact with inland fisheries. (Note: these are representative labels thus not necessarily mutually exclusive – e.g., there can be a subsistence component to all other fisheries sectors; water quality overlaps with the concerns of multiple sectors, including fishing, domestic use, tourism and nature conservation).

Inter-sectoral (beyond fishery)	
- Hydropower generation	- Flood control and drainage
- Potable water and domestic use	- Industrial use including mining
- Agriculture, silviculture and irrigation	- Recreation and tourism
- Nature conservation and animal rights	- Shipping and transportation
Intra-sectoral (within fishery)	
- Commercial fishery	- Recreational fishery
- Subsistence and indigenous fishery	- Migrant fishery
- Poaching/illegal fishery	- Aquaculture
- Fish trading and processing	- Marine fishery

Among the approaches developed to capture different kinds of values (e.g., socio-cultural and ecological values), economic valuation has been the one most commonly pursued. An enhanced understanding of the monetary value may reveal the fishery sector's *true* economic significance, which in many cases, have been simply buried and therefore ignored. Situating the valuation of fish and fisheries in the broader rubric of ecosystem services has also been touted as an effective strategy that highlights their essential connections to ecosystem functioning (e.g., Hoeinghaus et al. 2009).

> Tezzo et al. (this volume) report the annual price of 'leasable fishery' in the Ayeyarwady region of Myanmar based on direct survey work. In 2014, the average price of the lease was estimated to be US$ 5,726 with a large majority of the 1,265 leases recorded in the region valued above US$ 1,000. Given that US$ 1,105 is the average annual per capita income in Myanmar (World Bank 2014), these figures highlight the considerable value of fishery in the local context and its relevance as a prized asset.

In addition to economic values, there are other kinds of values, which can be understood to more fully characterize inland fisheries. In fact, the greatest offering of many inland fisheries to society is perhaps found in their non-economic contributions expressed through values that are non-monetary and even not easily quantifiable (i.e., for an analogous debate, see wealth-based vs. welfare-based functions of fishery, Cunningham et al. 2009; Béné et al. 2010; Nunan 2014). For instance, accurately capturing the scope of food security and nutritional benefits bestowed by inland fish and fisheries and the extent to which they

contribute to people's livelihoods can be an important marker of their importance. Furthermore, inland fisheries are often a source and a carrier of experiential, identity, cultural and place attachment values for those who participate, providing psychological, spiritual and communal benefits (e.g., Close et al. 2002; Jackson et al. 2005). These humanistic values that go beyond the instrumental purview can help set apart inland fisheries from other water-utilizing sectors, helping to advance different, and more diverse, arguments towards elevating the public perception and the political impetus for inland fisheries.

Aside from more conventional quantification techniques that include cost-benefit analysis, contingent valuation method, Economic Impact Assessment methods such as using the gross value of fish landings based on market prices (e.g., Neiland and Béné 2006) and various modelling approaches (e.g., Orr et al. 2012), there has also been an increasing interest in utilizing fish consumption data based on agricultural household surveys (e.g., Belton et al. 2011), non-monetary ranking techniques such as damage schedules (e.g., Song and Chuenpagdee 2013), socio-economic or livelihood analysis (e.g., Béné and Neiland 2003) and even narrative approaches that centre on individual, community and societal wellbeing (e.g., Song 2017). Despite the significant challenges noted above, there appears a widespread optimism that valuation is a research frontier that holds the prospect for a great breakthrough in clarifying and enhancing the inter-sectoral position of inland fisheries (Cowx and Portocarrero Aya 2011; Cooke et al. 2013; Lynch et al. 2017).

5.3. Power relations

This area of research privileges the role of power in addressing the inter-sectoral governance of an aquatic system. Involving multiple sectors with diverse interests and overlapping administrative boundaries means that there can arise uneven power relations that undergird a particular dynamic between water sectors, including the marginalization of inland fisheries.

The trend of inland fisheries research reflects the broader domain of fisheries and water resource research, in which power remains an understudied topic (Weitz et al. 2017). Even in studies that address power, prioritization of its specific facets, such as conflict, inequity and marginalization, are often needed for researchability (e.g., Bennett et al. 2001; Nguyen-Khoa and Smith 2004; Arlinghaus 2005). Nevertheless, this is widely-acknowledged as a crucial topic of investigation, with World Bank (2004), for instance, asserting that "it is necessary to recognize the reality of existing power and influence if effective fisheries and coastal management is to be achieved."

Asymmetrical power relations do not, however, always result in conflict and social disorder (Lukes 1974; Gaventa 1980). A seemingly peaceful and consensual situation may in fact be harbouring entrenched inequality, domination and deprivation in which the sense of powerlessness within fisher groups is prevalent and self-perpetuating. This reinforces the fact that an investigation of power is all the more crucial in a multi-stakeholder, inter-sectoral setting, in which large power differentials may be operating. In many inland fisheries, both in developed and developing regions, such covert power dynamics might be what is happening. Dedicated approaches drawing on political ecology or political economy (e.g., see Derman and Ferguson 1995; Sneddon 2007; Béné et al. 2009; Nayak et al. 2016; Sneddon and Fox

2012) will certainly be helpful. Yet, more general approaches utilizing qualitative methods such as field-based ethnographic research and discourse analysis of policy documents would also represent a useful contribution.

Salmi and Sipponen (this volume) have analysed the complex power relations that have occurred in vendace fisheries (*Coregonus albula*) in Finnish lakes. In the early 1990s, water owners of private lakes had used their legally-sanctioned management authority to refuse the granting of commercial fishing permits despite scientific reports suggesting that commercial fishery using small pair trawling and seine netting does not jeopardize the stock health. The authors write that local water owners' opposition to commercial fishing is tied to their will to stamp positional clout in local-level fisheries management and at the same time advance their recreational fishing opportunities. More recently, an increasing concern of nature conservationists for the bycatch of endangered Saimaa ringed seal (*Pusa hispida saimensis*) had successfully convinced water owners and government authorities to institute a system of seasonal fishing bans. While the fishing ban applied equally to the both commercial and recreational fishing groups, a heavier impact was on the approximately 60 commercial fishers located in the habitat of the Saimaa ringed seal who became deprived of an important income source, compared to about 400,000 recreational fishers in the area. According to the authors, the lack of consideration of the livelihood aspect for commercial fishers is another reflection of the weaker lobbying power and political standing of the commercial lake fishery in relation to the recreational sector. It also hints at the lower priority of natural resource utilization vis-à-vis nature conservation in decisions being made about waterbody use.

5.4. High-level discourse

This area of research seeks to examine high-level societal aspirations and discourses that exert influence on inland fisheries. Also phrased as 'global drivers' (Nayak and Berkes 2014; Lynch et al. 2016) or 'external inputs' (Nguyen et al. 2016), these are seen as external forces that go beyond the geographical confines of a defined waterbody (or a watershed), thus escaping the immediate control of local or national actors, and can strongly motivate objectives and priorities for development and management of inland waters (Lynch et al. 2016). Such multi-scalar dynamics are an increasingly important consideration in the current era characterized with economic globalization, supranational coordination and climate change. Concepts such as 'cross-scale linkages' (Berkes 2002) and 'telecoupling' (Liu et al. 2013) all elaborate on general theories of ways to ensure environmental and natural resource sustainability in light of these "distant" implications.

Inland fisheries are no exception to such expanding governance purview. Ideas, resources, finances, people and goods can all descend upon the sites of fisheries affecting the trajectory of inter-sectoral interactions. Synergistic and balanced relations that may had existed between fisheries and other sectors may start to tip in favour of a new dynamic fed by a development of a particular discursive undercurrent. The aspiration towards turning rivers into a source of hydropower generation is a well-reported case in point (Bakker 1999;

Winemiller et al. 2012). In the Mekong River basin, large-scale hydropower development powered by big dams is a dominant and long-running regional theme that has garnered the strongest political and financial clout (Gleacen and Palettu 2007). With Laos aspiring to be the hydroelectric "battery of Asia", for example, the social and ecological impacts the continuing hydro-development brings to fisheries and fishery-based livelihoods is real and looming (Baran and Myschowoda 2009; Vaidyanathan 2011). Understanding inter-sectoral interactions would therefore require a broadening of a research scope to see these multi-scalar connections as integral to the process of governing inland fisheries.

Hettiarachchi and Morrison (this volume) present a case of an urban wetland fishery in Kolkata, in which the fishery sector is put under growing pressure from a wider development agenda which has upset local-level symbiosis. In the early 20th century, in response to wastewater and sewage discharge from an expanding city, the dwellers of the East Kolkata Wetlands skillfully devised a vast network of freshwater ponds to transform pollutants into a source of nutrients for aquaculture. This had marked a symbiotic relationship between urban water treatment needs and wetland livelihoods, which was exemplified by the annual production of 8,000 t of fish in exchange for a daily intake of 0.7-1.0 million m^3 of wastewater in 2010. However, spurred by the pro-capital economic restructuring in India during the 1980s, the wetland system came under intense urbanization pressure. Speculative real-estate investment and the inflow of international finance capital ensued, and as a result, nearly 20% of the wetland area was reclaimed for real-estate purposes by 2003 with more unaccounted conversion suspected in recent decades.

Baer et al. (this volume) describe how a European Union-led agreement on improving water quality can influence the image of a lake such that water quality quickly establishes itself as the primary concern for the management of a waterbody. The societal narrative towards "clean" water can work to benefit those sectors that favour an oligotrophic condition with clear-blue water while overshadowing others that prefer a more mesotrophic state such as a commercial capture fishery. The authors write that the commercial fishery sector now find themselves second in terms of socio-political importance compared to environmental protection, tourism, water quality and outdoor recreation, and it no longer play a central role in lake management and decision-making.

6. Conclusion

Production of inland fisheries is dependent upon the quantity and quality of freshwater and aquatic habitats and is predominantly influenced by factors external to the fisheries. Many of the competing uses of freshwater resources, including agriculture, domestic use and hydroelectricity generation, and the lack of cross-sectoral integration among them are impacting the fisheries in multiple ways. The current volume focuses on this research agenda to present four thematic areas from which an understanding of inter-sectoral dynamics can

be derived with more rigor. 11 case study contributions are leading the way. More input is further requested, from other areas of the world as well as from diverse disciplinary angles. Viewing research outcomes and policy initiatives of inland fisheries through inter-sectoral lenses can help stimulate more fruitful research towards streamlined water development and contribute to a balanced governance of diverse industries and interests. We submit that failure to act upon this need risks further dissipation of the livelihood and biodiversity functions of inland waterbodies, putting millions of small-scale fishers and waterside communities' crucial dependence worldwide in jeopardy.

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