

# Establishing an economically and biologically sustainable and viable inland fisheries sector in South Africa – pitfalls of ‘path dependence’

Mafaniso Hara<sup>1</sup>

<sup>1</sup>Institute for Poverty, Land and Agrarian Studies, University of the Western Cape, P/Bag X17, Bellville 7535, Cape Town, South Africa

Small-scale fisheries play a significant role in livelihoods and food and nutrition security for millions of people around the world. However, these benefits are under threat, especially in developing countries such as in Africa, as a result of poor governance. The historical developmentalist and welfarist approach to management of small-scale fisheries in developing countries, dating back from colonial era, has resulted in problems of open-access regimes that usually lead to over-capitalisation, geographic spread of landing sites that makes it difficult to organise fishers for management activities, inadequate management capacity and poor funding of the sector. These lead to over-exploitation and degradation of fish resources, thereby negatively impacting the current and long-term benefits for small-scale fishing communities and society at large. Most countries that start off with such problematic fisheries management regimes and set on this path find it very difficult to reform the regimes. This article argues that South Africa needs to draw lessons from the mistakes of other (developing) countries in terms of the type of fisheries management regime governing small-scale fisheries, as it sets up and creates a new inland small-scale fisheries sector. Such ‘path dependence’ can set a country on courses of action and decisions that are extremely difficult to reverse and extricate a country from. There is no doubt of the need for more equitable distribution of access rights and benefits to inland fisheries for communities that had been excluded and marginalised under colonialism and apartheid. However, this has to be done without endangering the fish resources and in effect the very sustainable social-economic benefits that such reforms intend to achieve.

## CORRESPONDENCE

Mafaniso Hara

## EMAIL

[mhara@plaas.org.za](mailto:mhara@plaas.org.za)

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## INTRODUCTION

Small-scale fisheries are recognised as the dominant fishing sector globally (FAO, 2020; Tietze, 2016). It is estimated that the sector employs over 95% of all men and women engaged directly or indirectly in fisheries, thereby providing livelihoods for over 200 million people (FAO, 2016; Ratner and Allison, 2012). Of these, more than 90% are to be found in developing countries (FAO, 2009). Small-scale fisheries contribute nearly 60% to the global fish catch (Pauly and Zeller, 2016). Of the total 96.4 million tonnes global capture fisheries<sup>1</sup> production in 2018, 84.4 million tonnes were from marine while 12 million tonnes (12.5 %) were from inland fisheries. Twenty-five percent (about 3 million tonnes) of the global inland fisheries production was from Africa (FAO, 2020).

Although the global average annual per capita fish consumption increased steadily from 5.2 kg to 19.4 kg between 1961 and 2017, per capita consumption for Africa and the low income and food deficient countries (LIFDCs) in 2017 was 9.3 kg (FAO, 2020). Despite such lower levels of estimated per capita fish consumption, in 2013 19% of African consumers’ total animal protein came from fish, compared with 11% in Europe and 22% in Asia (Chan et al., 2019). Chan et al. (2019) also point to the context-specific importance of fish as a source of micronutrients, citing examples of Dagaa (*Rastrineabola argentea*) from Lake Victoria in East Africa and Kapenta (*Limnothrissa miodon*) in Southern Africa.

Therefore, small-scale fisheries play a significant role in poverty alleviation, food security, livelihoods, social and cultural values, and well-being of communities in Africa (Belhabib et al., 2015; Jentoft and Chuenpagdee, 2015; Béné et al., 2010; Allison et al., 2002). However, the contribution of the sector is threatened by poor governance (FAO, 2018; FAO, 2005). Studies around the world show that most small-scale fisheries are over-exploited, mainly because of over-capacity and competition over a common-pool resource (Béné et al., 2010; Andrew et al., 2007; Salayo et al., 2008; Salas et al., 2007).

In most developing countries, poor governance can be traced to colonial and post-colonial developmentalist<sup>2</sup> and welfarist<sup>3</sup> approaches that promoted free access and uncontrolled investment (Hara and Njaya, 2016; Nunan, 2014; Béné et al., 2010; Malasha, 2003; Jul Larsen et al., 2003), which usually result in over-capitalisation and over-exploitation of small-scale fisheries. Such management regimes and approaches can be very difficult to reverse once set in motion (FAO, 2020; Gutierrez et al., 2016; Hara and Njaya, 2016; Africa Progress Panel, 2014; Tweddle et al., 2015; Béné et al., 2010), because of the political pressure not to be seen as victimising the rural poor, who in most instances form the core constituency of those in power in developing countries. This review article argues that in order to create an economically and biologically sustainable and viable inland small-scale fisheries sector for South Africa, there is a need to avoid the mistakes made by African and other developing countries that had put in place management regimes that result in open access, over-capitalisation, inadequate management capacity, and poor funding for management, resulting in unsustainable small-scale fisheries sectors. Therefore, South Africa needs to draw lessons from histories of small-scale fisheries management from other countries on the pitfalls of historical ‘path dependence’ and avoid setting its new inland

fisheries sector on such a trajectory. As South Africa formalises and develops the small-scale inland fisheries sector, following Cabinet approval of the National Freshwater (Inland) Wild Capture Fisheries' Policy (RSA: Government Communications, 2021), the key question is 'what management regime needs to be put in place for a socio-ecologically sustainable and viable small-scale inland fisheries sector?'

Weyl and others (Weyl et al., 2020 p. 1) proposed that "there are ten key (research) questions and priority knowledge requirements that need to be tackled in order to formalise and develop a sustainable inland fishery in South Africa. These are: (i) What is the exploitation potential of inland fisheries?; (ii) What are the health risks from consuming freshwater fishes?; (iii) Who currently uses inland fisheries and what are their harvests?; (iv) What can we learn from historical constraints to inland fisheries development?; (v) How will governance of fisheries have to change in an evolving sectoral environment?; (vi) What are the options for fisheries enhancement?; (vii) What are the most appropriate fisheries technologies?; (viii) What value chains and employment opportunities are associated with inland fisheries?; (ix) What is the impact of water level fluctuations on fish production?; and (x) What are the impacts of pathogenic diseases on fish populations?"

Further to the questions that Weyl et al. (2020) ask, in particular Question (iv), I argue that for a sustainable and viable inland fisheries sector in South Africa, the new 'fisheries management regime' (FMR) for the sector will need to take cognisance of: problems of open access and overcapitalisation; the geographic spread of small-scale fisheries and what this means for monitoring, control and surveillance (MCS) and the possible implementation of an output-based small-scale fishery; the type of fishing rights to be used in the sector; institutional and organisational arrangement for management of the sector; and funding for the sector.

## FISHERIES MANAGEMENT REGIME

The science of fisheries management strives to replace chance and uncertainty about the state of exploited fish resources in the future with a reasonable degree of predictability (Arnason, 2011; Charles, 2001; Cochrane, 2000). Fisheries managers are usually faced with the following main questions (Tweddle et al., 2015; Fogarty and Collie, 2009; Hillborn, 2007; Gulland 1974):

- How big is the resource and how much fish can be caught each year while maintaining sustainability of the stock for the future?
- Given the potential (sustainable) catch, how should this be used for the greatest benefit for (national) society?
- What (management) actions need to be taken to achieve these objectives?

The historical ideal type of fisheries management approach (i.e. by the state alone, which assumes that there are no informal management systems among fishers and fishing communities) is to a large degree based on the assumption of free access to fish resources and hence the need to regulate fishing effort in order to attain biological conservation (Ward and Kelly, 2009; Hara, 2006; Hersoug and Paulsen, 1996). This necessitates the establishment of a fisheries management regime (FMR). A FMR comprises of three interdependent components, namely, a fisheries management system (FMS), a monitoring control and surveillance (MCS) system, and a fisheries judicial system (FJS) (Arnason, 2009; Hersoug and Paulsen, 1996). The FMS specifies the regulatory framework for the fishing activities and encompasses the general rules and the different management measures governing a fishery. For example, the technical input regulations such as the fishing gear dimensions (e.g. minimum

mesh sizes and maximum length), vessel restrictions (e.g. length and engine power), effort restrictions (e.g., number throws, days, hours, etc.) and output regulations such as annual maximum catch quotas. The MCS component is based on the need to monitor and control the fishing activities, data collection, and enforcement of the regulations. The MCS unit provides data such as catch for the management unit as well as other information for the judicial system (e.g., who is permitted to fish, how much a rights holder can catch, where rights holders can fish and what kind of gear and vessels they are permitted to use, etc.). The FJS is part of the general judicial system, sanctioning the violators, indicating both the type and level of possible punishment. The important thing to note is that all three are strongly interdependent. That is; the FMS relies on an efficient MCS and the MCS, in turn, on a working FJS (Hersoug and Paulsen, 1996). The influence also works in the other direction in that to attain the full benefits from a fishery, a co-ordinated and fully functional FMR is required.

## STATUS AND MANAGEMENT OF INLAND FISHERIES

In 2017, 34.2% of the world's marine fish stocks were classified as overfished<sup>4</sup> (FAO, 2020). In contrast, the aggregated global trends for inland fisheries had been that of steady growth, based on FAO's inland fishery catch statistics for the decade 2007–2016 (FAO, 2020; Funge-Smith, 2018). It is pointed out though that this positive trend could be misleading, since part of this increase could be attributed to improved reporting and assessment at the country level rather than real increase in production. In addition, this global trend showing increase in inland fisheries production and productivity may have masked declining trends in production in some individual countries (Funge-Smith, 2018), for example in Brazil, Thailand, Vietnam and Turkey (FAO, 2020). At an Africa level, the first Conference of African Ministers of Fisheries and Aquaculture (CAMFA 1), convened in September 2010 in Banjul, the Gambia, recognised that the benefits from Africa's fisheries sectors are under threat as a result of: ineffective governance; open-access character of capture fisheries; illegal, unreported and unregulated (IUU) fishing; insufficient financial investments; poorly conceived and implemented policies; and inadequate benefits from trade in fish and fish products (AUC & NEPAD, 2014). These factors contribute to the biological and economic overexploitation of many small-scale and industrial fisheries leading to negative impacts on the fish stocks, nutrition and food security, and jobs and livelihoods on the continent.

Although most developed countries are improving management of their fisheries, the situation, in terms of overcapacity, production per unit of effort and stock status, is getting worse for most developing countries (Ye and Gutierrez, 2017). A recent study shows that regions where there is under-developed fisheries management have threefold higher harvest rates and half the stock abundance compared to those regions where management is more developed and intensive (Hilborn et al., 2020). Evidently, under-developed less-intense management is common in many developing nations, which is fuelled by economic factors and inadequate management and governance capacities (Ye and Gutierrez, 2017).

## INLAND FISHERIES IN SOUTH AFRICA

In South Africa, inland fisheries mainly derive from the utilization of public storage dams<sup>5</sup> that had been constructed for capturing and storage of water for domestic, industrial and commercial irrigation farming. In most of the dams, exotic fish species had been introduced for recreational fishing, with the Department of Water and Sanitation policy recognizing only this fishing sector as one of the secondary beneficial uses of public dams (DWS, 2015; Hey, 1977). Historical fisheries legislation had mainly promoted the marine commercial fisheries sector, with marine small-scale

fisheries only achieving policy recognition in 2012 (DAFF, 2012) and being included in legislation through the 2014 amendment of the Marine Living Resources Act 18 of 1998 (RSA, 2014). Apartheid-era exclusion of rural communities from accessing fish resources had also contributed to South African inland fisheries being utilised primarily by recreational anglers (Britz et al., 2015; McCafferty et al., 2012; Weyl et al., 2007). A second challenge has been that the management of biodiversity in inland aquatic systems had historically been fragmented between government departments, mainly at provincial level, without a coherent national policy (Britz et al., 2015; Hara and Backeberg, 2014; McCafferty et al., 2012; Weyl et al., 2007). The major challenge, therefore, has been lack of an over-arching national policy and the institutional support to develop the sector (Britz et al., 2015)

Management authority for inland fisheries has historically been delegated to the provincial environmental and nature conservation authorities (Britz et al., 2015; McCafferty et al., 2012). Because the provincial environmental agencies do not have a development mandate, they have not promoted livelihoods based on fisheries despite evidence of increasing utilization of inland fisheries by communities (Britz et al., 2015; Hara and Backeberg, 2014; Ellender et al., 2009; Van der Waal et al., 2000). The lack of an over-arching national legal framework recognising the activities of small-scale fisheries and the conservation-oriented provincial legislations had also resulted in conflicts among resources users, in particular, between small-scale and recreational fishers (Britz et al., 2015; McCafferty et al., 2012). The institutionalisation of equitable and sustainable utilisation, through the enactment and implementation of the inland fisheries policy, will require fundamental reform of the existing provincial inland fisheries legislation/ordinances and governance arrangements (Weyl et al., 2020; Britz et al., 2015; Hara and Backeberg, 2014; McCafferty et al., 2012).

In recognition of the need for the formalization of inland fisheries, the Government of South Africa initiated a process of developing an Inland Fisheries Policy in 2016 (DAFF, 2016). This culminated in cabinet approval of the National Freshwater (Inland) Wild Capture Fisheries Policy on 4 August 2021 (RSA: Government Communications, 2021). The purpose of the Inland Fisheries Policy is stated as being: to guide the sustainable development of inland fisheries through legislative reform and harmonization; definition of access rights; development of criteria for ensuring sustainable harvest levels; ensuring government organisational support structures and capacity; cooperative governance and co-management arrangements; and the empowerment of rural communities to participate in equitable and sustainable management of the resource (DEFF, 2020). Therefore, the policy is grounded in the principles of inclusivity; equitable access; transformation; sustainable development; and an 'Ecosystem Approach to Fisheries' (EAF) that embraces the precautionary principle approach (FAO, 1995).

## LESSONS FROM DEVELOPING COUNTRY EXPERIENCES WITH SMALL-SCALE FISHERIES MANAGEMENT

Lessons can be drawn from historical experiences of small-scale fisheries management, particularly from developing countries, for the formalisation and development of a functional FMR for South Africa's new inland fisheries sector. The key lessons are in the areas of:

- Problems of open-access regimes and how these usually lead to over-capitalisation of small-scale fisheries
- Geographic spread that characterises small-scale fisheries and impossibilities of centralising landing and launching points for fishing operations, which makes MCS and implementation of output regulations very difficult

- The type of fishing rights that would be appropriate for equitable and sustainable utilization of small-scale fisheries
- Setting up and operationalising functional institutional and co-management arrangements
- Funding for inland sustainable fisheries management

## Open access and over-capitalisation

In most African countries, the colonial governments did not have formal regulations to govern small-scale fisheries. The reluctance of colonial governments (for example, the British) to regulate fishing activities in the colonies seems to have been general and not specific to any country. According to Hickling (1960), this general attitude against regulation of the fishing industries in the colonial territories was largely based on the arguments of the 1866 Royal Commission which had reviewed the fisheries laws of the United Kingdom. The commission had recommended the repeal of all laws for regulating fishing in the open sea and inshore waters since the commissioners believed that there was no satisfactory evidence that fishing had made any negative impact on the fish stocks<sup>6</sup>. The lack of trustworthy time-series statistics was put forward as the main reason for the failure to reach informed conclusions. This argument was extended to the colonial territories, saying that the state of most fisheries of the colonial and dependent territories was as primitive as that of the United Kingdom fisheries of 1866, and that in the great majority of cases fisheries statistics did not exist or where they existed were incomplete and inadequate (Hickling, 1960).

At independence, most African countries continued with the approach used under colonialism (Malasha, 2003). In most instances, the open-access approach was also preferred from a political developmentalist and welfarist approach (Hara and Njaya, 2016; Nunan, 2014; Béné et al., 2010). Most states saw fisheries as a sector that offered livelihoods and economic opportunities for the rural poor and therefore as an economic development sector. Therefore, all potential participants had to have the freedom to enter and participate in a fishery and, secondly, that they were not to be limited in terms of how much they could catch. As a result, most small-scale fisheries in Africa (for example, Malawi, Zambia, Uganda, Tanzania, Nigeria, etc.) have historically been managed as 'open access' sectors and without limiting output (Arthur, 2020; Richter et al., 2020; Purcell and Pomeroy, 2015; Hara and Njaya, 2016; Hara 2006). Licensing has mainly been used as a revenue collection tool, rather than a management tool (for example, for limiting number of participants, gears and vessels in a fishery). This is also one of the main and key differences between small-scale and industrial fisheries. In most countries (for example South Africa and western developed countries), the latter are managed on the basis of limited entry and provisioned quotas, which limits the number of individuals and/or companies (rights holders) that can enter the fishery and also how much fish each rights holder can catch annually. The management of small-scale fisheries based on an open access and limitless output approach has set most African small-scale fisheries on treacherous trends towards over-capitalisation and over-exploitation (Hara and Njaya, 2016), as had been feared by Hardin's (1968) 'tragedy of the commons'. This in the end works against the very objectives that they had set out to achieve, namely, poverty reduction and food security.

The dangers of open access are all too clear from the experience of most African countries, with the dissipation of rent, declining benefits and increased poverty (Martins et al., 2018; Jacquet et al., 2010). South Africa should avoid taking that route. Besides, good precedents have been set in the marine small-scale sector (DAFF, 2012), where a rights holder has to have a right/permit to fish thereby limiting access and, also, the rights are based on limited output (quotas).

## Geographic demarcation of management areas as fisheries management systems

There are more than 700 public dams in South Africa spread across all nine provinces (Britz et al., 2015; Hara and Backeberg, 2014). In addition, there are also natural lakes, rivers and floodplains. All these will form the basis for an inland fisheries sector in South Africa. The dams and natural systems are unique as they are in most instances separate entities (in particular, the dams) and located in geographic areas with different ecological and physiological characteristics (Weyl et al., 2020). The natural productivity of impoundments varies, with dams and natural systems in the warmer provinces, such as Limpopo, Mpumalanga, KwaZulu-Natal and the North West having higher productivity (Weyl et al., 2020; Britz et al., 2015; Weyl et al., 2015; Fouche et al., 2012; McCafferty et al., 2012).

It would be impractical to view and manage, let alone legislate, each impoundment or natural system as a separate individual fisheries management system. Therefore, one of the key issues for the new management regime under the new National Freshwater (Inland) Wild Capture Fisheries Policy would be resolving whether a general FMS with a slate of general management rules, regulations, procedures and processes would be applicable to all impoundments in South Africa, or whether the impoundments will be grouped and demarcated as geographic management areas whereby specific FMSs are then developed and implemented for these as management areas based on their unique characteristics. The question therefore becomes; 'what characterisations (ecological, physiological, geographical, socio-economic, etc.) should be used to demarcate the impoundments and natural systems into management areas where specific FMSs could be developed and applied?

A pervasive problem of small-scale fisheries in Africa and worldwide is the lack of centralised landing and launching sites where daily catch data can be recorded (Hara and Njaya, 2016; Lorenzen et al., 2016). As a result, fishers operate from their villages, which makes it difficult to regulate their activities or collect systematic catch data, such as is done in quota-based fisheries where landing is centralised (Funge-Smith, 2018; Lorenzen et al., 2016). The data collection systems that are generally used in small-scale fisheries are 'catch assessment surveys' and 'annual frame surveys' (Stamatopoulos, 2002). With the small-scale fishing sector to be based on hundreds of impoundments and natural systems, South Africa faces a similar challenge, and probably on a bigger scale. Careful thought will need to be applied in terms of how fisher activities are going to be organised and regulated, particularly if this is going to be a rights-based, limited access and limited output fishing sector – which should preferably be the case to avoid ending up with an open-access and unlimited-output fishery sector.

Could this be where 'community-based fisheries management' (CBFM)<sup>7</sup> and/or 'territorial use rights in fisheries' (TURF)<sup>8</sup> (Thi Quynh et al, 2017; Christy, 1982) can be the most potent and practical approaches to inland fisheries management in South Africa? CBFM refers to a management approach in which communities take a leading role in managing fisheries and adjacent coastal areas (Secretariat of the Pacific Community, 2010), which is the opposite extreme of centralised management by the state alone (Sen and Raakjaer Nielsen, 1996). Although most examples of CBFM and TURF are from developing countries, an example of CBFM from the North is the initiative called 'Turning the Tide: Communities Managing Fisheries Together' in Canada, which supported CBFM by communities in maritime provinces. CBFM in Canada had been largely motivated by aboriginal First Nations that had gained opportunities to enter the commercial fishery sector on a community basis (Charles, 2008).

Given the vast number of separate aquatic systems that are spread across all nine provinces geographically, CBFM or TURF approaches will need to be seriously considered. Additionally, the responsible management agencies will most likely not have adequate resources and enforcement capacity on the ground. Thus, adaptive community-based co-management and the TURF approach could provide for the most workable solution.

## Fishing rights and institutional arrangements for governing inland fisheries

Rights to a fishery have to be based on the type of resource; size of the resource; what the sustainable levels of harvesting should be; what the appropriate methods for sustainable harvesting should be; and who should be given the rights. Such decisions, presumably, have to be based on consultations with stakeholder groups, as is the practice in South Africa's industrial marine sector (Hara et al., 2014). In South Africa's marine sector, recommendations on the annual catch upper limits are made through 'scientific working groups' (comprised of industry stakeholders, natural scientists and social scientists) for each sub-sector. Another stakeholder group that makes inputs in each of the sectors are 'resource management working groups', which discuss and make recommendations on the distribution of rights and on management issues (Hara et al., 2014). The baseline and scoping study (Britz et al., 2015) and the follow-on study (Hara et al., 2021) made recommendations for the organisational and institutional arrangements for inland fisheries, which propose 'national and provincial working groups' convened under the chairmanship of the national department (Department of Forestry, Fisheries and the Environment (DFFE): Branch Fisheries) and provincial departments for fisheries. These recommendations have been adopted in the Inland Fisheries Policy (DEFF, 2020). What is different from the marine sector is that, firstly, the inland small-scale fishers are not currently organised to participate in such consultations as stakeholder groups. Secondly, there is currently no systematic collection of biological, ecological, social or economic data and information that could form the basis for advice to the Minister for evidence-based decision-making on the type of rights and appropriate levels of harvesting for sustainable inland fisheries management (Weyl et al., 2020; Britz et al., 2015). Since the development and formalization of the sector cannot be postponed until one has the required information and systems in place, this alludes to the 'precautionary principle approach' (DEFF, 2020; FAO, 1995), whereby exploitation should be formalised and allowed at precautionary levels, and collection of data from such activities should also be put in place so that a database can be developed that would provide scientific (natural and social) information on which future decisions could be increasingly based. While the allocation of fishing rights is ultimately a political decision (Hersoug, 2002), in the case of inland fisheries, the premise of the National Freshwater (Inland) Wild Capture Fisheries Policy is that such decisions will be influenced by evidence being accumulated from fishing activities.

The primary function of public dams is as storage dams for domestic, industrial and irrigation water (Hara et al., 2021; Britz et al., 2015; McCafferty et al., 2012). Recreational fish species were introduced in these dams for sport fishing, thereby giving historical claim to fishing on public dams to this sub-sector at the expense of small-scale fishers. Until 2021, small-scale fishers had never been recognised to the extent that activities by this group have been criminalised and have been a source of conflicts between small-scale fishers and recreational fishers (Britz et al., 2015; Tapela et al., 2015; Weyl et al., 2007). The National Freshwater (Inland) Wild Capture Fisheries Policy, will provide for the recognition and legitimisation of small-scale fisheries on public dams, including the use of gillnets where these will be legally approved as a suitable technique for harvesting.

Securing access to fishing grounds and protecting their fishing rights could provide incentives for small-scale fishers to invest their time, and build social networks for sustainable fishing practices and economic investment in fishing enterprises (Muchapondwa and Hara, 2021). Tenure security could also contribute towards overcoming factors affecting entry by rural women and men into higher earning inland fisheries market value chains (MVCs). For example, women fish vendors from Jozini Town on Pongola Dam have benefitted from being organised as a cooperative (Sizabantu), which in turn has been able to negotiate a fish purchase monopoly from the fishers that had been given fishing permits (Muchapondwa and Hara, 2021). Government's role has been to help organise the women into a cooperative, and also make the issuing of the fishing permits to the fishers conditional on prioritising the sale of their catch to the women's cooperative, thereby creating a win-win situation. Another example is on Flag Boshielo Dam where currently some of the recreational fishers are said to be taking away and selling their catch for income and profit in inland towns (some argue that this is to offset their costs – but then it is not expected that one should be offsetting their costs if they are fishing for leisure). In such contexts, a rule could be introduced to stop this practice by recreational fishers, and instead issue permits for organised small-scale fishers and post-harvest operators to occupy the niche to be left by the recreational fishers.

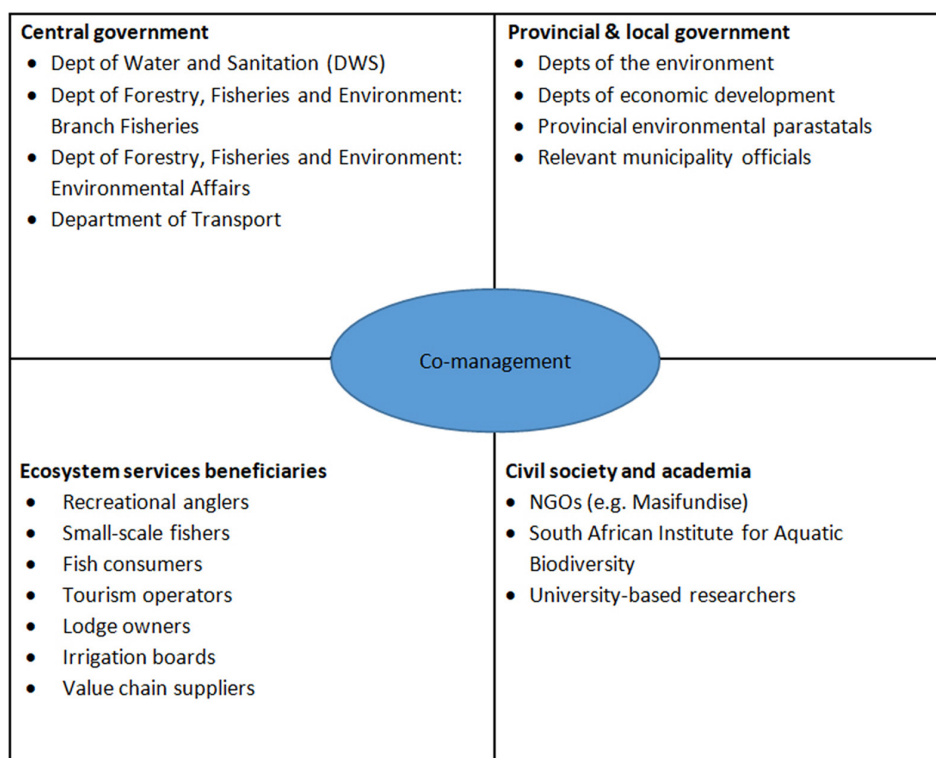
### Inland fisheries co-management

Co-management<sup>9</sup> has been implemented in many small-scale fisheries worldwide in recent decades. Some of the key dimensions of the co-management paradigm are as a mechanism for power sharing, institution building, enhanced trust and social capital, joint problem solving, knowledge-sharing and social learning (Evans et al., 2011; Berkes, 2009; Chuenpagdee and Jentoft, 2007). In addition, co-management is seen by many as a normative process to improve the legitimacy and effectiveness of fisheries management (Battistta et al., 2018; Pomeroy et al., 2015; Evans et al., 2011; Berkes, 2009; Jentoft, 1989).

Co-management is the proposed management approach for inland fisheries in South Africa. One of the main challenges for the governance of inland fisheries in South Africa is that there are multiple categories of stakeholders that utilise the dams and natural aquatic systems (Hara et al., 2021; Britz et al., 2015; McCafferty et al., 2012; Weyl et al., 2007). Given different and at times conflicting values that the multiple stakeholders attach to these ecosystems, the governance will need to be based on adaptive co-management (Hasselman, 2017; Fabricius and Currie, 2015; Smedstad and Gosnell, 2013; Plummer et al., 2012) and an ecosystems approach (based on achieving 'human wellbeing', 'ecological wellbeing', and 'good governance') (FAO, 2021; Garcia and Cochrane, 2005). Figure 1 summarises some of the key categorises of stakeholders utilising and deriving benefit from public dams (Hara et al., 2021).

The key stakeholders on public dams are as follows: Small-scale fishers who benefit from food and nutrition security through fish for household consumption and income; recreational anglers who benefit from sport and competitive fishing; the value chain suppliers who benefit from sale of fishing equipment; lodge and guesthouse owners and tourist operators providing services that enable people to come for recreational angling or for holidays; and irrigation farmers who benefit from the water and also the farm employees who benefit from direct employment on such farms.

Central government departments hold the mandates and responsibilities for ensuring the sustainable utilization of natural resources and maintenance of biodiversity in public dams and the dam catchment areas. These mandates are provided for through relevant legislation and policies<sup>10</sup>. In most instances, the central government mandates are implemented by their provincial departments, local governments or provincial environmental parastatals through decentralisation of authority. Historically, therefore, management of biodiversity on public dams has been undertaken using provincial environmental legislation and ordinances (Britz et al., 2015). The National Freshwater (Inland) Wild Capture Fisheries Policy, is based on centralising the legislative



**Figure 1.** Key stakeholders for co-management on public dams in South Africa (source: Hara et al., 2021)

mandate for inland fisheries into the hands of the national Department of Fisheries – DFFE: Branch Fisheries. This would ensure one overarching policy and legislation from which provinces can derive decentralised authority and responsibility, unlike the current situation whereby each province has its own legislation.

Success of co-management is usually evaluated both in terms of process indicators (for example, participation, fisher community influence, rule compliance, resource control and conflict resolution) and outcome indicators (for example, household income, household well-being, resource well-being, fishery yield, and resource access) (d'Armengola et al., 2018; Whitehouse and Fowler, 2018; Evans et al., 2011). Co-management evaluation studies undertaken so far demonstrate the importance of considering both process and outcome indicators in order to meaningfully evaluate and improve the impact of co-management as an approach for small-scale fisheries management in developing countries. While the process indicators do not directly address issues of power-sharing or trust-building, they do suggest improved inclusion of stakeholders in governance processes, improved capacity to control or influence decision-making, and improved compliance with management rules over time as benefits of co-management. Positive trends in process indicators are expected to lead to improved management outcomes, although literature shows that this is not guaranteed (Béné and Neiland, 2006).

Decisions are usually required on the evaluation criteria for successful co-management. Such indicators need to evaluate both process and outcome. Evans and others (Evans et al., 2011) suggested that improved yield and household income are key desirable outcomes for small-scale fisheries co-management in developing country contexts. For South Africa, a survey of these indicators at the outset of the co-management arrangement could act as the control or baseline against which to evaluate success and progress thereafter, given that there might not be a control group (non-co-management arrangement) for comparison or by which the observed changes can be judged as being attributable to co-management.

### **Funding for inland fisheries management**

An underlying problem of managing small-scale fisheries, especially if they are managed from a safety-net and/or welfare-function perspective and approach (Nunan 2014; Bene et al., 2010; Jul Larsen et al., 2003) is the question of how the sustainable management of the sector will be funded. In an ideal conventional fisheries management approach, participants in a fishery are required to pay a fee for the rights to fish. The size of fees is ideally supposed to be based on paying for management costs for the fishery – that is, cost recovery (Metzner, 2008). In most African countries, the developmentalist and welfarist approach has meant that, in most instances, gear licenses are not set and reviewed annually on the basis of cost recovery. Over the years, therefore, the fees have fallen behind the ideal level for cost recovery or value of the fishery to society. In most instances, the collection of gear licence fees is in itself usually poor. For example, in Malawi, only about 20% of the annual potential fishing gear licence fees is collected by the Department of Fisheries (Njaya et al., 2018). Also important to note is that in Malawi the gear licence fees go directly towards revenue collection for the country's general fiscus. The amount of funding from Treasury/Ministry of Finance for a sector usually depends on how much a specific sector contributes towards revenue collection or to a country's gross domestic product (GDP) (Njaya et al., 2018). South Africa will need to decide whether inland fisheries will be managed from a welfarist or cost-recovery perspective and approach. Without doubt, there are attendant challenges of collecting licence fees from small-scale fishers operating from their own villages on over 700 public dams.

Generally, the economic value of small-scale fisheries in developing countries is often unknown or invisible (Lynch et al., 2016) and the other benefits are intangible (Garcia et al., 2008). Usually, therefore, this in turn reduces government funding allocation for management of small-scale fisheries, thereby completing a vicious circle. That is, because small-scale fisheries do not usually contribute much to the fiscus in terms of revenue, the sector in turn get less funding for management of the sector than other sectors from Treasury/Ministry of Finance. While small-scale fisheries might not contribute as much as other sectors to the fiscus, they do generate significant welfare gains in terms of food security, livelihoods and healthy and stable communities in many countries (FAO, 2020; Lynch et al., 2016; De Graaf and Garibaldi, 2014). Thus, there remain strong arguments for funding and supporting the development and management of the inland fisheries sector in South Africa on the understanding that there are significant non-GDP social welfare gains for rural communities that can be realised from the sector.

### **PATH DEPENDENCE**

Path dependence is an economic concept which argues that the decision options available to one are dependent on and constrained by previous decisions or experiences (Baláz and Williams, 2007). In other words, 'history matters' (Liebowitz and Margolis, 2000 p. 981). In public policy, the notion of path dependence defines or is associated with situations whereby the present policy choices are constrained or shaped by institutional paths that result from choices made in the past (Torfing, 2009). In applying the analogy of path dependence, small-scale fisheries management regimes set up when such regimes were being institutionalised, for example, during colonialism in former colonies and perpetuated by post-colonial states, have largely remained unchanged. In most developing countries in Africa, the regimes were principally informed by developmentalist and welfarist thinking based on the assumptions that fish resources were limitless in terms of the harvest levels and fishing effort they could withstand. We know now that this is not the case; fish stocks have limits in productivity and can be overfished, not only by industrial fishing but also using small-scale fishing technologies and fishing effort. In most developing countries small-scale fisheries management regimes based on developmentalist and welfarist approaches have resulted in open-access fisheries and the resultant over-capitalisation, leading to over-exploitation and degradation of small-scale fisheries. Other consequences of open access are: undefined fishing rights (what belongs to everyone belongs to no one (Hardin, 1968)); difficulties in collecting data for evidence-based management; and problems of social and economic valuation of small-scale fisheries. Experience shows that it is very difficult to change or reform such regimes and the trajectory that they set the management of a fishery on once set in motion. For one thing, the socio-economic characteristics that small-scale fisheries take on and assume make reform very difficult and, secondly, government agencies responsible for fisheries management have to deal with political pressure that comes with any attempts at reforms that might alienate small-scale fishers. Therefore, South Africa needs to take cognisance of the type of management regime that should be put in place for a sustainable and viable inland small-scale fisheries sector, given the lessons and precedents from other countries and the path dependence that can result from formulation and setting up of such management regimes.

### **CONCLUSIONS**

The formalization of the inland fisheries sector in South Africa represents a significant step in the recognition and decriminalization of small-scale fishing activities in the country's

inland aquatic systems. The challenge will be putting in place a fisheries management regime that could ensure equity and sustainable utilization. This will require creating fisheries management systems based on the geographic, ecological, physiological and socio-economic variability of the aquatic systems. Lessons from other African and developing countries globally are particularly on: the need to avoid open-access regimes; the need to organise the sector for and implement limited entry and limited output; how to fund management of the sector; and the need for functional co-management. Other areas in which important lessons should be drawn are: the type of functional fishing rights and the overarching institutional arrangements for sustainable small-scale fisheries. Imbibing these lessons will be critical if South Africa is to create and formalise a socio-ecologically sustainable sector. Involving all stakeholders from the very beginning, through genuinely inclusive co-management processes and arrangements, could go a long way in ensuring sustainable and equitable inland small-scale fisheries, hopefully, across generations.

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## ENDNOTES

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- <sup>1</sup> Wild fisheries from oceans, lakes, rivers and other aquatic systems, excluding production from aquaculture.
- <sup>2</sup> The thinking and policy approach that saw fisheries as a new economic frontier that could be used for economic development and poverty reduction, in particular for rural communities. Based on this thinking, governments left fishing as open access for those who could afford the capital to enter and participate in the (economic) sector (Hara and Njaya, 2016; Jul Larsen et al., 2003).
- <sup>3</sup> The argument and policy approach that fisheries provide for the welfare of rural communities. In particular the sector acts as a safety net and buffer in times of economic problems such as loss of employment, drought, etc. (Béné et al., 2010; Jul Larsen et al., 2003).
- <sup>4</sup> Overfishing refers to a situation whereby stock abundance of a species is fished to below the level that supports maximum sustainable yield (MSY).
- <sup>5</sup> There are over seven hundred public dams of varying sizes in all the nine provinces.
- <sup>6</sup> This was a time when 'freedom of the seas' was still a strongly held principle. The Dutchman Hugo Grotius wrote 'The freedom of the seas' in 1608 to justify free movement of merchant ships in the conduct of Dutch trade in the East Indies. The sea, he argued, was limitless and could not become the possession of anyone, but was, by nature, suitable to the use of all. Grotius's proclamation is said to be the basis for the fundamental assumption of the 'freedom of the seas'. The belief at the time had been that fish in the seas were nobody's property. Fish were only capable of being reduced to possession by capture (McCrae and Munro, 1989). It was only with the adoption of the United Nations Convention on Law of the Sea (United Nations Organisation, 1982) that states started legally declaring 'exclusive economic zones' and sea enclosures began.
- <sup>7</sup> CBM has gained currency in debates about ways of decentralising resource management responsibilities through active involvement of user communities in the management of 'their resource(s)'. Often used by development agents from the 1980s, CBM has been used to refer to initiatives by the state to accomplish resource management objectives through encouraging and facilitating the participation of rural people communities (Hviding and Jul-Larsen, 1995).
- <sup>8</sup> Refers to area-based fishing rights. This rights approach allocates secure, exclusive privileges (not ownership) to fish in a specified area to groups, or in rare cases individuals.
- <sup>9</sup> Refers to a partnership in which government agencies, local communities and other resource users, non-governmental organisations and other stakeholders share, as appropriate to specific contexts, the authority and responsibility for the management of a specific territory or a set of resources (IUCN, 1996).
- <sup>10</sup> For example, the National Water Act, the National Environmental Management Act, the National Environmental Management: Biodiversity Act, South African Maritime Safety Authority Act, the Inland Fisheries Policy, Tourism Act, Food and Nutrition policies, etc.).