FishCounts – Increasing the visibility of small-scale fisheries in Cambodia's national planning

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Artisanal and family fishing make a significant contribution to Cambodia's economy and food security. Community fisheries are already empowered to manage local fisheries resources, but small-scale fisheries are often overlooked in policy making, partly due to a lack of reliable data. Developing a fisheries satellite account through the System of Environmental and Economic Accounts – Agriculture, Forestry and Fisheries would clarify the value such fishers bring to the economy, what investment and policy responses they need, and the sustainability of the country's current fisheries activities. This report explores the current state of Cambodia's fisheries and the data that would be needed to develop such a set of accounts. It considers the country's existing statistical information and monitoring efforts, and where the gaps, inconsistencies and overlaps lie. It proposes a phased approach to build on what already exists to create greater visibility for the contribution of small-scale fisheries to the national economy and their role in developing sustainable fishing and aquaculture in the face of growing demands and climate change.

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Summary

The objective of this study is to support the Royal Government of Cambodia to strengthen the way it accounts for and values fisheries, especially small-scale fisheries (SSFs), as a means of improving decision making and the accountability, traceability and sustainability of investments. It focuses particularly on improved accounting of SSFs as, despite their importance to poverty alleviation, food security and economic development, they tend to operate informally and are poorly reflected in statistics. This means they are not adequately factored into decision-making processes and as a consequence resources and investments often fail to reach those who need them most (IIED, 2019).

Cambodia has a large and highly productive inland capture fishery, a marine fishery along its 435 kilometre coastline and an emerging aquaculture sector. Its inland fisheries form part of the Mekong River system, one of the largest inland fisheries in the world. In 2018, inland and marine production combined, including aquaculture, was 910,153 tonnes (NSDP, 2019). Inland fisheries produced 535,005 tonnes, of which 360,730 tonnes came from family fisheries, 157,300 tonnes from rice field fisheries and 16,975 tonnes from bagnet fisheries in the Tonle Sap.

Fisheries make a significant contribution to Cambodia's gross domestic product (GDP) and to foreign exchange, employment and the livelihoods of the rural fishers, and food security. Cambodians are among the heaviest consumers of freshwater fish in the world, consuming around 52.4kg each per year representing 76% of Cambodia's intake of animal protein (FiA 2019a).

The law classifies fisheries in Cambodia into small-scale or family fisheries, middle-scale fisheries and large-scale or commercial fisheries. This study is focused on Cambodia's community fisheries, which are largely artisanal. Since 2012 almost all large-scale inland fishing areas have been abolished, except for 66 units of bagnet (dai) fishing on the Tonle Sap River, 13 units of river prawn bagnet fishing in Prey Veng Province and trawling in marine waters. Inland fisheries are largely managed by community fisheries (CFis). There are 516 CFis across Cambodia, in inland and marine waters, with 332,168 individual members (representing 147,518 households). However a large number of family-scale fishers in fishing communities are not members of a CFi.

Fisheries satellite accounts

This study explores the potential for developing a set of satellite fishery accounts using the **System of Environmental and Economic Accounts – Agriculture, Forestry and Fisheries (SEEA-AFF)** fisheries satellite account**s**. The SEEA-AFF offers a coherent framework for capturing data and information on fisheries and can help to: (i) improve understanding of stocks and flows and the sustainability of the sector; (ii) manage the fisheries resource sustainably; (iii) reduce uncertainty in the fisheries sector; (iv) identify priority areas for support; (v) de-risk investments; and (vi) report on commitments, such as Sustainable Development Goals (SDGs), and poverty reduction. This diagnostic study follows a methodology developed by IIED to understand priorities and capacities to establish fisheries accounts.

Disaggregated data on SSFs may be integrated into the accounts to increase the visibility of SFFs while helping to answer a range of policy questions including:

- **Value:** what do SSFs contribute to the national economy, employment and food security?
- **Investment:** what level of investment is needed and what are the returns to these investments?
- **Financial distribution:** where should public, private and donor investments be directed to deliver both socioeconomic and environmental objectives?
- **Intervention points:** what policy responses are needed to deliver both socioeconomic and environmental objectives?
- **Sustainability:** how sustainable are SFF harvest yields, and how would they respond to external changes such as climate change?

Key findings

Based on the core data and information reviewed, Cambodia could develop a fisheries satellite account using existing information which, if regularly updated by national institutions, would track the sustainability of one of the country's most critical natural resources, as well as inform key policy targets on poverty alleviation.

A number of factors would help to enable the production of a fisheries satellite account, including:

- **Interest within the government**. Cambodia has experience in building satellite accounts for tourism and forestry, which could serve as a stepping stone. The National Institute of Statistics (NIS) and the Fisheries Authority (FiA) have both expressed interest in building a fisheries satellite account, and the Ministry of Environment (MoE) is also interested in natural capital accounting (NCA).
- **Reasonable base of data to build on**. Despite some key data gaps and uncertainties, there are enough data to build a fisheries account which can be developed and refined over time.
- **Supporting initiatives**. The forthcoming NIS fisheries survey and the European Union funded CAPFISH project offer timely and significant opportunities to develop fisheries data and management. Existing work supporting CFis to monitor their areas, also provides an opportunity to engage communities in data collection to improve the coverage and accuracy of data collected. The FiA also has a community fisheries department, which can help support data collection and co-ordination on SSFs.

Key challenges and needs to support the development of fisheries satellite accounts and improve the visibility of data on SFF in general are:

- **Complexity of inland fisheries**. Estimating catches for small-scale fisheries is difficult because they use many different types of freshwater fishing gear and there are no official landing sites.
- **Statistical issues**. The design of the sampling frame for the planned fisheries census and surveys of representative fishing communities is critical for improving the accuracy of the data. Occupational classification in rural Cambodia is difficult as most individuals and households typically have multiple occupations.
- **Capacity**. Training in data and information collection and analysis over the past two decades has been limited and there are not enough trained staff at the provincial level to undertake the data gathering and analysis needed, including facilitating CFis in collecting fisheries data.
- **Co-ordination of data and research**. Greater co-operation is needed to manage and link the existing data, and to move towards a systematic approach for data collection. Mechanisms are needed strengthen: the integration and co-ordination of data from different departments in FiA and to improve inter-ministerial co-ordination of statistics relevant to fisheries management and accounting, as well as the other parties involved in fisheries data collection.
- **Funding**: Artisanal and small-scale fisheries statistics are costly to generate and there is currently little investment in these statistics. CFis rely on external organisations to fund their collection of statistics or improve their fisheries management plans. More funding is needed to develop fisheries statistics, along with buy-in from the Ministry of Economic and Finance and the Ministry of Planning. The government would need to establish a budget line for CFis or to provide financial support through provincial treasuries or community budgets.

The way forward

Based on the key data reviewed and stakeholder consultations undertaken as part of this diagnostic study the following road map is proposed to build a SEEA-AFF fisheries satellite account and enhance SSF statistics more generally. The central concept is a phased, tiered approach to implementation. Users should start with the use of national-level (default) data, including from international organisations, and address data gaps and build up the accounts over time.

Phase 1: Plan and prepare (2020)

- **Phase 1A. Building collaborative support and buy in for a fisheries satellite account.** This includes a policy workshop to confirm interest in developing the accounts with the NIS, FiA and MoE and a training workshop covering the policy applications and statistical features of fisheries satellite accounts and other related accounts.

- **Phase 1B. Define the focus of accounts, approach and work plan, and secure funding.**
- **Phase 1C. Strengthen the data collection and management process** to facilitate the effective preparation of the small-scale fisheries / natural capital account**.** This includes various initiatives, some of which are already planned by other projects
  - Establish the sampling frame for the NIS census on fisheries
  - collation, review and analysis of all past studies
  - Review and analysis of previous and ongoing to develop best practice approaches for working with CFis on monitoring and data collection
  - Develop a protocol for collecting monitoring data to harmonise information
  - Establish approaches to develop and disaggregate SSF data
  - Determine the best approach to measure fish stocks in order to determine whether species and fisheries are being under-fished, fully fished or over-fished
  - Establish a methodological framework to collect key missing data (collection of new data could be deferred to Phase 3 if resources are limited)
  - Establish mechanisms to improve data co-ordination and alignment.

Phase 2: Build the fisheries satellite account (2021)

The first set of accounts should be based on available national data and information from existing FAO and similar global data sets. This will build expertise in compiling the accounts and provide insights to users of their policy application and key areas that warrant investment in data collation. Compilers should focus initially on organising relevant physical data required for the accounts (eg quantity of fish harvested by type of fisheries and species), as these are a prerequisite for the monetary accounts and inform the sustainability of production, which is central to fisheries management and policy in Cambodia. The creation of a technical committee and a higher-level policy committee will help ensure inter-institutional collaboration and to build a national consensus on the final results.

Phase 3: Refine: ongoing development of the fisheries satellite account (2022 onwards)

Annual / regular compilation of the accounts will improve their coherence and ensure consistency across information sources over time. Crucially, the accounts need to be produced regularly to understand the sustainability of Cambodia's fisheries resources**.** Opportunities for the development of other accounts that could be linked to fisheries accounts, such as a land or ecosystem account, should also be explored so that fisheries are not viewed in isolation.

Abbreviations and acronyms

3Ss	Sesan, Sekong and Srepok rivers
ASDP	Agriculture Sector Strategic Development Plan
BMZ Germany	Federal Ministry of Economic Cooperation and Development – Germany
BSP	Budget support programme
CAPFISH	Cambodia Programme for Sustainable and Inclusive Growth in the Fisheries Sector
CAST	Commercialization of Aquaculture for Sustainable Trade
CEPA	Culture, Environment, Preservation Association
CFi	Community fishery
CFR	Community fish refuge committee
CI	Conservation International
CPA	Community protected area
CPUE	Catch per unit of effort
DP	Development partner
EEZ	Exclusive economic zone
EU	European Union
FACT	Fisheries Action Coalition Team, Cambodia
FAO	Food and Agricultural Organization of the United Nations
FFI	Flora and Fauna International
FiA	Fisheries Administration
FWUA	Farmer water user committee
GDP	Gross domestic product
GPS	Global Positioning System
HACCP	Hazard Analysis Critical Control Point
IFAD	International Fund for Agricultural Development
IFReDI	Inland Fisheries Research and Development Institute
IIED	International Institute for Environment and Development
IO	International organisation
ISA	Integrated Surveys on Agriculture
ISSCFC	International Standard Statistical Classification of Fishery Commodities
IUCN	International Union for the Conservation of Nature
IUU	Illegal, unreported and unregulated (fishing)
IWRM	Integrated Water Resource Management
KfW	Kreditanstalt für Wiederaufbau (Credit Institute for Reconstruction), Germany
LSMS	Living Standards and Measurement Study
MAFF	Ministry of Agriculture, Forestry and Fisheries
MaFReDI	Marine Fisheries Research and Development Institute
MCS	Monitoring, control and surveillance
MoE	Ministry of Environment
MPA	Marine protected area
MRC	Mekong River Commission
NCA	Natural capital accounting
NGO	Non-governmental organisation
NIS	National Institute of Statistics
NPCI	National Plan of Control and Inspection
NPOA-IUU	National Plan of Action against Illegal, Unreported and Unregulated Fishing
NSDP	National Strategic Development Plan
OHI	Ocean Health Index
PAFF	Partnership for Forestry and Fisheries
PSMA	Port State Measures Agreement
Sci-Cap	Scientific Capacity Development Initiative
SDC	Swiss Agency for Development and Cooperation
SDG	Sustainable Development Goal
SEEA-AFF	System of Environmental and Economic Accounts – Agriculture, Forestry and Fisheries
Sida	Swedish International Development Corporation Agency
SNA	System of National Accounts
SPF	Strategic Planning Framework for Fisheries
SSF	Small-scale fisheries
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
WAVES	Wealth Accounting and the Valuation of Ecosystem Services
WWF	World Wide Fund for Nature

1 Introduction

1.1 Objective of study and approach

The objective of this study is to support the Royal Government of Cambodia to strengthen the way it accounts for and values fisheries, especially small-scale fisheries (SSFs), as a means of improving decision making and the accountability, traceability and sustainability of investments by both the government and others. This study focuses particularly on improved accounting of SSFs as, despite their importance, they tend to operate informally and are rarely reflected in statistics (Box 1). This means they are not adequately factored into decision-making processes and consequently resources and investments often fail to reach those who need them most (IIED, 2019).

This diagnostic study explores the potential for developing a set of satellite fishery accounts using the **System of Environmental and Economic Accounts – Agriculture, Forestry and Fisheries (SEEA-AFF)**. The SEEA-AFF offers a coherent framework for capturing data and information on fisheries and can help to: (i) improve understanding of stocks and flows and the sustainability of the sector; (ii) manage the fisheries resource sustainably; (iii) reduce uncertainty in the fisheries sector; (iv) identify priority areas for support; (v) de-risk investments; and (vi) report on commitments, such as Sustainable Development Goals (SDGs), and poverty reduction. This study

BOX 1: THE IMPORTANCE OF SMALL-SCALE FISHERIES

Globally, SSFs play important social, cultural, environmental and economic roles.

The Food and Agricultural Organization of the United Nations' voluntary guidelines state: "Small-scale and artisanal fisheries, encompassing all activities along the value chain – pre-harvest, harvest and post-harvest – undertaken by men and women, play an important role in food security and nutrition, poverty eradication, equitable development and sustainable resource utilization." (FAO, 2015)

Small-scale fisheries are central to food security, supplying a significant proportion of the fish consumed locally and representing a high percentage of local fishing communities' animal protein intake (FAO, 2018). These fisheries generate jobs for about 12 million men and women, most of them poor and vulnerable, for whom fishing and fish trading are the principal sources of livelihood and income. Despite their importance to local and national economies, the real impact of SSFs is unknown and often ignored and there is still some stigma associated with the sector (IIED, 2019).

SSFs face many problems such as lack of infrastructure, low levels of technology and no access to markets and credit (Jacquet, 2008). In coastal areas small-scale fishers are forced to fish close to the shore, where their activities are further threatened by anthropogenic effects such as overfishing, harmful fishing practices, coastal erosion, oil pollution, mangrove and coral reef destruction, and competition with industrial fleets, sports fishing and tourism. With little access to alternatives and no means to withstand sudden shocks from market fluctuations and climate change, small-scale fishers are under threat (IIED, 2019).

follows a methodology developed by IIED to understand the country's priorities and capacity to establish fisheries accounts.

This rapid diagnostic assessment is based on a review of key data sources and discussions with key stakeholders on the status of fisheries statistics in Cambodia, the challenges facing the sector, on-going and planned initiatives to strengthen fisheries data, and the interest and capacity to build a fisheries satellite account. Appendix 1 provides a list of interviewees. The project also undertook site visits to two community fisheries (CFis) in Kampong Chhnang Province to understand the challenges they face and their potential role in generating better data. The core data reviewed are considered to provide a clear picture of the gaps, opportunities and challenges facing the development of fisheries statistics that would better reflect the contribution of SSFs.

1.2 Overview of fisheries in Cambodia

Cambodia has a large and highly productive inland capture fishery, a marine fishery along its 435 kilometre coastline and an emerging aquaculture sector (Rizvi & Singer 2011).

Cambodia's **inland fisheries** occupy an area of 4.16 million hectares which consists of 475 community fisheries (756,637ha), rice field fishing areas (2.5 million ha), 864 community fish refuges (5,682ha) and flooded forest (900,000ha) (Table 1).[1] Cambodia's inland fisheries form part of the Mekong River system, one of the largest inland fisheries in the world, yielding around 2.1 million tonnes of fish each year (Box 2).

Table 1: Area and types of inland fisheries (2018)

TYPES OF FISHERY AREA	NO OF SITES	AREA (HA)
Community fishing area	475	756,637
Rice field fisheries		2,496,790
Community fish refuge	864	5,682
Flooded forest		900,000
Total		4,159,109

Source: FiA, 2019

BOX 2: MEKONG RIVER SYSTEM

Cambodia's high fish productivity comes from the Mekong River system and its tributaries and associated floodplains (Funge-Smith, 2018). Cambodia has two main rivers, the Mekong and the Tonle Sap. The Mekong, the 12th longest river in the world, originates in China and passes through Myanmar, Laos, Thailand, Cambodia and Vietnam before entering the South China Sea (Hap et al., 2016). The 115 kilometre long Tonle Sap River is attached to Southeast Asia's largest lake – the Tonle Sap ('Great Lake'), which extends across Cambodia, and connects the Tonle Sap Lake to the Mekong River. The inland aquatic system of the Tonle Sap region is renowned for its flood-pulse phenomenon, which causes the Tonle Sap River to reverse its flow on account of the annual fluctuation of the Mekong's water volume, supplemented by the Asian monsoon regime. As a result the Tonle Sap River flows six months a year from southeast to northwest and six months a year in the opposite direction. It is considered to be one of the most productive ecosystems in the world, composed of deep silt deposits, fertile floodplains and flooded forests yielding high nutrient recycling and rich biodiversity (Kurien, 2017).

[1] There are 778,399 hectares of flooded forest in six provinces of the Tonle Sap floodplain. The Royal Government of Cambodia's sub decree No 197 dated 29 August 2011 protects 647,406ha of flooded forest.

The **marine fisheries** extend to 55,600 square kilometres. Cambodia has a 435km coastline and an Exclusive Economic Zone (EEZ) extending 200 nautical miles (Rizvi & Singer 2011). The marine fishery area contains significant habitats for fish spawning and refuge with 32,492 hectares of seagrass, 2,806ha of coral reef and 58,852ha of mangrove forest, 79% of which are located in Koh Kong province (FiA, 2018).[2]

Fisheries in Cambodia are classified into three broad scales by Article 30 of the Law on Fisheries (RGC, 2006): small-scale or family fisheries, middle-scale fisheries and large-scale or commercial fisheries. This classification is based on the type, number and size of fishing gear as defined by the Ministry of Agriculture, Forestry and Fisheries (MAFF). Each category is subject to specific regulations concerning gear, fishing grounds and the timing of fishing and related activities. Small-scale fisheries operating as community fisheries are the main fisheries in Cambodia (Box 3).

In 2001, aware of the need to safeguard fish stocks and to resolve long-standing conflicts between small-scale and large-scale fishers, the government embarked on a reform of the country's fisheries management and regulations. This led to the redistribution of fishing rights from commercial fishing lots to local communities. Community fisheries were established through a two-step reform process. First, in 2001, 56% of total fishing lots previously allocated to private owners were designated as open access. Then, in 2012, the remaining commercial fishing lots were abolished and all Cambodian citizens were given the right to manage natural fisheries resources in their area through the establishment of community fisheries (CFis). Almost all inland fishing areas are now under SSFs / CFis, with the exception of 66 units of bagnet (dai)[3] fishing on the Tonle Sap River and 13 units of river prawn bagnet fishing in Prey Veng Province under the direct supervision of the Fisheries Administration (FiA), and trawling in marine waters. Large-scale fishing has been prohibited on the Tonle Sap since 2012.

There are 516 CFis across Cambodia, in inland and marine waters, with 332,168 individual members (representing 147,518 households). This is considered to be an underestimate of CFi members however, as a large number of family-scale fishers in fishing communities are not registered as members of CFis. Of

BOX 3: DEFINING SMALL-SCALE FISHERIES IN CAMBODIA

Globally small-scale fisheries (SSFs) are described by a mix of indicators, which include gross registered tonnage, engine size, the type of gear used, how far from the shore fishing takes place and the nature of the economic activity (such as whether subsistence or traditional). SSFs can be subsistence (non-commercial) or artisanal (commercial). While there is no single, agreed definition of the subsector, SSFs and artisanal fisheries are often used as synonyms. The FAO (2015) defines SSFs as:

"Small-scale fisheries are family fisheries, based on small-size fishing gear that can be operated by one or two persons. Also rice field fishing is considered small-scale. Formerly, these fisheries were excluded from the official fisheries statistics and ignored by the fisheries administration." http://www.fao.org/fi/oldsite/FCP/en/KHM/profile.In Cambodia, SSFs are equated with subsistence fishing or family-scale fisheries, which is minimal (RGC, 2006), although many community fishers undertake small-scale fishing to generate additional cash income. It is undertaken using only a single piece of fishing gear (RGC, 2006). Therefore, in addition to SFFs as defined in Cambodia, this study is focused on Cambodia's community fisheries, which are largely artisanal, and can sometimes be of medium scale. The 2006 Fishery Law defines community fishing areas as "the fishery domain of the state handed over to the community fishery under agreement between the chief of Cantonment of the Fisheries Administration and the communities or groups of citizens living inside or around the fishery domain. These citizens are mainly dependent on fisheries for their daily life and use traditional fishing gears." (RGC, 2006)

A new fisheries law is under development, according to which four fishing categories are proposed: (i) family-scale fishing or traditional fishing; (ii) small-scale fishing; (ii) medium-scale fishing; and (iv) large-scale fishing. These fishing categories are to be defined based on the type, size, length and number of fishing gear or type of vessels used.

[2] Mangrove forest area by province: Koh Kong (46,529ha), Preah Sihanouk (9,352ha), Kampot (1,966ha) and Kep (1,005ha).
[3] The word "dai"means bag in Vietnamese (Deap, undated). Bagnet fisheries or dai fisheries use a stationary trawl positioned in the Tonle Sap River to capture "white" fish species migrating from the Tonle Sap Lake and its floodplain to the Mekong and Bassac Rivers from October to February/March when the Mekong River flood recedes (Ngor, 2000). Dai fisheries were introduced to Cambodia by Vietnamese fishermen between 1873 and 1889 (Deap, undated).

the total number, 475 CFIs are inland fisheries while 41 are marine fisheries (FiA, 2019).[4] Community fisheries occupy 929,063 hectares overall, of which 764,414ha are inland (538,947ha in the Tonle Sap region and 225,467ha in the Mekong and Bassac regions) and 164,649ha are in marine fisheries areas (Table 2).

A total of 792 **conservation areas** have been established in Cambodia, covering an area of 517,239 hectares (Table 3). Community fisheries have voluntarily established their own CFi conservation areas in 496 sites representing around 7–10% of the total community fishing ground, while state-managed conservation areas have been established in 148 sites. There are also 884 community fish refuge committees (CFRs) throughout the country, mainly in rice fields, where fishing is prohibited in the dry season.

In 2018, inland and marine fisheries production combined, including aquaculture, was 910,153 tonnes (NSDP, 2019). Inland fisheries produced 535,005 tonnes, of which 360,730 tonnes came from family fisheries, 157,300 tonnes from rice field fisheries and 16,975 tonnes from bagnet fisheries in the Tonle Sap. Cambodia's inland fisheries produce 34.89 kilograms of fish per head per year, exceeding Myanmar (24.46kg a year), Uganda (11.16kg a year) and Chad (9.36kg a year) (Funge-Smith, 2018). National productivity is estimated at 1,070 tonnes per square kilometre a year (Funge-Smith, 2018). Rice fisheries contribute 30% of fish production and play an important role in poverty reduction as they are operated by rice farmers who may not have the resources to dig ponds. They also contribute to fish diversity.

Table 2: Community fisheries and conservation areas (2018)

REGION AND TYPE	COMMUNITY FISHERIES		CFI CONSERVATION AREAS	
	NO	AREA (HA)	NO	AREA (HA)
Tonle Sap (a)	228	538,947	270	4,757
Mekong and Bassac (b)	247	225,467	171	3,020
Total inland (c = a + b)	**475**	**764,414**	**441**	**7,777**
Marine fisheries (d)	41	164,649	55	5,658
Total fisheries (e = c + d)	**516**	**929,063**	**496**	**13,435**
Total area of CFi not including conservation areas*		**756,637**		

* That is the total area of the CFis (929,063ha) minus the CFI conservation area (13,435ha).

Source: FiA, 2019

Table 3: Fisheries conservation areas (2018)

TYPE OF CONSERVATION AREA	NO OF SITES	AREA (HA)
Fishery conservation areas	58	120,003
Protected and conservation area for dolphins	1	77,630
Marine protected area (MPA)[1]	2	51,842
CFi conservation area	496	13,435
Conservation area established by provincial fisheries cantonments	87	2,427
Conservation area outside community fisheries fishing grounds	148	251,902
Total	**792**	**517,239**

* The two MPAs are: (i) Koh Rong Saloeum in Preah Sihanouk Province (40,535ha) and, (ii) Koh Po and Koh Tunsay in Kep Province (11,307ha).

Source: FiA, 2019

4 CFis in marine areas make up less than 10% of the total, and only a few of these are considered to be operating well (primarily in tourist destinations where they can be linked to ecotourism ventures). More resources are needed to support the operation of CFis in marine areas.

Table 4: Freshwater, marine and aquaculture production (2009–2018)

	FISHERIES PRODUCTION (TONNES)									
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Freshwater	390,000	405,000	445,000	509,000	528,000	505,005	487,905	509,350	527,795	535,005
Marine	75,000	85,000	91,000	99,000	110,000	120,250	120,500	120,600	121,025	212,100
Aquaculture	50,000	60,000	72,000	74,000	90,000	120,055	143,141	172,500	207,443	254,048
Total	515,000	550,000	608,000	682,000	728,000	745,310	751,546	802,450	856,263	910,153

Source: FiA, 2019

Marine fisheries production was 212,100 tonnes in 2018. Over the period 2009–2018, aquaculture production increased by 400%, reaching 254,048 tonnes in 2018. In comparison, freshwater fisheries (inland fisheries) increased by 37% and marine fisheries by 180% (Table 4). The government plans to continue to increase aquaculture production at an annual rate of 20% to help meet the increasing demand for consumption. There are 42,190 aquaculture ponds, 7,570 cages, and 714 pens throughout the country (Appendix 6.7), although the limits to growth for the aquaculture sector are not clear.

Fisheries make a significant contribution to Cambodia's gross domestic product (GDP) and to foreign exchange, employment and the livelihoods of the rural fishers, and food security. Since 1998, the contribution of the fishery sector to GDP has steadily increased from 1,470.6 billion riel in 1998 (US$393 million) to 4,609.5 billion riel (US$1.136 billion) in 2016.[5] However the sector's share of GDP has declined over the same period from 12.5% in 1998 to 5.70% in 2016.[6]

Fisheries provide employment in various forms – harvesting, processing, distribution and marketing – for at least a quarter of the country's population (Hortle et al., 2004; FAO, 2019a). Around 6 million Cambodians are estimated to be involved in fisheries (FAO, 2019a). Fishing is estimated to provide an annual family income of around US$589–1,433 (NIS, 2014), representing about 30% of the total family income.[7] The money gained from fishing helps to buy fuel, rice seeds and fertiliser for rice farming (Lieng et al., 2018).

A study by Kurien (2017)[8] illustrates the important role of women in community fisheries. Women work in fish processing and trading. In the marine sector, although women do not go to sea to fish, they are involved in arranging finance for fishing trips; gathering fish, mollusks and other organisms in near-shore areas; and processing. The involvement of women in the CFis (45% of members are women) has given them a formal status and voice in decision making. They have played key roles in promoting conservation actions for resource stability, education, development, the dissemination of information and exposing the moral argument against illegal fishing. The youth of the communities are involved in patrolling activities. Child labour in fishing remains prevalent. It is mainly boys who are involved in fishery-related activities, largely supporting their parents on a part-time basis so that it should also be possible for them to go to school.

Fish is a traditional staple in the Cambodian diet and vital to nutrition and food security. Cambodians are among the heaviest consumers of freshwater fish in the world, with annual per capita fish consumption of 41 kilograms representing 70% of Cambodia's intake of animal protein (FAO 2019a).[9] Fish is the most frequently eaten meat in Cambodia, eaten four to five days per week on average (NIS, MOP and MAFF 2015). In fishing-dependent areas, fish is twice as abundant in Cambodians' diets as pork, chicken and beef combined (Mousset et al., 2016). Over one third of households in the Tonle Sap and lowland areas report engaging in fishing to mitigate risks of food insecurity (Mousset et al., 2016).

[5] Using an exchange rate of 3,744 riel to the US$ in 1998 and 4,058 riel to the US$ in 2016, https://data.worldbank.org/, accessed 24 March 2020.
[6] http://www.nis.gov.kh/nis/NA/NA2016_Tab.htm.
[7] GDP per capita in 2018 was US$1,510 (http://data.worldbank.org/, accessed 17 April 2020).
[8] The study involved 1,095 CFi members from 60 CFis across 16 provinces in the Tonle Sap, Mekong and marine coastal region.
[9] An estimate of 52.4 kilograms per capita fish consumption (Hortle, 2007) representing 76% of Cambodia's intake of animal protein is also often cited, although 13 years old. Annual consumption patterns vary between provinces, from 105.2kg per capita in riparian provinces to 43.4kg in areas further from rivers (Hortle, 2007). Another estimate puts fish consumption in Cambodia at 63.5kg per capita per year (Needham and Funge-Smith, 2014).

CFis in Cambodia are vulnerable to storms and other environmental shocks, fluctuations in the availability of fish and other aquatic animals, children being involved in fishing to the detriment of their schooling, limited ownership of assets (including land), and high incidences of vector- and water-borne diseases. A recent research study on the Tonle Sap by the FAO and WorldFish outlined specific recommendations for strengthening the links between social protection and fisheries, including increasing the visibility of small-scale fishers in research, policy, planning and decision-making (FAO, 2019b).

Threats to sustainable inland fisheries include (i) pollution from agriculture and industry; (ii) illegal fishing by powerful people; (ii) the cutting down of the flooded forest; (iii) land grabs affecting the Tonle Sap; and (iv) illegally-constructed structures affecting water flows. Threats in marine waters include (i) fishing using destructive fishing nets (eg. shellfish dredgers);[10] (ii) trawling by larger boats; (iii) illegal fishing by vessels from other countries; and (iv) pollution of coastal waters.

While effective management is important, the extent of the flood plain and water levels are considered to be key factors affecting fish productivity. Water levels are affected by the construction of dams and climate change. There are 11 dams on the Mekong main stream, 2 of which are in Cambodia (in Kratie and Stung Treng provinces) and thousands of dams on its tributaries.

1.3 Outline of this report

The rest of this report is organised as follows. Section 2 introduces the concept of natural capital accounting and the SEEA-AFF accounts for fisheries, highlighting the key policy applications of fisheries satellite accounts. Section 3 outlines key policies and strategies related to the fisheries sector in Cambodia and the government institutions responsible for fisheries management and national accounts. Section 4 presents the existing data that could inform a fisheries satellite account, key data gaps and challenges, and key ongoing initiatives aimed at strengthening fisheries statistics. Section 5 concludes and outlines a road map for developing a fisheries satellite account for Cambodia.

[10] Shellfish dredgers (Chhneang os krum kraw la hol) which capture undulate venus (*Paphia undulata*), are considered a destructive fishing activity to the coastal aquatic environment when they do not comply with fisheries regulations. The use of gears shorter than 1.2m and with a mesh size bigger than 1.2cm and operated without engines, is permitted by proclamation No 319 MAFF/2015 on marine fishing gears of Ministry of Agriculture, Forestry and Fisheries.

2

Natural capital accounting

2.1 What is natural capital accounting and why is it important?[11]

A country's income generation is underpinned by its **wealth**. A country's wealth includes buildings; manufactured assets such as machinery; infrastructure such as highways and ports; natural assets such as land, forests, fish, minerals and energy; and human and social capital. **Wealth accounting** measures these assets; an important component of wealth accounting is **natural capital accounting**.

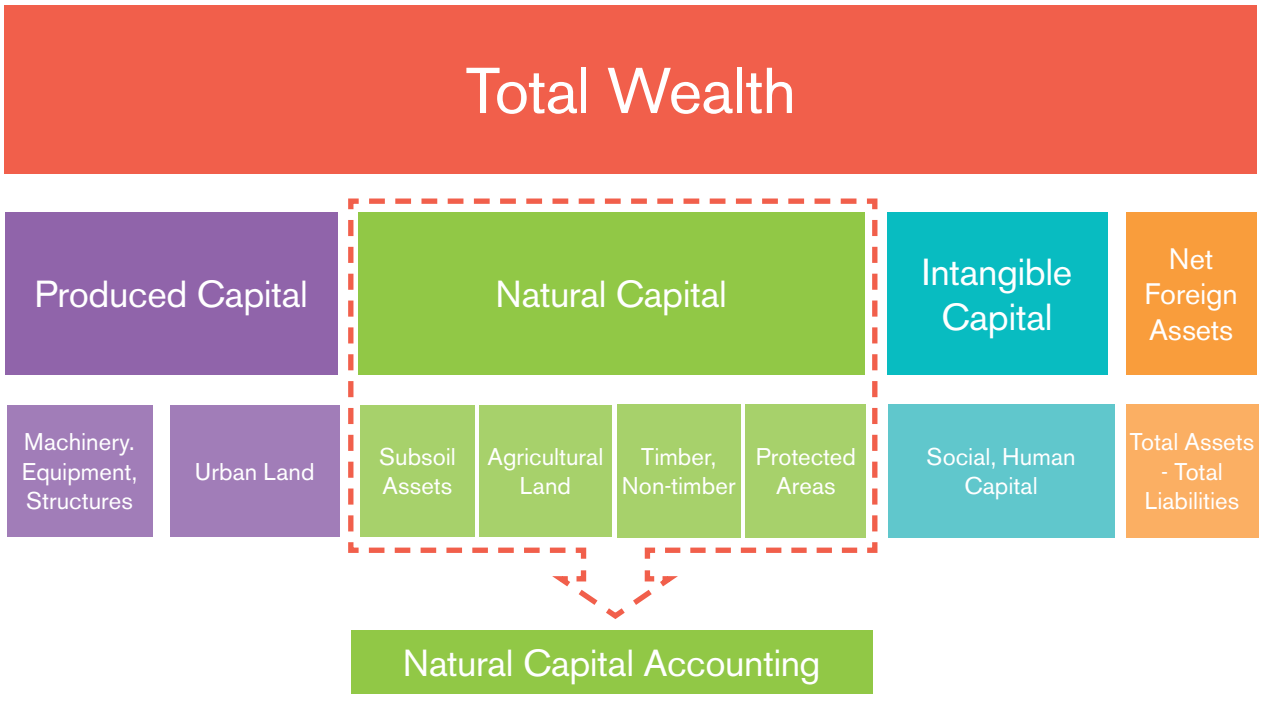
In all countries the national accounts constitute the primary source of information about the economy and are used to assess economic performance and inform policies. All countries follow the **System of National Accounts (SNA)** that provides an international standard for measuring national income and savings. The SNA has some provision for wealth accounting but few countries actually do it. Countries typically rely on gross domestic product (GDP) as a measure of economic performance. However, GDP only measures current income and production. It does not account for the assets that underpin the generation of income and therefore provides no information on whether growth is sustainable or not. GDP does not account for the depletion or degradation of natural capital, for instance, through the over-harvesting of fisheries, and fails to explicitly identify and record changes in the supply of critical ecosystem services, such as protection against coastal storms and carbon sequestration. Without wealth accounts, countries therefore have an incomplete and potentially misleading picture of likely trends in future income. Comprehensive wealth accounting measures the value of the different components of wealth (Figure 1). It goes beyond the SNA to include broader forms of wealth such as human capital and the benefits flowing from ecosystem services.

Natural capital includes minerals, energy, timber, agricultural land, fish and water, which are commonly bought and sold in markets. It also includes ecosystem services such as water filtration, flood protection and carbon storage, which are not readily captured in markets and whose value often remains invisible. As a result, the cost of ecosystem damage or loss is unknown, and this missing information can lead to the wrong development decisions. Natural capital is especially important to many developing countries where it forms a large share of their total wealth. For example, it is estimated that natural capital accounts for more than 30% of total wealth for low income countries (WAVES website https://www.wavespartnership.org/en).

Natural capital accounting (NCA) focuses on this critical component of wealth. It constitutes a systematic and integrated environmental-economic information system that can inform broad policy processes. NCA follows an international statistical

[11] Based on Bann et al. (2017).

Figure 1: Comprehensive wealth composition



Source: World Bank, 2015

standard approved by the United Nations Statistical Commission in 2012 – the **System of Environmental and Economic Accounts (SEEA)**. The Central Framework of the SEEA provides the overall framework for natural capital accounting. It provides a standard methodology for compiling accounts for material natural resources such as minerals, energy, water and timber, as well as the emission of pollutants like greenhouse gases, and linking this to information to the economy, in particular to GDP and policies for distributing benefits to different parts of society. It covers asset accounts and flow accounts, both monetary and physical. The SEEA is enhanced through **Experimental Ecosystem Accounts**, which describe how to account for ecosystem assets and services in both monetary and physical terms – for example, the storm protection function of a mangrove forest.

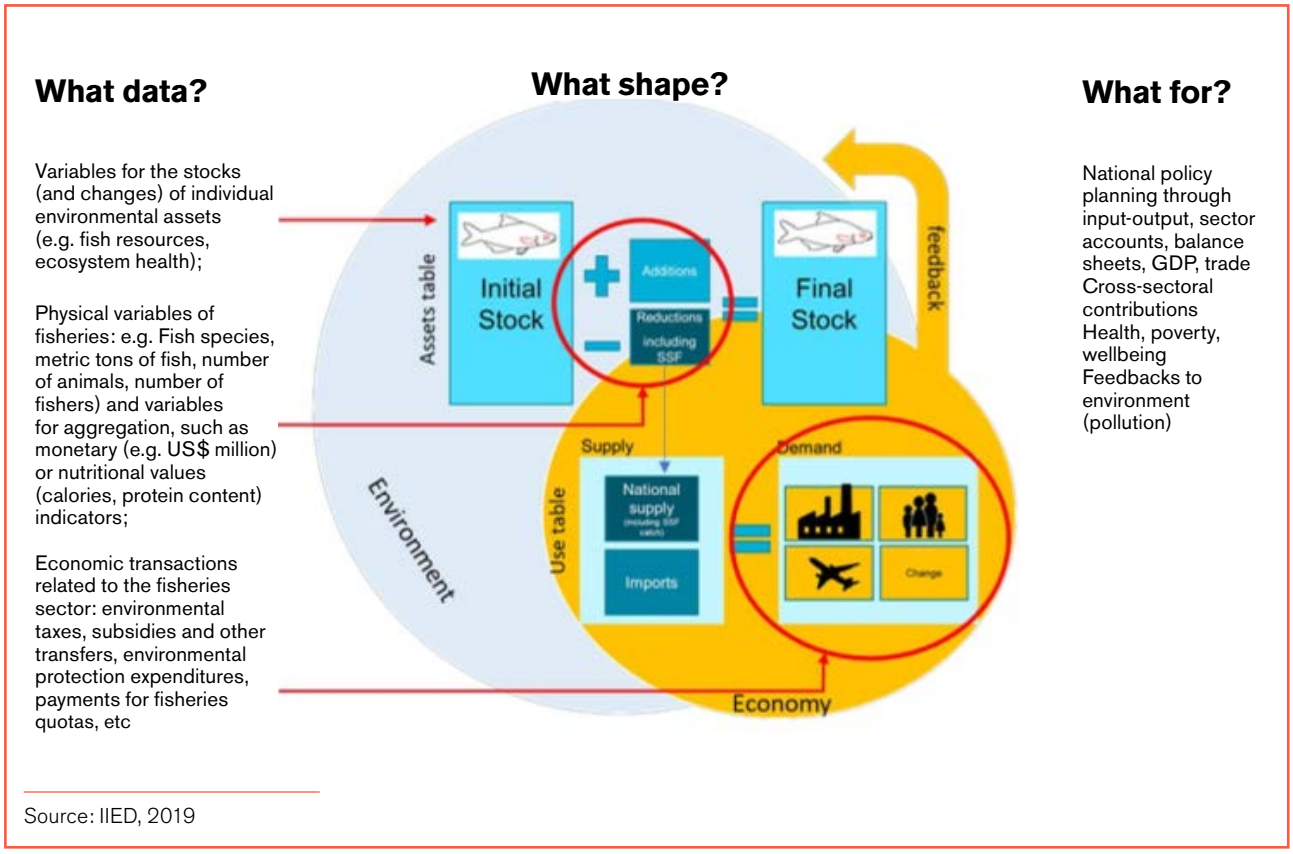
A well-developed national set of natural capital accounts can: (i) monitor losses and gains in natural capital over time through changes in physical quantities and monetary values; (ii) identify priority areas for investment and inform resourcing and management decisions; and (iii) highlight links with economic activity and pressures on natural capital. Furthermore, NCAs can help deliver the Sustainable Development Goals (SDGs) by making the links between the economy and the environment explicit, enabling sustainable policy decisions and progress monitoring.

2.2 System of Environmental and Economic Accounts

This diagnostic study uses the **System of Environmental and Economic Accounting framework for Agriculture, Forestry and Fisheries (SEEA-AFF)** (UN Statistics Division, 2018)[12] a statistical system for organising data to enable the description and analysis of the relationship between the environment and economic agriculture, forestry and fisheries activities. These activities depend directly on the environment and its resources while also having an impact on the environment. SEEA-AFF is based on the SEEA Central Framework and the SNA, which together provide a foundation for integrating environmental and economic data in monetary and physical terms.

[12] UN-approved accounting frameworks and methodologies include the System of Environmental and Economic Accounts, Agriculture, Forestry and Fisheries (SEEA-AFF), Oceans Accounts, and Experimental Ecosystem Accounts.

Figure 2: SEEA-Fisheries: What data?



Source: IIED, 2019

The main purpose of the SEEA-AFF is the integration of environmental and economic data with a view to supporting the mainstreaming of environmental information in economic planning, development policy, and analysis and monitoring. The framework can be used to:

- Improve the way fisheries in general are currently reflected in the Systems of National Accounts
- Disaggregate data to show participation of small-scale fisheries, and
- Introduce additional ecosystem services linked to oceans and coasts, for example energy and tourism.

The data collected in the framework can be linked to several data analysis models, such as input-output models to determine macroeconomic indicators (such as trade, consumer demand or government expenditure) and modelling exercises to measure impacts within the sector and across the economy (Figure 2).

The SEEA-AFF framework has two types of accounts: **assets tables** and **supply and use tables.** They can be estimated in physical terms (for example tonnes) and monetary units during a period of time (usually a year). Fisheries physical assets table and supply and use tables are provided in Appendix 2. IIED (2019) provides a detailed overview of the data needed and approaches to build these fisheries satellite accounts which better reflect small-scale fisheries (SSFs).

Asset accounts focus on stocks and flows and serve as important indicators of sustainability. The **physical asset account** shows the total biomass of all species harvested or cultivated within a national boundary. Consistent with the SNA, the production boundary applied in the SEEA-AFF includes illegal production and informal, non-observed activity. The SEEA-AFF includes commercial sea and freshwater operations, aquaculture, subsistence and recreational catches. Subsistence activity is commonly excluded from national accounts and GDP since it is not the subject of market transactions.

The physical asset account shows opening and closing stocks over a given period, as well as additions and reductions in stock resulting from natural growth, catches and other factors. Total supply consists of domestic production and imports; total use covers intermediate use of fish products, final consumption by households, changes in inventories and exports.

Closing stock = opening stock + additions (natural growth, other) – reductions (gross catch, natural and catastrophic losses, other reductions)

Monetary and physical asset accounts follow the same structure, the only difference being the inclusion of a row to record revaluations of assets in the monetary asset accounts.

The Fisheries **physical supply and use tables** record the total supply and use of all fish and aquatic products. For any given period, supply must be equal to use. The Fisheries **supply table** shows how much fish is captured in a year. It includes production from capture fisheries and aquaculture, and can be further disaggregated into production categories to make SSFs visible. Total supply includes domestic production and imports. **Fisheries use tables** show how much fish and aquatic products are consumed in a year, recording the use of all the products accounted in the supply table. Total use covers intermediate use of fish products, final consumption by households, changes in inventories and exports. The fisheries use table template can help to extend the analysis of the use or consumption of fish products in the physical flow table to measure calorie and nutritional intake from household fish consumption. Linking this information (which is also available in food balance sheets) with economic and environmental variables could help to improve assessments of food security and sustainability issues.

The SEEA-AFF is designed to provide national-level information and hence work with national datasets, but can be used at the **sub-national level** to highlight and focus on policy relevant location-specific environmental pressures and economic linkages. This involves defining a sub-national boundary for which a suitable range of data is available. The boundaries may be administrative – which suits the organisation of socioeconomic data – or environmental, for example by river basin or landscape type.

2.3 Linking fisheries satellite accounts to natural capital accounts and other extensions

There are various ways that fisheries satellite accounts can be extended over time to provide information on key policy areas. These include (UN Statistics Division, 2018):

- **Ecosystem accounting** involves measuring the change in the extent and condition of the ecosystem assets in a country, and the ecosystem services that each asset supplies. An approach to accounting for ecosystems in line with standard national accounting has been developed in the SEEA Experimental Ecosystem Accounting, but it is not yet developed with respect to agriculture, forestry and fisheries. However, the approach described in the SEEA-AFF should be seen as a key building block for the development of ecosystem accounting, as it involves the measures of individual environmental assets, such as fish. In line with in the SEEA Experimental Ecosystem Accounting, the production functions for individual fisheries products could be extended: (i) to include inputs of ecosystem services; and (ii) to consider the supply of ecosystem services from fisheries ecosystems to other economic units and to society generally.
- Ecosystem accounting is closely linked to the development of national-scale **carbon accounting** which tracks various stocks and flows of carbon over time. Given that the ecosystems and biomass associated with fisheries activities are important stores of carbon, this is a potential area of focus which the SEEA-AFF can inform and link to.
- A fisheries account could be developed into a natural capital coastal account (Box 4).
- **Environmental transactions.** Examples of fisheries economic transactions that are considered to be "environmentally related" include: (i) environmental protection and resource management expenditure by economic units involved in fisheries activities; (ii) environmental taxes and subsidies payable and receivable by these units; and (iii) rents payable by these units (eg payments in relation to fishing quotas). These data may be organised into environmental protection expenditure accounts or resource management expenditure accounts.
- This SEEA could be extended to incorporate a description of the supply chain, ie tracing the movements of fisheries products through the economy. The use of standard national accounts classifications facilitates the connection of data from the SEEA-AFF to datasets and models that are used for this analysis.
- **Integration of additional social statistics and indicators**. The SEEA-AFF includes data on employment, food consumption and nutrition. Extensions could be made to include data on rural incomes and poverty, access to water and energy in rural areas, and age and gender, which are of interest in terms of policy with regard to sustainable development, and demonstrating the importance of SSFs.

BOX 4: COASTAL NATURAL CAPITAL ACCOUNTING

Coastal natural capital accounting integrates physical and economic information on coastal natural capital (assets) with national economic accounts for better-informed management of coastal areas and design of development strategies in the context of natural hazard and climate risk.

Coastal natural capital accounts include measures of:

1. The 'blue economy': spatially distributed volume and value of assets (built capital like housing and natural capital like fisheries), livelihoods and income (GDP) generated by coastal natural capital, and the population, particularly the poor.
2. The exposure of the economy to risk: coastal land cover/land use accounts with topography and inshore bathymetry (if available), and spatial distribution of natural hazard risk (eg modelling of erosion).
3. The economic and social cost of natural hazards: spatially explicit expected damage to assets, livelihoods, incomes and population, especially the poor, whose vulnerability may not be well represented by measures like income and assets, from natural hazards like coastal erosion.

With this information about the location and economic magnitude of risks, decision makers can better plan where future development should take place, how to address the risks faced under the current location of infrastructure, economic activity and human settlements, and what actions might be taken to reduce the risks, making use of both 'grey' and 'green' infrastructure.

Source: Bann et al., 2017

2.4 Policy uses of natural capital accounting and fisheries accounts

Four policy priorities to which NCAs can contribute are (i) inclusive green growth and poverty reduction; (ii) food security; (iii) climate change, risk and economic growth; and (vi) economic and environmental sustainability (Vardon et al., 2018). All of these are highly relevant to the fisheries sector in Cambodia and would be well informed by the development of a fisheries satellite account.

The SEEA provides a consistent, coherent and comprehensive measurement framework for green growth, as it integrates economic and environmental statistics (UN et al., 2014). The United Nations Environment Programme (UNEP, 2011) and the Organisation for Economic Co-operation and Development (OECD, 2011) advocate environmental accounting as the underlying framework for deriving the indicators for green growth.

Given fisheries' contribution to GDP, livelihoods, poverty reduction and food security, the sustainability of the sector is a key concern. A fisheries account could highlight sustainability issues and the costs imposed by other sectors on fisheries.[13] Fish accounts could inform decisions makers as to whether fishing activities are being undertaken sustainably or if stock depletion is evident in the range of target species. Table 5 presents the main fish accounts and their policy applications.

Integrating specific data on SSFs into the accounts can help answer the following policy questions:

- **Value:** what do SSFs contribute to the national economy, employment and food security?
- **Investment:** what level of investment is needed and what are the returns to these investments?
- **Financial distribution:** where should public, private and donor investments be directed to deliver both socioeconomic and environmental objectives? For example, towards women and efforts aimed at gender equity, and / or towards other important socioeconomic groups such as low-income fishers?
- **Intervention points:** what policy responses are needed to deliver both socioeconomic and environmental objectives? For example, alignment of taxes and subsidies to promote inclusive and sustainable fisheries practices.
- **Sustainability:** how sustainable are SFF harvest yields, and how would they respond to external changes such as climate change?

[13] Although aquaculture is defined within the NCA standard as managed production of a produced asset (not the use of a natural asset), it is appropriate to incorporate aquaculture in both a fisheries satellite account and a land account.

Table 5: Fish accounts and potential policy uses

ACCOUNT	DESCRIPTION	POLICY USE
Fish stocks and flows — physical account	Identify biomass of major commercial fish species (wild stocks and aquaculture) at point in time and changes to that stock during a period of time.	Assess the sustainability of fish stocks, impact of natural events on fish stocks.
Fish stocks and flows — monetary account	Identify value of major commercial fish species (wild stocks and aquaculture) at point in time and changes to that value during a period of time.	Assess the value of stocks and changes in values over time from exploitation and impact of natural events.
Supply and use of fish — physical account	Flow of fish species (wild stock and aquaculture) and changes to that stock in physical terms (domestic consumption and export).	Assess alternatives for optimal use of fish resources, policies on inclusive development of sector and targeted investments. Improve assessments of food security and sustainability issues. Inform design of economic instruments for better fisheries management. Inform the economic benefits of no-take zones and of investment in more effective management.
Supply and use of fish — monetary account	The value of fish harvest and aquaculture production and the value of fish used for domestic consumption and export.	Assess alternatives for optimal use of fish resources, potential for developing export markets.

3 Institutional review

3.1 National policies and strategic plans

The **Strategic Planning Framework for Fisheries for 2015–2024** (SPF) has been defined for the management of the fisheries sector in line with the "Rectangular Strategy" for **Growth, Employment, Equity and Efficiency Phase IV** (FiA, 2015) and the recently-adopted **National Strategic Development Plan 2019–2023** (NSDP, 2019). This SPF contributes to the implementation of the Agriculture Sector Strategic Development Plan (ASDP, 2019). Appendix 3 presents the proposed joint monitoring indicators for the Fisheries Strategic Planning Framework 2015–2024. This identifies the improvement of fisheries statistics as a priority activity.

According to the SPF the major problems facing Cambodia's fisheries are:

- A large amount of illegal fishing activities, especially the use of illegal fishing gear, cutting of the flooded forest within community fisheries and state fishery domains, and trawling within inshore fishing areas.
- Adverse effects from hydro-dam construction in the Mekong and its tributaries.
- Community fisheries do not have the funding or capacity to implement their action plans and their management is weak in some cases.
- The greater commercialisation of rice production systems is likely to lead to both increased chemical inputs in rice field fisheries and physical changes to rice fields, which will limit opportunities for fisheries.
- Limited law enforcement, poor compliance with regulations and a lack of awareness about the importance of fishery resources among fishers and other stakeholders.
- Insufficient numbers of fisheries staff with the right skills and experience to address the current problems facing the sector.
- Limited equipment and funds to support the management, research activities, extension, conservation and protection of fishery resources.
- Lack of recognition of women's and children's roles and the problems they face in the fisheries sector especially the issues of child labour and gender inequality at the community level.

3.2 Key laws and regulations

The **Fisheries Law (2006**) represents the main legal instrument for managing Cambodia's fisheries. For both inland and marine areas, the law defines fishing grounds, access to fishing, the government structure for fisheries management and the establishment of locally organised groups, the community fisheries (CFis).

Access is limited by the scale of fishing. Only family-scale or subsistence fishing using small-scale fishing gear is permitted all year round in all fishing grounds, both inland and marine areas, without a licence (RGC, 2006, article 31). The type and amount of fishing gear are defined in the CFi action plan with the approval of local and competent fishery authorities. Access

rights are not only given to those living in fishing areas administered by Fisheries Administration (FiA) but also areas under the jurisdiction of the Ministry of Environment (MoE) under the Law of Protected Areas (2008), and the Ministry of Water Resources as stated in the Water Law 2007. Fishing is not permitted in conservation areas in order to preserve fish brood stocks and enhance fish reproduction. Where individuals have exclusive access rights to agricultural land in floodplain areas, the same area remains public in the wet season when it is flooded (RGC, 2006, article 9).

According to the Fisheries Law articles 65 and 69, commercial engagement in fisheries related operations along the value chain (e.g. harvesting, processing, transport) requires a licence. Local households are encouraged to engage in fish processing to improve their livelihoods and involvement in post-harvest value-added activities is high in the Tonle Sap region, particularly among fishers whose main livelihood comes from rice farming and fishing.

In 2005 the government issued a **Sub-decree on Community Fisheries Management** which sets out rules for the establishment, management and use of community fisheries (CFis). By law, CFis come under the general jurisdiction of the Ministry of Agriculture, Forestry and Fisheries (MAFF). A **CFi** can be formed by any group of Cambodian citizens who live in or near a fishing area and voluntarily establish an initiative to achieve the five objectives set out in the sub-decree. These are to (i) manage inland fisheries and related ecosystems where fishing lots have been cancelled; (ii) manage fisheries resources in sustainable and equitable manner; (iii) increase the understanding and recognition of benefits of fisheries resources through participation in their protection and management; (iv) provide the legal framework to establish community fisheries; and (v) improve standards of living and reduce poverty. Appendix 4 provides more details on the Fisheries Law 2006 as it pertains to CFis and the sub-decree on community management.

The 2006 fisheries law and the sub-decree on community fisheries management are in the process of being revised to strengthen fisheries institutions and management in line with current fisheries reform, poverty reduction policies of the Royal Government of Cambodia and the environment, social, and economic status of fisheries resources. The new law will, among other things: (i) provide an obligation to establish and manage fish landing ports; (ii) increase punishment for illegal offenders; (ii) strengthen fishing boat/vessel registration, food safety and certification, quality control, and inspection; and (iv) combat illegal, unreported and unregulated fishing (IUU). Community fishers are to be empowered and gain more rights to participate in fisheries management, business and development, communication and networking among community fisheries, and to share knowledge and experiences. The proposed new law will pay more attention to improving the livelihoods of community fishers through fisheries investment and business opportunities, including ecotourism development.

The Law on Protected Areas (2008), provides for the management of protected areas including wetlands. Article 22 states that "Traditional and customary access to natural resources to meet household consumption is allowed in sustainable use and conservation zones following guidelines provided by MoE" (RGC, 2008). Although zoning has to follow guidelines provided by MoE, the boundary delineation is done in consultation with local communities. Those with the right to access areas have a duty to ensure that the institutional and technical capacity is in place to manage the resource under their custody. Ensuring effective communication and liaison with relevant sectoral agencies and authorities is also required.

The **Law on Water Resources Management (2007)**, article 19, provides for access to water for multiple purposes including for establishment of Farmer Water User Communities to manage small-scale irrigation schemes including small reservoirs where water is used for fisheries purposes.

To harmonise all the legal instruments pertaining to natural resource management, including fisheries, the MoE is developing an overarching **Environmental and Natural Resources Code**.

3.2.1 International agreements

Cambodia is a member of the Convention on Biological Diversity 1992 and the Convention on International Trade in Endangered Species. Recently, Cambodia became a party to the Agreement on Port State Measures (PSMA, 2016), which seeks to prevent, deter and eliminate illegal, unreported and unregulated fishing. In January 2020, Cambodia became a member of the UN Convention on the Law of the Sea, an international law governing the rights and duties of states in maritime environments including the management of long-migratory fish species. Its ratification will help to strengthen the sustainable management and utilisation of migratory species and other relevant stock, protect marine biodiversity, combat IUU fishing, gather and distribute data and information about fishing activities, and promote management and conservative measures through effective monitoring, control and surveillance (Senate. 2020).

3.3 Key government institutions

Fisheries management is entrusted to the **Fisheries Administration** (FiA) of the MAFF. The FiA has seven departments and three research institutes: the Inland Fisheries Research and Development Institute (IFReDI), the Marine Fisheries Research and Development Institute (MaFReDI), and the Samdech Techo Hun Sen Aquaculture National Research and Development Institute. IFReDI and MaFReDI have a duty to provide scientific information and technical support for the sustainable development and management of inland and marine living aquatic resources in Cambodia, based on biological and socioeconomic research. Appendix 5 provides more details on the structure of the FiA.

Other ministries and agencies also have authority to plan and manage fisheries resources and/or fishing grounds under their respective mandates, albeit to a lesser extent. For instant, the Ministry of Environment has jurisdiction over the management of Protected Areas and National Parks and the Ministry of Water Resources is mandated to manage river basins, sub-basins, watershed run-off, groundwater and aquifers in collaboration with all concerned ministries (MOWRAM, 2007, article 10).

The **National Institute of Statistics** (NIS) of the Ministry of Planning is responsible for the collection, processing, and dissemination of official national statistics. It oversees the Social Statistics Department, the Census and Survey Department, the General Statistics Department, and the Economics Statistics Department. The institute has developed a tourism and forestry satellite account, which could serve as a stepping stone for the SEEA. They have expressed interest in building a fisheries satellite account, an ocean account and a land account (*pers. com*. January 2020). Furthermore, they are starting to think about natural capital accounts and environmental accounts to support reporting on the SDGs, in collaboration with the MoE. One criterion for developing new accounts is that they can sustain the work on an annual basis. To date the NIS has received some training on NCA from the United Nations Economic and Social Commission for Asia and the Pacific and the Malaysian statistics office.

In 2019, the NIS undertook an inter-census (between the main censuses) which covered agriculture and was based on face-to-face interviews of a randomly selected sample of 160,000 households in 1,350 enumerator areas (EAs). The results of the inter-census are not yet available, but it reportedly includes information on fish catches for marine, inland and rice fisheries (not by species) and on fishing gear.

The NIS are preparing to conduct a **Census of Agriculture in Cambodia** in 2020, updating the previous agriculture census of 2013. Fisheries have been poorly reflected in such censuses in the past; for example the census in 2013 did not collect fish catches, and only provided aquaculture data. A **fisheries survey module** is planned for 2020, which will be undertaken in collaboration with the FiA statistics department and supported by the FAO, as discussed further below.

4

Building a satellite fisheries account for Cambodia

4.1 Data review

This section presents the results of a data review undertaken to understand what data are available to build a fisheries asset account and a supply and use account, where the data are held, and data quality and data gaps. Table 6 summarises the data available, broadly organised into the data needed for supply and use tables and for asset accounts. However there is a lot of overlap between the two, with key data needed for both.

Table 6: Overview of data and information needs and availability

DATA CATEGORY	DATA AVAILABILITY
SUPPLY AND USE TABLE (but note data overlaps with asset account)	
Fish and aquatic products species, as per International Standard Statistical Classification of Fishery Commodities (ISSCFC).[a]	Marine fish catches are reported for 51 species (Appendix 6.5). There is no breakdown of catch by species for inland fisheries. Monitoring of bagnet fisheries in the Tonle Sap River provides information about catches by species, but only overall catches are reported in official fisheries statistics.
Disaggregated data for different categories of fisheries.	Data are available (FiA official statistics) for: • **Freshwater fisheries**: large-scale (dai fisheries) operating in concession fishing areas in the Tonle Sap River, family fisheries in family-scale fishing areas, open access areas, flood plains and rice fields (RGC, 2006). • **Marine fisheries**: although there are both family-scale and artisanal fisheries, catches are only officially reported for artisanal fisheries (Appendix 6.4). • **Aquaculture**: freshwater and marine aquaculture production is officially reported as overall production, there is no breakdown by species. But there is a separate report of aquaculture production for snakehead fish, eels, frogs, turtles, shrimp, crabs, molluscs, blood cockles and crocodiles (Appendix 6.6).

DATA CATEGORY	DATA AVAILABILITY
Description of fleets and types of fishing: eg industrial, semi-industrial, small-scale, informal, touristic/ recreational, subsistence.	Fishing is classified into three types: (i) small-scale fishing gear/ subsistence fishing; (ii) middle-scale fishing; and (3) large-scale fishing (RGC, 2006). The descriptions of types of freshwater fishing gear are available. Deap et al. (2003) defines around 150 gear types and groups them into 16 major categories. Proclamation No 458 of MAFF (2012) defines 94 types of freshwater small-scale/ family fishing gear according to the types and size of fishing gear for closed and open fishing season. Proclamation No 319 of MAFF (2015) has 30 types of marine small-scale/family fishing gear and 25 middle-scale / artisanal fishing gear. The FiA official statistical report lists (FiA, 2019) 34,092 non-motorised fishing boats/vessel, categorised into ≥5tons and ≤5tons capacity (Appendix 6.20), and 83,115 motorised fishing boats/vessels categorised into ≤10 horsepower, 10–30Hp, 30–50Hp and ≥50Hp (Appendix 6.21) in both fresh and marine waters. The marine census (FiA, 2018) provides additional information on the number of fishing vessels by size (large, medium and small) and by engine power (horsepower).
Licences (and approximations of the reliability of the number of licences in relation to operating vessels, possibly through surveys or expert consultation).	Licensed fishing boats in **marine waters** are available from the 2018 marine census by the FiA and show that only 3% of vessels are licensed. In inland waters, licences are only provided for large-scale fishing: 55 lots of bagnet fishing in Tonle Sap River, 13 sites of river prawn fishing in Prey Veng Province, and for small cyprinid fish bagnet fishing, 7 sites in Prey Veng Provinces and 4 sites in Takeo province. Small-scale fishing/family fishing by community fishers can be practised without a licence. Free licensing is also given to medium-scale fishing in both marine and fresh water.
Gross and nominal catch recorded in live-weight equivalent by species.[b]	Only gross catches are available. Discarded, subsistence and recreational catches are not recorded.
Estimates of catch by SSF / CFi fisheries.	Data are recorded on freshwater catches; SSF/family fishing operate in open access areas, community fishing areas, flood plains and rice fields. SFF fisheries are conducted by communities and are artisanal fisheries.
Estimates of illegal, unreported and unregulated (IUU) catches, including surveys, patrolling reports from monitoring, and expert advice (this information also links to asset accounts / stock assessments).	Fish catches from IUU are not estimated. The FiA only reports the number of illegal cased encountered through patrolling (Appendix 6.15). The 2020–2023 FAO/EU CAPFISH Programme for Sustainable and Inclusive Growth in the Fisheries Sector plans to fight against IUU fishing (FiA 2019). The FiA has updated its National Plan of Action against Illegal, Unreported and Unregulated Fishing (NPOA-IUU), inventoried and marked its fleet, drafted a National Plan of Control and Inspection (NPCI) and started to revise its Law on Fisheries 2006.
Estimates for discarded fish and links to potential post-harvest uses (note that derivative products and not included in supply and use tables).	Not available.
Gear types and size of vessel, number of fishers, boats or trips / days at sea (per month) for different categories of fisheries.	• **Gear type**: the number freshwater fishing gears used in *freshwater fisheries* is recorded by province, categorised into industrial fisheries, artisanal fisheries and family fisheries • **Fishing vessels** in inland and marine waterways are recorded, categorised into non-motorised, and motorised (according to horsepower) • **Number of fishers**: data are available, but uncertain for inland fisheries • **Days at sea (per month) for different categories of fisheries**: not known.

DATA CATEGORY	DATA AVAILABILITY
Mean catch per unit effort (CPUE) per gear type (as an indicator of change in stock size).	Studies using fish CPUE have been used to monitor the status of the inland fisheries in Cambodia. Monitoring studies by IFReDI and Mekong River Commission (MRC) are (i) gill net fisheries in Kratie, Stung Treng and Ratanakiri, which have been conducted annually since 2007; (ii) larvae drift in Chaktomuk River; and (iii) bagnet fisheries in Tonle Sap River since 1994 (see Appendix 7). Fishery officers at the district level in 13 provinces estimate CPUE using a form provided by the FiA.
Imports – total imports of fisheries commodities in live weight equivalent, categorised as: (i) food, which includes whole-meat, filleted and processed fish in live weight equivalent; and, (ii) non-food, which includes fodder, industrial use and other uses.	Fresh fish and 18 types of seafood are imported through 19 international gateways by air and land. Fresh fish mainly from aquaculture are imported from Vietnam and Thailand in the dry season when there is shortage of wild fish supply to meet local demand.
Use table – intermediate consumption **Feed:** use of fish products as input to manufactured feeds, an important element of modern commercial aquaculture (in granule or pellet form, fish meal and fish oil). **Other uses:** this includes all other industrial uses except export, household final consumption and changes in inventories	Fish catch not acceptable for human consumption are used as fish feed in aquaculture or fertilisers. Estimates of amounts used are not available.
Use table – household final consumption **Food***:* total amount of fish and aquatic products consumed by households as food, both purchased and otherwise obtained. **Other uses:** refers to the total amount of fish and aquatic products consumed by households for purposes other than food.	The last consumption study was conducted by Hortle in 2007, supported by the MRC, which reviewed previous studies to estimate fish and other aquatic animal consumption in Cambodia and the Lower Mekong countries of Thailand, Laos and Vietnam. (see Section 1.2).
Use table – changes in Inventory **Post-harvest losses:** includes fish and fish products lost between the point of capture or harvest and the point of use. **Other changes**: other positive or negative changes in inventory.	Not available.
Use table – exports **Food** including whole-meat, filleted and processed fish. **Non-food** which includes fodder, industrial use and other uses.	Exports of freshwater fish are recorded by fish species and provincial fisheries cantonment. Fish paste (*prahok*) is the biggest export in terms of volume/number accounting for 57% of all exports. Appendix 6.11 and Appendix 6.12 show that only three provinces reported their exports in 2018, so the true extent of food exports is unknown.
ASSET ACCOUNT: DATA / INFORMATION NEEDED FOR STOCK ASSESSMENT	
Stocks of aquaculture facilities.	The number and area of ponds, cages and pens for aquaculture are recorded.
Migrating fish and those that straddle the border of a country's exclusive economic zone which are considered to belong to that country while inhabiting the zone.	Not available.

DATA CATEGORY	DATA AVAILABILITY
Define the exclusive economic zone (EEZ), and designated inshore fishing areas and marine protected areas that may affect fish density.	EEZ is 200 nautical miles. Protected areas defined and mapped.
All resources in coastal and inland fisheries in its EEZ throughout their life cycles.	Stock assessments are not available. Assessment of inland fish stocks is complicated as Cambodian fisheries are multi-species with 500 fish species and 150 types of fishing gear. Fish catch assessments for the period 1997–2002 were undertaken by a project for the management of freshwater capture fisheries of Cambodia funded by the MRC/ Danida.
Fish stocks on the high seas and those subject to international agreements on exploitation, in accordance with the portion of access rights to the resources that belong to it. Estimates must be in line with legal frameworks for international fisheries management established under the UN Convention on the Law of the Sea.	Not available.
Commercial sea and freshwater operations, aquaculture, subsistence and recreational catches.	See above.
Weight of fish caught in IUU fishing activity (this information also links to Supply and Use Table).	IUU statistics are not available (see above).
Biological and bio-economic fish studies in Cambodia.	Availability unclear – literature review required. There are a number of biological, economic, environmental, impact and ecological studies by the MRC (http://www.mrcmekong.org).
For inland waters: surface area of lakes and wetlands.	Total wetland area is 46,150 square kilometres, consisting of 41,661km^2 of freshwater wetlands, 3,045km^2 of lakes, 15km^2 of ponds, 29 km^2 of marine tidal intercoastal areas, riverbank 25 km^2 of riverbank and 1,375 km^2 of riverine areas (MRC, 2019).
For marine environments, indicators such as the mean trophic index and the ocean health index.	Not available.
Number of small scale fishers, disaggregated by sex, age, location.	Not available. A small number of site-specific studies are reportedly available, but have not been reviewed.
Water accounts can provide information on health of freshwater resources. Of particular relevance may be assessment of changing seasonal patterns of the area of rivers and wetlands that can provide important habitats for the breeding cycle of certain fish stocks.	Water quality in the Cambodian Mekong is very good, safe for human consumption and aquatic animals (MRC, 2019). The water quality of Cambodian marine waters is not monitored.

Notes: [a]The scope of the physical flow account is all fish and other aquatic products. To support the aggregated perspective the SEEA-AFF groups fish products based on the International Standard Statistical Classification of Fishery Commodities (ISSCFC). In this classification, fisheries commodities are classified according to the species and to the degree of processing. There are 13 major groups: freshwater fish; diadromous fish; demersal fish; tuna, bonito, billfish; other pelagic fish; other marine fish; crustaceans; cephalopods; other molluscs; other aquatic animals; pearls, sponges, coral; algae; and macro plants. These groupings of fish products may also be categorised by production process, such as aquaculture or capture fisheries.

[b]The supply table has four main categories for domestic output (catch or harvest) (i) **gross***:* total live weight of fish caught (including subsistence, commercial, illegal, unreported, and unregulated); (ii) **nominal***:* live weight equivalent retained and landed by fishers after at-sea discards, equal to the gross catch less the discarded catch; (iii) **discarded***:* catch discarded at sea in live weight equivalent (UN Statistics Division suggests this to be the difference between gross and nominal catch); and (iv) **other catch***:* (including household catch) entry includes other fish production except for capture fisheries and aquaculture, eg subsistence catch or recreational fishing.

4.1.1 Fisheries Administration statistics

The official annual report of the Fisheries Administration (FiA) of the Ministry of Agriculture, Forestry and Fisheries (MAFF) is the main source of fisheries statistics (FiA, 2019). Appendix 6 provides the FiA statistics for 2018.

National fisheries statistics are compiled by the FiA based on information collected from 25 provincial and city fishery cantonments. Provincial fisheries cantonments compile statistics from regional fisheries (groups of districts) once a year using a template provided by the FiA. Cambodia uses the FAO fisheries statistical approach, according to which fishery officers at the district level visit and observe fish landings and estimate catch per unit of effort based on the number of active days, and type of gear and boats. A project funded by the MRC/Danida (1994–2002) for the management of freshwater capture fisheries of Cambodia introduced the approach and trained 80 fishery officers in 13 central provinces and cities to use it. The FiA prepare the data received from the provincial departments for MAFF, which is responsible for providing the data to the Ministry of Planning. The National Institute of Statistics (NIS) is provided with high-level estimates on total catches and value to be integrated into the System of National Accounts (SNA).

Fishery production (catch) is reported for the following categories of fishery: (i) freshwater fisheries covering dai (bagnet) fisheries, family-scale fishing in the public fishing domain and family fisheries in rice fields; (ii) marine fisheries; and (iii) aquaculture (fish culture, shrimp, crocodile culture and fish fingerling production). In 2018, the total marine, inland capture fishery and aquaculture production was 910,153 tonnes. Freshwater fisheries amounted to 535,005 tonnes, comprising 16,975 tonnes of fish from dai fishing in the Tonle Sap River, 360,730 tonnes from family fishing in the public domain and 157,300 tonnes from rice field family fisheries. The marine fish catch was 121,100 tonnes and aquaculture production was 254,048 tonnes (Appendix 6.1).

Family fishing catches in both freshwater (inland) and marine public fishing domains totalled 360,280 tonnes in 2018. The FiA reports these figures broken down into 24 provinces and Phnom Penh (Appendix 6.2). The totals range from 130 tonnes in Odoar Meanchey and Preah Vinhear to 45,300 tonnes in Seim Reap. Marine and inland family rice field fisheries totalled 157,300 tonnes, ranging from 190 tonnes in Kep to 18,200 tonnes in Battambang and Kampong Thom (Appendix 6.3).[14] The catch in marine artisanal fisheries was 121,100 tonnes from the four coastal provinces – Kep, Kampot, Kompong Son and Koh Kong – ranging from 1,450 tonnes in Kep to 50,210 tonnes in Koh Kong (Appendix 6, Table 4).[15] Marine fish catches are reported by 51 species (Appendix 6.5). There is no breakdown of catch by species for inland fisheries.

Aquaculture production statistics are available for freshwater fish, snakehead fish, eel, frog, turtle, shrimp, crab, molluscs, bloody cockle, marine fish, fish fingerlings and crocodiles (Appendix 6.6). The number and area of ponds, cages and pens for aquaculture are also recorded. In 2018, there were 76,478 ponds, 8,158 cages (92% of which were in use), and 724 fish pens (Appendix 6.7). Table 7 below shows that aquaculture production has increased by 400% over the period 2009–2018.

Table 7: Aquaculture production (2009–2018)

DESCRIPTION/ UNITS	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Aquaculture (tons)	50,000	60,000	72,000	74,000	90,000	120,055	143,500	172,500	207,443	254,048
Crocodiles (heads)	185,000	283,000	230,000	250,000	320,000	215,500	298,669	307,000	392,777	410,000
Fish fingerlings '1000s heads	69,750	110,440	130,000	140,000	150,000	120,000	180,500	194,000	205,000	210,000

Source: FiA, 2019

[14] It is not clear if marine fisheries are in fact included in the data presented in Annex 6.2 and Annex 6.3. For example, Annex 6.2 reports a total in 2018 of 360,280 tonnes, which is the total reported under Table 1 for 'Family fisheries in public fisheries domain' for freshwater fisheries.
[15] The title suggests that these data do not include large-scale marine fisheries.

The number of fish hatcheries and community fish refuges are recorded by provincial fisheries cantonment (Appendix 6.8). There are 309 fish seed production farms producing 210 million fish fingerlings and 884 community fish refuges. Community fish refuges are established by individuals from one or more village who voluntarily agree to work together to sustainably manage and conserve fish brood stocks in public ponds and lakes in order to maintain fish reproduction. They are recognised and supported by the competent fishery authority and the local authorities.

Fish processing. Annual statistics are collected on fish processing activities. Statistics on processed freshwater fishery products are provided for each provincial fisheries cantonment covering the following products: dry salted fish, smoked fish, fermented fish (*phaak*), fermented fish (*mam*), fish paste (*prahok*), dry fish, salted fish, dry shrimp, fish cake, fish sauce and 'other'. In 2018 Cambodia produced a total of 73,000 tonnes of processed freshwater fishery products, with the top three processed products by weight being fish paste at 29,881 tonnes, dry salted fish at 18,221 tonnes and salted fish at 17,027 tonnes (Appendix 6.9). Information is available on 25 processed marine fishery products, with the top three by weight being dry seaweed, steamed fish and boiled crab (Appendix 6.10). The total production of fish sauce, including marine fish sauce, was 58 million litres (Appendix 6.9 and Appendix 6.10).

Fish exports. Exports of freshwater fish are recorded by fish species and provincial fisheries cantonment. According to the data for 2018, exports were only made from four provinces: Kampong Chhnang, Siem Reap, Kampong Cham and Takeo, with Kampong Chhnang province accounting for 86% of all exports (Appendix 6.11). Similarly, processed fresh fish exports are also only recorded from four provinces: Kratie, Kampong Chhnang, Battambang and Siem Reap. This suggested that exports are under-reported as data are unavailable for the majority of provinces. Fish paste (Khmer name – *prahok*) is the biggest export in terms of volume/number accounting for 57% of all exports (Appendix 6.12). The total volume of freshwater exports was 30,554 tonnes of which fresh fish amounted to 18,251 tonnes and processed freshwater fish products 12,303 tonnes (Appendix 6.11 and Appendix 6.12). There are no data on marine and aquaculture fish exports.

Conservation areas. In total 665 conservation sites have been established throughout the country of which 148 sites are state-owned and 517 are within community fisheries areas (Appendix 6.13). As part of the fisheries reform in 2001 and 2012, 50 state-owned conservation areas were established covering 97,583 hectares. There are 97 deep pool conservation sites in northeastern Cambodia and 6,000 hectares of coral reef, seagrass and mangrove conservation areas in coastal areas.

Community fisheries. The number of community fisheries (CFis) and their members are reported in Appendix 6.14. In 2018 there were 516 community fisheries, of which 411 were registered with MAFF, with 332,168 individual members across 147,518 households. They are present in all provinces in Cambodia with the exception of Palin, Kampong Speu, Odoar Meanchey and Preah Vihear. Kratie has the most (66), followed by Kampong Chhnang (58). There are 517 CFi conservation areas.

Illegal fishing in freshwater and marine waters. In 2018, there were 3,204 cases of illegal fishing of which 228 pertained to marine fisheries. These included 2,950 cases involving the confiscation of illegal equipment,[16] 130 fines issued, 124 cases sent to court and 42 offenders sent to prison (Appendix 6.15). Fines and sales of illegal equipment accrued a total of 230 million riel (US$57,508) (Appendix 6.16).

Fisheries revenue. Total fisheries revenue in 2018 was 1,876 million riel (US$469,161) (Appendix 6.16), derived from various sources (Table 8, below). Revenue from bagnet fisheries accounts for around 60% of overall revenue.

Fishing gear. The amount of freshwater fishing gear in use is recorded by province (Appendix 6.17), broken down into industrial fisheries, artisanal fisheries and family fisheries. Industrial fishing gear covers barrage fisheries, bagnet fisheries and bagnets for capturing river prawn. Artisanal fisheries gear covers seine nets, deep dragnets, V-shaped push nets, giant cast nets, giant lift nets, fish weir traps and pair trawls. Family fishing gear covers gill nets, encircling gill nets, scoop nets, basket traps and cylinder traps. Gill nets dominate registered gear at 10,800,517 units in 2018, followed by cylinder traps at 218,872 units. The numbers of a further 17 types of active family fishing gear are also reported by province (Appendix 6.18).[17] The most widely used are hooks (42,538,593 units), bamboo tube trap (577,757 units), and hooks and lines (419,000 units). The large amount of fishing gear in use makes it difficult to accurately estimate SSF fish catches. A wide range

[16] These comprised: mosquito nets (1,344,604 metres); fishing poles and stakes (533,396 pieces); cylinder mosquito nets (19,513 units); electrofishing devices (382 units); bamboo fences (1,216m); brush park (50,782m^2); and newly-developed fish traps (3,964 units). They also released illegal fish back into the wild (72,967 kilograms).

[17] Freshwater gear includes cast net, cylinder trap, bamboo vertical cylinder trap, wedge-shaped scoop basket, drop door trap, horizontal cylinder trap, giant lift net, multi-pronged barbed spear, one- pronged barbed spear, two-pronged eel fork, bamboo tube trap, wedge cone trap, snake head wedge trap, plunge basket, encircling net, hooks, and hook and line.

Table 8. Summary of fisheries revenue (2018)

REVENUE MECHANISM	AMOUNT IN RIEL	COMMENT
Fees for bagnet fisheries	660,123,250	Fishing fee derived through bidding process
Gains from deposit	460,998,250	Money deposited by bagnet bid participants and allocated as their fishing fee for the second fishing season.
Fees for marine fisheries	170,559,500	
Previous debt	6,000,000	Debt recovery.
Fines and sale of illegal equipment	230,033,500	The sale of illegal fishing equipment seized such as boats.
Public service fee	190,320,000	This mainly relates to the fishery import licensing fee.
Property rent	149,590,713	Rent paid on state-owned buildings and warehouses.
Other income	9,018,595	
Total	1,876,643,808	

Source: FiA, 2019

of marine fishing gear is also used.[18] Of the 18 types of marine fishing gear used, mackerel gill nets (1,830,600 units), crab gill nets (644,500 units) and octopus traps (518,590 units) are the top three in terms of numbers (Appendix 6.19).

Fishing boats. In 2018 there were 34,092 non-motorised boats, 94% of which had a capacity of less than 5 tonnes. Ten provinces had over 1,000 non-motorised boats registered, including Kandal (8,862), Banteay Meanchey (4,400) and Pursat (3,612), while 13 provinces have fewer than 500 (Appendix 6.20). A total of 697 non-motorised boats were recorded in coastal provinces, all of which were under 5 tonnes. There were 83,115 motorised boats/vessels recorded in 2018 (Appendix 6.21); 7,212 (8.5%) were in coastal provinces. Motorised boats are categorised by engine power, with 71% of boats having engines below 10 horsepower and only 1.2% with engines over 50Hp.

Employment. Based on FiA statistics, in 2018 a total of 2,385,543 people were employed in fishery related activities. Of these, 2,256,499 (95%) were employed in family and rice field fisheries, 20,347 in artisanal and industrial fisheries, 28,118 in fish processing and 80,579 in fish farming (Appendix 6.22). There are full-time and part-time fishers, with others fishing occasionally. As discussed, other sources cite the number of people employed as fishers or working in fisheries related activities at up to 6 million.

4.1.2 Marine census, 2018

The FiA conducted a marine census over the period August–October 2018 in fishing villages across the four coastal provinces of Cambodia providing key baseline information on marine and coastal areas. The census found that there were 7,552 vessels in operation across the coastal provinces (Table 9).

The census grouped fishing vessels into three categories: large vessels with a length greater than 24 metres, medium-sized vessels 12–24m in length and small vessels of less than 12m in length (Table 10). They were also categorised by engine power (Table 11). Nearly all vessels are small or medium sized, with 70% of fishing vessels categorised as small. Only 10 large fishing vessels were recorded as being in operation in marine waters. Around 89% of fishing vessels have an engine of less than 50 horsepower.

[18] Marine fishing gear includes: trawler, anchovy encircling seine, beach seine, encircling seine, drift gill net, shrimp gill net/ shrimp trammel gill net (three layer), crab gill net, needlefish gill net, whitefish gill net, mullet gill net, mixed species gill net, mackerel gill net, octopus trap, scoop net and dredger, hand push net, hook, bamboo fake, and traps for capturing fish, crab and squid.

Table 9: Number and types of fishing vessels in the marine census (2018)

TYPES OF FISHING VESSELS	KOH KONG	PREAH SIHANOUK	KAMPOT	KEP	TOTAL
Fishing vessels	**3,396**	**2,523**	**1,039**	**594**	**7,552**
Non-fishing vessels					
Vessels for transportation	155	16	0	0	171
Vessels for purchasing fishery catch	14	6	0	0	20
Aquaculture vessels	33	0	0	0	33
Other vessels	32	3	0	0	35
Total non-fishing vessels	**234**	**25**	**0**	**0**	**259**
Total vessels	**3,630**	**2,548**	**1,039**	**594**	**7,811**

Source: FiA, 2018

Table 10: Number of fishing vessels by size in the marine census (2018)

TYPES OF FISHING VESSELS	LENGTH OF VESSELS (M)	KOH KONG	PREAH SIHANOUK	KAMPOT	KEP	TOTAL
Big vessels	≥24	10	0	0	0	10
Medium vessels	12–<24	773	930	317	304	2,324
Small vessels	<12	2,613	1,593	722	2,90	5,218
Total		**3,396**	**2,523**	**1,039**	**594**	**7,552**

Source: FiA, 2018

Table 11: Number of fishing vessels by engine power in the marine census (2018)

FISHING VESSELS BY ENGINE POWER (HP)	KOH KONG	PREAH SIHANOUK	KAMPOT	KEP	TOTAL
<50	2,967	2,115	1,028	589	**6,699**
51–90	157	110	7	5	**279**
91–180	179	257	4	0	**440**
181–270	57	26	0	0	**83**
270–540	36	15	0	0	**51**
Total	**3,396**	**2,523**	**1,039**	**594**	**7,552**

Source: FiA, 2018

There were 34 types of fishing gear used (Table 12), the five most common being trawlers, crab traps, crab and fish gill nets, and traps with 100 slit entrances, which together make up 70% of the total amount of gear in use.

Around 29% of fishing vessels are equipped with Global Positioning Systems (GPS), 1% with GPS and an eco-sounder, and 1% with a compass. Hence the majority of fishing vessels have no GPS or fish finder devices. Around 45% of fish catches are kept in ice

Table 12: Number and type of fishing gear used in marine waters in the marine census (2018)

NO	TYPE OF FISHING GEAR	KOH KONG	PREAH SIHANOUK	KAMPOT	KEP	TOTAL
1	Trawler	329	854	323	63	1,569
2	Crab trap	731	235	91	116	1,173
3	Crab gill net	651	259	23	116	1,049
4	Fish gill net	456	256	175	37	924
5	Trap with 100 slit entrances	1	216	253	154	624
6	Shrimp gill net	332	188	30	4	554
7	Hook and line for squid	215	121	3	51	390
8	Troll line for cuttlefish	93	103	52	23	271
9	Push net	92	112	3		207
10	Hand push net	89		19	2	110
11	Dredger for blood Cockle	44	57	1		102
12	Fish trap	38	35	10	5	88
13	Fish hook	65	14	1		80
14	anchovy encircling seine	54	1			55
15	Squid trap	37	9	3		49
16	Spear	48				48
17	Fyke net	3	29		11	43
18	Fish bottom hook	18	6		3	27
19	Dive to capture oyster	2		24		26
20	Encircling seine net			22		22
21	Gill net for mantis shrimp	18				18
22	Fishing vessel with light to attract fish or anchovy seine net to capture fish	18				18
23	Shrimp trap		14			14
24	Shrimp push net	14				14
25	Crab scoop net	13				13
26	Long line	13				13
27	Floating gill net		11			11
28	Long line for bottom ray	6	1		2	9
29	Beach seine		2	1	5	8
30	Seine net (*Uon Tith*)	5			2	7
31	Encircling net	1		5		6
32	Crab scoop net	5				5
33	Cast net	3				3
34	Snail trap	2				2
	Total	3,396	2,523	1,039	94	7,552

Source: FiA, 2018

Table 13: Number of fishing vessels registered and unregistered in the marine census (2018)

REGISTRATION	KOH KONG	PREAH SIHANOUK	KAMPOT	KEP	TOTAL	PERCENTAGE
Unregistered	3,217	2,469	1,039	593	7,318	97
Registered	191	41	2	0	234	3
Total	3,408	2,510	1,041	593	7,552	100

Source: FiA, 2018

storage, 29% are kept alive, 0.1% in frozen storage and 26% (mixed big and small fish) are kept fresh and left on vessels (FiA 2018). No small fishing vessels and only some medium-sized fishing vessels have ice for fish storage during their 24 hours-fishing trips (FiA 2018). Fishing vessels are rarely registered, with 97% of the fishing vessels found to have no official registration (Table 13). There were 116 fishing vessels with a fishing licence of which 96 were issued by the FiA and the other 20 by the provincial Departments of Agriculture.

There are 81 fishing ports, small fish landings and village fish landings. In total there are 16,151 marine fishers (7,201 in Koh Kong Province, 5,686 in Preah Sihanouk Province, 2,042 in Kampot province and 1,222 in Kep Province). According to article 34 of the Fishery Law (RGC, 2006), all activities related to fishing, aquaculture, and the stocking, processing, buying and selling of fishery products require a permit and for actors to hold a logbook issued by the Fishery Administration for statistical records. They are required to record statistics daily in the logbook and be certified by the competent fisheries administration on a monthly basis, but only 21 of the total 7,552 fishing vessels were found to have a log book (FiA, 2018).

4.1.3 Monitoring studies

Numerous research and monitoring studies, mainly in inland waters, have been undertaken which provide data and information. However, these studies are fragmented across time and space and were designed to meet a variety of purposes. There has been no systematic collation of data and information from previous studies. This study has reviewed key monitoring studies by the FiA and others. It has not been possible to also undertake a review of the scientific literature, which may hold some data of relevance to the fisheries satellite accounts and SSFs.

1. Inland Fisheries Research and Development Institute studies

A number of long-term fisheries monitoring studies are undertaken by the Inland Fisheries Research and Development Institute (IFReDI) in collaboration with the Mekong River Commission (MRC) to identify trends, as discussed below.

An ongoing monitoring study on **fish larvae** which started in 1994 in Chaktomuk (the Cambodian Mekong Quarter Bra) provides annual data on fish larvae species and abundance.[19] The study uses bongo nets to filter fish larvae flowing from the upper Mekong River section to Chaktomuk, and then distributes the fish larvae to the lower Mekong River, Bassac River and Tonle Sap River. The study findings show a positive relationship between fish larvae produced and fish production. In 2018 a total of 113 fish species belonging to 25 families were identified in the Mekong and Tonle Sap rivers comprising 50 species of Cyprinidae (44% of the species), 10 species of Pangasiidae (9%), 6 species each of Siluridae and Cobitidae (5%) and 19 other families with 1–3 species each (28%) (IFReDI, 2018). The data from 2004 to 2017 show that the density of fish larvae captured in Chaktomuk varied from year to year and correlated with changes in the flood level of the Mekong River in Cambodia (Table 14). The higher the flood level, the greater the fish larvae density (Bunthang and Phanara, 2018).

The monitoring of **gill net fisheries in northeastern Cambodia** has been ongoing since 2007. This monitoring study provides incentives to community fishers to record daily fish catches in six selected communities. The study monitors fish abundance by species as an indicator of the health of fisheries in the upper Cambodian Mekong River. So far, no trend analysis of gill net fisheries has been undertaken.[20]

[19] Monitoring drift of fish larvae and fry in the Mekong and Tonle sap rivers in Cambodia.

Table 14: Density of fish larvae and flood level in the Mekong River in Cambodia (2004–2017)

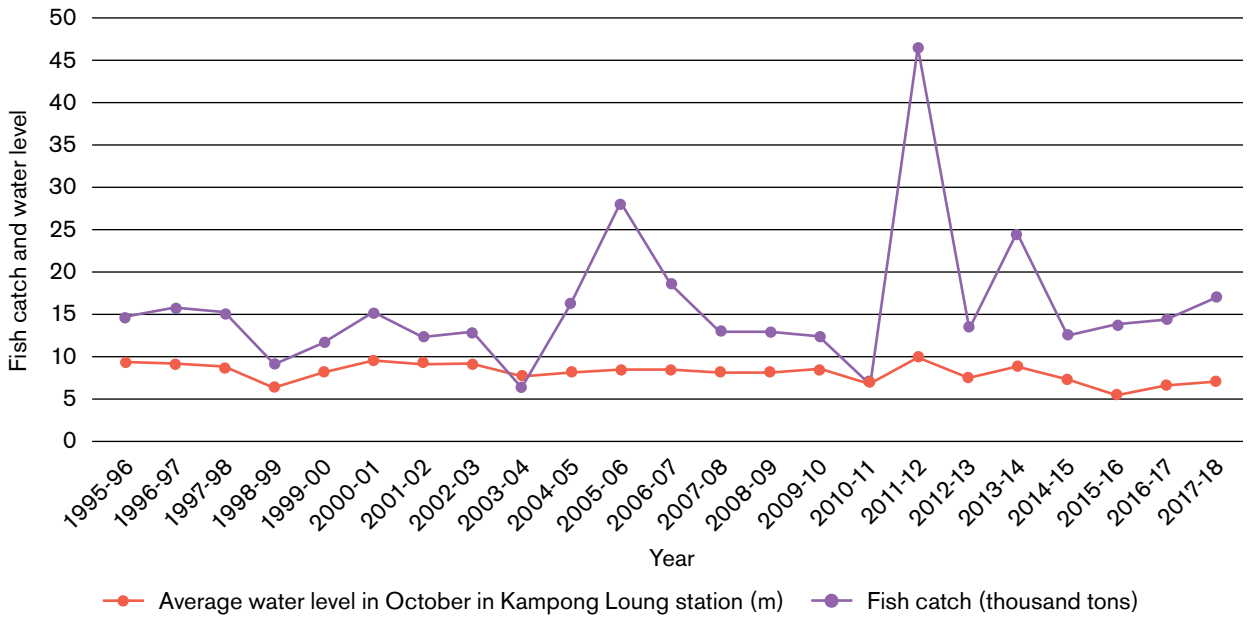
YEAR	DENSITY OF FISH LARVAE (PCS./M³)	FLOOD LEVEL (M)
2004	228	7.8
2005	91	6.8
2006	53	7.1
2007	36	5.6
2008	47	7.3
2009	24	7.7
2010	12	3.6
2011	7	4.3
2012	91	6.6
2013	421	6.8
2014	38	7.7
2015	58	7.8
2016	328	7.9
2017	121	7.5

Source: IFReDI, 2019

Bagnet fishery monitoring in Tonle Sap River (also known as dai fisheries) started in 1994. Monitoring data show a fluctuation in annual fish catch by species and species diversity in relation to flood water levels of the Mekong River measured at Kampong Luong hydrological station in Kampong Chhnang Province (Figure 3). Many fish species tend to spawn around the onset of the floods and their fry enter the food-rich wetlands within the floodwaters. Other species use the flooded plains and forests for reproduction and as nurseries. The most productive of these are the so-called opportunists – small, fast-growing and prolific species that are low in the food chain. Large numbers migrate back to the river when the floods recede from October through February. Migration usually peaks in December and January, and monitoring is conducted from October to February/March depending on the condition of flood from the Mekong River. These dai fisheries monitoring data are used as an indicator for the whole of Cambodia's freshwater system, and especially for white migratory fish species in Cambodia's central floodplain.

Monitoring reports are shared with FiA's planning and statistics department, but do not seem to be used at all to complement and confirm the reliability of the provincial statistics that feed into national macro indicators such as GDP[21]. The impression from monitoring data is that fish catch, larvae and dai

Figure 3: Bagnet fisheries catch and average water level in the Tonle Sap River (1995–2018)



Source: Fish catch data were taken from the Fishery Administration, Cambodia and water level data were taken from the Department of Hydrology and River Works at the Ministry of Water Resource and Meteorology.

[20] Bunthang, *pers. com.* 2020.

fisheries are declining, because of the water levels. In 2019 for example the rains were two months late causing drought. Some trends are apparent; for example in areas with dams there are no patterns of seasonal peaks. For dai fisheries, catch per unit of effort (CPUE) is stable, but there is a decline in diversity, with 10 species making up 90% of the catch.

IFReDI teamed up with the Scientific Capacity Development Initiative (Sci-Cap) to improve Cambodian Mekong fisheries management through a collaborative fisheries monitoring project. The project, which is now finished, used a different monitoring protocol to the MRC, over a period of 4 years. MRC monitoring uses three types of fishing gear (hook, line and gil net) belonging to fishermen while Sci-Cap provided gear to fishermen for experimental purposes. The IFReDI Sci-Cap database reportedly covers all key freshwater areas – the Sesan, Sekong and Srepok rivers ('3Ss'), Tonle Sap, and Lower / Upper Mekong – and collected data on catches per fisher day, water level and temperature across seasons based on a random sample of households and habitats. The project worked with non-governmental organisations (NGOs) in the field, a local organisation, the Culture and Environment Preservation Association (CEPA) and the World Wide Fund for Nature (WWF). Some interviewees expressed the view that the fish monitoring tool used was too scientific and complicated.

A protocol for standardised fish sampling in Mekong countries was developed in 2016 by WorldFish and IFReDi (Boon et al., 2016). One of the aims of the study was to bridge the gap between the government and communities as well as between the science and policy. Key elements of the initiative included support for the development of a suite of monitoring indicators and a tiered strategy to provide widespread data coverage in collaboration with Sci-Cap; capacity development for systematic monitoring and surveys of the Lower Mekong standardised across government agencies, NGOs and community fisheries; and integration of data into the online monitoring database set up by Sci-Cap for the collation and distribution of data and information. The location for developing the protocol was the downstream reaches of the 3Ss river basin in northeast Cambodia.[22]

2. Others

This section provides an overview of a selection of studies and initiatives undertaken by NGOs and international organisations.

CEPA have been supporting community fisheries since 2000. They facilitate communities to collect and record monitoring data on fish catches, species, size and weight to measure the impact of community management. They work with communities along the Mekong River in Kratie and Stung Treng, which are important spawning areas. Catches and CPUE have been seen to increase in areas managed by communities and these increases are believed to be linked to the conservation management practices in place, such as the protection of deep pool fisheries and flooded forest to strengthen stock in the spawning season and hence enhance fish reproduction.

Fisheries Action Coalition Team (FACT) work with community fisheries encouraging them to conserve and protect their areas. Under a 4-year European Union (EU) project they set up and trained a data collection group in the Mekong area. Fish catches were monitored weekly and the results used to encourage conservation efforts, as the monitoring demonstrated a positive link between fish catch and good management. This work is set to continue through a small grant from the Swedish International Development Cooperation Agency (Sida). In 2019 fish catches declined, something believed to be linked to climate change and the low level of water in the Tonle Sap.

WWF-Cambodia supported fish catch monitoring in Kratie as part of the Sci-Cap project over a two-year period (WWF, 2016). The overall purpose of the training was to give members of Community Fisheries the skills to become researchers and data collectors. The training was conducted by the Sci-Cap and attended by fishermen from 10 CFis. The participants were taught how to monitor and record the size and weight of each fish species from their daily fish catch. These data are vital to understanding fish abundance in CFi projects and the species of fish present, in order to safeguard the populations, and if collected over time can highlight potential concerns over sustainability. The fishermen were provided with GPS devices to monitor their catches as well as their locations. The data was compiled into a database and sent to the Sci-Cap team in the United States, however it was not possible to determine the status of this database.

A limited number of NGOs are working in coastal and marine fisheries, such as Fauna and Flora International (FFI), Mangroves for the Future / International Union for the Conservation of Nature (IUCN), and FACT (freshwater and marine). FFI set up a marine programme 10 years ago and are supporting communities to manage Marine Protected Areas (MPAs). They work with two CFis in Koh Rong and in Koh Sdach. They are looking to expand their work and have submitted a proposal to the Blue Action Fund for a 5-year project, which would allow FACT and FFI to work along the

[21] An example of a report on dai fisheries monitoring is provided in Appendix 7.
[22] The Sekong and Srepok rivers both originate in Vietnam and flow into the Sesan river which also originates in Vietnam and joins the Mekong River in Stung Treng Province, Cambodia.

entire coast to build community capacity in patrolling. FFI have undertaken some monitoring of coral reefs (using satellite imagery), mangroves and seagrasses to support MPA development and inform zoning. This work has not fed into or been designed to inform the valuation of ecosystem services. They have also undertaken small-scale monitoring of fish catch, for example a survey at fish landing site of target species such as sea horses, and have collected socioeconomic data.

IUCN have several projects in the Tonle Sap, Mekong and coastal and marine areas. An EU project during 2013–2016 called Strengthening the Capacity of Fishing Community was implemented by IUCN and FACT. The project provided direct support to communities on how to build capacity, better manage their resource and establish and manage fish conservation areas. The Boeng Tonle Chhmar Ramsar site was selected as a study site as there had been limited investment by other donors and it is remote and difficult to access in the rainy season. In a number of cases community protected areas, under the MOE, and community fishing areas overlap and co-management has been promoted. Where fish conservation areas have been established with the co-operation of communities, fish stocks have been seen to be increasing and the confidence of community members has been restored. However, an independent evaluation of the project found that building capacity is not enough to ensure protection and that the lack of community-level financing is a key challenge despite a range of potential sources of financing (eg contributions from members, saving groups,[23] ecotourism and Commune Investment Funds). In response, IUCN has piloted a Mini Fund for Community Fisheries management. Working with community fisheries in the Tonle Sap and Mekong, it deposits US$5,000 per community with a local bank, which generates US$35 per month at 9% interest. This interest covers around 50% of the monthly budget of the CFi's management and operational costs (such as patrol costs and meetings). An additional €20,000 from Kreditanstalt für Wiederaufbau (KfW) will be used to provide similar support to two more communities at the Ramsar site. IUCN has also developed a monitoring tool to assess the effectiveness of this approach and to build a case for its replication.

IUCN has worked with communities to monitor fish catches in the buffer areas of fish conservation areas, as an indicator for conditions within the conservation area. Local communities have recorded data on the number and type of species caught weekly using a basic form. Non-CFi members can fish in the buffer zone area but are required to pay a Fishery Resource Management Fee, which goes towards managing the fishery, of 5,000 riel, about US$0.25 a day (they can reportedly sell around US$5 worth of fish a day). The aim is to build capacity in community fishery management and they plan to work with FACT and CI to develop a fisheries monitoring form for target areas.

WorldFish, funded by the United States Agency for International Development (USAID), is undertaking monitoring work in community fish refuges / rice fields in 40 sites across 4 provinces. The project is in its second phase and a dataset is available dating back to 2012. Data collection is ongoing until the end of 2020. The data are based on a survey component and actual / experimental fishing and are used to assess the quality of conservation areas / catch. The study covers rain-fed flood areas, not the flood plain. WorldFish's estimates of annual catch in rice fields are reportedly higher than the FiA. FiA's estimates are based on 30% of inland fisheries catch, based on dai fisheries which are well monitored.

World Bank Integrated Water Resource Management (IWRM) Phase 3 project is working in Stung Treng and Kratie Provinces on the Mekong River supporting 70 community fisheries with different activities such as developing management plans and community fisheries livelihood enhancement. The study undertook a baseline survey and will do an end-of-project survey in 2021.

There are a number of studies of sharks, ray sand mackerel in Cambodia and Southeast Asia by **SEAFDEC** (http://repository.seafdec.org/discover) such as:

- Paving the way for the development of non-detriment findings: Towards precise species identification of sharks and rays in Southeast Asia in 2019
- Standard Operating Procedures (SOP) Sharks, Rays and Skates Data Collection in the Southeast Asian Waters in 2017
- Field guide to rays, skates and chimaeras of the Southeast Asian region (in Cambodian language) in 2017
- Application of standard operating procedures for collecting data on sharks and rays in Southeast Asian countries in 2016
- Improving data collection on sharks in Southeast Asia: Regional approach to address CITES-related concerns in 2013

[23] Savings groups are group of people who establish a secure place for borrowing and saving money. The amount of money depends on the ability of the group. Loans are given to group members at low interest rates and without collateral. This may also be referred to as self-help groups or revolving funds (Lieng et al., 2018).

4.2 Key ongoing initiatives related to fisheries statistics

There are two key initiatives that are working to improve fisheries statistics and data management: the EU Cambodia Programme for Sustainable and Inclusive Growth in the Fisheries Sector (CAPFISH) project and the 50 x 2030 initiative described below.

The EU established the CAPFISH project to help the Royal Government of Cambodia achieve its long-term vision of social and economic development, food security, and poverty reduction as initiated with the Deep Fisheries Reforms and laid down in the National Strategic Development Plan. This 5-year programme started in July 2019 and is reportedly the biggest EU fisheries project in the world. The programme has two components: one on aquaculture (**CAPFISH-Aquaculture,** at €30 million) and one on capture fisheries (**CAPFISH-Capture Fisheries,** €92.7 million).[24]

The stated objective of CAPFISH-Capture Fisheries is for Cambodia to have sustainable capture fisheries, contributing to food security and poverty reduction. It comprises three pillars of engagement: (i) fisheries conservation and management; (ii) fisheries post-harvest and trade; and (iii) fishing communities' social and economic development. The CAPFISH-Capture Fisheries Programme functions by budgetary support to the FiA and by complementary support provided through the FAO (for fisheries management and conservation), the United Nations Industrial Development Organization (UNIDO, on post-harvest and trade) and NGOs and civil society organisations (for the improvement and diversification of fisheries communities' livelihoods).

The FAO Complementary Support project aims to strengthen fisheries management at the community, district/provincial and national levels. The project has nine outputs organised into six interlinked components.[25] Component 4 – improved knowledge for fisheries management – relates to two outputs: creation of a fisheries management system (Output 6) and more effective and relevant research for fisheries management (Output 7). Output 6 is closely aligned with the development of a fisheries satellite account and is summarised in Box 5.

The budget support to the FiA is to support implementation of its policies and better prioritize its needs (including research needs). The development of research guidelines to monitor fish catch in inland and marine waters has been identified as priority, with a methodology to do this expected in 2020. FiA have recently agreed a one-year workplan under which the FiA's Community Fisheries Development Department and IFReDI will develop research guidelines on how to adopt and fund CFis, approved by Ministry of Finance and Economy and MAFF, in addition the department will develop the CFi database. This enhanced database will be important for indicating the status of CFis and intervention gaps and priorities. Currently, FiA and FAO/EU CAPFISH are in the process of preparing the draft guidelines and undertaking consultations.

The **50 x 2030 initiative** aims to have routine agricultural surveys instituted by 2030 in 50 low and lower-middle income countries, including Cambodia, and to harness the power of data to boost the productivity and livelihoods of the world's 500 million smallholder farmers and support countries in achieving Sustainable Development Goal 2.[26] The initiative works with national statistical offices to support the implementation of two well-established surveys: the World Bank's Integrated Surveys on Agriculture ISA as part of the Living Standards and Measurement Study and the FAO's AGRISurvey. The initiative is expected to evolve new methods of data collection, such as geospatial and remote sensing technologies. It is funded by USAID, the Bill & Melinda Gates Foundation, the Australian Department of Foreign Affairs and Trade, the World Bank, the FAO, the International Fund for Agricultural Development, the German Federal Ministry of Economic Cooperation and Development (BMZ) and the EU.

In Cambodia USAID is funding 5 years of full support and 10 years of technical support provided through FAO for an annual agricultural survey. An agricultural survey is planned for 2020, and will include a module on fisheries. One objective is to make data collection more efficient through the rationalization of existing surveys and other means. For example, the National Institute of Statistics produces a Social Economic survey every two years, which collects data on agriculture that could be more closely aligned with the agricultural survey.

[24] The total estimated cost of the CAPFISH-Capture Fisheries Programme is €92.7 million, with a €87 million contribution from the EU budget, comprised of €35 million for budget support, €49.8 million for complementary support and €2.2 million for audit, evaluation and contingencies.
[25] (i) Fisheries conservation, management and compliance; (ii) Tonle Sap Biosphere Reserve; (iii) support to fishing communities; (iv) **improved knowledge for fisheries management**; (v) general fisheries institutional capacity enhancement; and (vi) project management.
[26] Specifically, Indicators 2.3 (double agricultural productivity and incomes of small-scale farmers) and 2.4. (ensure sustainable food production and implement resilient agricultural practices).

BOX 5: FAO COMPLEMENTARY SUPPORT PROJECT, CAPFISH-CAPTURE FISHERIES PROGRAMME, OUTPUT 6: SUPPORT CREATION OF AN INTEGRATED FISHERIES INFORMATION MANAGEMENT SYSTEM

Output 6 aims to make fisheries information more comprehensive, reliable and accessible to users at the national, provincial, and district levels by:

a) Building capacity within small teams/units of FiA in database management, Geographical Information System (GIS) mapping and statistics

b) Improving the quality and availability of catch and other fisheries statistics

c) Establishing an online integrated fishing vessel and license/permit database

d) Improving electronic management and exchange of fisheries information within FiA and between national and provincial providers of fisheries information

e) Linking fisheries to cross-sectoral information systems.

The project's activities for this output may include:

- Providing support to the assessment of the fisheries information system including technical capacities, IT and telecommunication infrastructures, in the Ministry of Agriculture, Forestry and Fisheries and in other existing governmental bodies, through:
  - Identification of the priority information needs for fisheries management
  - Diagnosis of the current fisheries data collection and analysis methodologies used by FiA departments and sub-national administrations (eg InProCam model[27])
  - Diagnosis of the current national fisheries information management system (including IT infrastructure/databases and processes) used by FiA to compile and manage relevant information from its departments and sub-national administrations
  - Repeat assessments of the systems and progress.
- Support the development of an integrated fisheries information system, though a progressive and modular approach including such aspects as (i) administrative records such as vessel registry, fisher registry, licenses and logbooks, and monitoring, control and surveillance (MCS) activities; (ii) databases on community fisheries mechanisms; (iii) catch statistics (coming from permanent statistics or periodic surveys); (iv) FiA annual work plan monitoring and evaluation, for example through supporting the development of guidelines and methodologies for statistical surveys, including catch surveys for marine and freshwater fisheries and providing advice and mentoring to the FiA on the organisation of FiA's training programme on fisheries statistics, including data collection and analysis.
- Harness opportunities to provide relevant fisheries-related information through cross-sectoral census and surveys, such as the annual agriculture survey, the annual Cambodia socioeconomic survey, etc.
- Improve dissemination of fisheries statistics and information, including cross-sectoral planning and monitoring systems such as monitoring of the Sustainable Development Goals (SDG).

Source: FAO, 2019a

In the past the sampling frame used has been tailored towards crops, livestock and aquaculture and therefore does not reflect fisheries. A revised sampling frame for fisheries, based on areas important to fisheries (eg a specific frame for the Tonle Sap / Mekong rivers) and different classifications of fisheries are needed to derive an accurate estimate of the number of fishers (part-time and full-time) and total catches. The official estimate is that there are 2 million fishers, but some feel that the real number could be double this. For marine areas, the FiA's 2019 study can serve as a frame, but it is as yet unclear how to set the frame for inland waters where fisheries are very diverse. Given the importance of getting the sampling frame correct, the survey for the fisheries module may be deferred to 2021, with 2020 used to define the frame. One suggestion is that community fisheries could be used to develop the sampling frame. but this is problematic as

[27] The model is suggested by FiA's Inland Fisheries Research and Development Institute and aims at calculating Cambodia's inland fisheries production. The model is about the total fish stock based on different parameters including: (i) the affects (exotic species); (ii) drivers (hydrological patterns); (iii) influences (physical environment- vegetation and hydro-power dams); and (iv) conditions (feeding, breeding, accessible migration).

not all community fishers are currently registered. This could become feasible in the future by building on the development of the CFi database. Strengthening the capacity of the community fisheries and local fisheries officers would help to gain a better estimation of number of fishers and fish catches. FiA has established networks of CFis in some provinces, which could help improve law enforcement, CFi management and fisheries information.

4.3 Key data gaps

A common view among interviewees for this study is that there is a high level of uncertainty around fisheries data. Good data and information were reportedly available during the period 1995–2002 due to a Danida-funded project on the management of freshwater fisheries, which invested in data collection. There has been limited investment in fisheries statistics since then. Key areas where data are missing or uncertain are discussed below.

CFi database. FiA's database on CFis is underdeveloped and as a result is unable to guide investment decisions. The FiA is planning to develop the nationwide database of CFis and community fish refuges (CFRs) covering both marine and inland fisheries, with the support of the FAO under the CAPFISH project. The purpose of the database is to store information on the status and progress of community fisheries management and implementation online so that all stakeholders can access the information and contribute to the database. With this information the government, development partners and NGOs can decide where and how to intervene to help communities.

Capture fisheries. Improving the reliability of catch data is seen as a priority. Official statistics show production is increasing, but this does not correlate with available evidence on stock based on monitoring studies. Gathering and analysing data on SSFs is challenging for a range of reasons (Box 6). Related to this is the development of processes to collect data, including the potential role that communities can play in data generation. FiA's recent marine census does not cover catch.

Stock assessments are not available for inland or coastal and marine fisheries and the impression is that stocks are declining and fish are becoming smaller, due to overfishing.

BOX 6: UNDERSTANDING SMALL-SCALE FISHERIES CATCHES IN CAMBODIA

Fish catches are usually estimated as a function of effort based on the number of fishers, boats or trips for each gear type and the mean catch for that gear type (i.e. CPUE). Most official fisheries information comes from mandatory inspections and data collection from logbooks and ports, so tends to exclude SSFs. Difficulties in obtaining information on SFFs include:

- SSFs are not always well regulated or monitored, unless the species caught are of high commercial value.
- Catch data may exclude sales in local markets or catch that is illegally sold locally or across borders
- Official accounts rely on local co-operatives for data collection and will exclude information from non-associates.
- Catch or harvests from women or children are often not reported. Although their contribution is often for subsistence, significant amounts go into local markets. To truly represent SSFs, information should go beyond catches and take a more holistic approach, for example including the often-ignored roles of women and children.
- Inspections are not always mandatory, and small-scale fishers tend to land outside official ports, for example fishers land their catch at home and much of the produce is dispersed through scattered informal markets, although it may be possible to track information by directly engaging with buyers and extracting information from their invoices. In Cambodia there are no landing ports.
- It is possible to track some information for SSFs with licences but extrapolating to fishers without licences requires additional steps for validation.
- Some small-scale fishers keep their own logbooks, although the reliability and accuracy of this information has been questioned, due to the inability to cross-check and validate.

Source: IIED, 2019

Estimating fisheries stocks requires special expertise, but can be built on (IIED, 2019):

- A **qualitative assessment** of fish stocks by considering various biological and bio-economic models and catch statistics to show whether species and fisheries are being under-fished, fully fished or over-fished.
- **Estimating stocks based on effort:** a common approach is to consider changes in the gross catch relative to fishing 'effort' – for example: labour, days at sea or size of vessel and fishing gear. The catch per unit effort (CPUE) may be an indicator of the change in stock size, assuming that population density and population size are correlated, and that the CPUE increases as population densities increase. Although this may be valid for larger industrial fisheries, it may not hold for SSFs. Size (length) distributions of landed catch by species can be a more accurate measure of the fishery ecosystem.
- Using **indicators of the condition of marine and inland water ecosystems** to understand the state of fish and other aquatic resources. These include:
  - Land-cover accounts, which are part of the SEEA Central Framework, for information on the surface area of lakes and wetlands – for example, to assess the changing seasonal patterns of an area of rivers and wetlands, such as mangroves, that can provide important habitats for the breeding cycle of certain fish stocks.
  - Indicators such as the mean trophic index and the ocean health index may be used for marine environments.[28]
  - Indicators of the condition and quality of water resources, such as changes in river flow, may be available on an ad hoc basis for specific locations.

Data on employment in fisheries and number of fishers by activity. Estimates of the number employed in fisheries in Cambodia range from 2 million to 6 million. There is uncertainty around the number of fishers working full time and part time across areas and types of fisheries. A socioeconomic study undertaken in 1995/7 in 6 provinces in the Tonle Sap floodplain funded by Danida, estimated that 10% of the population are employed full time in fisheries and 35% part time (Ahmed et al., 1998). Therefore, if 50% of population are involved in fisheries, this would amount to around 4 million people. A figure of 2,385,543 people is currently officially used (FiA, 2019). Another source places the overall number involved in fisheries at around 6 million Cambodians, however, precise analysis on gender roles and involvement is still lacking within the sector and there is a recognised need to collect more gender disaggregated data and information (MAFF, 2015). Rural women play important roles in fisheries alongside other contributions to the household, often unpaid, such as assuming responsibility for post-harvest management and home-based small local enterprises that process agricultural and fish products. In addition, 62.1% of children (aged 5–14 years old) have been reported to be working in the agriculture sector including fisheries such as fishing, post-harvest fisheries activities, repairing fishing gear and fish trading (FAO, 2019a).

Illegal, unregulated and unreported fishing. There are no estimates of illegal fish catch, however, the FiA is developing the National Plan of Action against Illegal, Unreported and Unregulated Fishing (NPOA-IUU) and National Plan of Control and Inspection (NPCI). The FiA will implement NPOA IUU and NPCI 5-year plan from April 2020. IUU-related reports are therefore anticipated from 2020 onwards.

Rice field fisheries / community fish refuge.[29] The rice field fishery catch was estimated at 157,000 tonnes in 2018 but the data are said to be limited (FiA, 2019). FiA are planning to update the area used for rice field fisheries to include the supporting areas that fish use to migrate through rice fields. A study on the potential of community fish refuges (CFRs) in rice field agro-ecosystems by WorldFish showed that a household may annually harvest 200–300 Kg of fish and other aquatic animal (OAA) from different aquatic habitats such as streams, water canals, lakes and rice fields (Brooks and Sieu, 2016). About one third of those 200–300 Kg may come from rice fields (Brooks and Sieu, 2016). The yield of fish and OAA in floodplain rice field fisheries in Battambang province was about 119 kilograms per hectare per season (Hortle et al., 2008).

Aquaculture. 10–15% of aquaculture production is located in marine areas. Assuming a 600,000 tonnes yield limit from capture fisheries, the Government is emphasising meeting growing consumption needs through increased aquaculture production. The Government has proposed increases in aquaculture production of a 20% a year have been proposed, but whether this is feasible has not been specified. Nor has the extent to which the country would need to rely on imports to meet potential shortfalls in supply due to falling productivity, increased demand and limits to sustainable aquaculture expansion.

[28] The mean trophic index is a prime marine biodiversity indicator. It is the Convention on Biodiversity's name for the mean trophic level of fisheries landings. The Ocean Health Index (OHI) is a scientific framework used to measure how healthy oceans are.
[29] Community fish refuges (CFRs) are a stock enhancement or fish conservation measure to improve productivity of rice field fisheries. In this context, a man-made pond or natural pond in a seasonally inundated rice fields that can hold water throughout the year is established as a dry season fish refuge for fish brood stock conservation (Olivier et al., 2012).

Consumption. The last consumption survey was undertaken by the MRC in 2007 and estimated fish consumption at 52.4 kilograms per person per year (Hortle, 2007). Other sources cite consumption per had ranging from 41kg to 63.5kg. A fish consumption survey combined with information about aquaculture production and fish import and exports could be used to build up an understanding of fish productivity. Import permits are issued by the Ministry of Agriculture, Forestry and Fisheries (MAFF) and fisheries imports and exports are controlled at 19 international border gates by the Cambodia Import-Export Inspection and Fraud Repression Directorate-General (CAMCONTROL) of the Ministry of Commerce.

4.4 Enabling factors, challenges and needs

This section provides an overview of the factors supporting the development of a fisheries account and challenges and needs.

4.4.1 Enabling factors

Interest within the government. The NIS and FiA have both expressed interest in building a fisheries satellite account and have experience in building other satellite accounts. The MoE is also reportedly interested in natural capital accounting.

BOX 7: COULD COMMUNITY FISHERIES PLAY A FORMAL ROLE IN DATA COLLECTION?

There are a number of examples of NGOs and the FiA supporting the participation of community fishers in the provision of fisheries data and information at specific locations. There is potentially scope for CFis to be used more formally in generating key data (eg on catches, species or length). This would serve many purposes. At the community level, data collection acts as a self monitoring tool, enhancing communities' awareness and understanding of their resources, while at the national level the data could inform national statistics and guide policy and investments. CFis have management committees and patrol groups, who could potentially be involved in data collection.

For such a system to work, an enabling environment needs to be established based on political will, allocation of resources, a standardised approach and the right incentives for communities.

- **Standardisation of monitoring and data collection approaches and templates**. Currently a number of NGOs are working with community fisheries to collate monitoring data using their own templates and approaches. For the data to inform official statistics at any scale requires a standardised monitoring protocol and template. Such a standardised process would need to be driven by the FiA. The data template needs to be simple, tailored to education levels and the fact that CFis have limited experience in keeping records, and to the time available to communities given their need to fulfil livelihood activities. Local fishery offices would need to assist CFis in data collection.
- **Incentives**. A general view is that CFis need incentives to support data collection as it would take time away from their income earning activities, and that involvement would need to be voluntary. NGOs have in the past provided cash incentives for fishers to complete monitoring forms. The FiA is developing CFi guidelines on the basis of which CFis will be able to receive ongoing financial support through the Ministry of Economy and Finance (MEF) to implement their community fisheries action plan. This may include incentives for data and information collection depending on their action plan. However, incentives do not necessarily need to be financial; for example, the provision of data might be used to justify / support micro finance. Such non-cash incentives remove the risk of sustainability issues and potential bias.
- **Capacity building and training**. CFis need additional training and support to engage in data collection. A lesson learnt from previous initiatives is that due to weak reading, writing and numeracy levels, fisheries officers or researches need to support data collection and recording activities by CFis. Data processing and analysis needs to be done by researchers or fisheries officers, who also required additional training in this area.

A phased approach would transition to a system where communities routinely collect data for the government over time. Potential steps include: (i) a review of templates that have been employed by FiA and other organisations, to understand common features that have worked well and lessons learnt; (ii) development of a standardised template with inputs from all parties; (iii) piloting the template on representative communities (marine / inland); and (iv) rolling out nationally.

Reasonable base of data to build on. While there are some key data gaps and uncertainties, there are enough data to build a fisheries account which can be developed and refined over time. The FiA's fisheries data and information would form an important contribution to a fisheries satellite account.

Supporting initiatives. The forthcoming NIS fisheries survey (50 x 2030 initiative) and the EU-funded CAPFISH project offer timely and significant opportunities to develop fisheries data and management. In addition, work supporting CFis in monitoring their areas provides an opportunity to engage communities in data collection in the medium to long term to improve the coverage and accuracy of the data collected (Box 7). The FiA also has a department dedicated to community fisheries, which can help support data collection and co-ordination on SSFs.

Challenges and needs

Complexity of inland fisheries. Estimating catch is difficult because there are multiple types of freshwater fishing gear (around 150) and fish catch fluctuates from day to day. There are also no official landing sites so it is difficult to record catch from CFis and SSFs. One possibility is to use GPS trackers on small-scale fishers' boats but while this technology is not expensive it needs the commitment of fishers and people who collect the data.

Statistical issues. Designing the sampling frame for the planned fisheries census and undertaking surveys of representative fishing communities is critical for moving towards more accurate data. Basing estimates on simple averages is liable to present a misleading picture of the sector as it minimises the importance of the sector to full-time fishers (as opposed to part-time and seasonal fishers) who depend on fisheries for their income. Occupational classification in rural Cambodia is difficult as livelihood diversification is the norm and any individual or household typically has multiple occupations.

Capacity. Almost two decades ago the MRC built the capacity of fisheries officers in data and information collection and analysis in 13 provinces in central Cambodia. Since then there has been limited training and many of those trained by the MRC have retired or have been reassigned to other areas. There are not enough trained staff at the provincial level to undertake the data gathering and analysis needed, including facilitating the work of CFis in collecting fisheries data.

Challenges to introducing environmental accounting to policy processes. Bass et al. (2017) elaborate the following common challenges related to the integration of SEEA into policy: (i) the prevailing policy focus on the short term and limited policy readiness for change; (ii) acceptance of the information presented and its perceived credibility and trustworthiness; (iii) the communication of complex information; (iv) ensuring collaboration and understanding among diverse professions and institutions; and (v) maintaining high-level support. They propose ten "living principles" for ensuring that environmental accounting is policy-ready, grouped under four headings: comprehensive, purposeful, trustworthy and mainstreamed (Bass et al., 2017).

Co-ordination of data and research. The SEEA-AFF serves as a tool for harmonising and aligning data from various agencies and sources (surveys and censuses, administrative sources, and geospatial information systems). However, this requires increased harmonisation of existing data-collection efforts across different data domains. The regular production of accounts therefore requires legal, administrative and technical mechanisms for data exchange to be established. Agencies compiling accounts often benefit from national laws giving them the authority to collect and use information as well as security of funding for the ongoing production of accounts (Vardon et al., 2018). Such mechanisms need to be developed in Cambodia, led by the government. Mechanisms to improve data co-ordination and alignment include first the strengthening of the integration and co-ordination of data from different departments in FiA (the Department of Community Fisheries who collect SSF data, Department of Aquaculture who have data on Community Fish Refuges, IFReDI and MAFReDI who have monitoring data, and the Department of Planning, Finance and International Cooperation who are in charge of fisheries statistics). Second, it will require inter-ministerial co-ordination of statistics relevant to fisheries management and accounting among the NIS, FiA and MoE. Third, the parties involved in fisheries data collection (NGOs, the government and international organisations) will need to hold regular meetings. Some existing co-ordination mechanisms such as the NGO network and the Coalition of Cambodia Community Fisheries could be built on for mutual support and sharing information.

Funding. Artisanal and small scale fisheries statistics are costly to generate and there is currently little investment in statistics. The FiA receives roughly US$2 million a year from the government and around US$10 million per year from development partners. CFis rely on external organisations to fund the collection of statistics or improvement of their fisheries management plans. There is a need to establish a budget line for CFis or potentially to provide financial support through the provincial treasury or community budget. Commune Investment funds may be a source of financing for CFi management or data collection while some communities are also trying to generate their own income, for example through ecotourism initiatives.[30]

The challenges facing the development of CFis are discussed in Box 8.

BOX 8: INSIGHTS FROM COMMUNITY FISHERIES IN KOMPANG CHHNANG PROVINCE

Although remarkable progress has been made in establishing and developing CFis, they continue to face challenges such as weak law enforcement and lack of capacity, incentives and income for people to actively participate in the sustainable management of their community fisheries. This is borne out by the two CFis visited as part of this study in **Kompang Chhnang Province**.

Community fishing grounds in Koh Keo, Svay Chrum Commune, Roleab Ear District occupies 1,200 hectares of the Tonle Sap floodplain. Some 900 fishers use the area including members and non-members of the community fisheries in Svay Chrum commune and some others from nearby communes within 20 kilometres of the community fishing ground. Mainly small-scale or family subsistence fishing is practised under a community fishery which is co-managed between the government and the fishing community. The CFi targets multiple species, commonly capturing 55 species (mostly small cyprinid species) for family consumption and sale. There are no scientific studies of the status of fish stocks in this community fishing ground, however community fishers reported that some species are overexploited while others are recovering.

Fishing is typically undertaken by family members and fishing boats and equipment are family-owned. The men usually fish, with women helping occasionally. Cast nets, gill nets, set gill nets, traps (bamboo tube traps for eel, brush bundle traps known as *kansum* in Khmer), plunge baskets (*ang rut*), hooks and lines, hand dragged seine nets, and wedge-shaped scoop baskets (*chhneang day*) are commonly used. Boats have an engine capacity of 6–20 horsepower, and are less than 10 metres long and under 10 gross tonnes. Fishers operate in an area of up to 6 metres depth less than 10 kilometres from the shore of the lake. The average duration of fishing trip is around 6 hours. The boats do not have any ice storage and fish are brought to nearby markets and are mostly consumed locally. There are no fish landing sites.

Prior to the reform of the fishery sector in 2011, there was conflict between small- and large-scale fishers (the owners of fishing lots). However, this was addressed through the reform which abolished all fishing lots, and the establishment of this community fishery in 2007.[31]

Pumping water from a lake adjacent to the Tonle Sap Lake in dry season has caused low water levels and resulted in fish kill. Occasionally, the community suffers from floods, droughts, storms (which damage crops houses and school), and fish diseases resulting in fish kills. Like most rural Cambodians, Koh Keo community fishers are both farmers and fishers – they are full-time fishers in the wet season and farmers and part-time fishers in the dry season.

Kampong Os CFi is located in Kampong Os Village, Kampong Os Commune, Chul Kiri District. The community first established itself as a farming community in 2010 growing rice, beans and vegetables, and later registered as a fishing community in 2012. The community fishery occupies an area of 570 hectares and has 186 members. Members meet five times per year and mostly discuss ways of saving money and illegal fishing. The CFi management committee has seven members (five men and two women), who meet monthly to discuss patrolling, illegal fishing, management issues and collaboration with local authorities. They have not yet established a conservation area. Their patrol group consists of 15 patrollers who meet once a month. The major issue they face is illegal fishing, which they have no authority to prevent. The annual decline of fish catch is believed to be due to fish poaching, and as a result they are forced to use smaller mesh sizes to catch smaller fish. Fishing is mainly for family consumption.

[30] FACT are promoting livelihoods (ecotourism) and have set up a Community Saving Group. With an initial investment of US$1,000, monthly interest of US$30 is accrued – US$10 goes to conservation and US$10 to the CFi committee. Money is also lent to members at a 3% interest rate.
[31] Conflict between community fishers and agricultural farmers over the use of water sometimes occurs in other fishing communities.

5 Conclusions and recommendations

5.1 Conclusions

This diagnostic study has explored the potential for developing a set of satellite fishery accounts using an accounting framework that will help to disaggregate fisheries data and provide greater visibility to small-scale fisheries (SSFs). While SSFs are central to poverty alleviation, food security and economic development in Cambodia, they are currently under-represented in statistics including censuses making it difficult to adequately prioritise them in policy and planning. Furthermore, the total economic value of the fisheries sector in Cambodia is unknown both because of gaps in official statistics, and the illegal or informal nature of much of the activity in the sector.

Natural capital accounting is data intensive and a relatively new concept for Cambodia, as it is for many countries. However, Cambodia has experience in building satellite accounts (for tourism and forestry) and had expressed interest in developing a fisheries satellite account. A fisheries satellite account could be developed using existing information which, if regularly updated by national institutions, would track the sustainability of one of Cambodia's most critical natural resources, as well as inform key policy targets on poverty alleviation. Bass et al. (2017) note that while it takes time to produce accounts with the full range of functions, countries with relatively new programmes have been able to apply accounts to decision making and enrich national, sectoral, and regional planning.

The FiA routinely collects data on fish catches, processed products, exports and fishing gear and vessels, which are reported annually and integrated into national accounts. However, the reliability of the data, especially on fish catches, is widely questioned and stock assessments will be needed to better understand the sustainability of Cambodia's resources. Key statistics used in official documents, such as consumption data, are decades old and need to be updated. A number of projects undertaken in Cambodia over the past 20 years have generated data but they are often project specific, using different approaches at different sites. No analysis of the data available, taking into account all past and ongoing efforts, has been undertaken in any systematic way. While this diagnostic study has tackled this at a high level, a more detailed review is required covering the numerous disparate studies that have been undertaken.

Greater co-operation is needed between organisations to manage and link the available data, and move to a systematic approach for data collection in the future. More funding is also needed to develop fisheries statistics, along with buy-in from the Ministry of Economy and Finance and the Ministry of Planning given the role the fisheries sector plays in reaching key government policies, including delivery of the SDGs, and the importance of data for monitoring, management, policy development and decision making.

5.2 Road map

Based on the key data reviewed and stakeholder consultations undertaken as part of this diagnostic study, the following road map is proposed to build a SEEA-AFF fisheries satellite account and enhance SSF statistics generally. It should be noted that a central concept of the SEEA-AFF is a phased, tiered approach to implementation. It is recommended that users start with the use of national-level (default) data, including from international organisations, and address data gaps and build up the accounts over time.

As part of the FAO's complementary support project under CAPFISH, the FiA will have support to rationalise and target its data collection and set up a data management system. The FAO's project may support an initial study setting out what has happened in the past to develop a baseline, with the support of a statistician. This therefore represents a potential area of collaboration for any on-going work by IIED and / or other development partners to develop a fisheries satellite account.

A three-phase approach to the development of the satellite account is recommended, as broadly set out in Figure 4, and outlined below.

Phase 1: Plan and prepare

Phase 1A.

Build collaborative support and buy in for a fisheries satellite account (2020)

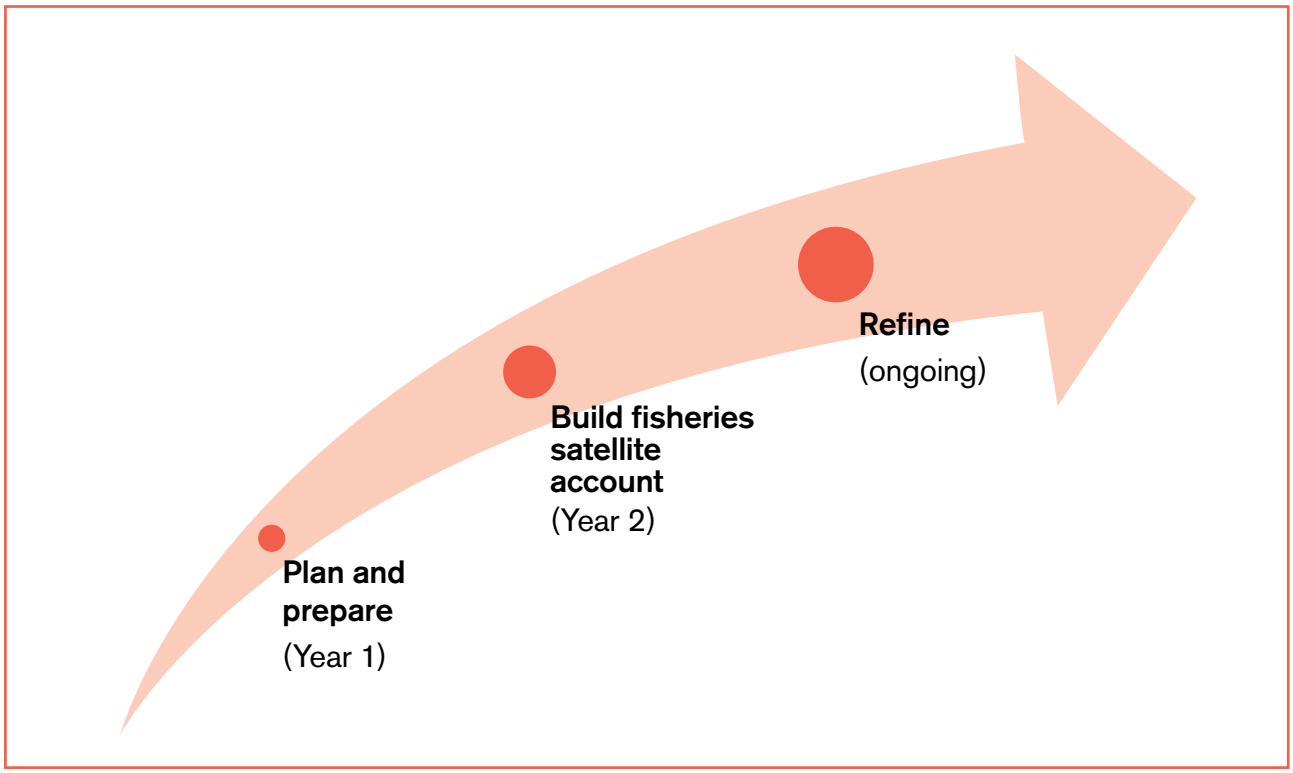
- Policy workshop to confirm interest in developing a set of fisheries satellite accounts with the NIS, FiA and MoE and determine priority areas for data generation.
- Training workshop covering policy applications and statistical features of fisheries satellite accounts and other related accounts such as coastal / ocean accounts.

Phase 1B:

Define approach and work plan and secure funding (2020)

- Define the scope of the proposed accounts. This includes the focus of the account (fisheries satellite account, coastal or ocean account) and the scale (national or sub-national). A pilot account at the sub-national level could be undertaken to build capacity and demonstrate the use of accounts, for example related to inland fisheries on the Tonle Sap, or a marine fisheries account.

Figure 4: Developing a fisheries satellite account



- Define approach, work plan, budget/funding to build account including collaboration mechanisms between government and non-government organisations, and their respective roles.
- Seek funding for ongoing technical support and training for Phase 2.

Phase 1C.

Strengthen the data collection and management process to facilitate the effective preparation of a small-scale fisheries natural capital account **(2020)**

- Establish the sampling frame for the NIS census on fisheries (supported by the FAO, 2020/21).
- Collate the existing information. Undertake a comprehensive review and analysis of past studies in the published and grey literature to inform the accounts. Where different estimates are available, determine the best data to use and the compatibility of data with common SEEA-AFF / NCA definitions and classifications.
- Review and analyse previous and ongoing projects and initiatives supporting CFis to develop best-practice approaches for working with CFis on monitoring and data collection.
- Develop a protocol for collecting monitoring data to harmonise information.
- Establish approaches to develop and disaggregate SSF data.
- Develop stock assessments to inform the fisheries asset account. Determine the best approach for measuring fish stocks (in order to determine whether species and fisheries are being under-fished, fully fished or over-fished) based on a detailed review of available biological and bio-economic models and catch statistics.
- Establish a methodological framework and collect the data for key data gaps such as on IUU fishing and estimates of discarded fish and links to post-harvest uses. However, collection of new data could be deferred to Phase 3 if resources are limited.
- Establish mechanisms to improve data co-ordination and alignment including: (i) strengthened integration and co-ordination of data from different departments in FiA (Department of Community Fisheries which collects SSF data, Department of Aquaculture which has data on community fish refuges, IFReDI and MAFReDI which have monitoring data, and the Department of Planning, Finance and International Cooperation which is in charge of fisheries statistics); (ii) Inter-ministerial co-ordination of statistics relevant to fisheries management and accounting among the NIS, FiA and MOE; (iii) regular meetings of the parties involved in fisheries data collection groups (NGOs, government and international organisations). Some existing coordination mechanisms such as the NGO network and the Coalition of Cambodia Community Fisheries can be built on to support each other and share information.

Phase 2. Build the fisheries satellite account (2021)

- Maintain inter-institutional collaboration during the data processing and analysis to ensure national consensus on the final results. This could be through the establishment of a technical committee and higher level policy committee.
- It is recommended that compilers focus initially on organising relevant physical data to populate the physical accounts, as opposed to monetary data, as these data are a prerequisite for the monetary accounts and inform the sustainability of production, which is central to fisheries management and policy in Cambodia.
- Compile a first set of accounts based on available national data and information from existing FAO and similar global data sets, to build up expertise in compiling the accounts and provide insights among users of the policy application of the accounts and key areas that warrant investment in data collation.
- Disseminate the NCA among policy makers and stakeholders to demonstrate the usefulness of the accounts.
- Plan for refinements (Phase 3).

Phase 3: Refine: ongoing development of satellite account (2022 onwards)

- Annual / regular compilation of the accounts to improve coherence and ensure consistency between information sources over time. Crucially, the accounts need to be produced regularly to understand the sustainability of the fisheries resource**.**
- Explore opportunities for development of other accounts that can be linked to fisheries accounts, so that fisheries are not viewed in isolation, for example a land account or an ecosystem account.[32]

[32] **Land accounts** are a good entry point to map out key habitats linked to fish stocks (such as freshwater bodies and mangroves) and can be used to illustrate how the health of habitats affects fish production.

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Appendices

Appendix 1: Schedule of meetings and people met

FishCounts Mission to Cambodia January 13th – 21nd 2020

DATE	MEETING / ACTIVITIES
Monday 13	Team meeting
	Ms Luy Rasmey, Executive Director, Culture and Environment Preservation Association (CEPA)
	Mr Om Savath, Executive Director, Fisheries Action Coalition Team (FACT)
Tuesday 14	Mr Thay Somony, Director, Department of Aquaculture Development, Fisheries Administration Mr Suy Sereiwath, Director, Maine Fisheries Research and Development Institute, Fisheries Administration
	H.E. Mrs Hang Lina, Director General of National Institute of Statistics, Ministry of Planning Mr Keo Chettra, Director, National Accounts Department
Wednesday 15	Mr Aymeric ROUSSEL, Attaché, EU Delegation and Co-Chair of Technical Working Group on Fisheries (TWGF)
	Sara Freed, WorldFish
	Mr Antonio Schiavone, Head of Operations, FAO Mr Rick Gregory, Senior Fisheries Specialist – CAPFISH (Capture), FAO) Mr Iean Russell, Senior Policy Advisor, Food and Nutrition Security Impact, Resilience, Sustainability and Transformation (First Programme, FAO)
	H.E. Mr. So Sophort, Deputy Secretary General of Cambodia National Mekong Committee (CNMC)
Thursday 16	Dr Peng Bun Ngor, Fish Community Ecologist, IFReDI
	Prof. Robert S. Pomeroy, World Bank Project (via Skype)
Friday 17	Ms. Saramany Duong, National Programme Officer, Agriculture and Land Governance, Agriculture and Food Security Domain, Swiss Cooperation Office in Cambodia, Swiss Agency for Development and Cooperation – SDC
	Mr Kim Sour, Senior Research Coordinator, Fauna and Flora International
	Dr Touch Bunthang, Acting Director of IFReDI, Fisheries Administration
Saturday 18	Mr Lou Vanny, IUCN
Sunday 19	
Monday 20	Visit to CFi in Kampong Chhnang Province Mr Prak Leang Huor, Deputy Director, Department of Agriculture, Forestry and Fisheries (PAFF), Kampong Chhnang Province Mr Ly La, Director, Kampong Chhnang Provincial Fisheries Cantonment 7 members of Kampong Os community fisheries, Kampong chhnang Province
Tuesday 21	Visit to CFi in Kampong Chhnang Province Mr Samnang, Chief of Koh Keo community fisheries, Kampong Chhnang province and 4 other CFi committee members

Appendix 2: Fisheries satellite accounts

2.1. Physical asset account

Physical asset account for fish and aquatic resources (1,000 tonnes)

	Opening stock	Additions to stock			Reductions to stock					Net change in stock	Closing stock
Type of fish / aquatic resource		Natural growth	Other additions	Total additions	Gross catch / harvest [a]	Natural losses	Catastrophic losses [b]	Other reductions	Total reductions		
Cultivated aquatic resource	Breeding stock inventories										
Natural (wild) aquatic resources [c]											

Source: Table 4.9 SEEA-AFF

Note:
[a] The "Gross catch / harvest" column is linked to the **supply table.**
[b] Unexpectedly large losses from disease or natural disasters should be recorded as catastrophic losses.
[c] Measuring natural (wild) aquatic resources: opening and closing stocks and elements of change in stocks cannot usually be observed or measured directly, except for harvests or gross catch. Therefore, biological models and assumptions are used to make estimates (see Section 5.9 of the SEEA Central Framework (UN, 2015)). Many countries conduct occasional assessments of resources and use these to calibrate their models. See for example the ongoing work by the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) in the Pacific: www.unescap.org/events/asia-and-pacific-regional-expert-workshop-ocean-accounts.

2.2. Physical supply and use tables

SUPPLY TABLE		DOMESTIC OUTPUT													IMPORTS		
		SMALL-SCALE FISHERIES						LARGE-SCALE FISHERIES									
		CAPTURE FISHERIES			AQUACULTURE			CAPTURE FISHERIES			AQUACULTURE						
		Gross catch	Discarded catch	Nominal catch	Gross catch	Discarded catch	Nominal catch	Gross catch	Discarded catch	Nominal catch	Gross catch	Discarded catch	Nominal catch	Food use	Non-food	Total	Total supply
Fish and other aquatic products																	
Fish	freshwater fish																
	diadromous fish																
	demersal fish																
	tuna, bonito, billfish																
	other pelagic fish																
	other marine fish																
Crustacean	crustaceans																
Molluscs	cephalopods																
	other molluscs																
Aquatic animals/ other	Other aquatic animals																
	Pearls, sponges and corals																
Aquatic plants, algae	Algae																
	Macro plants																

2.3. Physical flow account for use of fish and aquatic products (tonnes)

USE TABLE FEED		INTERMEDIATE		HOUSEHOLD FINAL CONSUMPTION			CHANGES IN INVENTORY		EXPORTS		
		Other use	Food consumption	(of which)	Other use	Post-harvest/ catch losses	Other changes	Food use	Non- food use	Total exports	Total use
Fish and other aquatic products											
Fish	freshwater fish										
	diadromous fish										
	demersal fish										
	tuna, bonito, billfish										
	other pelagic fish										
	other marine fish										
crustacean	crustaceans										
Molluscs	cephalopods										
	other molluscs										
Aquatic an	Other aquatic animals										
	Pearls, sponges and corals										
Aquatic pl	Algea										
	Macro plants										

Appendix 3: Proposed fisheries joint monitoring indicators for 2019–2023 (June 2019–December 2020)

OUTCOME 2019–2023: SUSTAINABLY STRENGTHENED FISHERIES RESOURCES MANAGEMENT & DEVELOPMENTA

OUTPUT 2019–2020	OUTPUT INDICATOR WITH BASELINE AND TARGET 2019–2020	MAIN ACTIVITY (IDENTIFIED IMPLEMENTER) 2019–2020	PARTNERSHIP ACTIONS (REQUIRED/ PREREQUISITES)
1. Natural fish catch production maintained (National Strategic Development Plan [NDSP] target)	1.1 Capture fisheries production from all sources sustained at around 600,000 tonnes annually [including around 100,000 tonnes from marine fisheries] (Strategic Planning Framework [SPF] updated target). • Baseline for 2018: 656,105 tonnes (including 121,100 tonnes from marine production).[b] • Target for 2020: 600,000 tonnes.[c]	1. Revision and adoption of the Fishery Law, CFi sub-decree and sub-decree on marine fisheries (Fisheries Administration [FiA] with development partner [DP] support; Ministry of Agriculture, Forestry and Fisheries [MAFF]; MoI). 2. Implementation of the fisheries programme of the ASDP 2019–2023, through development of detailed operational 5-year sub-programme / cluster plans (aligned with conservation plan, and the NPOA-IUU and NPCI) and rolling 3-year Budget Support Programme (BSP) (FIA with DP support and EU budget support). 3. Improvement of fisheries statistics (FiA with DP support) 4. Implementation of regular biennial nationwide assessments of CFi and state conservation effectiveness (FiA).	1. implementation of ongoing financial and technical support to FiA (World Bank, European Union [EU], Food and Agriculture Organization [FAO]) 2. Effective implementation of well co-ordinated and harmonised parallel interventions contributing to the development of the CFi/ CFR (SDC and PaFF partners, Conservation International, Worldfish, ForumSyd, etc) 3. Effective sector co-ordination through the Technical Working Group on Fisheries (TWGFi) and DP group, including timely information by FiA on new projects under formulation by DPs that are not in the country or do not attend the TWGFi. 4. Continued effort on the promotion of renewable energies and alternatives to hydropower dams (WWF lead).
	1.2 Total state conservation area under effective conservation (ie scoring above 4 using FiA/DFC's assessment methodology). • Baseline for 2018[d]: 66,120ha of inland fish conservation areas **assessed** as strongly protected (no data for marine conservation). • Target for 2020: 142,135ha (SPF target).		
	1.3 Number of strong community fisheries (CFis) (ie scoring above 4 in the CFi effectiveness assessment led by CFDD/FiA) and total area under their conservation efforts. • Baseline 2018: 33 CFis.[e] • Target 2020: 150 (ASDP target).		
	1.4 Number of community fish refuge committees (CFRs) effectively managed. • Baseline for 2018: to be determined. • Target for 2020: 175 CFRs (out of a total of 870 CFRs).[f]		

OUTCOME 2019–2023: SUSTAINABLY STRENGTHENED FISHERIES RESOURCES MANAGEMENT & DEVELOPMENTA			
OUTPUT 2019–2020	**OUTPUT INDICATOR WITH BASELINE AND TARGET 2019–2020**	**MAIN ACTIVITY (IDENTIFIED IMPLEMENTER) 2019–2020**	**PARTNERSHIP ACTIONS (REQUIRED/ PREREQUISITES)**
2. Increased aquaculture yields by 20% annually	2.1 Total seed production from domestic hatcheries.g[9] • Baseline for 2018: 210 million heads.[h] • Target for 2020: 300 million heads [ASDP].	1. Strengthen domestic research programme on fish breeding and broodstock covering the species of main market value (in continuation of activities initiated by National Research and Aquaculture Development Institute (NARDI), Freshwater Aquaculture Research and Development Center (FARDeC) under EU-funded programme) and Agence Française de Développement (AFD). 2. Promote and foster private investment in hatcheries and small-scale feed production in providing business development support (AFD, CAST).	1. Partnership between national research centres and international research institutions. 2. Well-functioning TWG Aquaculture sub-group, notably to ensure a close co-ordination between AFD and CAST programme.
3. Improved quality and safety of consumption of products from aquaculture and capture	3.1 No. of establishments (including aquaculture farms) that have received quality seali and/or HACCP certification (ASDP). • Baseline for 2017: 2.[j] • Target for 2020: 10[k] (BSP).	1. Sensitise consumers/public on the importance of quality schemes/ standards such as Quality Seal (covering GAqP) and HACCP in assuring safety and quality of fish and fishery products (AFD, UNIDO, CAST, FiA). 2. Build capacity of fishery business operators (farmers, processors, etc.) to comply with food safety schemes/standards (eg Quality Seal, HACCP) (AFD, UNIDO, CAST, FiA). 3. Operationalise Quality Seal scheme which also covers GAqP (AFD, UNIDO, CAST, FiA). 4. Empower the competent authority by introducing and implementing new legal tools (eg listing business operators) (AFD, UNIDO, CAST, FiA).	1. Partnership: AFD, CAST, FiA, UNIDO deliver single joint message: think of safety of fish and fishery products, think of Quality Seal, or Hazard Analysis Critical Control Point (HACCP). 2. Pre-requisite: fishery law empowers the competent authority.

Source: FiA, 2019

a MAFF's inputs to NSDP 2019–2020.
b FiA annual report 2018.
c MAFF's inputs to NSDP 2019–2020.
d Inland only 119,686ha by conservation assessment within 58 state conservation areas. The scoring system – over 4 for fisheries conservation assessment exercise which was done by FiA in 2018.
e Result of CFi assessment in 2018 by FiA.
f Based on the data provided by DAD for the final draft version of the 10- year SPFC.
g Should not include production from nurseries (eg hapa nets) to avoid double counting of seed sold by local hatcheries to nurseries and counting of possible seed importation by nurseries.
h FiA statistics 2019.
i To include GAqP standards.
j UNIDO report [CEDEP II] 2017.
k Target does not refer specifically to Quality Seal or HACCP, but Good Hygiene Practices.

Appendix 4: Community fisheries – legal aspects

The government encourages local fishers to participate in responsible and sustainable fishery management. Article 59 of Fisheries Law 2006 permits all Cambodian citizens to form CFis in their own fishing grounds on a voluntary basis. This gives them the responsibility, through a signed agreement between the community fisheries and provincial fishery competent authority, for the conservation and management of the fishery resources. Where necessary they can decide to set aside an area under their CFi management as a conservation zone or non-fishing zone.

Establishment of a CFi area is based on resource potential and the need for traditional access by local communities, and follows a consultation with relevant stakeholders and communities to assess suitability (RGC, 2006, article 61). Non-members can still access resources in the designated area provided that they comply with the local rules adopted by the established CFi. This is to ensure that access by non-members are not compromised (article 8, Internal Rules of CFi).

As fisheries and other natural resources belong to the state, a local community group needs to enter into an agreement with FiA / MAFF for a CFi and with the Ministry of the Environment (MoE) for a community protected area (CPA) or a registration with provincial Ministry of Water Resources before the resources can be entrusted to them. The agreement is subject to renewal every 3 years for CFis and 15 years for CPAs, which depends largely on the performance of the communities.

To combat illegal fishing, CFis are encouraged to seek support from local authorities and relevant agencies and take collective action to curb and ultimately stop fishing offences. CFis are required to develop their own by-laws to support the management of their areas and implement their management plan for the effective operation and sustainable use of resources in their own fishing ground (RGC, 2006, article 62).

The Decentralise and Deconcentrate policy (D&D) encourages people's participation in public administrations, particularly women in CFi management committees. The CFi committee undertake activities related to conservation, regulation and improvement of fisheries in their respective domains, building on their indigenous knowledge. Committee members are also encouraged to take part in local fisheries management activities, such as the planting of flooded forests and releasing fish seeds to enhance wild stock production.

Community fishing areas have multiple uses such as farming in the dry season, family water use, agricultural irrigation, and navigation and transport. Conflicts occurring over the different uses of the water-related resources are solved according to the existing fisheries and other relevant law, rules and regulation. Conflict resolution is managed in the first instance through consultation and co-ordination with local levels of authority (commune and district authority/district fisheries competent authority). If the conflict can not be solved at this level, then it is referred to higher levels of authority (provincial and national authority/courts).
In 2005, the government issued a **Sub-decree on Community Fisheries Management** which sets out rules for the establishment and management of community fisheries (CFi). Only small-scale/family fishing gear can be used in CFi fishing ground. In addition, the CFi is managed by the CFi guideline of MAFF and other by-laws.

Five objectives for community fisheries were spelt out in the sub-decree: (i) manage inland fisheries and related ecosystems where fishing lots have been cancelled; (ii) manage fisheries resources in a sustainable and equitable manner; (iii) increase the understanding and recognition of the benefits of fisheries resources through participation in their protection and management; (iv) provide the legal framework to establish community fisheries; and (v) improve standards of living and reduce poverty.

Article 27 states that a CFi agreement may be cancelled if there is serious violation or failure to enforce provisions in the CFi agreement and other relevant regulations such as ensuring sustainability of fisheries resources. A collective decision by the CFi management committee supported by two-thirds of the members is also a precondition for the termination of an agreement (RGC, 2005, article 27). The implementation of a CFi management plan, developed and agreed to within the CFi and endorsed by FiA, is monitored to assess the performance of the CFi and is the basis for decisions on the renewal of the agreement (RGC, 2005, articles 27 and 28). Similar procedures are required for **community protected areas** managed by the MoE in collaboration with FiA.

Each government agency has established under its respective structure a department to assist and monitor the effective implementation of community groups. They ensure that the relevant community groups are established following due process and serve the intended purposes.

CFis and CPAs are required to develop a management plan, by-laws and internal rules following a template provided by the relevant government agency.

The CFi committees are encouraged to be involved in local government. For example, selected CFi committees participate in monthly commune council meetings building rapport and raising their issues within the group. A network of CFi groups has been proposed in the new revision of the CFi sub-decree, and have already been established in some provinces to communicate and share information. Their engagement with the commune council, the lowest elected representatives of the government, can provide many benefits including addressing illegal fishing, the communication of fisheries issues to local administration channels, and the provision of funding for CFi work.

Appendix 5: Organisational structure of the fisheries administration

The FiA is a government authority under the Ministry of Agriculture, Forestry and Fisheries (MAFF). As shown in the above organizational chart, to fulfil its mission and goal, FiA has a nationwide-organizaitonal structure of seven departments and three research institutes at central level, five Fisheries Administration Inspectorates (a regional Fisheries Administration), and five research centres. At sub-national level, there are three levels of Fisheries Administration: 23 municipal/provincial Fisheries Administration Cantonments, Fisheries Administration Divisions, and Fisheries Administration Units (Sangkat) under the direct supervision of the Department of Agriculture, Forestry and Fisheries (DAFF).

Both IFReDI and MaFReDI have a resposibility to provide scientific information, technical support and fisheries statistics for the sustainable development and management of inland and marine living aquatic resources in Cambodia. Both IFReDI and MaFReDI conduct data collection and analysis and research on the biological, technical transfer (fishing gear), socio-economics, and fisheries technology.

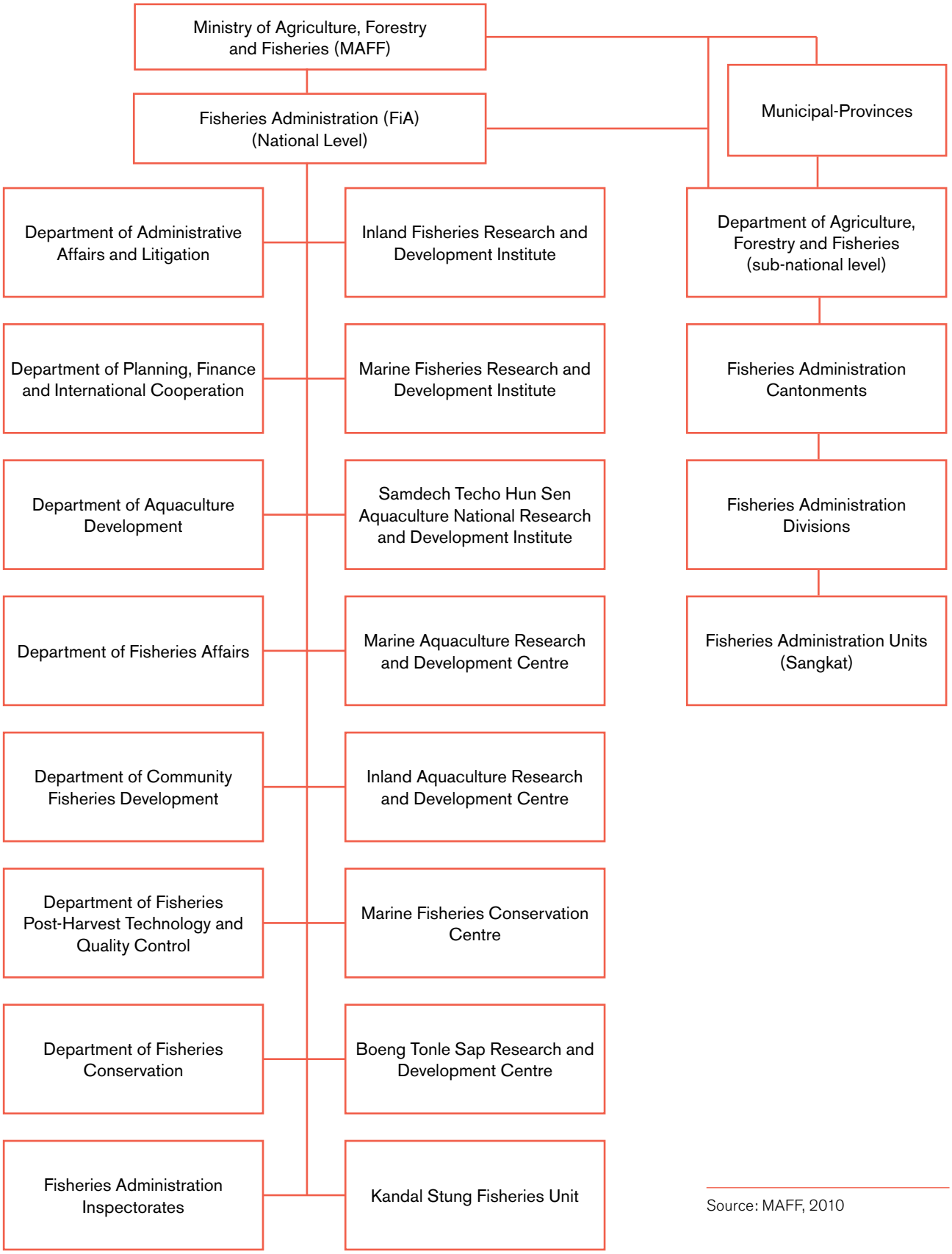
Research and Statistics

Articles 7, 9 and 15 of the 2006 Cambodian Fisheries Law places a legal mandate on the fisheries administration to conduct scientific fisheries research in order to provide information to inform fisheries conservation, management and development practices (RGC, 2005). For example, Article 7 of the Cambodian Fisheries Law states that the Fisheries Administration has a duty to undertaken scientific research for conservation, development of fishery economy and the promotion of aquaculture.

The 2005 sub-decree of community fisheries management encourages community fishers to share their local knowledge and experiences through meetings, workshops, consultations, data collection, and apply fisheries management to their community fishing grounds (RGC, 2005).

Articles 5 and 6 of the sub-decree on designated official statistics (RGC, 2010) states that: (i) the designated statistical units within ministries and government institutions shall be responsible for collecting, compiling, analysing, publishing and disseminating statistics to the public; and, (ii) the National Institute of Statistics, Ministry of Planning shall disseminate basic and sectoral statistics to the public, either produced by itself or in co-operation with other government statistical units.

Organisational structure of the fisheries administration



Source: MAFF, 2010

Appendix 6: Fisheries Administration statistics 2018

6.1 Fish catch statistics (2018)

			IMPLEMENTED	PLANNED	IMPLEMENTED	COMPARED	
NO	DESCRIPTION	UNIT	2017	2018	2018	PERCENTAGE	INCREASED-DECREASED
A	B	C	(1)	(2)	(3)	(3)/(2)	(3)-(1)
1	Freshwater fisheries	tonnes	**527,795**	**502,000**	**535,005**	**106.57**	**7,210**
	Dai fisheries	tonnes	16,625	12,000	16,975	141.46	350
	Family fisheries in public fisheries domain	tonnes	352,470	345,000	360,730	104.56	8,260
	Family fisheries in rice field	tonnes	158,700	145,000	157,300	108.48	-1,400
2	Marine fisheries	tonnes	**121,025**	**110,000**	**121,100**	**110.09**	**75.00**
3	Aquaculture	tonnes	**207,443**	**250,000**	**254,048**	**101.62**	**46,605**
	Fish culture-shrimp	tonnes	207,443	250,000	254,048	101.62	46,605
	Crocodile culture	heads	392,777	300,000	410,000	136.67	17,223
	Fish fingerlings production	fingerlings	205,000,000	220,000,000	210,000,000	95.45	5,000,000
4	Fish processing	tonnes	**82,600**	**91,000**	**83,735**	**92.02**	**1,135**
	Freshwater	tonnes	72,000	82,000	73,000	89.02	1,000
	Marine waters	tonnes	10,600	9,000	10,735	119.28	135
	Fish sauce production	litres	57,000,000	60,000,000	58,000,000	96.67	1,000,000
5	Fishery exports	tonnes	**13,000**	**20,000**	**14,500**	**72.50**	**1,500**
	Fresh products	tonnes	8,500	15,000	9,500	63.33	1,000
	Processed products	tonnes	4,500	5,000	5,000	100.00	500
6	Protection of fishery resources (illegal cases)	cases	**3,925**		**3,204**		**-721**
	Freshwater	cases	3,888		2,970		-918
	Marine waters	cases	37		234		197

NO	DESCRIPTION	UNIT	IMPLEMENTED 2017	PLANNED 2018	IMPLEMENTED 2018	COMPARED PERCENTAGE	COMPARED INCREASED-DECREASED
A	B	C	1	2	3	3/2	3-1
7	Resource enhancement						
	Released juvenile fish and river prawns	pieces	2,000,000		4,500,000		2,500,000
	Flooded forest and mangrove plantation	hectare	15		80		65
	Installation of boundary cement poles in freshwater fishery conservation area	units	40		34		-6
8	Government revenue	Riel	**2,986,646,684.56**	**3,043,545,400**	**1,904,763,808**	**62.58**	**-1,081,882,877**
	Dai fishing fee	Riel	2,103,100,000	2,006,000,000	1,127,121,500		
	Marine fishing fee	Riel	99,626,700	644,000,000	198,679,500		
	Financial penalty/fine	Riel	385,698,000	100,000,000	230,033,500		
	Debt remained not paid	Riel					
	Property rent	Riel	150,042,620	135,545,400	149,590,713		
	Public service	Riel	226,900,000	158,000,000	190,320,000		
	The balance not paid to the government treasury	Riel	14,434,365		8,018,595		
	Rent of government crocodile broodstock	Riel	1,000,000		1,000,000		
	Fines for illegal fishery transportation	Riel	3,175,000				
	The money claimed from the deposit for river prawn fishing	Riel	2,670,000				

6.2 Marine and inland family fisheries catch in public fishing domains (2018)

NO	FISHERIES CANTONMENT	IMPLEMENTED IN 2017	PLANNED FOR 2018	IMPLEMENTED IN 2018	COMPARED	
					%	INCREASED-DECREASED
1	Phnom Penh	**760**	8,000	**760**	9.50	0
2	Kandal	**20,490**	22,000	**20,800**	94.55	310
3	Prey Veng	**13,720**	15,000	**13,900**	92.67	180
4	Takeo	**15,330**	16,000	**15,400**	96.25	70
5	Svay Rieng	**1,400**	1,500	**1,430**	95.33	30
6	Kampong Cham	**17,940**	18,000	**18,230**	101.28	290
7	Tbong Khmum	**7,870**	8,000	**7,970**	99.63	100
8	Kratie	**4,750**	5,000	**4,780**	95.60	30
9	Stung Treng	**2,000**	5,000	**2,050**	41.00	50
10	Ratanak Kiri	**660**	1,000	**680**	68.00	20
11	Mondul Kiri	**470**	1,000	**490**	49.00	20
12	Kampong Chhnang	**41,700**	45,000	**42,300**	94.00	600
13	Pursat	**37,200**	40,000	**38,100**	95.25	900
14	Battambang	**26,300**	28,000	**27,100**	96.79	800
15	Pailin	**150**	1,000	**160**	16.00	10
16	Kampong Speu	**800**	1,000	**820**	82.00	20
17	Kampong Thom	**40,300**	41,000	**41,500**	101.22	1,200
18	Siem Reap	**44,100**	41,000	**45,300**	110.49	1,200
19	Banteay Meanchey	**4,800**	5,500	**5,200**	94.55	400
20	Odoar Meanchey	**120**	500	**130**	26.00	10
21	Preah Vihear	**120**	500	**130**	26.00	10
22	Kep	**3,600**	3,000	**3,650**	121.67	50
23	Kampot	**12,000**	8,000	**12,900**	161.25	900
24	Kamong Som	**43,400**	15,000	**43,800**	292.00	400
25	Koh Kong	**12,490**	15,000	**12,700**	84.67	210
Total		**352,470**	**345,000**	**360,280**	**104.43**	**7,810**

Source: FiA, 2019

6.3 Marine and inland family fisheries catch in rice field fisheries (2018)

NO	FISHERIES CANTONMENT	IMPLEMENTED IN 2017	PLANNED FOR 2018	IMPLEMENTED IN 2018	COMPARED	
					%	INCREASED-DECREASED
1	Phnom Penh	**350**	500	**280**	56.00	-70
2	Kandal	**3,450**	2,500	**3,000**	120.00	-450
3	Prey Veng	**10,290**	9,500	**10,600**	111.58	310
4	Takeo	**10,540**	10,500	**10,500**	100.00	-40
5	Svay Rieng	**8,600**	8,000	**8,400**	105.00	-200
6	Kampong Cham	**6,000**	7,400	**6,050**	81.76	50
7	Tbong Khmum	**3,530**	3,000	**3,500**	116.67	-30
8	Kratie	**1,800**	1,500	**1,800**	120.00	0
9	Stung Treng	**1,000**	900	**1,000**	111.11	0
10	Ratanak Kiri	**995**	900	**970**	107.78	-25
11	Mondul Kiri	**980**	900	**980**	108.89	0
12	Kampong Chhnang	**12,660**	12,000	**12,660**	105.50	0
13	Pursat	**16,100**	15,000	**16,100**	107.33	0
14	Battambang	**18,200**	17,000	**18,200**	107.06	0
15	Pailin	**300**	300	**300**	100.00	0
16	Kampong Speu	**5,000**	5,000	**5,000**	100.00	0
17	Kampong Thom	**18,300**	15,000	**18,200**	121.33	-100
18	Siem Reap	**15,500**	13,000	**15,200**	116.92	-300
19	Banteay Meanchey	**11,950**	10,000	**11,400**	114.00	-550
20	Odoar Meanchey	**2,100**	2,000	**2,100**	105.00	0
21	Preah Vihear	**2,755**	2,400	**2,750**	114.58	-5
22	Kep	**180**	100	**190**	190.00	10
23	Kampot	**6,690**	6,000	**7,100**	118.33	410
24	Kamong Som	**950**	900	**480**	53.33	-470
25	Koh Kong	**480**	700	**540**	77.14	60
Total		**158,700**	**145,000**	**157,300**	**108.48**	**-1,400**

Source: FiA, 2019

6.4 Marine fish catch of artisanal fisheries (2018)

NO	PROVINCIAL FISHERIES CANTONMENT	IMPLEMENTED IN 2017	PLANNED FOR 2018	IMPLEMENTED IN 2018	COMPARED	
					%	INCREASED-DECREASED
1	Kep	1,400	2,000	1,450		50
2	Kampot	21,645	10,000	21,660	216.60	15
3	Kamong Som	47,790	50,000	47,780	95.56	-10
4	Koh Kong	50,190	48,000	50,210	104.60	20
Total		**121,025**	**110,000**	**121,100**	**110.09**	**75**

Source: FiA, 2019

6.5 Marine catch by species (2018)

NO	SPECIES/LOCAL NAMES	PROVINCIAL FISHERIES CANTONMENT				TOTAL
		KEP	KAMPOT	KAMPONG SOM	KOH KONG	
1	Grouper / trey tuk ke	18	31	140	120	**309**
2	Spanish mackerel / trey beka	15	65	980	483	**1,543**
3	Barramundi fish (late calcanfer) / trey chhpung	30	110	70	144	**354**
4	Fourfinger Threadfin / trey karao	40	25	75	525	**665**
5	Barred queenfish / trey sampan	20	0	110	496	**626**
6	Silver pompano / trey chap	15	0	210	353	**578**
7	Mackerel	350	410	1,240	984	**2,984**
8	Shark / trey chhlam	49	180	140	97	**466**
9	Synaptura / trey andat chhke	76	120	430	487	**1,113**
10	Small-scale croakder / trey prama	20	70	470	96	**656**
11	Thinlip barb / trey trawsak	100	150	390	500	**1,140**
12	N.A / trey kraap khnul	180	210	470	457	**1,317**
13	Parrot fish / trey seik	150	250	210	232	**842**
14	Apollo sharkminnow / trey dangdao	20	50	400	614	**1,084**
15	Red fish / trey kraham	160	380	520	3,526	**4,586**
16	N.A / trey ang re	155	160	430	592	**1,337**
17	N.A / trey kataing	28	450	370	846	**1,694**
18	N.A / trey chi	367	8,570	15,850	23,560	**48,347**
19	Shrimp / bongkea	500	3,500	4,770	1,131	**9,901**
20	Ray / trey bawbel	25	120	500	775	**1,420**
21	Squid	450	510	3,730	1,765	**6,455**
22	Mantis shrimp / bangkong kandob	10	110	330	376	**826**

NO	SPECIES/LOCAL NAMES	PROVINCIAL FISHERIES CANTONMENT				TOTAL
		KEP	KAMPOT	KAMPONG SOM	KOH KONG	
23	Giant mud carp / kdam thmor	10	300	350	309	**969**
24	Swimming crab / kdam she	750	970	1,300	1,641	**4,661**
25	Singapore vinegar crab / kdam chor	11	300	330	103	**744**
26	Snail / khchang	2	50	330	650	**1,032**
27	Paphia exarata / krum krolahole	2			254	
28	Blood cockle / kreng chheam	2	200	910	1,076	**2,188**
29	Mixed venus / ngeav chamroh	4	20	2,070	2,222	**4,316**
30	Krill / ky	70	450	310	527	**1,357**
31	Striped bonito / trey chheam		60	345	606	**1,011**
32	Mangro snapper/ trey ang koey	5	70	195	30	**300**
33	*Xenentodon spp.* / trey phtong	60	220	600	496	**1,376**
34	Golden trevally / trey kamchruoch	4	115	130	279	**528**
35	Laotian shad / trey kbork	20	160	180	655	**1,015**
36	N.A/ trey kantuy roeng	10	200	200	549	**959**
37	N.A / trey kone Kum	5	70	220	201	**496**
38	John's snapper / trey boh tra	6	170	300	121	**597**
39	Barraed queenfish / trey kalaing	2	160		302	**464**
40	Anchovy / trey kakoem	20	180	3,790	747	**4,737**
41	Brushtooth lizard fish / trey kdor chin	20	130	660	437	**1,247**
42	Painted sweetlips / trey kachi	2	43	120	60	**225**
43	N.A / trey praw luos	120	210	190	454	**974**
44	Cobia / trey phtuok samut	1	15.0	200	65	**281**
45	Marine eel	10	8	550		**568**
46	N.A / trey sor	6	250		15	**271**
47	Blood cockle	7	500		137	**644**
48	Mixed fish species	130	15	496	20	**661**
49	Crab	60		75	130	**265**
50	Snails	80	143	470		**693**
51	Sea weed /saray samut	20	250			**270**
52	Jelly fish / por puh toek	8				**8**
Total		**4,225**	**20,730**	**46,156**	**50,245**	**121,100**

Source: FiA, 2019

6.6 Aquaculture production (2018)

NO	PROVINCIAL FISHERIES CANTONMENT	IMPLEMENTED IN 2018										UNITS: TONNES EXCEPT FOR CROCODILES (HEADS) AND FINGERLINGS (THOUSANDS)				
		Freshwater fish	Snakehead fish	Eel	Frog	Turtle	Shrimp	Crab	Mollusc	Bloody cockle	Marine fish	Total	Fish fingerlings	Croc	Sea weed	other
1	Phnom Penh	25,200	3,280									**28,480**	18,000	11,100		
2	Kandal	19,261	21,271									**40,532**	30,000	13,500		
3	Prey Veng	11,544	1,680		580							**13,804**	13,000			
4	Takeo	13,970	550									**14,520**	20,000			
5	Svay Rieng	5,300										**5,300**	5,300			
6	Kampong Cham	10,791	1,200	3	6							**12,000**	9,700			
7	Tbong Khmum	4,300	1,100									**5,400**				
8	Kratie	4,690	500									**5,190**				
9	Stung Treng	180										**180**	200			
10	Ratanak Kiri	35										**35**				
11	Mondul Kiri	70										**70**				
12	Kampong Chhnang	15,500	1,647	55	15							**17,217**	17,000	7,100		
13	Pursat	11,840	7,630									**19,470**	19,000	3,120		
14	Battambang	7,950	5,685									**13,635**	13,000	20,150		
15	Pailin	60										**60**				
16	Kampong Speu	600										**600**	500			
17	Kampong Thom	25,900	5,340	28	5	8						**31,281**	28,000	18,600		
18	Siem Reap	9,500	9,230	10	3	1						**18,744**	16,000	327,200		
19	Banteay Meanchey	2,100			75							**2,175**	6,000	4,650		
20	Odoar Meanchey	90										**90**	300			
21	Preah Vihear	80	10									**90**	100			
22	Kep	48			2		6	24			15	**95**				
23	Kampot	1,493			2		2,272	199			413	**4,379**	9,200		2,105	
24	Kamong Som	3,580	3,082				46	57		86	276	**7,127**	4,700	4,580		
25	Koh Kong	12					23	7	7,077	6,155	300	**13,574**				
Total		**174,094**	**62,205**	**96**	**688**	**9**	**2,347**	**287**	**7,077**	**6,241**	**1,004**	**254,048**	**210,000**	**410,000**	**2,105**	

Source: FiA, 2019

6.7 Number and sizes of ponds, cages and pens for aquaculture (2018)

NO	PROVINCIAL FISHERIES CANTONMENT	FISH POND				CAGE				FISH PEN				OTHER
		TOTAL		IN USE		TOTAL		IN USE		TOTAL		IN USE		
		Number	Area (sq.m)	Number	Area (sq.m)	Number	Area (sq.m)	Number	Area (sq.m)	Number	Area (sq.m)	Number	Area (sq.m)	
1	Phnom Penh	302	1,288,700	289	1,231,770	389	10,200	333	8,890	150	648,460	140	607,460	
2	Kandal	922	2,134,125	868	1,721,667	683	35,114	564	32,340					
3	Prey Veng	12,050	3,127,680	9,140	2,484,460	475	10,645	340	7,930					
4	Takeo	24,500	6,125,000	8,530	2,133,000									
5	Svay Rieng	936	280,400	936	280,400									
6	Kampong Cham	1,100	660,000	1,100	660,000	230	11,040	230	11,040					
7	Tbong Khmum	131	3,808	131	3,808	552	2,907	552	2,907					
8	Kratie	750	375,000	500	50,000	120	720	120	720					
9	Stung Treng	150	15,000	55	5,500	7	84	5	60					
10	Ratanak Kiri	320	32,000	200	22,000									
11	Mondul Kiri	870	69,600	420	37,800	2	24	1	12					
12	Kampong Chhnang	1,034	155,100	168	25,200	557	6,684	455	5,460					
13	Pursat	3,274	1,200,300	1,372	877,300	1,062	106,200	1,062	106,200					
14	Battambang	4,019	1,607,600	305	122,000	566	4,132	566	4,132					
15	Pailin	950	104,500	250	20,500									
16	Kampong Speu	6,500	650,000	353	35,300									
17	Kampong Thom	840	1,240,000	840	1,240,000	483	5,000	483	5,000					
18	Siem Reap	1,420	255,600	1,200	216,000	920	27,600	840	25,200					
19	Banteay Meanchey	620	124,000	380	76,000					306	6,120	306	6,120	
20	Odoar Meanchey	450	54,000	250	30,000									
21	Preah Vihear	355	46,150	100	13,500	12	84	10	68					
22	Kep	217	43,400	35	7,000					25	555	25	555	Plastic pond
23	Kampot	14,200	17,540,000	14,200	17,540,000	550	4,950	550	4,950					Shrimp-fish pond
24	Kamong Som	495	226,844	495	226,844	1,300	11,700	1,300	11,700					
25	Koh Kong	73	57,350	73	57,350	250	5,750	159	1,239	243	1,400,000	243	1,400,000	
Total		**76,478**	**37,416,157**	**42,190**	**29,117,399**	**8,158**	**242,834**	**7,570**	**227,848**	**724**	**2,055,135**	**714**	**2,014,135**	

Source: FiA, 2019

6.8 Number of fish hatcheries and community fish refuges (2018)

NO	PROVINCIAL FISHERIES CANTONMENT	FISH HATCHERIES STATION			NUMBER OF COMMUNITY FISH REFUGES IN 2018
		LOCATION OF THE STATIONS	FISH SEED PRODUCTION FARM	FINGERLINGS (PCS)	
1	Phnom Penh		1	26,000,000	
2	Kandal		12	30,000,000	16
3	Prey Veng		26	13,500,000	79
4	Takeo		37	20,400,000	64
5	Svay Rieng	Svay Rieng	17	5,300,000	25
6	Kampong Cham		17	9,700,000	16
7	Tbong Khmum		3		14
8	Kratie		12		10
9	Stung Treng		5	200,000	
10	Ratanak Kiri		17		14
11	Mondul Kiri		9		6
12	Kampong Chhnang		10	17,000,000	25
13	Pursat	Kro Kor, Kan Dieng, Bakan, Kravanh,	20	19,500,000	40
14	Battambang	Battambang	20	13,000,000	45
15	Pailin	Khlong village, O Ta Vao, and Pailin	1		10
16	Kampong Speu	Chbar Mon, Borsed	24	500,000	173
17	Kampong Thom	Banteay Yumreach, Panha Chy	4	18,000,000	47
18	Siem Reap	Sangkat oeuk Vil	13	16,000,000	103
19	Banteay Meanchey		12	6,600,000	47
20	Odoar Meanchey	Kauk Rumduol Station	5	300,000	12
21	Preah Vihear	Cham Khsan commune, Leading Team Reaksmey	7	100,000	21
22	Kep		2		6
23	Kampot		27	9,200,000	77
24	Kamong Som		3	4,700,000	20
25	Koh Kong		5		14
Total			**309**	**210,000,000**	**884**

Source: FiA, 2019

6.9 Processed freshwater fishery products (2018)

UNITS: TONNES, EXCEPT FISH SAUCE (THOUSAND LITRES)

NO	PROVINCIAL FISHERIES CANTONMENT	PROCESSED FRESHWATER FISHERY PRODUCTS											
		Dry salted	Smoked fish	Fermented fish (phaak)	Fermented fish (mam)	Fish paste (prahok)	Dry fish	Salted fish	Dry shrimp	Fish cake	Total	Fish sauce	OTHER
1	Phnom Penh	3,023	15	77	33	624		1,453		329	**5,554**	4,900	176 fish oil
2	Kandal	2,400	1,019	100	10	920		700			**5,149**	8,590	
3	Prey Veng	780	120	400	35	1,600	50	1,150		60	**4,195**	3,400	
4	Takeo	785			17	670		2,150			**3,622**	4,600	
5	Svay Rieng	100						10			**110**	100	
6	Kampong Cham	1,050	2	31	4	150		50			**1,287**	4,450	
7	Tbong Khmum	465	16	36	10	60		22			**609**	900	
8	Kratie	525	5	40	5	130		5			**710**	400	
9	Stung Treng	273		18		30		2			**323**	300	
10	Ratanak Kiri	40	3	7		75		30			**155**	15	
11	Mondul Kiri	35	3	8		45		30			**121**	10	
12	Kampong Chhnang	1,650	765	245	60	6,100	75	3,835	33	10	**12,773**	6,200	10 fish oil
13	Pursat	1,550	69	147	108	3,400	30	985	13		**6,302**	5,100	
14	Battambang	1,370	79	300	182	5,200	50	95			**7,276**	3,100	
15	Pailin	5	3	2		17		10			**37**		
16	Kampong Speu	20									**20**	10	
17	Kampong Thom	1,960	450	1,000	600	5,200	120	3,800	20		**13,150**	4,500	
18	Siem Reap	1,970	564	140	102	5,300		2,700	81		**10,857**	5,500	
19	Banteay Meanchey	200	70	100		360					**730**	700	
20	Odoar Meanchey	10									**10**	10	
21	Preah Vihear	10									**10**	15	
Total		**18,221**	**3,183**	**2,651**	**1,166**	**29,881**	**325**	**17,027**	**147**	**399**	**73,000**	**52,800**	

Source: FiA, 2019

6.10 Processed marine fishery products (2018)

Units: tonnes, except fish sauce (thousand litres)

NO	ITEMS OF PROCESSED PRODUCTS/ LOCAL NAMES	PROVINCIAL FISHERIES CANTONMENT				TOTAL
		KEP	KAMPOT	KAMPONG SOM	KOH KONG	
1	Dry shrimp	32	270	190	210	**702**
2	Dry squid	18			33	**51**
3	Dried ray / baw bel Kriem				35	**35**
4	Dry salted fish	19	350	90	135	**594**
5	Steamed fish	1	590	580	90	**1,261**
6	Crab meat	228			6	**234**
7	Shrimp paste	20	260	280	150	**710**
8	Salted crab	2	250	30	300	**582**
9	Fermented shrimp / Phaak bongkea	5	150	30	65	**250**
10	Fermented fish / Phaak trey	5	300	150		**455**
11	Frozen shrimp		150		18	**168**
12	Frozen squid				11	**11**
13	Shell of crab	70		150		**220**
14	Dry shell of crab	7		25		**32**
15	Boiled crab	525	250			**775**
16	Fish feed	22		40	32	**94**
17	Dry seaweed	1	250	150	1,200	**1,601**
18	Meat of blood cockle		220	260	220	**700**
19	Unpeeled shrimp		50			**50**
20	Meat of snail			260	65	**325**
21	Fish powder			190	15	**205**
22	Spanish mackerel / trey baam			600		**600**
23	Dried krill / bongkea kriem			580	70	**650**
24	Dried anchovy / trey kakoeum kriem		100	45		**145**
25	Dry shell of shrimp	45	200	30	10	**285**
Total		**1,000**	**3,390**	**3,680**	**2,665**	**10,735**
26	Fish sauce	830	3,170	900	300	**5,200**

Source: FiA, 2019

6.11 Exports of fresh freshwater fish (2018)

FISH SPECIES	PROVINCIAL FISHERIES CANTONMENT										TOTAL
	Prey Veng	Takeo	Kampong cham	Kratie	Stung Treng	Kampong Chhnang	Pursat	Battambang	Kampong thom	Siem Reap	Banteay Meanchey	
Marbled sleeper			5			43				5		**53**
Microenema spp.						108				15		**123**
Striped snakehead						376				600		**976**
Chevron Snakeheak						400				800		**1,200**
Pangasius spp.						1,071				200		**1,271**
Wallago attu						229				2		**231**
Featherback						112				2		**114**
Snake skin gourami						242						**242**
Belodontichthys dinema						390						**390**
Cirrhinus microlepis						159						**159**
Eel						43				12		**55**
Frog						122				8		**130**
Botia spp.						105						**105**
Pangasius larnaudiei						629				5		**634**
Bronze feather back						395				5		**400**
Thynnichthys thynnoides						3,460				5		**3,465**
Mystus nemurus						395				5		**400**
Peacock eel						132				35		**167**
Freshwater shrimp						3				30		**33**
Mollusk						1,297				300		**1,597**
Mixed fish species		400	15			6,091						**6,506**
0	**0**	**400**	**20**	**0**	**0**	**15,802**	**0**	**0**	**0**	**2,029**	**0**	**18,251**

Source: FiA, 2019

6.12 Exports of processed freshwater fish (2018)

FISH PRODUCTS	PROVINCIAL FISHERIES CANTONMENT											TOTAL
	Prey Veng	Takeo	Kampong cham	Kratie	Stung Treng	Kampong chhnang	Pursat	Battambang	Kampong Thom	Siem reap	B. Meanchey	
dry salted fish						360		580				**940**
smoked fish						269		66				**335**
fish paste (*prahok*)				15		2,210		4,136		647		**7,008**
fermented fish (*phaak*)				5		208		715				**928**
fermented fish (*mam*)						2		370				**372**
Salted fish						600		23				**623**
refrigerated fish						520						**520**
frozen fish												**0**
fish oil						43						**43**
dry fish						76		3				**79**
refrigerated freshwater shrimp						95						**95**
fish cake						43						**43**
dry freshwater shrimp						30						**30**
salted fish species						420				833		**1,253**
salted mixed gourami						34						**34**
Total	**0**	**0**	**0**	**20**	**0**	**4,910**	**0**	**5,893**	**0**	**1,480**	**0**	**12,303**

Source: FiA, 2019

6.13 State-owned and community fisheries conservation areas (2018)

NO	PROVINCE	CONSERVATION AREAS IN COMMUNITY FISHERIES	STATE-OWNED CONSERVATION AREAS	TOTAL
1	Phnom Penh			**0**
2	Kandal	5	5	**10**
3	Prey Veng	25	9	**34**
4	Takeo	10	10	**20**
5	Svay Rieng	3		**3**
6	Kampong Cham	19	2	**21**
7	Tbong Khmum	9	1	**10**
8	Kratie	28	15	**43**
9	Stung Treng	52	24	**76**
10	Ratanak Kiri	34	4	**38**
11	Mondul Kiri	6	2	**8**
12	Kampong Chhnang	43	7	**50**
13	Pursat	41	6	**47**
14	Battambang	49	7	**56**
15	Pailin		1	**1**
16	Kampong Speu			**0**
17	Kampong Thom	76	5	**81**
18	Siem Reap	24	4	**28**
19	Banteay Meanchey	38	2	**40**
20	Odoar Meanchey			**0**
21	Preah Vihear			**0**
22	Kep	7	3	**10**
23	Kampot	19	9	**28**
24	Kamong Som	19	21	**40**
25	Koh Kong	10	11	**21**
Total		**517**	**148**	**665**

Source: FiA, 2019

6.14 Number of community fisheries and their members (2018)

NO	PROVINCE	NO OF COMMUNITY FISHERIES (CFIS)	NO OF CFIS REGISTERED AT MAFF	CFI CONSERVATION AREA	NO OF HOUSEHOLDS	NO OF INDIVIDUAL MEMBERS
1	Phnom Penh					
2	Kandal	29	5	5	4,366	6,945
3	Prey Veng	28	27	25	10,874	11,913
4	Takeo	18	10	10	17,083	17,372
5	Svay Rieng	1		3	837	838
6	Kampong Cham	22	13	19	10,829	14,293
7	Tbong Khmum	16	9	9	2,146	4,407
8	Kratie	66	51	28	8,770	31,752
9	Stung Treng	50	50	52	5,077	21,336
10	Ratanak Kiri	14	14	34	703	1,556
11	Mondul Kiri	3	3	6	920	1,920
12	Kampong Chhnang	58	52	43	12,229	14,411
13	Pursat	35	28	41	5,602	11,789
14	Battambang	47	42	49	11,832	16,348
15	Pailin					
16	Kampong Speu					
17	Kampong Thom	44	40	76	4,032	20,160
18	Siem Reap	23	22	24	16,271	23,772
19	Banteay Meanchey	21	10	38	8,828	30,022
20	Odoar Meanchey					
21	Preah Vihear					
22	Kep	5	5	7	250	735
23	Kampot	10	7	19	2,213	2,594
24	Kamong Som	16	13	19	3,607	3,607
25	Koh Kong	10	10	10	2,304	4,754
Total		**516**	**411**	**517**	**147,518**	**332,168**

Source: FiA, 2019

6.15 Combating illegal fishing activities (2018)

NO	PROVINCE/ REGIONAL FISHERIES INSPECTORATE	NO OF ILLEGAL CASES				NO OF OFFENDERS JAILED
		PUNISHMENT	SENT TO COURT	DESTRUCTION OF ILLEGAL EVIDENCE	TOTAL	
1	Phnom Penh	3		9	**12**	
2	Kandal	7	15	123	**145**	
3	Prey Veng	14	22	246	**282**	
4	Takeo	1		141	**142**	
5	Svay Rieng			101	**101**	
6	Kampong Cham	6	1	132	**139**	2
7	Tbong Khmum	23	6	67	**96**	
8	Kratie	2	18	223	**243**	1
9	Stung Treng		4	97	**101**	4
10	Ratanak Kiri			28	**28**	
11	Mondul Kiri			19	**19**	
12	Kampong Chhnang	2	14	256	**272**	2
13	Pursat	3	7	228	**238**	3
14	Battambang	3		208	**211**	
15	Pailin			12	**12**	
16	Kampong Speu			3	**3**	
17	Kampong Thom	10	18	257	**285**	13
18	Siem Reap	18	10	232	**260**	7
19	Banteay Meanchey			30	**30**	
20	Odoar Meanchey			0	**0**	
21	Preah Vihear			35	**35**	
22	Kep			38	**38**	
23	Kampot		8	60	**68**	
24	Kamong Som	6		30	**36**	
25	Koh Kong	14	1	30	**45**	10
26	Fisheries Inspection Chaktomuk			45	**45**	
27	Fisheries Inspection Mekong			59	**59**	
28	Fisheries Inspection South Tonle Sap			74	**74**	
29	Fisheries Inspection North Tonle Sap	1		90	**91**	
30	Coastal Fisheries Inspection	16		31	**47**	
31	Fisheries Administration (Central)	1		46	**47**	
	Total	**130**	**124**	**2,950**	**3,204**	**42**

Source: FiA, 2019

6.16 Fisheries revenue (in Cambodian currency: riel) (2018)

NO	PROVINCE / FISHERIES INSPECTION	FEES FROM BAGNET FISHERIES	GAINED FROM DEPOSIT	FEES FROM MARINE FISHERIES	PREVIOUS DEBT	FINES AND SALE OF ILLEGAL EVIDENCE	PUBLIC SERVICE FEES	PROPERTY RENT	OTHER INCOME	TOTAL
1	Phnom Penh	175,600,000	209,000,000		6,000,000	2,920,000	8,800,000			**402,320,000**
2	Kandal	121,500,000	218,250,000			49,000,000				**388,750,000**
3	Prey Veng	213,023,250	33,748,250			17,200,000				**263,971,500**
4	Takeo					35,000,000				**35,000,000**
5	Svay Rieng									**0**
6	Kampong Cham					26,500,000				**26,500,000**
7	Tbong Khmum					4,000,000				**4,000,000**
8	Kratie					6,000,000	800,000			**6,800,000**
9	Stung Treng					9,280,000	12,400,000			**21,680,000**
10	Ratanak Kiri					19,000,000	23,600,000		1,000,000	**43,600,000**
11	Kampong Thom									**0**
12	Siem Reap					31,000,000				**31,000,000**
13	Kep			5,616,000						**5,616,000**
14	Kampot			4,752,000			1,600,000			**6,352,000**
15	Kampong Som			152,763,500		4,800,000	13,200,000			**170,763,500**
16	Koh Kong			7,428,000						**7,428,000**
17	Fisheries Inspection Chaktomuk									
18	Fisheries Inspection Mekong									
19	Fisheries Inspection South of Tonle Sap									
20	Fisheries Inspection Norht of Tonle Sap									
21	Marine Fisheries Inspection					17,833,500				**17,833,500**
23	Fisheries Administration (central)	150,000,000				7,500,000	129,920,000	149,590,713	8,018,595	**445,029,308**
Total		**660,123,250**	**460,998,250**	**170,559,500**	**6,000,000**	**230,033,500**	**190,320,000**	**149,590,713**	**9,018,595**	**1,876,643,808**

Source: FiA, 2019

6.17 Amount and types of fishing gear in freshwater fisheries (2018)

NO	PROVINCES	INDUSTRIAL FISHERIES (NUMBER OF SITES)			ARTISANAL FISHERIES (NUMBER OF FISHING GEARS IN PIECES)							FAMILY FISHERIES (NUMBER OF FISHING GEARS IN PIECES)				
		Barrage fisheries	Fish bagnet	Bagnet for river prawn	Seine net	Deep dragnet	V-shaped push net	Giant cast net	Giant lift net	Fish weir trap	Pair trawl	Gill net (length in meters)	Encircling gill net	Scoop net	Basket trap	Cylinder trap
1	Phnom Penh		19		7	43	15	5				31,500				420
2	Kandal		36		9	29					30					36,252
3	Prey Veng	30	7	13	460	6	24	58			4	2,273,500		6,120	510	16,310
4	Takeo		4		75		50	70				150,000			900	45,000
5	Svay Rieng											12,000				
6	Kampong Cham				38	50		24			20	489,270			2,000	8,400
7	Tbong Khmum					2		6			2	89,747			1,176	7,230
8	Kratie				25	10	50	10	180			300,000		200	500	1,000
9	Stung Treng											135,000			300	2,000
10	Ratanak Kiri											62,000			312	400
11	Mondul Kiri															
12	Kampong Chhnang				17	24	36	144		845		1,180,000	44	97	5,850	3,960
13	Pursat											1,000,000			500	5,200
14	Battambang											2,032,000				73,000
15	Pailin											2,000				50
16	Kampong Speu															
17	Kampong Thom				15							2,150,000	20		2,000	4,500
18	Siem Reap											850,000	60	120	20	1,000
19	Banteay Meanchey				30		85		12	500		16,000	80	2,300		1,600
20	Udoar meanchey											15,000				11,500
21	Preah Vihear											12,500	30	250	500	1,050
Total			**66**	**13**	**676**	**164**	**260**	**317**	**192**	**1,345**	**56**	**10,800,517**	**234**	**9,087**	**14,568**	**218,872**

Source: FiA, 2019

6.18 Types and number of family fishing gear (2018)

PROVINCE	Cast net	Cylinder trap	Bamboo vertical Cylinder trap	Wedge-shaped scoop basket	Drop door trap	Horiz. Cylinder trap	Giant lift net	Multi-pronged barbed spear	One- pronged barbed spear	Two-pronged eel fork	Bamboo tube trap	Wedge cone trap	Snake head wedge trap	Plunge basket	Encircling net	Hooks	Hook & line
Phnom Penh	420	80	25	30		200		35			200			50	30	950	25,000
Kandal	1,306	2,589		852		26,263	2				31,897					8,118,868	
Prey Veng	17,850	8,760	224	22,120	20	350	460	26,010	2,730	680	48,840	50	303	1,552	347	1,964,600	
Takeo	540	12,000		150		14,000	10	150	100	210	9,500			300	450	28,000,000	
Svay Rieng	40	250		50										60		1,000	
Kampong Cham	180	550	2,800	69		330	38				2,900					50,150	
Tbong Khmum	205	1,300		58		305	451				9,995			55	98	72,700	
Kratie	2,000		500	100	3,000	500	100	50	50	40	9,000			200	20	2,000,000	
Stung Treng	5,000	200	1,000	200	3,000			300	300		500		100	200		50,000	
Ratanak Kiri	660	250			752		20		400	230	580	170		190		230,000	
Mondul Kiri	9,700	80		70	130				80		190		30	26	40	19,500	
Kampong Chhnang	1,300	2,850	10,980	430		18,600		490	380	340	30,000	1,100	720	490	350		394,000
Pursat	9,260	6,300	30,500	1,500		18,000	305	1,000	400	200	20,000	500	100	700	1,000	105,000	
Battambang	13,000	18,000	2,500	300		109,000	160	800	700		295,000			1,300		1,300,000	
Pailin	350	150						100	120		10,000		100	20		10,000	
Kampong Speu	155	195	165	78						120	205			235	60	125	
Kampong Thom	2,550	4,000	4,000	350		25		1,000	1,050	100	5,000	300		800	700	350,000	
Siem Reap	810	1,600	150,000	60		1,000	260	50	50		2,500	20	20	300	10	250,000	
Banteay Meanchey	1,600	2,700		230		2,200					2,400					4,500	
Udoar Meanchey	83,000	72,000		12,000	4,500			10,100	8,000	3,000	98,200			540		9,400	
Preah Vihear	380	50	10	65	150		5	70	30	10	850	70	250	30	60	1,800	
Total	**150,306**	**133,904**	**202,704**	**38,712**	**11,552**	**190,773**	**1,811**	**40,155**	**14,390**	**4,930**	**577,757**	**2,210**	**1,623**	**7,048**	**3,165**	**42,538,593**	**419,000**

Source: FiA, 2019

6.19 Number and types of marine fishing gears (2018)

GEAR TYPES	UNITS	KEP	KAMPOT	KAMPONG SOM	KOH KONG	TOTAL
Trawler	pieces	42	170	1,562	255	**2,029**
Anchovy encircling seine	pieces				30	**30**
Beach seine	pieces	4	15	1		**20**
Encircling seine	pieces			12		**12**
Drift gill net	metres	3,000		335,000	150,500	**488,500**
Shrimp gill net / shrimp trammel gill net (three layer)	metres	5,000	90,000	138,000	273,570	**506,570**
Crab gill net	metres	35,000	140,000	450,000	19,500	**644,500**
Needlefish gill net	metres	2,800	150,000	45,000	13,000	**210,800**
Whitefish gill net	metres	3,000	100,000		47,600	**150,600**
Mullet gill net	metres	6,000	30,000		37,500	**73,500**
Mixed species gill net	metres	2,000	100,000	225,000		**327,000**
Mackerel gill net	metres	3,000	1,500,000	132,000	195,500	**1,830,500**
Octopus trap	pieces	20,000	200,000	98,000	200,590	**518,590**
Scoop net and dredger	pieces			33		**33**
Hand push net	pieces	60	1,200			**1,260**
Hook	pieces	5,000	2,000	45,000	7,400	**59,400**
Small winged set bag	pieces		15	25		**40**
fish, crab and squid trap	pieces	7,000	75,000	105,760	249,555	**437,315**

Source: FiA, 2019

6.20 Number of non-motorised fishing boats and vessels (2018)

		NUMBER OF NON-MOTORISED BOATS (IN UNITS)			
NO	PROVINCES	CAPACITY < 5 TONNES	CAPACITY > 5 TONNES	BOAT WITH CLOSED COMPARTMENT	TOTAL
1	Phnom Penh	100	45	32	**177**
2	Kandal	8,831	15	16	**8,862**
3	Prey Veng	2,414			**2,414**
4	Takeo	300			**300**
5	Svay Rieng	100			**100**
6	Kampong Cham	105			**105**
7	Tbong Khmum	457	542		**999**
8	Kratie	400	80		**480**
9	Stung Treng	2,000	100		**2,100**
10	Ratanak Kiri	1,350			**1,350**
11	Mondul Kiri	20			**20**
12	Kampong Chhnang	2,820	128	67	**3,015**
13	Pursat	3,393	214	5	**3,612**
14	Battambang	1,500	50	20	**1,570**
15	Pailin	6			**6**
16	Kampong Speu				**0**
17	Kampong Thom	1,450	250	30	**1,730**
18	Siem Reap	1,200	60	35	**1,295**
19	Banteay Meanchey	4,010	350	40	**4,400**
20	Odoar Meanchey	560	50		**610**
21	Preah Vihear	250			**250**
22	Kep	134			**134**
23	Kampot	242			**242**
24	Kamong Som	320			**320**
25	Koh Kong	1			**1**
Total		**31,963**	**1,884**	**245**	**34,092**

Source: FiA, 2019

6.21 Number of motorised boats and vessels (2018)

	NUMBER OF MOTORIZED BOATS/VESSELS				
PROVINCES	<10HP	10–30HP	30–50HP	>50HP	TOTAL
Phnom Penh	167	60	15		**242**
Kandal	9,314	78	37		**9,429**
Prey Veng	6,535	3,246		1	**9,782**
Takeo	7,200		500		**7,700**
Svay Rieng	20				**20**
Kampong Cham	5,217				**5,217**
Tbong Khmum	1,800	2,200			**4,000**
Kratie	2,500	300			**2,800**
Stung Treng	1,000	2,300	200	50	**3,550**
Ratanak Kiri	1,440	560			**2,000**
Mondul Kiri	90	140			**230**
Kampong Chhnang	12,810	2,130	148	47	**15,135**
Pursat	1,532	563	97	37	**2,229**
Battambang	1,500	5,000	100	15	**6,615**
Pailin	2				**0**
Kampong Speu					**0**
Kampong Thom	2,500	670	115	20	**3,305**
Siem Reap	990	1,210	28	360	**2,588**
Banteay Meanchey	460	155	35		**650**
Odoar Meanchey	330				**330**
Preah Vihear	50	25	6		**81**
Kep			520	74	**594**
Kampot	601		452		**1,053**
Kamong Som	1,095	1,360	5	285	**2,745**
Koh Kong	2,099	479	87	155	**2,820**
Total	**59,252**	**20,476**	**2,345**	**1,044**	**83,115**

Source: FiA, 2019

6.22 Number of fishers, fish processors and fish farmers (2018)

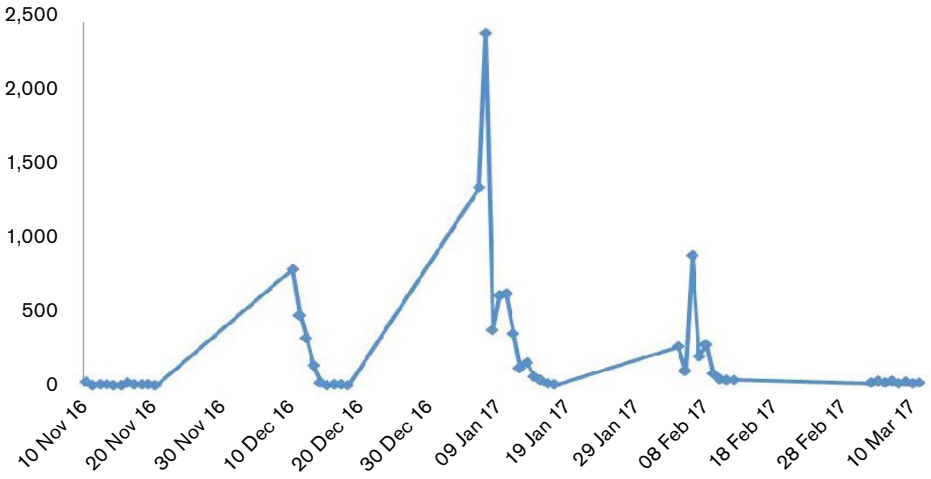
NO	PROVINCE	FAMILY AND RICE FIELD FISHERIES		ARTISANAL AND INDUSTRIAL FISHERIES		FISH PROCESSORS		FISH FARMERS		TOTAL	
		Household	Individual	Household	Individual	Household	Individual	Household	Individual	Household	Individual
1	Phnom Penh	995	1,810	19	280	20	100	670	1,336	**1,704**	**3,526**
2	Kandal	58,432	982,006	95	272	544	1,488	1,257	2,514	**60,328**	**986,280**
3	Prey Veng	148,000	153,000	95	350	150	450	4,590	4,750	**152,835**	**158,550**
4	Takeo	75,000	145,000	100	250	80	160	85,300	22,000	**160,480**	**167,410**
5	Svay Rieng	1,300	1,650					820	1,640	**2,120**	**3,290**
6	Kampong Cham	64,161	70,577			31	141	1,330	2,660	**65,522**	**73,378**
7	Tbong Khmum	23,949	39,910	10	115	126	252	1,441	2,882	**25,526**	**43,159**
8	Kratie	300	600	1,800	3,600	200	400	650	1,300	**2,950**	**5,900**
9	Stung Treng	3,300	6,000	300	600	120	360	55	70	**3,775**	**7,030**
10	Ratanak Kiri	7,800	10,500					200	200	**8,000**	**10,700**
11	Mondul Kiri	7,653	11,479					420	680	**8,073**	**12,159**
12	Kampong Chhnang	101,200	303,600			5,825	17,475	848	2,544	**107,873**	**323,619**
13	Pursat	35,338	13,405			138	662	2,425	7,275	**37,901**	**21,342**
14	Battambang	8,500	25,500			700	2,100	796	2,523	**9,996**	**30,123**
15	Pailin	350	600					220	240	**570**	**840**
16	Kampong Speu	129	352					430	480	**559**	**832**
17	Kampong Thom	53,000	152,500			450	1,350	650	1,375	**54,100**	**155,225**
18	Siem Reap	7,850	39,250			280	840	2,050	2,920	**10,180**	**43,010**
19	Banteay Meanchey	57,300	121,200			240	720	730	1,320	**58,270**	**123,240**
20	Odoar Meanchey	30,400	47,200			200	350	250	290	**30,850**	**47,840**
21	Preah Vihear	14,600	24,560					108	180	**14,708**	**24,740**
22	Kep	1,500	3,000	60	120	20	150	60	120	**1,640**	**3,390**
23	Kampot	3,500	70,000	300	600	80	400	10,000	20,000	**13,880**	**91,000**
24	Kamong Som	13,700	21,660	1,630	6,800	120	720	280	1,280	**15,730**	**30,460**
25	Koh Kong	5,570	11,140	1,840	7,360					**7,410**	**18,500**
Total		**723,827**	**2,256,499**	**6,249**	**20,347**	**9,324**	**28,118**	**115,580**	**80,579**	**854,980**	**2,385,543**

Source: FiA, 2019

Appendix 7: Additional data on bagnet fisheries monitoring in the Tonle Sap River

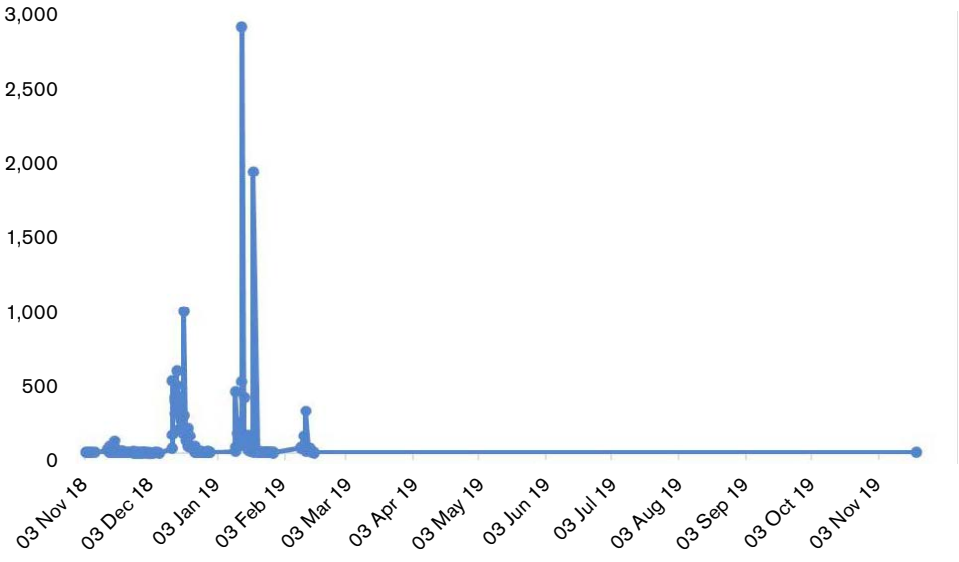
In the fishing season 2016–2017 it was found that in the low catch period, the dai unit filled up every 1–3 hours, catching 3–10 kilograms of fish. In the high catch period, the dai unit filled up every 15–45 minutes, catching from 200 to 1,400kg of small-sized fish. Approximately 10 kg sub-samples were taken from each haul to measure total length and weight by species. Prices per kilogram of the first sale were also recorded in field datasheets. Average catch per haul per dai as shown in Figure A. Three main peaks were observed. The first peak occurred on 10 December 2016, the second and longer peak took place on 6th-7th January 2017 and the third peak occurred on 6th February 2017. The average catch per haul per dai in the peak period was around 2,337kg in January 2017 (IFReDi, 2017). In the fishing season 2018–2019 three main peaks were observed (Figure B). The first peak occurred on 14 January 2019 (2.87 tonnes/haul/dai) and the second peak on 19 January 2019 (1.89 tonnes/haul/dai) (IFReDI, 2019). Similar to fish larvae monitoring, the bagnet fisheries monitoring shows fish species, size and abundance in relation to the Mekong River flood level (Hortle et al., 2004).

Figure A: Average catch (kg) per haul per dai



Source: IFReDI, 2019

Figure B: Average catch (kg) per haul per dai



Source: IFReDI, 2019

Artisanal and family fishing make a significant contribution to Cambodia's economy and food security. Community fisheries are already empowered to manage local fisheries resources, but small-scale fisheries are often overlooked in policy making, partly due to a lack of reliable data. Developing a fisheries satellite account through the System of Environmental and Economic Accounts – Agriculture, Forestry and Fisheries would clarify the value such fishers bring to the economy, what investment and policy responses they need, and the sustainability of the country's current fisheries activities. This report explores the current state of Cambodia's fisheries and the data that would be needed to develop such a set of accounts. It considers the country's existing statistical information and monitoring efforts, and where the gaps, inconsistencies and overlaps lie. It proposes a phased approach to build on what already exists to create greater visibility for the contribution of small-scale fisheries to the national economy and their role in developing sustainable fishing and aquaculture in the face of growing demands and climate change.

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