

**Illuminating Hidden Harvests: The global and local contributions and impacts of small-scale fisheries to sustainable development**

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## 1. Introduction

Small-scale fisheries (SSF) are increasingly appreciated for their importance for poverty alleviation, food security, and sustainable fisheries management, particularly in developing and marginalized regions of the world. Small-scale fisheries represent a diverse and dynamic sub-sector or even an intersection of sectors, often characterized by seasonal migration and other dynamic patterns of interaction in society and with the environment. The precise characteristics of the fishery vary depending on the location; indeed, SSF tend to be strongly anchored in local communities, reflecting often historic links to adjacent fishery resources, traditions and values, and supporting social cohesion”(FAO 2015b).

The Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (herein ‘SSF Guidelines’) recognize the great diversity of small-scale fisheries and that there is no single, agreed definition that clearly distinguishes between small-scale or large-scale fishing activities<sup>1</sup>. Furthermore, given that the definition of small-scale fisheries (SSF) varies considerably in different countries, advancing a universal definition is not considered appropriate. However, the lack of a global definition of SSF poses methodological challenges for better understanding the contributions and impacts of SSF at global scales.

In addition, only a number of efforts currently exist towards collecting primary data on SSF at a global level. The lack of systematic data collection across countries and across disciplines hinders the development of robust studies that illuminate the intersections between SSF and the different dimensions of sustainable development. The first challenge is that data collected on fisheries does not often disaggregate between SSF and large-scale fisheries (LSF), which is crucial for adequately characterizing the specific contributions of SSF. The second challenge is that fisheries data is greatly focused on catch, despite the fact that SSF are a multi-sectorial activity that intersects with fisheries management, poverty alleviation, and food security. In order for this challenge to be better addressed, these different types of data spanning social and nutrition dimensions should also be collected.

A good starting point is to leverage secondary sources of data, specially at national, sub-national, and local levels. The present paper describes the methodological challenges of a global SSF study that aims to explore how existing information on harvesting, pre-harvesting and post-harvesting activities can contribute to expand dominant notions and understandings of the contributions of SSF to sustainable development. We ask the question: What would the methodological process to increase the likelihood of systematically understanding the nutrition

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<sup>1</sup> “These Guidelines recognize the great diversity of small-scale fisheries and that there is no single, agreed definition of the subsector. Accordingly, the Guidelines do not prescribe a standard definition of small-scale fisheries nor do they prescribe how the Guidelines should be applied in a national context. These Guidelines are especially relevant to subsistence small-scale fisheries and vulnerable fisheries people. To ensure transparency and accountability in the application of the Guidelines, it is important to ascertain which activities and operators are considered small-scale, and to identify vulnerable and marginalized groups needing greater attention. This should be undertaken at a regional, subregional or national level and according to the particular context in which they are to be applied. States should ensure that such identification and application are guided by meaningful and substantive participatory, consultative, multilevel and objective-oriented processes so that the voices of both men and women are heard. All parties should support and participate, as appropriate and relevant, in such processes” (Par 2.4. p.1-2, Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication, FAO 2015).

security, economic and environmental contributions and impacts of SSFs at global and local scales look like?

The specific objectives of this proposed global SSF study are to: 1) Illuminate the hidden contributions of SSFs to the three dimensions of sustainable development – social, economic and environmental – as well as governance, leveraging local and global data to qualify and quantify these contributions to the extent possible; and 2) Identify the key drivers of change or transformation, including both threats and opportunities, describing these through narratives including key variables that can be quantified. In this broad context, the new study will provide policy-makers and scholars with a more comprehensive, integral view of the complex, yet important contributions (and challenges) SSF make to society and the environment every day around the world.

Because of the need to work with secondary sources of data that might be already available, we will necessarily adopt the assumptions already embedded on how this data was collected and analyzed. Although we will be able to collect a limited amount of empirical data, our ability to expand our understanding of the contributions of SSF will be limited, for the most part, by data availability and the degree of compatibility among different data sources. As a starting point for a global study that achieves the above objectives, this paper (i) presents an initial assessment of the feasibility of conducting the study, and (ii) summarizes the research strategy we are taking to carry out this ambitious undertaking.

## **2. Relevant Background Information**

### *a. The initial Hidden Harvest study*

In 2012, the World Bank, FAO and WorldFish Center published a study that included estimates of the scope and economic importance of small-scale fisheries entitled *Hidden Harvest: The Global Contribution of Capture Fisheries ('HH1')* (World-Bank 2012). The HH1 study provided essential information and estimates on the large role of small-scale fisheries (SSF) within the world's fisheries, a role subsequently recognized in the SSF Guidelines, adopted by the FAO Committee on Fisheries (COFI) in 2014 as an international policy instrument.

Interest and work on SSF have skyrocketed in the last two decades, presumably making available other sources of data and ways to understand the contributions of SSF since HH1 in 2012. It is worth noting the dominant notion of fishing as synonymous with harvesting. Indeed, the literature has paid much more attention to harvesting than to any other aspects of fishing such as pre-harvesting and post-harvesting activities (Lindkvist et al. 2017). Since the HH1 study, international attention to the role that SSF play in sustainable development has continued to expand. Generating more systematic information that improves our understanding of the global contributions of SSFs is needed to facilitate progress and operationalize the implementation of the SSF Guidelines around the world.

We provide a methodological process for the design of a new study aimed to documenting the state of knowledge about the contributions of SSF to different dimensions of sustainable development as conceptualized in 1987 by the World Commission on Environment and Development, which refers to development as the activities that meet the needs of the present without compromising the ability of future generations to meet their own needs. This concept contains within it an overriding priority on the essential needs of the world's poor, as well as a recognition of limitations imposed by the state of technology and social organization

on the environment's ability to meet present and future needs (WCED 1987). As such, the concept is described in terms of three dimensions of sustainability: social, environmental and economic, and its achievement is the basis for wide range of international policy objectives, goals and instruments, e.g. the Sustainable Development Goals (SDGs), and those relevant here are one and two (SDG 1 and SDG 2) to end poverty and hunger respectively.

With the understanding that not everything that can be counted counts and not everything that counts can be counted, we aim to leverage local and global data to provide a broader perspective than what is currently available about the contributions of SSF to sustainable development. This global SSF study would be a valuable synthetic academic exercise in its own right given the challenges for data collection and systematization these fisheries have historically faced (but see concerted effort by [www.tbti.net](http://www.tbti.net) to counteract this), and the resultant lack of information to inform the fisheries global policy discourse. However, beyond the academic value of this exercise, the project aims at producing information about the contributions of SSF that fisherfolk, fishworkers, and their organizations can use to advance their goals and make their voice heard. In this context, we also hope that the analysis would help advance conversations towards the design of a participatory monitoring and implementation framework for the SSF Guidelines and their overall implementation around the world.

The process to design this global SSF study began in June 2017 at an initial workshop hosted by the Food and Agriculture Organization (FAO) of the United Nations that brought together about 40 external experts in addition to FAO staff from the Fisheries and Aquaculture Department and other relevant departments (FAO 2017). The goal of the workshop was to discuss the scope, main contents, type of data and methodologies for data collection and analysis in the new study. The present paper was developed following the discussions held at this initial workshop and provides an overview of the proposed study approach.

### **3. Research strategy to design the global SSF study**

Conceptually, when useful, we use a social-ecological framing to inform the design of the global SSF study. A fishery is not purely a biophysical system isolated from human influence, nor is it a purely social system that functions independently of the ecosystems that provide resources that humans need – essentially any delineation between the social and the ecological is an artificial arbitrage. In anthropocentric terms, a fishery above produces outcomes for society. Some of these outcomes could be considered as contributions to sustainable development, and categorized according to the three dimensions of the concept: social, environmental and economic. These outcomes or contributions, can hence be measured as dependent variables in the fishery, as has been the case in many similar analyses of human-nature interactions. Similarly, within this diagram, governance can be described as a filter between the human-nature interaction, as an independent variable affecting the outcomes for society (Ostrom 2005, Basurto and Nenadovic 2012). We define governance as the process of discussing, agreeing, designing and implementing informal and formal rules (i.e. procedures, laws) to allow for members in society to have orderly and productive interactions with one another for a specific goal (Basurto et al. 2017), and specifically governance of the rights of access and the rules for use of either a defined area or associated resources as tenure.

We followed the SSF Guidelines to define small-scale and artisanal fisheries as encompassing all activities along the value chain—pre-harvest, harvest and post-harvest—undertaken by men and women and playing an important role in food security and nutrition, poverty eradication, equitable development and resource utilization.

### *3.1 initial scoping and planning of the study*

As a first step in designing the global SSF study, we developed an initial list of potentially relevant contributions of SSF to sustainable development and the challenges faced in maintaining those contributions. The compilation of contributions served as an initial signpost to identify a ‘wish list’ of indicators, as well as searching for available datasets that could contribute to the new global SSF study. Given that the study aims to include a broader scope of the socio-economic contributions of SSF than the HH1 study, the potential datasets included food security, nutrition, and poverty reduction, as well as the three dimensions of sustainable development more broadly (social, economic, and environmental). Following lessons learned from HH1 in terms of how the best data was found, this initial approach relied on conducting a systematic scientific literature review (2012-2017), *ad-hoc* searches and an expert query to find additional available datasets we might have missed through the literature and *ad-hoc* searches (FAO 2017).

For each indicator, we included a definition and corresponding operationalization variables. Definitions were extracted or adapted from glossaries and published reports of recognized international organizations, primarily the FAO (for food, nutrition, fisheries-related and other indicators) and the International Labour Organization (for labour-related indicators), as well as the UN more broadly, the World Trade Organization (WTO), The World Bank, and the European Commission. Additional guidance was taken from peer-reviewed scientific literature, where necessary.

The initial set of indicators was presented as a background paper at the initial workshop hosted by FAO in June 2017, thus serving as material for extensive discussion and revisions by the workshop participants and subsequent publication as the Workshop Proceedings for the June 2017 meeting hosted by FAO in Rome, Italy (FAO 2017). The resulting set of indicators is shown in Table 1.

Following the compilation of databases and data sources for each indicator, we continued to refine the list of indicators by comparing it to the datasets and data sources available. This process helped determine the variables for which data is not currently available through databases but might be feasible to collect through a case-study approach, gray literature analysis, and national-level statistics.

We then categorized most indicators according to the feasibility of measuring them at different geographic levels and based on data availability, including data that is potentially scalable to global estimates as well as non-scalable but relevant data in order to fulfill the objectives of the study. The indicators were then categorized by data availability (i.e., scale and data sources) as well as potential approaches to document each indicator.

Once the indicators and potential data sources for scalable and non-scalable data were matched up using the information compiled on the indicators, data availability, and feasibility of approaches, we identified an overall research approach for collecting data on each indicator. A second experts workshop took place in May 2018 at the University of Washington (UW) with

12 experts in SSF from around the world to further discuss the research strategy for data collection. This process helped determine the final list of indicators to be measured, and helped identify and prioritize resources, instruments, and strategies for data collection efforts.

### 3.2 Types of contributions to sustainable development and their indicators

Based on our knowledge of the literature on common-pool resources (Ostrom 2005), a review of the literature, and expert query and feedback we received at the 2017 FAO workshop, we organized the contributions of SSF to sustainable development and their array of indicators into five broad categories: 1) *contributions to the social dimensions* of sustainable development, 2) *contributions to the environmental dimension* of sustainable development, 3) *contributions to the economic dimension* of sustainable development, 4) *status of governance* as a mechanism to enable these contributions, and 5) *key drivers of change to these contributions* (both endogenous and exogenous to the fisheries). We used this classification to re-organize the ‘wish list’ and the potentially useful sources of information we found.

Table 1 below includes the list of 17 indicators that resulted from the systematic scientific literature review (2012-2016), ad-hoc searches, recommendations from the expert query conducted during the workshop at FAO (2017) and refined at the UW workshop (2018). It offers potential variables or proxies for each indicator identified along with corresponding definitions. This list also includes descriptions of the key drivers of change, including both threats and opportunities, that can be described through narratives including key quantifiable variables (when possible).

**Table 1.** Initial List of indicators proposed to measure the contributions of SSF to sustainable development.

Indicator categories	Definition
<b>SOCIAL INDICATORS</b>	
Income from SSF for food security	Household income from SSF (e.g., proportion and value of income from SSF, including pre- and post-harvest), by gender, for food security.
Fish supply from domestic SSF	The volume of fish available for human consumption from domestic SSF over a period of time for a specific population.
Protein contribution from SSF	The supply of protein from fish over a specific period of time for a specific population.
Micronutrient contribution from SSF	The supply of micronutrients (specially vitamin A, B12, D, Calcium, Iodine, Iron, Zinc and fatty acids) from fish over a specific period of time for a specific population.
Food safety concerns around SSF products	Food safety concerns around SSF products (e.g., disease spread, food contamination).
Distribution of nutritional benefits	The proportion of the supply from fish (or protein and/or micronutrient from fish) available to vulnerable segments of the population in terms of low-income and gender.

People dependent on SSF	Number of dependents on direct income (harvesting activities) and indirect income (pre-harvesting and post-harvesting activities) from SSF (including family members and disaggregated by gender).
<b>ENVIRONMENTAL INDICATORS</b>	
Marine and inland SSF catch	Fish landings (volume <sup>2</sup> in tons and value in \$ USD) from marine and inland fisheries.
SSF catch use	Catch utilization with respect to subsistence, commercial domestic for human consumption, commercial domestic for non-human consumption (e.g., fishmeal), and commercial exported.
Status of stocks exploited by SSF	The state <sup>3</sup> of targeted stocks with respect to fishing pressure, environmental conditions, etc.
SSF fleet characteristics	Description and number of vessels per vessel type and size (or descriptions of non-vessel fishing methods), gear type, engine power, fuel type of the different fleets, number of crew members per vessel, and number of days at sea per calendar year.
Carbon efficiency	Carbon footprint of SSF compared to LSF concerning catch production and seafood consumption.
<b>ECONOMIC INDICATORS</b>	
Number of employees in SSF	Number of employees in the three sub-sectors (pre-harvest, harvest, and post-harvest) in SSF <sup>[1]</sup> , disaggregated by gender and work category (full-time, part-time, occasional).
Investment in SSF	Investment (\$USD) in SSF from national government budgets (and ways it is being used).
Total revenue from SSF	The total sales of capture fish product over a specific time period (from harvesting activities).
Price of SSF catch	Ex-vessel prices (\$ USD), i.e., the prices that fishers receive for their catch (tons), or the price at which fish are sold when they first enter the seafood supply chain, for commercially exploited fish stocks.
SSF exports	Catch exported (volume and value) per year at the smallest political jurisdiction possible (e.g., municipality, township, etc.) for marine and inland SSF.
Production cost of SSF	Cost of production during pre-harvesting (e.g., boat-building), harvesting, and post-harvesting activities.
<b>GOVERNANCE INDICATORS</b>	
Diversity and characteristics of institutional arrangements	The different characteristics of institutional arrangements include: Whether or not it is a formal (i.e., recognized by law) and/or informal (i.e., recognized by customary norms only) arrangement, what is being managed, the type of property rights it provides, the type of fishery it applies to (marine, inland, SSF, LSF), the number of cases where this type of arrangement is applied, the number of fishers operating within and outside of this arrangement, and details about gender inclusion/exclusion.
Tenure /access	Socially-defined agreements held by individuals or groups (either recognized by law or customary norms) on the rights of access and the rules for use of either a defined area or associated resources within SSF <sup>4</sup> , including gender inclusion/exclusion issues.
Rights of fishers	Formal (i.e. state-recognized) fishing property rights within SSF, including those specific to gender.

<sup>2</sup> FWE is the preferred metric for all usage as this allows a degree of inter-comparability. When the weight is derived by calculation of data from another source (e.g. expenditure survey), the term Fresh Weight Equivalent is used.

<sup>3</sup> See Appendix Table 1 of FAO (2011) for criteria for different stock status designations.

<sup>4</sup> Adapted from FAO definitions for management rights of forests (FAO 2015a).

Representation	Formal right to participate in fisheries policy processes (e.g., conception, design, and implementation of fisheries-related policy and regulations) within SSF, including gender inclusion/exclusion issues.
Policy on devolvement of management rights and responsibilities	Transfer of fishery management rights and responsibilities from the Public Administration to individuals, households, communities, or private companies through long-term leases or management agreements within SSF <sup>4</sup> .
Involvement of fishing organizations	Involvement of fishing organizations (either national organizations or national/sub-national offices of international organizations) engaging with fisheries and fisheries management activities.
<b>DRIVERS OF CHANGE</b>	
Fishing pressure	The amount of fishing effort (determined by the amount of boats and time those boats are harvesting in the water and how this relates to the species ability to replenish itself) for a certain species of fish or shellfish.
Illegal fishing	Catch rate from illegal fishing per year.
Climate change	Changes in the availability of fish as a result of climate change <sup>5</sup> .
Climate variability	Changes in the availability of fish as a result of climate variability <sup>6</sup> .
Physical displacement	All situations where a person has been forced to move from their home or country, often due to armed conflicts or natural disasters. In the fisheries context: displacement from either their homes or from spaces used to harvest resources, e.g. due to large-scale development projects.
Product dumping	Export of a product at a lower price than the price it normally charges on its own home market.
Loss of social capital	Loss in the social resources (networks, memberships of groups, relationships of trust, access to wider institutions of society) upon which people draw in pursuit of livelihoods.
Science and technology	Changes in technology related to pre-harvest, harvest, and post-harvest sub-sectors as well as influential research affecting SSF dynamics (e.g., information and communication technology across sub-sectors).
Distortion of demand and supply	Lower or higher prices or production than levels that would usually exist in a competitive market.
Physical infrastructure	Presence of physical infrastructure for fisheries operations (e.g., landing docks, processing stations, freezer access).
Health services	Access to health services (hospitals, clinics, medication, vaccines) provided by government institutions.
Demographic changes overall	The composition of each country's population, encompassing population size, structure, distribution, and spatial and temporal changes.
Habitat loss and degradation	Activities such as deforestation, mining, land reclamation, drainage or irrigation for agriculture, development, that cause habitat loss or degradation within inland and marine aquatic environments and which impact upon small-scale fisheries. There are several forms of habitat degradation such as sedimentation, pollution, degradation of water quality, habitat fragmentation and invasive species.

#### 4. Approaches for measuring and collecting existing data on the indicators

##### 4.1 Working with different levels of data availability

<sup>5</sup> Climate change refers to a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC 2014).

<sup>6</sup> Climate variability refers to 'a change of climate attributable to natural causes (UNFCCC-Art. 1, IPCC 2014).



Based on the list of potential indicators identified through literature review and expert query and the database assessment, the indicators were organized among three levels of data availability:

- global data: Indicators for which it may be feasible to utilize global-level databases;
- sub-regional (i.e. patchy) data: Indicators for which data, although potentially of high quality, are only available for some regions, countries, or fisheries, or are not comparable across cases and locations due to inconsistency in measurement approach; and
- limited data: Indicators for which little to no data sources were identified beyond a single case study.

Each level of availability presents advantages and disadvantages. Below we provide a short description of each.

#### *4.1.1 Working with global databases*

The global databases available constitute promising information sources in terms of developing the most comprehensive assessment of the contributions of small-scale capture fisheries to sustainable development. Nonetheless, a number of methodological questions remain to be addressed in order to capture the utility of these databases. First, for most of the global databases, it is not possible to disaggregate the data to small-scale and large-scale fisheries. Second, under or misreporting of SSF catch, especially subsistence catch, pervades all of the global databases, although some have ventured to correct for this. Thus, utilizing these valuable sources of data will entail developing valid empirical approaches to correct for under or misreporting and estimate the ratio of small-scale to large-scale fisheries contributions (e.g. to production, trade, or consumption). One potential approach is to estimate under or misreporting and key ratios through country-level case studies. Key ratios include:

- SSF under or misreporting of contributions (e.g. production, trade or consumption)
- SSFs production (relative to large-scale fisheries production) for marine and inland fisheries (ideally by taxon/group, e.g. large pelagic species, small pelagic species, demersal species, crustaceans)
- SSFs exports (relative to large-scale fisheries contributions to exports) (ideally by taxon/group, e.g. large pelagic species, small pelagic species, demersal species, crustaceans)
- Proportion of SSFs production destined for export
- SSFs employment (relative to large-scale fisheries employment)

Some of these ratios are referenced in the empirical approaches to measuring indicators described below. See Table 6 for a list of empirical strategies for indicators assessed using global databases.

#### *4.1.2 Working with sub-regional (i.e. patchy) data*

A number of databases assessed presented data at the country level but only for a subset of countries in the world or even at the level of individual fisheries. Even though the coverage is below the global level, some of these data are nonetheless crucial with regard to informing a study of SSFs contributions. Thus, these databases can be utilized in concert with the country-level case studies as either stand-alone sub-global statistics or as bases for extrapolation. See

Table S5 in Supplementary Material 1 for a list of empirical strategies for indicators assessed using patchy databases.

#### *4.1.3 Working with limited data*

For many of the potential indicators identified for the update, the available data are non-existent or highly limited. Nonetheless, it may be worthwhile to include them in the report a discussion of the contributions of SSFs. Such discussions would allow the report to provide an indication of the importance of these contributions in spite of the lack of data to quantify them. This would serve to highlight important dimensions along which it is necessary to improve data collection and emphasize the persistence of data challenges for SSFs. Therefore, Table 2 also summarizes the indicators for which data are extremely limited and provides some data sources or publications that may serve as relevant foundations for discussion and further study.

#### *4.2 Practical approaches to estimating contributions*

In sum, there are three practical approaches that can be taken to generating estimates of the contributions of SSF to sustainable development:

- *Extrapolate*: As in the original HH1 study, country-level case studies can be used to extrapolate up to global estimates. Country-level datasets may complement case study data collection efforts.
- *Apply ratios*: Global level data that is not disaggregated to small- and large-scale fisheries can be used to generate estimates of SSF contributions by applying key SSF ratios (listed above).
- *Use illustrative (thematic) cases*: When neither extrapolating from country-level case studies nor applying ratios to global datasets is possible due to data limitations, it may still be useful to highlight single cases (e.g. a fishery or fishing community) that exemplify SSF contributions in particular places and inform future data collection efforts.

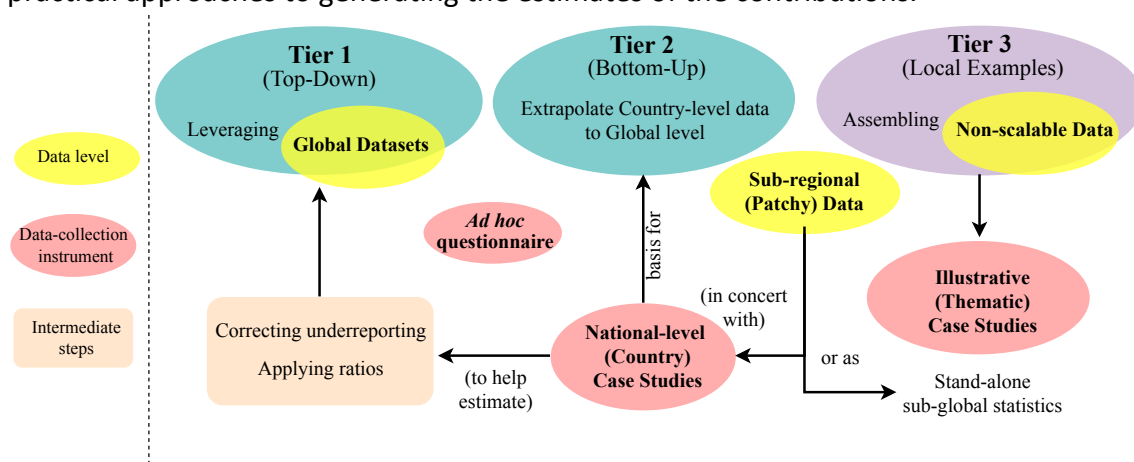
For the purpose of this study, SSF should include subsistence fisheries and exclude recreational fisheries. For each indicator, data will be collected in a time series to the extent possible, ideally covering at least the last three decades. While all potential indicators identified in the initial list (Table 1) stand to inform a more thorough understanding of the contributions of SSF to sustainable development, varying data availability imply the need for multiple distinct approaches to measuring and assessing indicators.

### **5. Integrated approaches: A tapestry of methods**

While new data is available since HH1 was completed, there is still a lack of readily suitable global datasets for the variables needed to estimate measures of the indicators identified. For example, during the identification and assessment of available databases, it was revealed that not all available data sources can be used immediately since they often do not disaggregate between small- and large-scale fisheries. Therefore, it will still be necessary to assemble a methodological tapestry for the new global SSF study. Doing so will likely involve one or more of three main approaches (tiers) to generating global estimates of each of the contributions of SSF to sustainable development:

- *Tier 1*: Leveraging global datasets by correcting for SSF under and misreporting and applying ratio estimates to disaggregate small-scale and large-scale fisheries contributions (top-down). To do this we will rely on national-level (country) case studies;
- *Tier 2*: Undertaking national-level (country) case studies that can form the basis for extrapolation to the global level (bottom-up) complemented by the information obtained via the *ad hoc* questionnaire implemented by FAO to different countries; and/or
- *Tier 3*: Assembling non-scalable data through thematic case studies to highlight measures of the indicator for specific people rooted in specific places.

When possible, we will triangulate the data collected via tiers 1 and 2 with information obtained via an *ad hoc* questionnaire implemented by FAO to different countries. Taken together, these approaches can contribute to a report that couples the ‘big numbers’ about the global contribution of SSF to sustainable development, with grounded and textured narrative about multifaceted nature of contributions and the gravity of the impacts of drivers of change (including challenges and threats) on those contributions. Figure 1 illustrates how these approaches relate to the different levels of available data, data-collection instruments, and practical approaches to generating the estimates of the contributions.



**Figure 1.** Methodological tapestry for the new global SSF study.

### 5.1 Country Case Studies

Estimating measures for all of the indicators will heavily rely on an approach based on *national-level (country) case studies*, similar to the original HH1. These *country case studies* will provide a basis for disaggregation between small- and large-scale fisheries, ‘correcting’ data, and to allow for extrapolations. Therefore, *country case studies*, combined with database information and the *ad-hoc* questionnaire issued by FAO, will form the backbone of the global estimates for the study.

We see the need to undertake country case studies for three reasons:

- 1) To provide the most accurate description to date of the SSF sector at country level, through the collection and/or estimation of data using the best available sources of information at national, subnational and/or local level. This might not necessarily be

official data. Overall, the country case study outputs will form the basis for global synthesis, constituting a primordial approach to achieve the objectives of the IHH study.

- 2) To leverage global datasets by correcting for misreporting and/or applying ratio estimates to disaggregate contributions from SSF and large-scale fisheries (LSF).
- 3) To develop and document a methodology to assess the contribution and impacts of small-scale fisheries to sustainable development that is suitable for each country's context and data availability.

To achieve the highest scientific rigor and transparency on the methodologies used, country case study authors will use the same research protocol for data collection to ensure comparability across country case studies, a good basis for synthesis, and overall robustness of the IHH study. A handbook describing the research protocol was developed with detailed instructions and data compilation templates, and this handbook is handed out to every country team conducting a national-level case study. Each team is also expected to complete a methodological training session with the IHH technical team via an individual videoconference prior to initiating the case study work. This session is meant to address any questions, concerns, or suggestions by the researchers.

Researchers are expected to use the best available information to report on all the IHH indicators collected through:

- *Official or unofficial databases:* Engagement with governments and management agencies to access public official or unofficial and/or confidential databases and archives
- *Literature review:* Review of independent studies at the national and subnational levels (including gray and primary peer-reviewed literature)

Case study researchers are also expected to avoid data that are of dubious quality or clearly incomplete and be creative and resourceful in finding and accessing sources of better quality. In case no (or patchy) data are available from the above-mentioned data sources, alternative approaches are expected to be adopted, including:

- *Identification of available proxies:* use of alternative variables that are known to be associated to the indicator of interest.
- *Extrapolation of available data to fill any data gaps, providing an explanation of how the extrapolation was done and why it is deemed as valid.*
- *Expert elicitation:* Consultation with fishery experts and stakeholders within country. This can be one-on-one conversations with highly knowledgeable individuals to capture their technical opinion, based on their long-term observation of the fishery, about issues for which there is no quantitative data available.
- *Field data collection through surveys:* only in extraordinary cases and after discussion and approval by IHH Technical Team.

The country teams are expected to turn in drafts of their case study, which undergoes a thorough screening process to ensure data quality, completeness, and clear explanations of the source and validity of the data, as well as any methodologies or manipulations that were undertaken.

### 5.2 Case study selection criteria

Methodological choices about case study data collection will be a crucial factor influencing the validity and broader potential impact of this global SSF study. In this regard, it's essential to explicitly define the case study selection criteria, and their relationship with the ability for the suite of case studies to speak more broadly to the global contributions of SSF.

Priority countries for case studies were selected with the aim to include those countries where fisheries and small-scale fisheries have a high importance in terms of capture, employment and nutrition, according to the available data. Particularly, we aimed at including a) those countries where the absolute contribution of fisheries to the global figures for the selected indicators is high, and b) those countries where the absolute contribution to the global figures might be low, but where fisheries have a high relative importance within-country compared to other sectors. For this, two sets of indicators were adopted to characterize countries according to: a) indicators of absolute (i.e. at a global scale) importance of fisheries: total fisheries production, total SSF production, total number of fishers, and b) indicators of relative (i.e. within-country) importance of fisheries: production per capita, SSF production per capita, fishers as percentage of total country labor force and fish protein in the diet as a percentage of total protein intake. Countries were selected based on their rankings of these sets of indicators using currently available data.

In addition, we will aim to have a balanced representation of countries according to geographic diversity, as well as according to the Human Development Index (HDI), which summarizes average achievement encompassing average conditions of life expectancy, education, and a decent standard of living. Studying the role of SSF in this diverse and representative group of countries will help us better understand their contributions at global level. We expect to conduct at least 40 country case studies.

### 5.3 Thematic Case Studies

*Illustrative (thematic) case studies* will also play an important role not only to informing the aggregate figures, but also serving to highlight the importance of SSF in different domains. The information provided through these *thematic case studies*, though not always quantitative, can illustrate the importance of SSF at a local level, which is a dimension that can easily be lost when aggregating to the national, regional, or global levels.

While we consider it necessary to include developed countries in the study to provide a full global picture of SSF contributions to sustainable development, the focus of both the national-level country case studies, as well as the thematic case studies, will be on developing countries given that the estimates from HH1 study indicate that this is where most SSF are located.

## 6. Conclusions

This paper summarizes an initial assessment of the feasibility of conducting a global study on the contributions of SSF to sustainable development, and on that basis, proposes an approach to conduct the study. We summarize a broad set of indicators recommended to better measure the contributions of SSF to sustainable development, and we propose a methodology to collect and organize this information. Despite the wide range of global datasets relevant to

measuring these indicators, which were not available when the HH1 study was conducted prior to 2012, these datasets have significant shortcomings in relation to the objective of the new global SSF study, most notably that: (i) data are not disaggregated between small and large-scale fisheries in most datasets, and (ii) information is missing in these datasets on some key themes identified as critical to measuring the contributions of SSF to sustainable development. As a result, the global SSF study will still rely fundamentally on approaches based on national-level case studies, to both unlock these datasets and to extrapolate from the national level in order to generate global estimates.

Using the variety of approaches proposed in section 5, the new global SSF study will provide a much broader view of the contributions of small-scale fisheries to sustainable development, consistent with the principles articulated in the SSF Guidelines and measurable towards international policy objectives such as SDGs 1 and 2. Measures of the large set of indicators identified here for that purpose will be estimated at the global level to the extent possible, and shown at local levels for illustrative purposes when it is not. The information will be organized according to the conceptual framework proposed in this paper, in order to illustrate the relationships between the indicators for governance, key drivers of change and contributions to sustainable development. The objective of this update is to share this information widely in order to help draw the attention of policy and decision-makers to the global importance of SSF for sustainable development, as it is defined and articulated in a number of internationally-agreed policy instruments and goals.

Beyond this objective, the update will also identify recommendations for policy-makers to start to collect data and track measures of these indicators more systematically, so that this effort can help accelerate a global monitoring framework for SSF and the application of the SSF Guidelines. In that sense, we hope that in five years the international community will not need to return to conduct another update such study, but rather continue to summarize and utilize these indicators based on updated measures from operational monitoring systems. At that stage, the 'hidden harvests' would be far less 'hidden'.

The update will be carried out over the following steps: (i) select case studies, (ii) collect data from each of the select countries, (iii) analyze the data according the three approaches described in section 5, (iv) synthesize the results in a FAO publication for policy-makers as well as a peer-reviewed publication, and (v) carry out ongoing communication to policy-makers and stakeholders on the process and findings. The final publication is expected in late 2019.

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