



Rockefeller Foundation

Innovation for the Next 100 Years



Securing the Livelihoods and Nutritional Needs of Fish-Dependent Communities

May 2013

Foreword

The Rockefeller Foundation marks its 100th year in 2013. The Foundation's mission, unchanged since 1913, is to promote the well-being of humankind throughout the world. During the course of its history, the Foundation has supported the ingenuity of innovative thinkers and actors by providing the resources, networks, convening power, and technologies to move innovation from idea to impact. It supports work that expands opportunity and strengthens resilience to social, economic, health, and environmental challenges. The Foundation seeks to achieve its mission through work aimed at meeting four equally important goals: revalue ecosystems, advance health, secure livelihoods, and transform cities.

Starting in June 2012, the Rockefeller Foundation began investigating the pressing problem of the declining health of the oceans due to climate change, overfishing, pollution and habitat destruction, and the effects of this decline on poor and vulnerable people who depend on marine ecosystems for food and livelihoods. The goal was to better understand the nature of the problem and the potential impact of interventions in the fields of fisheries, aquaculture, poverty, and food security.

The Foundation assembled a portfolio of learning grants that examined this problem from multiple perspectives in order to inform and assess the viability of and potential impact for future engagement on this topic. We supported four scoping studies that sought to identify populations dependent on marine fisheries, as well as review past experience with integrated approaches to fisheries management within a livelihoods and food security context. In partnership with Bloomberg Philanthropies, we also supported scoping work in four countries to assess opportunities for a coordinated strategy integrating national policy, local management, and innovative financing.

We have learned a tremendous amount from the work our grantees have done, captured here by partner FSG in a summary and synthesis. We hope this information will contribute to the broader body of knowledge on this topic, as well as our own work.



Cristina Rumbaitis del Rio
Senior Associate Director, Rockefeller Foundation

Table of Contents

Scale and Urgency of the Problem	4
Impact on Poor and Vulnerable Populations	4
Root Causes of Vulnerability	7

Current Approaches	9
Alternative Livelihoods	9
Wealth-Based Approaches	10
Aquaculture	11
Shared Fisheries Governance	13

Emerging Trends	16
Experimentation with Market-Based Approaches	16
Interest from New Sources of Capital	17
Adoption of a More Holistic View of the Problem by Philanthropic Funders	17
Conservation Efforts Integrated with Poverty and Food Security	18
Growing Recognition of the Role of Seafood in Achieving Food and Nutritional Security	18

An Evolving View	19
Opportunities	19
Integration of Conservation with Rights and Equity Considerations	21
Expansion of Successful Management Regimes	22
Greater Integration of Women	22
Support for Market-Based Approaches	23
Implementation of Innovative Financing Mechanisms	23
Encouraging Smarter Growth in Aquaculture	24
Shifting Philanthropic Funding to a More Holistic View of the Problem	24

Conclusion	25
-------------------	-----------

Appendix	26
Definition of Terms	26
Acronyms	27
Grantees	28
Sources	32
Acknowledgements	34
Disclaimer	34

Scale and Urgency of the Problem

Fisheries and aquaculture represent one of the world's largest and fastest-growing food production systems, in terms of both value and consumption. The industry contributes significantly to the global economy, generating \$500 billion in wealth annually. Global demand for seafood is rising dramatically: worldwide fish consumption per capita has grown at a rate of 12.3 percent per year between 2005 and 2010 (compared with 8.0 percent annual growth for meat, including beef, poultry, sheep, and pork), and is expected to continue to climb, increasing from 144 million tons in 2009 to 230 million tons by 2050.

Moreover, **nearly a billion people worldwide depend on the oceans to meet their nutritional needs and sustain their livelihoods**. Seafood is a vital source of nutrition – including micronutrients, lipids, and protein – critical for good health and early childhood development. Furthermore, fisheries and aquaculture employ 55 million people and support the livelihoods of between 660 and 820 million people globally. According to the Organisation for Economic Co-operation and Development (OECD), “In many coastal areas, there are few alternative employment opportunities for fishers, resulting in a high degree of dependence on fishing activity.”

Despite the size, growth, and global relevance of the fishing industry, **the ability of fisheries to deliver nutritional benefits, sustain**

livelihoods, and contribute to economic growth is increasingly threatened. The Millennium Ecosystem Assessment concluded that coastal ecosystems are among the most productive, yet highly threatened, systems in the world. Increasing demand, combined with pollution, climate change, habitat destruction, massive overcapacity and subsidization of the industrial fishing industry, and widespread illegal fishing practices, has led to 76 percent of all fisheries becoming fully exploited, over-exploited, or depleted. As a result, productivity of wild fisheries is declining at a rate of 500,000 tons per year. Without effective intervention, it will be impossible to meet projected growth in fish demand without depleting wild capture fisheries, improving the sustainability of aquaculture, or finding alternative means of seafood production.

Impact on Poor and Vulnerable Populations

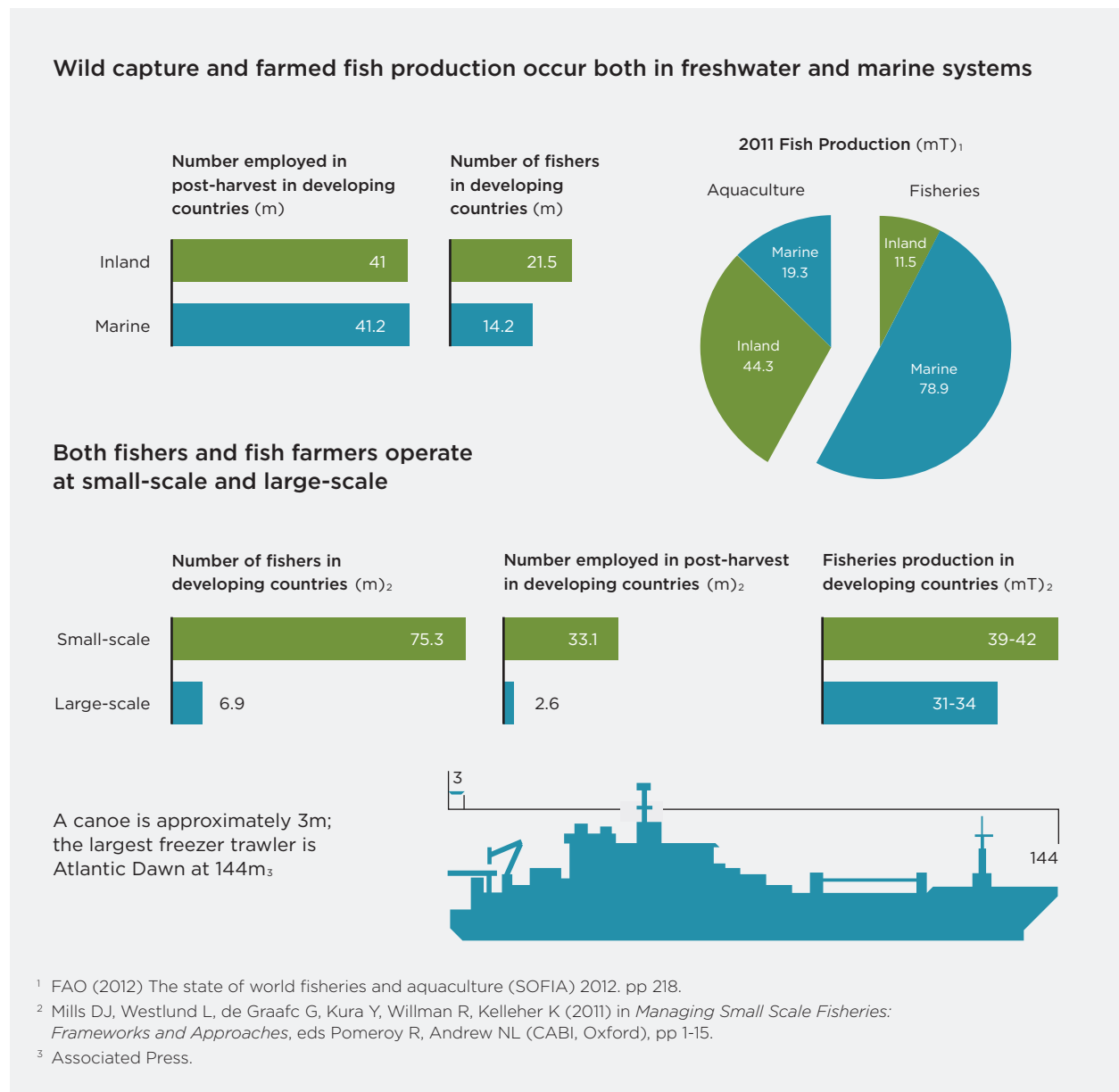
Changes in the marine ecosystem and the associated decline in wild capture fishing will have a particularly profound impact on poor and vulnerable populations, who are disproportionately dependent upon the oceans for both their livelihoods and nutrition. Particularly susceptible groups include: the

one-third of fishers living below the poverty line; residents of low-income, food-deficit countries for whom fish protein comprises a significant proportion of animal protein and micronutrient consumption; and women who work as fish processors and are often excluded from fishery management decisions.

Ninety-seven percent of fishers live in developing countries, and the vast majority are employed in small-scale, non-industrial fisheries, which generate approximately half of all fish caught for human consumption (see Fig. 1).¹ Despite this enormous contribution to the global economy, **one-third of fishers live on less than US\$1.25 per day**. Given their limited assets and income, these small-scale fishers are often forced to engage intermediaries

who may be more powerful and claim a disproportionately high portion of earnings. For example, in Tanzania, fishers often rent boats from processors or rent collectors and are obligated to provide a large proportion of their catch as payment. In spite of challenges such as this, fish dependence in coastal communities remains high, as fishing is both culturally ingrained and offers the most lucrative opportunity for employment.

Figure 1. Production and employment in fisheries and aquaculture (WorldFish 2012)



¹ FAO (2012) The state of world fisheries and aquaculture (SOFIA) 2012. pp 218.

² Mills DJ, Westlund L, de Graaf G, Kura Y, Willman R, Kelleher K (2011) in *Managing Small Scale Fisheries: Frameworks and Approaches*, eds Pomeroy R, Andrew NL (CABI, Oxford), pp 1-15.

³ Associated Press.

¹ See Rockefeller Foundation grantee WorldFish's final report for more information on characteristics of the fishing industry. <http://aas.cgiar.org/publications/resilient-livelihoods-and-food-security-coastal-aquatic-agricultural-systems-investing#.UVN7rBeG2uY>

Not only do fish-dependent communities face extreme economic vulnerability as a result of declining fish stocks, but their **food and nutritional security are also at risk**. Over three billion people worldwide consume more than 20 percent of their animal protein from fish, and food-deficit countries are particularly dependent on fish as a key dietary staple. In addition to its vital contribution to protein supply, fish is an important source of micronutrients and lipids. More than two billion people are deficient in essential vitamins and minerals found in fish, especially vitamin A, iron, and zinc. These deficiencies are particularly detrimental at key stages of human life—including pregnancy, breastfeeding, and early childhood—and can cause severe and often irreparable damage in physical and mental development. As a result, declining fish consumption in vulnerable coastal communities, particularly among women and girls, is likely to have significant inter-generational repercussions.

Women, who represent 47 percent of the fisheries workforce, are particularly vulnerable.

Given the need to attend to household duties, women are typically employed in lower-margin, post-harvest activities, such as processing and trading, that allow them to work close to home. As such, they earn significantly lower income than their male counterparts engaged in fish harvesting. Women are also vulnerable to changing market dynamics in the fishing industry. For example, when income levels rise for traditionally female roles, women are often pushed out of the sector to make room for men (see box on the Role of Women in Octopus Fishing in Tanzania). The resulting loss of economic opportunities for women can have long-lasting effects on families and communities: studies show that women invest as much as 90 percent of their income to provide food, education, and healthcare for their children and families, compared with only 30 percent reinvested by men.² When women lose their source of income, children and families suffer.

The Role of Women in Octopus Fishing in Kilwa, Tanzania

In Kilwa, Tanzania, women traditionally fish for octopus for family consumption and to sell in local markets. However, when international firms began to buy directly from local fishers, prices and incomes increased, which prompted men to enter the market. In doing so, they began to use boats out on the reef—an activity prohibited for women—and ignored the traditional practice of only fishing during certain times of year to preserve the octopus stock. Impact from these changes was dramatic: Not only were women quickly displaced from the industry, eliminating a key source of income for families, but profits also fell for all fishers due to increased costs (from boats, fuel, scuba gear, etc.) and decreased catch per fisher.



² See Rockefeller Foundation grantees Wildlife Conservation Society and WorldFish's final reports for more information on women and gender issues in fish-dependent communities. <http://www.wcs.org/search-results.aspx?searchTerm=gender%20perspective>
<http://aas.cgiar.org/publications/resilient-livelihoods-and-food-security-coastal-aquatic-agricultural-systems-investing#.UVN7rBeG2uY>.

Root Causes of Vulnerability

While the degraded natural resource base is a fundamental driver of the declining ability of fisheries to deliver sustained nutritional and economic benefits, there are a number of additional systemic failures that negatively impact fish-dependent communities.

- **Political marginalization:** Given widespread poverty, low levels of education, and exclusion from the political systems responsible for fishery management, small-scale fishing communities commonly lack the ability to advocate for their rights. Often commercial interests invested in large-scale, industrial fisheries overpower the interests of small-scale or artisanal fishers.
- **Gender inequalities:** In addition to earning lower income than men, women in the fishing industry are often excluded from fishery management decision-making processes. A review conducted by the Wildlife Conservation Society found that women were substantially involved in decision-making processes for resource management in only two of 11 sites surveyed, despite the fact that women were materially involved in some aspect of the local fisheries value chain in all 11 sites.
- **Limited access to markets:** Coastal communities are often highly isolated geographically and logistically from regional and global markets, limiting the ability of small-scale fishers to tap into demand for exported seafood and command higher prices for their catch. As WorldFish states: “Market access barriers continue to pose serious obstacles for developing countries to expand their participation in international trade, add value to their exports, and ensure sustainable fisheries development.”



Fishing boats in Puerto Chacabuco, Chile

- **Weak institutions and infrastructure:** Fish-dependent communities are frequently served by government agencies and institutions that lack the capacity to effectively engage the community, fairly enforce regulations, and counter corruption. The United Nations Environment Program notes that “fishing regulations, such as property rights, quotas, protected areas, and bans on destructive practices, are difficult to enforce for any government but are especially problematic for many developing countries.”³ Moreover, government structures are frequently siloed, with ministries of agriculture, health, finance, and trade lacking incentives to integrate environmental, economic, and social objectives.

These root causes of vulnerability, both local and global in nature, interact in complex ways to increase the vulnerability of fish-dependent communities. Not all fish-dependent communities are vulnerable in the same ways (see box on Identifying the Most Vulnerable Populations). In our dynamic and interconnected world, fisheries are a prime example of the ways in which the fates of political, economic, and coastal systems are deeply intertwined.

³ See the United Nations Environment Programme report “Overfishing and Other Threats to Aquatic Living Resources” for more information on institutional limitations.



Nutrition



Economy



Coastal
Protection



Culture

Identifying the Most Vulnerable Populations

As the global population continues to expand and demand for fish rises with the growing middle class, reliance upon marine ecosystems for a range of essential needs will also continue to increase. Understanding which populations are most dependent on marine ecosystems, and how their dependence varies, can enable identification of those regions most vulnerable to environmental and economic stresses related to fishing. This, in turn, can help conservation and development efforts prioritize the most vulnerable regions and tailor approaches to address their specific needs.

Conservation International analyzed key dependencies—including nutritional, economic, coastal protection, and cultural—on marine ecosystems. The conceptual framework was built on three components: the magnitude of the benefit of the dependence, the degree of susceptibility of the human population to a loss of the dependence, and the ability of the population to obtain an alternative for the dependence.

Conservation International’s methodology was global in scope, utilized sub-national data when available, and integrated findings across dependencies. Nutritional dependency was measured by determining a population’s average proportion of dietary protein derived from marine sources, the percentage of underweight children in the country, and the availability and accessibility of alternative foods. Economic dependence was determined by assessing the average of the ratio of marine fisheries revenue to total GDP, the ratio of fisheries-related employment (direct and indirect) to the total labor force, and the average education level of the population as a proxy to possessing the skills for alternative employment. Coastal dependency was quantified based on coastal communities’ degree of exposure based on storm frequency, sea level rise, elevation, distance from the coast, and population density.

The analysis indicated that dependencies vary significantly by geography. Nutritional dependence is highest in Southeast Asia, Sri Lanka, the Philippines, Indonesia, and several West African countries. Economic dependence is highest in several relatively developed countries, including Chile and Peru as well as other less developed countries like Papua New Guinea. Coastal dependency is highest the Philippines, the southern coasts of Japan and China, and the Caribbean.

Current Approaches

A variety of marine resource science and management approaches have been employed in an attempt to protect the world's oceans. **These current approaches were largely developed to achieve environmental outcomes; to varying degrees they also aim to improve the livelihoods and nutrition of fishing communities.** Many efforts have focused on the replenishment of fish stocks or conservation of marine biodiversity, but they have not successfully taken into account the profound effects on fishers and their families when encouraged to fish less, or recognized the vital role played by women in both the success of the industry and as a critical link to poverty alleviation. Furthermore, traditional interventions developed in the context of single-species, large-scale fisheries in industrialized countries (which employ only 0.5 percent of the global fishing workforce), must be adapted to the context in which the vast majority of fishers operate—that of small-scale fisheries in developing countries.⁴ In order to effectively address the needs of vulnerable fish-dependent populations, these approaches must be tailored for the local context and carefully consider the potential for unintended negative impacts on the community.

Alternative Livelihoods

Alternative livelihood programs, designed to encourage fishers to reduce or eliminate fishing activities in pursuit of other income-generating opportunities, are often proposed as a solution to overfishing. However, evidence indicates that **these efforts often have limited success, as fishing remains a more profitable source of income than alternative employment opportunities.** For instance, a review of 56 livelihood diversification efforts in Southeast Asia and the Pacific suggested that alternative livelihood interventions have had virtually no effect on fish stocks. Because alternative livelihoods were not lucrative enough in most geographies to serve as a viable substitute for

fishing, fishers maintained their fishing activities while supplementing household income with newly available ventures. For example, in the Philippines and Indonesia, conservation groups introduced seaweed farming to coastal populations; while communities did embrace this new activity, it was typically performed by women and children, or by fishers outside of prime fishing times, and did not result in reduced fishing levels. In other countries, such as Malaysia, where livelihood diversification efforts effectively shifted some fishers into new vocations, there was no change to the system overall, as new fishers seized the opportunity to capitalize on less-crowded waters, ultimately maintaining pressure on fish stocks.

⁴ See Rockefeller Foundation grantee WorldFish's final report for more information on traditional approaches. <http://aas.cgiar.org/publications/resilient-livelihoods-and-food-security-coastal-aquatic-agricultural-systems-investing#.UVN7rBeG2uY>.

The review also found that livelihood diversification programs can lead to unintended consequences if they fail to consider the complex social dynamics present in fish-dependent communities. For instance, in the Solomon Islands, when fishers shifted to new vocations, they no longer brought home supplies of healthy, fresh fish for daily consumption. As a result, their families began eating more processed foods, resulting in nutritional declines and poorer health outcomes due to increased saturated fat and sugar intake.⁵ Elsewhere, livelihood diversification attempts targeting women were ineffective because they

did not address the unique set of challenges faced by the female population, including lack of education, illiteracy, and a need to remain close to home in order to tend to domestic responsibilities.

Overall, the evidence base suggests that alternative livelihood interventions are unlikely to be an effective means of conserving fish stocks or improving the overall health and well-being of fish-dependent communities. In most fish-dependent communities, few employment options are as lucrative, or as critical to identity and way of life, as fishing.

Wealth-Based Approaches

Wealth-based approaches have long been embraced as a tool to maximize the rents generated from fishing and increase the contribution of fisheries to GDP and national growth.⁶ The theory behind this approach to fisheries governance argues that subsidies and perverse incentives in the sector have resulted in too many boats chasing too few fish, leading to the over-exploitation of fish stocks and economic inefficiency. It posits that reducing the capacity of fishing fleets will lead to greater aggregate wealth generation that can be reinvested in public goods, allowing the government to better support poverty reduction and food security policies and programs.

Research suggests that in order for wealth-based approaches to contribute to broader poverty reduction, the following conditions are important:

- The fishery sector is large enough that the additional wealth generated has a detectable impact on national GDP growth;
- Losses in employment are compensated for by gains in wealth;
- Institutional capacity exists to designate, distribute, and enforce property or use rights;

- Mechanisms to capture revenues from the sector are effective and efficient;
- Policies and accountability frameworks are in place to ensure that wealth is channeled toward poverty reduction.

Therefore, wealth-based approaches are applicable in some contexts, but not all. Many developing countries lack the human, infrastructure, and financial capacity to enforce fisheries regulations or generate the data necessary to centrally manage resource extraction. As such, **wealth-based approaches applied to developing country contexts have often fallen short of their aims to increase GDP and help alleviate poverty.** One such example is the current fishing partnership in which the European Union (EU) pays annually for the right to fish in West African territories. A recent study concluded that the agreements have “improved trade from West Africa to Europe but do nothing to generate national added value or sustainable profits.” While increased trade has driven improvements in industrial facilities, as well as the technical and sanitary aspects of fish packaging for export, the fisheries agreements have had negative impacts on fish stocks,

⁵ See Aswani, Shankar, et al. 2007 for more information on substitution of packaged foods for fresh fish.

⁶ See Rockefeller Foundation grantee WorldFish’s final reports at <http://aas.cgiar.org/publications/resilient-livelihoods-and-food-securitycoastal-aquatic-agricultural-systems-investing#.UVN7rBeG2uY>; DFID 2005; Cunningham et al. 2009; Allison, Edward H., et al. 2012; and Béné et al. 2010 for more information on wealth-based and rights-based approaches

disrupted marine ecosystems, and reduced the supply of fish for local and national consumption. Heavily subsidized licenses to EU trawlers to fish off the coast of West Africa have led to overfishing; over the past 10 years, catch off the coast of Senegal has decreased by 75 percent, causing environmental consequences and limiting small-scale fishers' ability to generate income to support their families.⁷

Few developing countries demonstrate the conditions necessary for wealth-based approaches to fisheries management to effectively contribute to poverty alleviation. Furthermore, even for those countries in which the appropriate conditions do exist, wealth-based approaches fall short of addressing the complex social and economic needs of vulnerable fish-dependent communities, including the deeply ingrained cultural proclivity to fish and the important role of women in the fishing industry.

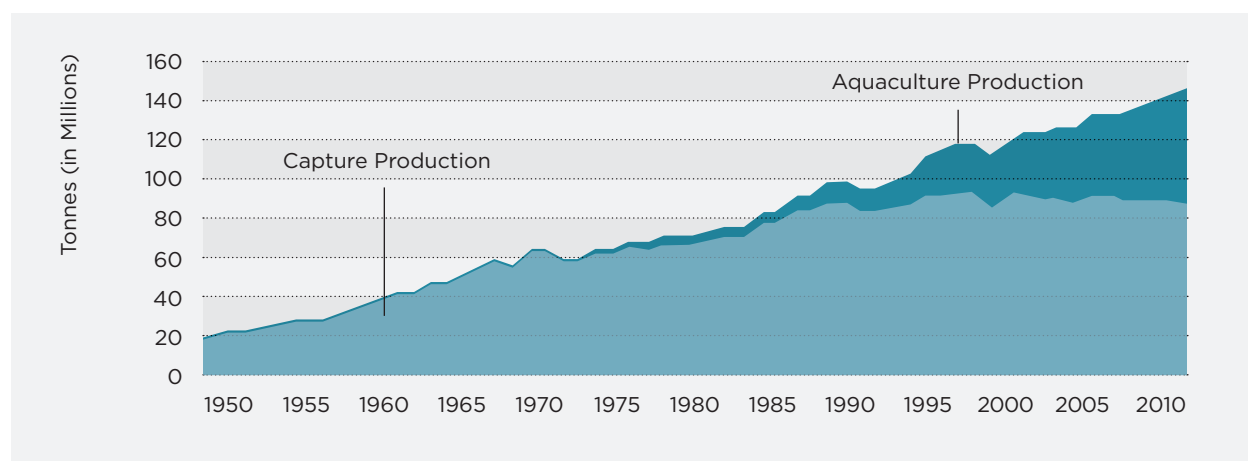
Aquaculture

In response to rising demand for seafood, the aquaculture industry has grown at an average annual rate of nearly nine percent between 1980 and 2010 (see Fig. 2) and is expected to outstrip production from wild-caught fisheries in the next decade. Growth has been particularly rapid in China, South and Southeast Asia, Central America, and in some African countries, notably Egypt and Nigeria.

There is evidence of **both positive and negative impact from widespread adoption of aquaculture as a means to satisfy the world's growing demand for fish**. Some well-managed aquaculture projects have generated internal rates of return of 20 to 30 percent over a 10-year period, while simultaneously improving the livelihoods of

vulnerable fishers. For example, between 2003 and 2009, poor fishers in Nigeria were provided with microfinance loans to invest in small and medium-scale fish farms, resulting in increased fish production, improved revenue for fish farmers, mitigation of rural-urban migration, and generation of new employment opportunities for the community. Furthermore, all of this was achieved without environmental degradation.⁸ Large-scale aquaculture efforts can also benefit fish-dependent communities through development of much-needed infrastructure. For instance, in Indonesia, the success of shrimp farms in Lampung and Palembang has contributed to the development of new schools and clinics that benefit the entire community.

Figure 2. Aquaculture production has risen dramatically while wild capture production has declined (Source: FAO)



⁷ See Failler, P. et al. 2011 for more information on the EU-West Africa fishing partnership.

⁸ See Odebiyi, O. C. et al. 2012 for more information on microfinance loans for aquaculture in Nigeria

However, evidence suggests that aquaculture also can have detrimental environmental impacts and contribute to the marginalization of small-scale fishers for several reasons outlined below.

- **Spread of disease:** Disease outbreaks in farmed seafood can have profound environmental and economic consequences, by spreading to wild fish stocks or ruining fish farm production. Infectious Salmon Anemia (ISA), a lethal disease of Atlantic salmon, originated in aquaculture and has since been documented in wild fish stocks in Sweden, Nova Scotia, Canada, and the United States. In recent years, shrimp farms in several countries in Asia, South America, and Africa have experienced high mortality due to disease, sometimes resulting in total loss of production. In 2011, disease outbreaks virtually wiped out farmed shrimp production in Mozambique.
- **Genetic pollution:** Cultured species are often bred or otherwise genetically engineered to exhibit abnormally high growth rates, usually at the expense of other characteristics inherent to wild species. When genetically engineered fish escape and breed with native fish, genetic traits optimal for aquaculture, but not to survival in the wild, are passed on to offspring. In Maine, federal officials estimate that only 500 Atlantic salmon with native genetic makeup remain in the wild. The long-term consequences of these genetic adaptations are difficult to predict.
- **Dead zones:** Dead zones are hypoxic (low-oxygen) areas in a body of water. These zones arise as a result of high-density coastal operations that pollute surrounding waters with nitrates from fish waste and uneaten food pellets. One study found that a salmon farm of 200,000 fish releases fecal matter roughly equivalent to the untreated sewage of 65,000 humans; many farms in Norway, Canada, and Chile contain four to five times that number of fish.
- **Coastal habitat destruction:** The construction of fish farms requires conversion of productive coastal land into aquaculture farms. In Asia, over 400,000 hectares of mangroves have been converted into brackish-water aquaculture for



Photo: GIO

Offshore Cobia Fish aquaculture in Taiwan

shrimp farming. Tropical mangroves are critical to erosion prevention, coastal water quality, and the reproductive success of many marine organisms, and they provide a sustainable and renewable source of firewood, timber, pulp, and charcoal for local communities. The destruction of this native asset has eliminated large numbers of wild plants and animals that local people traditionally relied upon to feed their families. Loss of habitat has also increased the threat to coastal communities from storm waves and other natural disasters.

- **Marginalization of small-scale fishers:** Aquaculture can threaten the livelihoods of small-scale fishers due to both re-allocation of productive coastal fishing zones to farming and decreased habitat and sustainability of wild-capture fish. For example, mangrove destruction in the Philippines resulted in significant loss of habitat for wild fish, salinization of ground water, and release of toxic substances. These effects decreased local fishers' ability to harvest from their traditional region, forcing them to travel further to access productive waters for fishing.

Whether the benefits of aquaculture will outweigh the risks has yet to be determined. As rising demand for seafood results in increased reliance on farmed fish, it will be important to strengthen environmental safeguards and ensure equity of access to resources for fish-dependent communities, positioning aquaculture as a sustainable solution that both protects the marine ecosystem and helps ensure economic opportunities for small-scale fishers.⁹

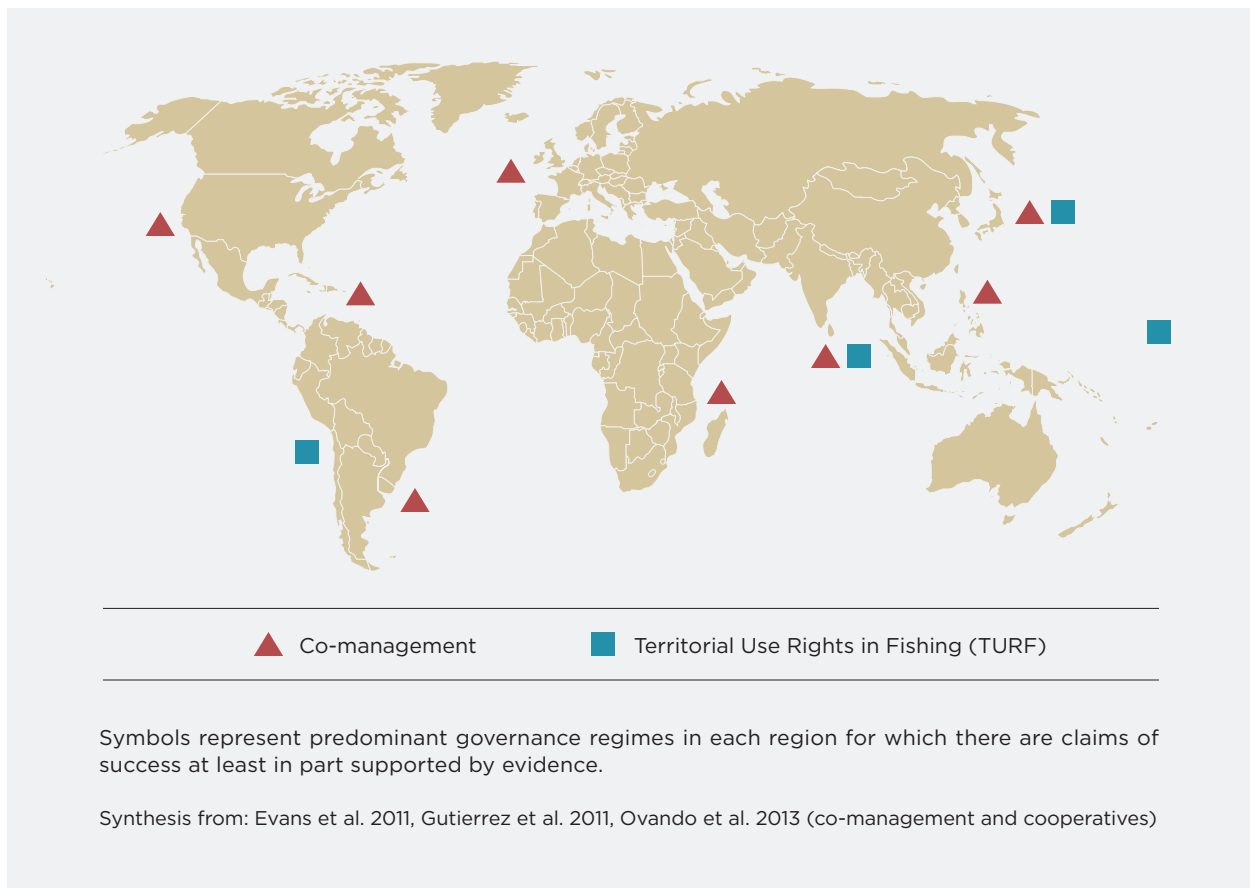
⁹ See Thomas, B. and R. Subasinghe, 2011; Phillips, M. et al., 2011; FAO Policy Perspective 2009; and Rockefeller Foundation grantee WorldFish's final report for more information on aquaculture. <http://aas.cgiar.org/publications/resilient-livelihoods-and-food-security-coastal-aquatic-agricultural-systems-investing#.UVN7rBeG2uY>.

Shared Fisheries Governance

As fisheries around the world have continued to experience over-exploitation and depletion of marine resources, some governments have abandoned ineffective top-down, “command and control” approaches to resource management in favor of piloting new shared fisheries governance systems. There are many examples of these emerging systems; for instance, in the people-centric community co-management approach, fishers and government share the responsibility and authority for fishery management, and

develop formal agreements on their respective roles, responsibilities, and rights in management. Implemented in 44 countries (see Fig. 3), across both inland and wild capture fisheries, community co-management has resulted in improvements in governance processes, increased capacity of small-scale fishers to influence fisheries management decisions, improved compliance with management rules, and ultimately improved stock levels.¹⁰

Figure 3. Examples of co-management and TURFs implemented in various geographies worldwide



¹⁰ See Gutierrez et al. 2011 for more information on community co-management.

One example of a successful inland fishery community co-management effort can be found in the Oxbow Lakes region of Bangladesh. During the mid-1990s, an intervention allowed men and women to fish in ponds on government-owned lands and gave them the authority to co-manage these resources in teams. As part of the program, the international NGO BRAC provided the fishers with microcredit and training in management and marketing. A follow-up study conducted seven years after the end of the effort demonstrated impressive economic, social, and nutritional benefits. The local fishers' share of income from catch increased from 40 percent to 60–70 percent, while average daily income rose from US\$1.00 to \$3.70. Women's average daily income quadrupled from US\$1.00 to \$4.00. Women fishers also realized greater community influence as a result of their inclusion in decisions regarding the management of the ponds. In addition, local fish consumption increased by 108 percent, from 7.9 kg to 16.5 kg per year, leading to improvements in household nutrition.

Such research suggests that there is **potential for community co-management approaches to improve the livelihoods and nutrition of coastal communities**. One means for doing so involves national policies that support managed access to fisheries property rights. An example of a potentially effective rights-based strategy can be found in Territorial Use Rights in Fisheries (TURFs).

TURFs, based on the theory of co-management, promote the transfer or establishment of rights among key fishery stakeholders with the aim of addressing the problems associated with overfishing under open-access regimes. The



Source: Javier Rodriguez

Abalone harvesting via a Chilean TURF

territory governed by a TURF can include the surface, bottom, or an entire water column within a specific area; the selected region is clearly marked and access is provided by law to a given fishing association or community. Under this model, the fishers are responsible for managing and sustaining fisheries. The potential benefits of such an approach include increased legitimacy and compliance due to direct fisher participation in the management process, as well as improved knowledge and understanding of managed resources due to mandated information exchange between fishers and scientists.

Examples of TURFs are widespread, from lagoon fisheries on the Ivory Coast, to beach seine net fisheries along the West African coast, to shellfish and seaweed collection sites in South Korea and Japan, and to benthic fisheries in Chile (See box on TURF governance in Chile¹¹). Across the globe, the most effective TURFs have formally included fishers in planning and surveillance processes, ensuring that local needs and perspectives are represented and addressed.

¹¹ See Rockefeller Foundation grantee the Nature Conservancy's website for more information on TURFs in Chile. <http://www.nature.org/ourinitiatives/regions/southamerica/chile/index.htm>.

TURF Governance in Chile

Chile is a global leader in developing co-management approaches for near-shore marine resources targeted by artisanal fishermen. After an overfishing crisis led to closure of the Chilean abalone fishery in the early 1990s, the country implemented a TURF policy, which today encompasses more than 700 separate TURFs managed by local fishing associations via community-based catch-share agreements.

Studies of the Chilean TURF model have demonstrated improvements in both environmental and social outcomes. A research review indicates significant increases in the abundance and size of managed species within TURFs and no-take zones when compared with open-access areas. At the same time, Chilean fishers have realized a variety of benefits, including: more efficient scheduling of the harvest period to coincide with market fluctuations; improved ability to meet harvest quotas early, allowing time to diversify income through additional jobs; and an increased sense of cooperation, solidarity, and power-sharing among fishers and fishing associations. Fishers have also enjoyed the economic benefits associated with collective bargaining power. For example, before TURFs were established, harvests were typically bought and sold informally along beaches, requiring fishers to bargain with individual buyers, often leading to lower sale prices. Under the TURF system, sales are either arranged before the harvest or catches are kept “stored” until favorable prices can be negotiated. This system allows fishers to sell their combined catches exclusively through legal markets and receive fairer prices for their harvest.



Emerging Trends

Several decades of experimentation with various interventions and approaches to fisheries management have generated evidence that, under certain conditions, recovery of fish stocks is possible and can be achieved relatively quickly. Studies of well-managed fisheries, located predominantly in developed countries, suggest that significant recovery can be achieved in four to 26 years, depending on the ecological dynamics of the fishery. Moreover, a recent review of the world's unassessed fisheries, located primarily in developing countries, indicates that appropriate management regimes can result in increases in fish biomass of 56 percent. However, conservation efforts developed and tested in developed countries cannot simply be applied to developing country contexts, in which the dynamics are often quite different, featuring a greater number of fishers, poor data on fish stocks, and weak governance. Furthermore, it is critical to consider the complex needs of fish-dependent communities and avoid unintended social, economic, or nutritional consequences.

There is growing evidence that, given increased urgency around marine sustainability coupled with the lack of comprehensive solutions provided by many traditional fisheries management techniques, some organizations are exploring more integrated approaches,

considering the linkages between conservation, economic development, and food security. **There is early evidence that, in this dynamic, ever-evolving field, shifts are occurring and movement toward a more systems-based approach is underway.**

Experimentation with Market-Based Approaches

A variety of market-based policies and incentives to align commercial and conservation objectives—such as the certification of sustainable seafood, the emergence of eco-brands, and direct-to-consumer marketing and educational efforts—have demonstrated some success in changing both supplier practices and consumer demand. This trend is evidenced by the growing role of certifiers like the Marine Stewardship Council (MSC), which currently certifies 14 percent of all seafood consumed in the United States as “sustainable,” as well as commitments by major corporations to incorporate sustainable fishing

practices into their supply chains. For example, in 2006, Walmart announced a goal to carry 100 percent MSC-certified wild-caught fish in its stores within three to five years. As of Jan. 31, 2012, 76 percent of the company's fresh, frozen, farmed, and wild seafood suppliers were third-party certified as sustainable and an additional eight percent had developed the required certification plans. Likewise, in 2011, Darden Restaurants committed to ensuring that all of its aquaculture products are certified to Global Aquaculture Alliance (GAA) standards.

Interest from New Sources of Capital

The fishing industry is characterized by several strong value drivers, including favorable price trends, rising consumer demand, increasing retailer demand for sustainable seafood, and a complex supply chain with opportunities for efficiencies in vertical integration. These characteristics make it a promising area of interest for investors, including impact investors, who can

help incentivize sustainable practices (see box on Mission-Related Investment in Sustainable Fisheries). Research conducted by WorldFish has shown that investments in small aquaculture enterprises can be commercially rewarding for investors while simultaneously generating environmental and social benefits.

Mission-Related Investment in Sustainable Fisheries



In 2012, Confluence Philanthropy launched a year-long educational program on mission-related investing in sustainable fisheries and food systems. The program aims to create a community of practice by bringing together grant-makers and donors in a series of educational webinars and in-person round table discussions to discuss how to apply mission-related investing to sustainable fishing practices. The ultimate goal is create an alternative finance stream to support sustainable fisheries.

Adoption of a More Holistic View of the Problem by Philanthropic Funders

There is some early evidence to suggest that several leading philanthropic funders active in conservation are beginning to take a more holistic and system-wide view of fisheries decline. In interviews, these funders¹² noted the following early trends:

- **Movement toward a systems focus:**

Conservation and development-minded organizations are beginning to see fish-dependent communities through a “systems” lens that encompasses the entire value chain, including food security and equity in assets. A World Bank interviewee stated, “Almost all of the donor and NGO community realizes that if they don’t address the human aspect

of conservation, then they are not going to address the problem. The bulk of the community, both donors and NGOs, are really turning the page on this big-time.”

- **Increasing emphasis on engaging**

communities: Some leading funders recognize that they should work together with NGOs to improve understanding of local contexts, tailor approaches to build local capacity, and involve communities in fisheries management. A representative from the Gordon and Betty Moore Foundation noted, “Unless you work with the community and align with its needs, your efforts will not work.”

¹² Interviewees included the Gordon and Betty Moore Foundation, the David and Lucile Packard Foundation, Bloomberg Philanthropies, and the World Bank.

- **Need to build the capacity of key government institutions:** Funders stress the importance of local government regulatory capacity to effectively implement programs that are beneficial to fish-dependent communities and enable them to manage investments effectively. A representative from the Packard Foundation indicated that “strong management capacity from government agencies is needed so communities don’t fish themselves out.”



Hout Bay Harbour, South Africa

Conservation Efforts Integrated with Poverty and Food Security

After a period of promoting “fortress conservation” in the form of strict “no-take” marine protected areas, some conservation NGOs are beginning to embrace new approaches to integrate conservation with development efforts, often in partnership with social development NGOs and private sector economic agents. For example, in 2008, CARE and the World Wildlife Fund (WWF) launched an integrated alliance to address root causes of poverty and environmental degradation in Mozambique. In 2011, CGIAR launched the Research Program on Aquatic Agricultural Systems (AAS) to reduce

poverty and improve food security for people whose livelihoods depend on aquatic agricultural systems. Likewise, other major conservation organizations—including Conservation International, the Nature Conservancy, Wildlife Conservation Society, and several major conservation funders (e.g., the David and Lucile Packard Foundation, the Gordon and Betty Moore Foundation, and Bloomberg Philanthropies)—are increasingly viewing poverty reduction and food security objectives as complementary to conservation aims, and aligning their approaches accordingly.

Growing Recognition of the Role of Seafood in Achieving Food and Nutritional Security

Despite the high-quality protein, omega-3 fatty acids, and abundance of other micronutrients it provides, fish has traditionally been virtually absent from mainstream food security strategies. However, there is evidence that this is changing, with global food security efforts increasingly including fish. For example, the Food and Agriculture Organization (FAO) of the United Nations now promotes fish as integral to food security, and fisheries and aquaculture represent an area of increasing interest for the Feed the Future initiative, the US government’s global hunger and food security effort.



Fish for sale hanging in a coastal fish market in Chile

An Evolving View

Over the past several decades, a variety of policy tools and management approaches have demonstrated that recovery of fish stocks is possible. As global seafood demand is expected to rise over the coming decades, it is likely that mounting political pressure will result in increased efforts to improve the ecological sustainability of fisheries. However, given the complex, dynamic relationship between fisheries and aquaculture, poverty, and food security, the implications for the poor and vulnerable of this “sustainability transition” remain unclear. Although there is potential for improvement in marine resources to produce social and economic benefits for fish-dependent communities, without appropriate emphasis on rights and equity, these benefits are unlikely to be evenly distributed, and may have unintended negative consequences for fish-dependent communities.

There is a growing body of evidence to suggest that there are strategies and interventions, such as community co-management and TURFs, that can restore marine ecosystems and simultaneously improve the livelihoods of poor or vulnerable communities dependent on those ecosystems. **An emerging view that puts people at the center of the fisheries socio-ecological system shows promise**, suggesting that a more productive path toward conservation and development outcomes

should emphasize engagement of fishers in management decisions and appreciate the role women play in both the fishing industry and their communities. **A focus on the rights of small-scale fishers, coupled with greater opportunity and agency for women, can be a helpful framing to guide interventions** that seek to address the multidimensional causes of vulnerability among fish-dependent communities, and the declining resilience of marine ecosystems.

Opportunities

The combination of rising seafood demand and declining wild capture fish production has led to a critical inflection point, causing stakeholders to consider new approaches to marine conservation. As such, there exists a unique opportunity for the field to support a systems approach that restores the ecosystem and improves the livelihoods, food security, and nutrition of fish-dependent communities.

By supporting integrated, rights- and equity-based efforts, policies, and practices, there is an opportunity to shift the transition to sustainable fisheries toward more equitable outcomes. In order to effectively address the root causes of fisheries collapse and the increasing vulnerability of small-scale fishers—including climate change, resource and power imbalances, political and economic marginalization, and weak supporting

institutions and infrastructure—integration of approaches addressing marine conservation, economic development, and food security will be required. Developing these integrated, system-focused approaches provides the opportunity to build upon evidence of what works, takes advantage of early momentum in new areas, and ensures that real and lasting social and economic benefits are delivered alongside environmental improvements (see box on Key Opportunities for the Field).



Fishing in West Africa

Summary of Opportunities and Actions for the Field

Key Opportunities for the Field	Specific Action to Drive Opportunity
Integration of Conservation with Rights and Equity Considerations	Foster more multi-stakeholder, multi-level interventions that integrate rights and equity concerns with sustainability objectives
Expansion of Successful Management Regimes	Test promising approaches in context and adapt to new geographies, ensuring that community needs are addressed
Support for Market-Based Approaches	Connect small-scale fishers in developing countries with developed markets for high-value fish
Greater Engagement of Women	Advocate for the active engagement of women in fisheries management, and ensure that interventions do not inadvertently exacerbate existing gender inequalities
Implementation of Innovative Financing Mechanisms	Test emerging financing mechanisms, measuring effectiveness, and evaluating the potential for broader implementation
Encouraging Smarter Growth in Aquaculture	Provide support for the expansion of sustainable, pro-poor aquaculture to new geographies and seafood species
Support the Marine Conservation Movement in a Shift toward a More Holistic View of the Problem	Encourage more funders to enter the field, embrace a rights- and equity-focused approach, diversify funding across the value chain, and shift funding toward lower-income countries

Integration of Conservation with Rights and Equity Considerations

Efforts such as the CARE-WWF partnership, CGIAR's AAS initiative, and the Global Partnership for Oceans indicate that major players are beginning to recognize the importance of an integrated approach to marine conservation that takes into account poverty alleviation and food security concerns to ensure resilience of the marine social-ecological system (see box on Leveraging Partnerships for Action). Going forward, there is **opportunity to foster more multi-stakeholder, multi-level interventions and partnerships that integrate rights and equity concerns with sustainability objectives**. Realizing this vision will require effective collaboration

between conservation NGOs and governments, which are responsible for policy and regulatory support; private sector actors, which have experience developing and delivering relevant financial and social services; and development organizations, which have experience addressing poverty, rights, and food security issues. Funders and other influential global players, such as the United Nations, can support and engage with these partnerships to emphasize the importance of the social dimension of ecosystem sustainability and help bring to conservation efforts more voices, particularly those of women, to represent the needs of fish-dependent communities.

Leveraging Partnerships for Action



The Global Partnership for Oceans is a growing alliance of more than 100 governments, international organizations, civil society groups, and private sector actors committed to addressing the problems of overfishing, pollution, and habitat loss. The Global Partnership convenes stakeholders to mobilize significant human, financial, and institutional resources for effective public and private investments in priority ocean areas. These investments aim to improve capacity and close the gap in implementing global, regional, and national commitments for healthy and productive oceans. Select goals of the Partnership include:

- Increase and sustain the annual net benefits of capture fisheries to \$20-\$30 billion from a current net economic loss of \$5 billion
- Reach a target of two-thirds of global fish supply from sustainable aquaculture
- Double the area covered by marine protected areas to a total of five percent
- Reverse the trend of increased sewage, nutrient, and marine litter in targeted ocean areas

Expansion of Successful Management Regimes

Examples exist of fisheries management models that emphasize inclusive decision-making processes and engage communities, including women, in formulating management plans and rules. These approaches, including co-management and TURFs, have demonstrated potential to conserve marine resources while simultaneously improving livelihoods and food security. There is an opportunity for stakeholders worldwide to assess the factors critical to successful shared resource management, learning from both the fishing industry and parallel sectors, such as tropical forestry. **The most promising approaches must then be tested in context and adapted to new geographies**, ensuring that communities

possess the assets required to capitalize on improvements in fisheries management. Supporting interventions could include: addressing the health and educational needs of mobile fishing communities to improve their resilience to shocks and stresses; developing financial services for fishers who typically lack land as collateral; strengthening institutions to promote access to justice and conflict resolution; and empowering women to realize their rights. It is important to ensure that fisheries management efforts are complemented by sustainable livelihood initiatives rooted in a deep understanding of the unique constraints and opportunities experienced in fish-dependent communities.¹³

Greater Integration of Women

The past several decades have seen numerous efforts to elevate the importance of gender issues in fisheries management. Although in some places women's participation in decision-making has improved, progress has been uneven. Evidence suggests, however, that interventions targeting women can have positive social and economic results. For instance, a joint program undertaken by the governments of Ghana and the Netherlands demonstrated the potential to improve economic opportunities and agency for women fishers. The initiative provided more efficient, higher-quality smoking ovens to women processing fish for sale in villages along Ghana's coast, built advocacy networks to encourage women to engage in fisheries management processes, and established microcredit networks to support women as entrepreneurs in the community. When researchers interviewed the targeted women five years later, they unanimously reported that the ovens improved the quality of their fish, and two-thirds stated that they had seen their profits rise as a result. Additionally, a majority of the women interviewed indicated that they had been economically empowered by the adoption of the improved technology.



Tanji, The Gambia

Building upon successes such as this, there remains ongoing need for significant and widespread changes in fisheries management to ensure that initiatives address the needs of women, including insecure land and fisheries resource tenure, scarcity of time, poor educational opportunities, lack of access to financing, and increased exposure to health risks. As such, there is **opportunity for global stakeholders to advocate for the active engagement of women in fisheries management, and ensure that interventions do not inadvertently exacerbate existing gender inequalities.**

¹³ See Rockefeller Foundation grantee WorldFish's final report for additional information on fisheries management transformation. <http://aas.cgiar.org/publications/resilient-livelihoods-and-food-security-coastal-aquatic-agricultural-systems-investing#.UVN7rBeG2uY>.

Support for Market-Based Approaches

To date, market-based approaches attempting to align commercial and conservation objectives—including seafood certification, promotion of eco-brands, and consumer education campaigns—have largely focused on developed markets and high-value fish, such as tuna and salmon. There is **opportunity to more effectively connect small-scale fishers in developing countries with developed markets for high-value fish**, allowing them to benefit from demand for sustainable seafood and

attract higher prices for their catch, while at the same time incentivizing sustainable management of fisheries resources. In addition, foundations, conservation and development NGOs, and advocacy organizations can help support initiatives to increase consumer demand for sustainable fish, and encourage companies to follow the lead of corporations such as Walmart and Darden Restaurants in committing to sustainable practices in their seafood supply chains.

Implementation of Innovative Financing Mechanisms

Like market-based conservation approaches, innovative financing mechanisms in fisheries have focused primarily on high-value fish in developed country markets. Evidence suggests that there is an **opportunity to develop new models that are applicable to developing countries**. To test this potential, a collaboration of three Rockefeller Foundation grantees developed a set of strategies intended to utilize private capital to drive sustainable fishing practices in developing country fisheries. These frameworks build upon lessons learned from conventional financing strategies, incorporate features to mitigate risk, and create incentives for sustainability.

- **Artisanal Fisheries Route-to-Market (FR2M) Fund:** The FR2M Fund would raise a US\$1–5 million fund to support the growth of small and medium enterprises (SMEs) that source fish sustainably. In exchange for use of sustainable fishing practices, fishers would be provided an ownership interest in the fund, creating a financial incentive to utilize more sustainable practices and therefore contribute to conservation returns. Investors would earn a financial return through the payment of dividends from the small business investments.
- **Fisheries Public-Private Partnership (FPPP):** The FPPP would develop a US\$20–50

million fund to support private partners to deliver services (e.g., stock assessments, data monitoring, regulatory enforcement, ecosystem services management) in exchange for long-term services contracts with government authorities. Repayments would be performance-based, and aim to reduce project costs, accelerate implementation, and shift risk of performance from the public sector to the private sector.

- **Fisheries Impact Fund (FIF):** The FIF would raise private capital to fund a suite of sustainability interventions targeting the recovery of a specific species. The innovative feature of the fund would be its establishment of long-term supply contracts between fishers and seafood products companies, with fishers agreeing to utilize sustainable practices, and seafood companies agreeing to pay a commission to investors as the fishery recovers. Long-term supply agreements would aim to increase income to small-scale fishers and provide greater security of supply to seafood companies over time.¹⁴

Potentially effective investment tools such as these have yet to be fully tested and implemented. Going forward, there is opportunity for the field to pilot these strategies, rigorously measuring effectiveness, and evaluating the potential for broader implementation.

¹⁴ See Rockefeller Foundation grantee EKO Asset Management Partners' website for more information on innovative financing strategies. <http://ekoamp.com>.

Encouraging Smarter Growth in Aquaculture

While poorly managed aquaculture can have negative repercussions for both communities and the environment, sustainably designed, pro-poor fish farming has the potential to generate substantial societal benefit.¹⁵ There is an opportunity for global stakeholders to provide support for the expansion of such sustainable, pro-poor aquaculture to new geographies and seafood species. Specific opportunities include:

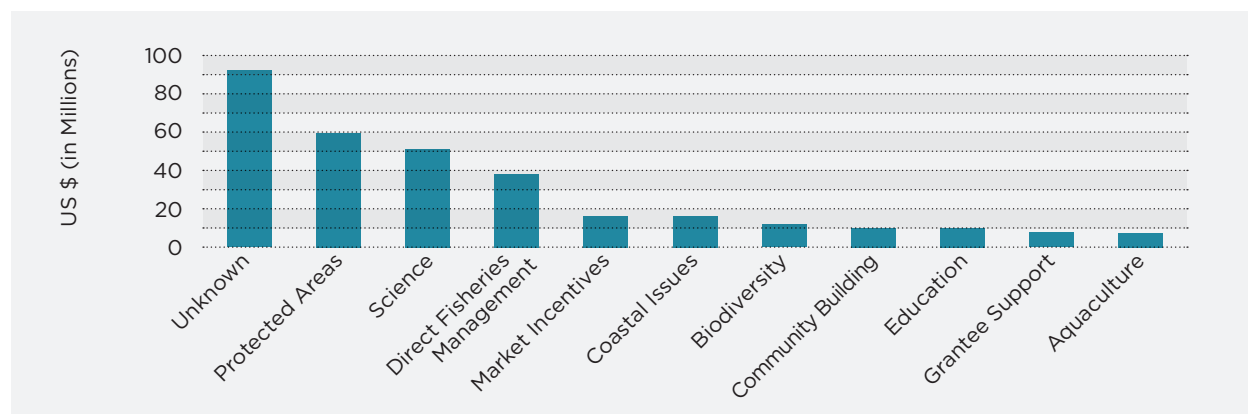
- **Supporting knowledge transfer** to share expertise from effective programs to new geographies, and from other successful rural enterprise development programs to the aquaculture sector;
- **Providing technical assistance** around biosafety, surveillance, reporting, and control systems for diseases that threaten the sustainability of the sector;
- **Building management capacity**, including targeted support to enable small fish farms to meet certification and quality requirements for high-value export markets;
- **Improving access to capital**, exploring the role of patient capital from impact investors specifically designed to meet the needs of small-scale fishers (e.g., loan repayment terms to match the fishing season).¹⁶

Shifting Philanthropic Funding to a More Holistic View of the Problem

Although there is some evidence of donors beginning to recognize the need for more integrated solutions, overall funding trends indicate an opportunity to shift additional funding to new approaches. Philanthropic funders spent US\$300 million on marine issues in 2011, but investments were focused largely on the production and harvesting of sustainable, high-value fish in developed countries (see Fig. 4), with very little support dedicated to developing

countries or the intermediate steps of processing and distribution, where 70 percent of the fisheries workforce is employed. Moreover, only a handful of funders are active in the space, with eight private foundations together providing 63 percent of total funding. Increased outreach and education efforts are needed to **encourage more funders to enter the field, embrace a rights- and equity-focused approach, diversify funding across the value chain, and shift funding toward lower-income countries.**

Figure 4. Private funding by intervention 2007 - 2009 (Source: California Environmental Associates)



¹⁵ See Rockefeller Foundation grantee WorldFish's final report for more information on smarter growth in aquaculture. <http://aas.cgiar.org/publications/resilient-livelihoods-and-food-security-coastal-aquatic-agricultural-systems-investing#.UVN7rBeG2uY>.

¹⁶ See Manta Consulting, 2011 and Verde Ventures' website for more information about access to capital for fishers.

Conclusion

The world has reached a critical inflection point in our approach to fisheries management and marine ecosystem conservation. Poor and marginalized communities dependent upon small-scale fisheries face increasingly insecure livelihoods, diminished nutrition, and social disruption due to declining fish catches combined with broader social and economic vulnerabilities. Our actions in the near-term will determine the fate of wild capture fisheries and the social benefits they provide, including whether these communities will become sustainable or confront potential collapse. If global demand for fish continues to climb, driven in large part by growing middle-class populations in middle-income countries, fishing activity will increase, placing further stress on limited marine resources and exacerbating the fragility of the system. Without effective, systemic intervention, the status quo will result in more than just the collapse of an industry and environmental catastrophe; low-income coastal communities will see their main source of income and nutrition disappear, pushing them deeper into poverty.

While some fisheries recovery models have proven effective in various regions of the world, many conventional conservation approaches have been largely incomplete in addressing the unique social and economic needs of fishing communities. However, **the growing body of evidence around rights-based approaches and momentum toward more systems-level change suggest an opportunity to preserve marine ecosystems while improving livelihoods and food security for fish-dependent communities.** Expanding interventions that embrace this concept could make a material contribution in shifting the transition to sustainable fisheries management toward more equitable outcomes. In order to effectively address the complex system failures that threaten fish-dependent communities, governments, NGOs, industrial fishers, local community groups, and small-scale fishers can work together, embracing an integrated approach to conserve the ecosystem and improve livelihoods, nutrition, and food security. This



School of Fish and Fan Coral, Madagascar

approach will require a **reframing of the problem, evolving from a narrow focus on the marine ecosystem to a multi-systems focus on vulnerable communities.** Such alignment of conservation goals with development objectives could not only protect our oceans but also ensure the well-being of the millions of people who depend on them for their livelihoods and health.

Appendix

Definition of Terms

Aquaculture: The farming of aquatic organisms including fish, mollusks, crustaceans, and aquatic plants with some sort of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated.

Co-Management: Co-management can be formally defined as a partnership arrangement in which fishers, harvesters, and government share the responsibility and authority for the management of the fishery. Through consultations and negotiations, the partners develop a formal agreement on their respective roles, responsibilities and rights in management, and mechanisms for conflict resolution.

Fisher: A fisher is someone who harvests fish, regardless of gender.

Fishery: A fishery can refer to the sum of all fishing activities on a given resource; for example, a hake fishery or shrimp fishery. It may also refer to the activities of a single type or style of fishing on a particular resource; for example, a beach seine fishery or trawl fishery.

Food Security: When all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life.

Large-Scale Fishers: Fishers operating from relatively large vessels and with moderate/high levels of technology and capital investment.

Rights-Based Approach: Focuses on resource use and tenure rights, motivated by the observation that exclusive resource tenure provides users with incentives for both efficient economic exploitation and sustainable resource management.

Marine Capture Fisheries: Refers to all kinds of harvesting of naturally occurring living resources in marine ecosystems.

Marine-Protected Areas: A protected marine intertidal or sub-tidal area set aside by law or other effective means. It provides degrees of preservation and protection for important marine biodiversity and resources – a particular habitat or species, or sub-population, for example – depending on the degree of use permitted. In MPAs, activities (e.g., of scientific, educational, recreational, or extractive nature, including fishing) are strictly regulated and could be prohibited.

Nutrition Security: When secure access to appropriately nutritious food is coupled with a sanitary environment, adequate health services, and care, to ensure a healthy and active life for all household members.

Open-Access Fishing: Open access is the condition where access to the fishery (for the purpose of harvesting fish) is unrestricted; i.e., the right to catch fish is free and open to all.

Small-Scale Fishers: Fishers operating from relatively small vessels and with low levels of technology and capital investment.

Social-Ecological Systems: Complex, integrated systems in which humans are part of nature. Social-ecological systems act as strongly coupled, complex, and evolving integrated systems.

Wealth-Based Approach: Aims to maximize economic rents from fisheries in order to increase the contribution of fisheries to GDP and growth as a means of achieving poverty reduction.

Wild-Caught Fish: Fish caught that live in conditions that are not controlled. This is the opposite of aquaculture.

Acronyms

AAS	Aquatic Agricultural Systems
BRAC	Formally Bangladesh Rural Advancement Committee
CGIAR	Formally Consultative Group on International Agricultural Research
CI	Conservation International
DFID	Department for International Development
EU	European Union
FAO	Food and Agricultural Organization
FIF	Fisheries Impact Fund
FPPP	Fisheries Public-Private Partnership
FR2M	Fisheries Route-to-Market
GDP	Gross Domestic Product
MPA	Marine Protected Area
MSC	Marine Stewardship Council
NGO	Non-Governmental Organization
PPP	Public-Private Partnership
SME	Small and Medium-Sized Enterprises
TNC	The Nature Conservancy
TURF	Territorial Use Rights in Fishing
UEA	University of East Anglia
UNFPA	United Nations Population Fund
USAID	United States Agency for International Development
WCS	Wildlife Conservation Society
WWF	World Wildlife Fund

Grantees

The Rockefeller Foundation partnered with eight grantees to investigate various elements of the issue of declining marine health and the impact on poor and vulnerable people who depend on marine ecosystems for food, nutrition, and livelihoods. While these organizations have different interests and priorities, they are all concerned about both conserving the marine ecosystem and improving the lives of fish-dependent communities. The Foundation engaged these specific grantees to research different parts of the problem based on the grantee's expertise. Their findings informed the Foundation's view that there is a critical need to reframe the issue to position people at the center and take an integrated systems-wide approach to tackling the problem.

University of East Anglia (UEA)

The Rockefeller Foundation engaged UEA to **better understand the linkages between fisheries, poverty, and food security**. UEA conducted a scoping study to identify ways to ensure that reforms and policies result in poverty reduction and food security benefits for vulnerable people who are dependent on fish and fisheries for food and livelihood. Key findings include:

- Current efforts to combine marine resource conservation with poverty reduction focus on improved resource governance. Important as this is, it neglects other potentially complementary pathways to poverty reduction, such as improving access to health and education in fishing-dependent communities.
- Reframe fisheries as part of the food system, rather than just a resource conservation issue.
- Fisheries and aquaculture contribute to food security in diverse ways; indirect pathways can be as important as direct nutrition.
- Where fish is a vital component of a nutritious diet, any management action that purposively makes it less available to food-insecure people is a violation of the human right to food.
- Fish trade from low-income, food-deficit countries does not necessarily take food from the mouths of the poor.
- Aquaculture is helping to maintain and increase global per capita supply and is starting to supply low-cost fish to low-income consumers through domestic and regional markets.
- Fish contain key nutrients, some of which cannot be obtained more readily from other sources.
- Fish can be an important source of micronutrients, the deficiencies of which cause illness, particularly in pregnant and lactating women and infants.
- Fish is not yet explicitly part of any major initiative to reduce the “hidden hunger” of micronutrient deficiencies.
- Food is not just a source of nutrition; it also has cultural and social functions.
- Seafood consumption can be harmful to health but benefits usually outweigh risks.
- Fisheries and aquaculture in low-income, fish-dependent countries need to be managed with food security in mind.
- Wealth-based fisheries won't help poverty reduction and food security everywhere.
- Fishers are often reluctant to diversify out of fishing because the alternatives are less financially rewarding and threaten identity and job satisfaction.

Conservation International (CI)

The Foundation engaged Conservation International to help **quantify human dependence on marine ecosystems**. CI worked with global experts to create a conceptual framework of dependence based on the magnitude of the benefit of the service that is provided, the susceptibility of the human population to a loss of that service, and the ability of the population to obtain an alternative for the service. Experts identified four dimensions of dependence: nutritional, economic, coastal protection, and cultural dependence. Initial spatially explicit analyses were conducted to identify where people were most dependent on marine ecosystems to provide them with food. By better understanding the geographic locations that are most dependent on the marine ecosystem, policymakers, funders, and practitioners can more strategically prioritize areas in which to focus efforts. Initial results of nutritional, economic, and coastal protection dependencies highlighted geographic priorities in West Africa and Southeast Asia for multiple dependencies. The grantee found that there was not sufficient data to effectively capture cultural dependencies at the global scale. Key findings include:

- Nutritional dependence was highest in Southeast Asia, Sri Lanka, the Philippines, Indonesia, and in several West African countries.
- Economic dependence highlighted several countries that are relatively developed.
- Coastal dependency was highest in the Philippines, the southern coast of Japan and China, and the Caribbean.

Wildlife Conservation Society (WCS)

The Foundation engaged WCS to better **understand the role of women and how to integrate gender empowerment into marine conservation strategies**. Through this project, WCS identified a portfolio of opportunities around the world in which understanding gender dynamics more broadly, and engaging women specifically, can improve coastal and fisheries management efforts and contribute to positive and long-lasting environmental change. To place this work within the context of conservation and small-scale fisheries management efforts globally, WCS conducted a broad assessment of fisheries, gender and livelihoods issues. In addition, the organization assessed its marine conservation programs across 11 sites in nine countries (Bangladesh, Belize, Fiji, Gabon, Indonesia, Kenya, Madagascar, Nicaragua, and Papua New Guinea) to determine how gender and gender dynamics are (or could be) integrated into coastal and marine conservation strategies and activities. Overall findings include:

- Households and communities are not homogenous. The influences of local gender disparities and power dynamics need to be accounted for as they have important implications for health, nutrition, livelihoods, and natural resource management.
- Increases in fish catch or improved market values do not always equal increases in food security, and may contribute to reduced household and family nutrition and inequitable access to coastal resources.
- Marine conservation and management initiatives must consider the whole fisheries value chain, including extraction, processing, marketing, and consumption.
- Women are key players throughout the fisheries value chain but they are often marginalized from decision-making and resource management processes.
- Fisheries management and conservation approaches often benefit one sector of society and can have unintended, negative consequences for poverty, livelihoods, and human well-being if they are based on or exacerbate unequal social power dynamics within communities.
- There is a greater need for a more holistic approach to fisheries management and marine conservation, as there is increasing vulnerability of coastal fishing communities to a growing number of “upstream” or “outside” events that result in increased flooding, coastal erosion and pollution which negatively affect small-scale fisheries-based livelihoods.

The Nature Conservancy (TNC)

The Foundation engaged TNC to provide a country perspective on a promising approach: Territorial Use Rights in Fisheries (TURFs). TNC conducted a comprehensive review of lessons learned about Chile's TURF program, specifically addressing the governance challenges in making TURFs a successful management approach for small-scale, near-shore fisheries. The Chilean TURF model has proven to be successful under certain circumstances and is seen by many as the example to follow to move small-scale coastal fisheries from the current open-access regime to a rights-based management approach. TNC's research highlighted both areas of strength and challenges for the Chilean TURF program. Some positive findings include:

- Chilean TURF policy is transparent and equitable.
- The system has promoted the formation of fishing associations and increased the political voice and communication among fishers; between fishers and the scientific community; and between fishers and the state.
- There has been improvement in fishers' knowledge and understanding, which has contributed to a sense of resource stewardship on the part of fishers.
- In some regions the system has allowed for increased economic stability and diversification of incomes.

Challenges include:

- Lack of environmental considerations in the design and management of the TURFs.
- An uneven distribution of valuable resources and infrastructure among regions.
- Limited market access and capacity to produce value-added products.
- A weak governance system and insufficient capacity in many of the fishing associations to ensure the success of TURFs.
- The non-existence of formal mechanisms for the periodic review and subsequent adjustment of the system.

Oceana, Rare, and EKO Asset Management Partners

The Foundation partnered with Oceana, Rare, and EKO Asset Management to assess how to **create a model to achieve sustainable fishery management and increase fish stocks to improve livelihoods and ecosystems in specific geographies**. For each of the four countries studied (the Philippines, Brazil, Chile, and India) the collaboration assessed how the coordinated expertise and skills of Rare and Oceana could be leveraged to develop specific interventions, and whether EKO would be able to develop strategically-targeted private investments to facilitate progress in fisheries management techniques to benefit fishers. Artisanal fishers in these countries are often poor, vulnerable, and disenfranchised. More abundant fish stocks and more sustainable management mechanisms can lead to improved livelihoods with gains including increased nutrition, financial security, and stronger social and political capital. Findings that span countries include:

- Restoring fisheries to maximum sustainable yield could increase fish stocks substantially, leading to an increase in the sustainable protein supply for tens of millions of people in Brazil, Chile, the Philippines, and India, decreasing hunger in the poor and vulnerable coastal populations.
- Building sustainable local and national fishery management systems also develops social cohesion, builds local leadership capacity, ensures access to financial capital, enables a political voice for marginalized communities, and leads to long-term protection and maintenance of ecosystems.

- There are new, promising financing strategies to deploy that borrow from traditional investment strategies and could accelerate the impact of sustainable fisheries' strategies.
- The intervention strategies of the three groups are complementary and can mutually reinforce gains made in the other organizations' areas. Oceana's work on national policy, Rare's work building local management capacity, and EKO's effort to facilitate financial capital for fisheries' transition will help achieve sustainable fisheries management in a shorter timeframe.

WorldFish

The Foundation engaged WorldFish to understand early lessons from the implementation of the Aquatic Agricultural Systems program, addressing development challenges in defined geographies with clear theories of change and impact pathways that are co-developed and "owned" by intended beneficiaries at all levels. Key messages from WorldFish's research include:

- Coastal aquatic agricultural systems are generally highly productive, but multiple constraints limit the ability of poor families to harness this productivity to improve food security, nutrition, and income.
- Securing improvements in fisheries and aquaculture for poverty reduction requires addressing these constraints in a multi-sectoral context.
- Transformational change depends on local, multi-stakeholder driven solutions.
- Key drivers of change are shared across geographies, suggesting the potential for exchange of lessons.
- Technological and market innovation to improve productivity and income of poor coastal fishers and farmers must be complemented by investments that enhance their resilience.

Sources

- Ahmed, Mahfuz. 2006. WorldFish. "Market Access and Trade Liberalisation in Fisheries." *Natural Resources, International Trade and Sustainable Development*.
- Allison, Edward H., et al. 2011. "Aquaculture, Fisheries, Poverty and Food Security." WorldFish Working Paper 2011-65.
- Allison, Edward H., et al. 2011. "Poverty Reduction as a Means to Enhance Resilience in Small-scale Fisheries." *Small-scale Fisheries Management*.
- Allison, Edward H., et al. 2012. "Rights-based fisheries governance: from fishing rights to human rights." *Fish and Fisheries*.
- Aswani, Shankar, et al. 2007. "Do Marine Protected Areas Affect Human Nutrition and Health? A Comparison between Villages in Roviana, Solomon Islands." *Coastal Management*.
- Brugère, Cécile, et al. 2008. "Livelihood Diversification in Coastal and Inland Fishing Communities: Misconceptions, Evidence and Implications for Fisheries Management." FAO.
- California Environmental Associates. 2011. "Design for Sustainable Fisheries." Draft to the Steering and Advisory Committee.
- CGIAR Research Program on Aquatic Agricultural Systems (2012). Resilient livelihoods and food security in coastal aquatic agricultural systems: Investing in transformational change. CGIAR Research Program on Aquatic Agricultural Systems, Penang, Malaysia. Project Report: AAS-2012-28.
- Cisneros-Montemayor et al. 2013. "Extent and implications of IUU catch in Mexico's marine fisheries." *Marine Policy*.
- Costello et al. 2012. "Status and Solutions for the World's Unassessed Fisheries." *Science*.
- Darden Restaurants website. <http://www.darden.com/commitment/sustainability.asp>.
- Defeo, O., et al. 2005. "More Than One Bag for the World Fishery Crisis and Keys for Co-management Successes in Selected Artisanal Latin American Shellfisheries." Reviews in *Fish Biology and Fisheries*.
- Evans, Louisa, et al. 2011. "Assessing the impact of fisheries co-management interventions in developing countries: A meta-analysis." *Environmental Management*.
- Failler, Pierre and Binet, Thomas. 2011. "A critical review of the European Union-West African fisheries agreements." *Oceans: the new frontier*. TERI Press, New Delhi, pp. 166-170.
- FAO. 2009. "Analysis of aquaculture development in Southeast Asia."
- FAO. 2012. "The State of World Fisheries and Aquaculture."
- Grantee reports to Rockefeller Foundation
- Gutierrez, N., et al. 2010, 2011. "Leadership, Social Capital and Incentives Promote Successful Fisheries." *Nature*.
- Harriss, John. 2005. Political "Participation, Representation and the Urban Poor." *Economic and Political Weekly*.
- Lebel, P., et al. 2009. "Women Farm Fish: Gender and Commercial Fish Cage Culture on the Upper Ping River, Northern Thailand." *Gender Technology and Development*.

- Manta Consulting. 2011. "Financing Fisheries Changes: Learning from Case Studies."
- Mills, David J., et al. 2011. "Under-reported and Undervalued: Small-scale Fisheries in the Developing World." *Small-scale Fisheries Management*.
- Nunan, F. 2006. "Empowerment and Institutions: Managing fisheries in Uganda." *World Development*.
- Odebiyi, O. C., et al. 2012. "Small and Medium Scale Aquaculture Enterprises (SMES) Development in Ogun State, Nigeria: The Role of Microfinance Banks." *Libyan Agriculture Research Center Journal International*.
- OECD Glossary of Terms. <http://stats.oecd.org/glossary/index.htm>.
- OECD Review of Fisheries, 2011.
- Phillips, M., et al. 2011. "Inclusive aquaculture: business at the bottom of the pyramid." *FAO Aquaculture Newsletter*.
- Pomeroy, Robert. 2004. Fisheries Co-Management: A Fact Sheet for Connecticut Fishermen. Connecticut Sea Grant College Program, University of Connecticut.
- Ratner, Blake D., et al. 2012. Overseas Development Institute. "Wealth, Rights, and Resilience: An Agenda for Governance Reform in Small-scale Fisheries." *Development Policy Review*.
- Resilience Alliance website Glossary. <http://www.resalliance.org/index.php/glossary>.
- Sumaila, Rashid, et al. 2012. "Benefits of Rebuilding Global Marine Fisheries Outweigh Costs." *PLOS One*.
- The Poultry Site website. 2010. "China's Growth Influences Global Meat Sector." <http://www.thepoultrysite.com/articles/1708/chinas-growth-influences-global-meat-sector>.
- Thomas, B., et al. 2011. "Aquaculture's Role in Improving Food and Nutrition Security" in *Combating Micronutrient Deficiencies: Food-based Approaches*. Food and Agriculture Organization of the United Nations.
- UNEP report. "Overfishing and Other Threats to Aquatic Living Resources." <http://www.unep.org/dewa/giwa/publications/finalreport/overfishing.pdf>.
- UNFPA website on Gender Equality. <http://www.unfpa.org/gender>.
- UN Special Rapporteur on the Right to Food. <http://www.srfood.org>.
- Verde Ventures website. <http://www.conservation.org/global/verdeventures/publications/pages/publications.aspx>.
- *Wall Street Journal*. 2012. "China's Hunger for Fish Upsets Seas."
- Walmart website. <http://www.walmart.com>.
- Willing, Jane. 2007. "Expert Meeting on the Human Side of Fisheries Adjustment." OECD.
- World Bank. 2012. "World Development Report on Gender Equality and Development."
- World Bank. 2003. *Ghana - Fisheries Sub-Sector Capacity Building Project*. Washington D.C. - The World Bank. <http://documents.worldbank.org/curated/en/2003/06/2409696/ghana-fisheries-sub-sector-capacity-building-project>.
- WorldFish. 2008. "Fisheries and HIV/AIDS in Africa: Investing in Sustainable Solutions."
- WorldFish. 2010. "The Hidden Harvests: The Global Contribution of Capture Fisheries."

Acknowledgements

We would like to thank the experts from the following organizations for providing their perspectives and insights at a November convening of grantees and partners in New York:

- The World Bank
- World Wildlife Fund
- Stirling University
- PLAAS Institute for Poverty, Land and Agrarian Studies
- National Fisheries Solidarity Movement (NAFSO)

We also want to thank individuals from the following funder organizations for contributing their thoughts and points of view via telephone interviews:

- The World Bank
- Bloomberg Philanthropies
- The Gordon and Betty Moore Foundation
- The David and Lucile Packard Foundation

Lastly, we would like to thank the Rockefeller Foundation Search grantees for sharing their research documents and attending an in-person convening in November 2012 to ensure a robust synthesis of findings:

- Conservation International
- EKO Asset Management Partners
- Nature Conservancy
- Oceana
- Rare
- University of East Anglia's School of International Development
- Wildlife Conservation Society
- WorldFish

Disclaimer

This report contains the findings from eight Rockefeller Foundation grantees and additional research from FSG. The findings represent the synthesized Search findings, and should not be interpreted as the views of the Rockefeller Foundation.

FSG is a nonprofit consulting firm specializing in strategy, evaluation, and research, founded in 2000 as Foundation Strategy Group. Today, FSG works across sectors in every region of the world—partnering with foundations, corporations, nonprofits, and governments—to develop more effective solutions to the world's most challenging issues. www.fsg.org





Rockefeller Foundation
Innovation for the Next 100 Years

The Rockefeller Foundation
420 Fifth Avenue
New York, NY 10018, U.S.A.
Main Phone: 212.869.8500
Media Inquiries: 212.852.8454
www.rockefellerfoundation.org