



OVERVIEW

The Sunken Billions Revisited

Progress and Challenges
in Global Marine Fisheries



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Overview

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This booklet contains the overview, as well as a list of contents for *The Sunken Billions Revisited*. The PDF of the final, full-length book, once published, will be available at <https://openknowledge.worldbank.org/> and print copies can be ordered at <http://Amazon.com>. Please use the final version of the book for citation, reproduction, and adaptation purposes.

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Contents of the Full Report

Overview

- 1. Introduction: Trends in Global Fisheries and Fisheries Governance**
- 2. Basic Approach: The Bio-Economic Model and Inputs**
- 3. The Sunken Billions Revisited: Main Results**
- 4. Dynamics of Global Fisheries Reform: Recovering the Sunken Billions**



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O V E R V I E W

The Sunken Billions Revisited: Progress and Challenges in Global Marine Fisheries

Global marine fisheries are in crisis. The proportion of fisheries that are fully fished, overfished, depleted, or recovering from overfishing increased from just over 50 percent in the mid-1970s to about 75 percent in 2005 and to a staggering 90 percent in 2011 (figure O.1). This biological overfishing has led to economic overfishing, which creates economic losses.

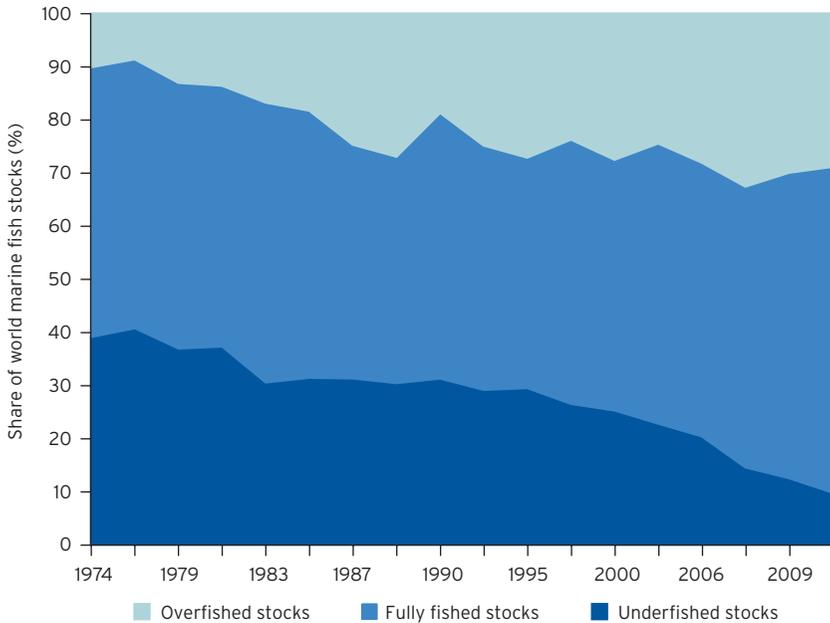
An earlier study estimated annual lost revenues from mismanagement of global marine fisheries at \$50 billion in 2004

To quantify the value of this economic loss, in 2009 the World Bank and the Food and Agriculture Organization (FAO) published a study on the economic performance of global fisheries, *The Sunken Billions: The Economic Justification for Fisheries Reform*. The study highlighted the very weak economic performance of the global fisheries sector, estimating the lost economic benefits at about \$50 billion a year. This finding stimulated policy discussions and made a compelling case that comprehensive reforms were necessary in fisheries around the world to recover these sunken billions. The report also changed the direction of development assistance in support of international fisheries, including by the World Bank, which established reform of fisheries governance as the fundamental entry point to its fisheries investment programs.

The 2009 report was written in the context of a long-term decline in fish stocks, stagnant or even slightly declining catches since the early 1990s, and an increase

FIGURE 0.1

State of global marine fish stocks, 1974-2011



Source: FAO 2014.

in the level of fishing by a factor of as much as four. The productivity of global fisheries decreased tremendously, as evidenced by the fact that catches did not increase nearly as rapidly as the global level of effort (apparent in a doubling of the size of the global fleet and a tripling of the number of fishers). Another source of uncertainty is the increasing impacts of climate change, including sea-level rise, rising ocean temperatures, acidification, and changes in patterns of the currents.

This study follows the same approach as the earlier (2009) one. Both studies treat the world's marine fisheries as one large fishery, and they both model the economic performance of the sector in terms of this single aggregate fishery. This study, however, departs from the original one by deepening the regional analysis.

In addition, this study examines the range of complex issues that surround the reform of global fisheries management, including the financial and social costs of transitioning to a more sustainable resource management path, the considerable governance challenges associated with managing the largely open-access ocean resources, and the complicating factor of climate change. Although it does not attempt to address all of these issues fully, it lays out a comprehensive estimate of what the economic benefits of transitioning to higher value-added and more sustainable fisheries might look like.

This study estimates 2012 annual lost revenues at \$83 billion

The primary objective of this study is to reinforce the messages of the 2009 publication and to catalyze calls for accelerating and scaling up the international effort aimed at addressing the global fisheries crisis. The analysis reveals economic losses of about \$83 billion in 2012, compared with the optimal global maximum economic yield equilibrium. This result is not statistically different from the sunken billions estimated for 2004, which was adjusted to \$88 billion, based on improvements in the model, better data, and adjustment to 2012 dollars. Both figures are strikingly large, and they highlight the fact that the fisheries sector is being managed in a deeply unsustainable manner.

These sunken billions represent the potential annual benefits that could accrue to the sector following both major reform of fisheries governance and a period of years during which fish stocks would be allowed to recover to a higher, more sustainable, and more productive level. These stocks cannot be recovered immediately, even if ideal sector governance were somehow imposed overnight. Rather, the process of recovery implies large transition costs and long-term sector restructuring.

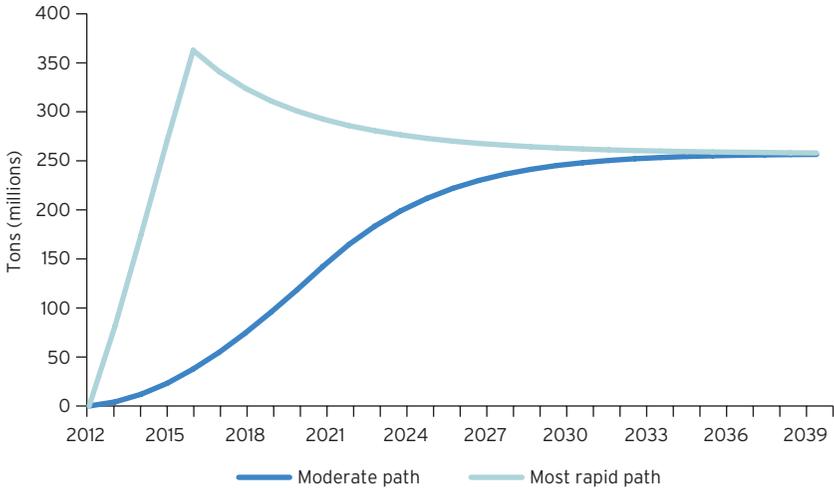
Restoring fisheries would yield substantial returns

Severely overexploited fish stocks have to be rebuilt over time if the optimal equilibrium is to be reached and the sunken billions recovered. To allow biological processes to reverse the decline in fish stocks, fishing mortality needs to be reduced, which can only happen through an absolute reduction in the global fishing effort (as captured by the size and efficiency of the global fleet, usually measured in terms of the number of vessels, vessel tonnage, engine power, vessel length, gear, fishing methods, and technical efficiency). To reach the sustainable optimal state, global fleet overcapacity would have to be reduced by 44 percent from the level inferred for 2012. Doing so would likely lead to the following economic benefits:

- The biomass of fish in the ocean would increase by a factor of 2.7.
- Annual harvests would increase by 13 percent.
- Unit fish prices would rise by up to 24 percent, thanks to the recovery of higher-value species, the depletion of which is particularly severe.
- The annual net benefits accruing to the fisheries sector would increase by a factor of almost 30, from \$3 billion to \$86 billion.

FIGURE 0.2

Benefits of global fisheries reform: projected dynamics of biomass (in comparison with current path)



Note: The most rapid path involves reducing fishing effort to zero for first several years and then holding it at the optimal level. The moderate path involves reducing global fishing effort by 5 percent a year between 2012 and 2022. The current path involves fixing fishing effort at the 2012 level.

Bold measures are required to achieve this 44 percent reduction in the global fishing effort and to allow overexploited fish stocks to recover. At one hypothetical extreme, if the fishing effort were reduced to zero for the first several years and then held at an optimal level, global stocks could quickly recover to over 600 million tons in 5 years and then taper off toward an ideal level. Reducing the global fishing effort by 5 percent a year for 10 years would allow global stocks to reach this ideal level in about 30 years (figure O.2).

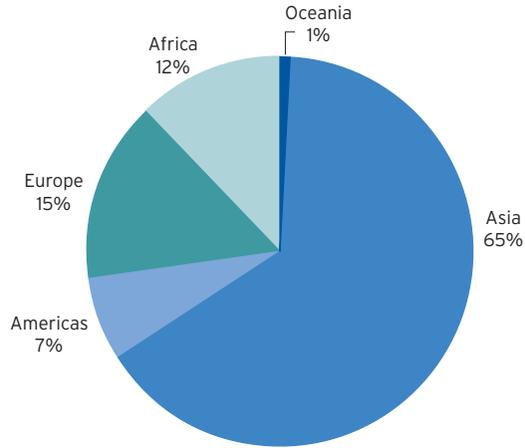
The need for reform is greatest in Asia and Africa

This study extends the original investigation to identify the economic performance of fisheries in five world regions (Africa, the Americas, Asia, Europe, and Oceania). Because initial economic performance and the level of overexploitation vary greatly by region, the effort required would differ across regions. Asia and Africa are suffering the greatest economic losses, implying a greater need for governance reform in those regions (figure O.3).

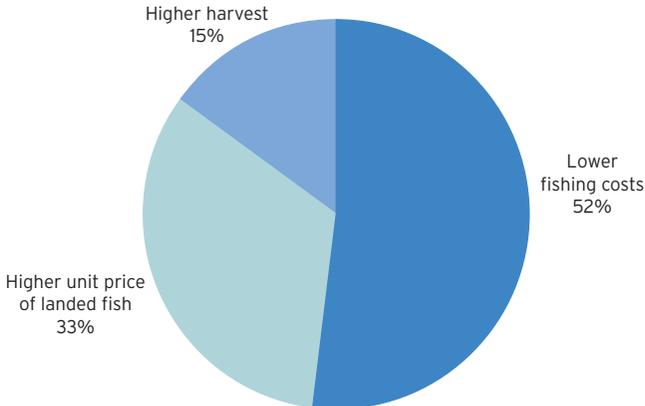
The quality of data varies greatly across regions, rendering the assessments of economic performance and the estimates of forgone economic benefits by region less reliable than the global results. The regional results should be interpreted in that light and a continued effort made to improve fisheries statistics at the national, regional, and global levels.

FIGURE O.3

Distribution of sunken billions by region

**FIGURE O.4**

Sources of economic benefits from moving to the optimal sustainable state for global fisheries



Transitioning to a sustainable level of fishing would be difficult—but the benefits would far exceed the costs

Transitioning to a sustainable level of fishing would involve significant policy and governance challenges at the global, national, and local levels. It would also impose costs on some stakeholders. The single largest source of economic gain from moving to a sustainable level of fishing would be the 44 percent reduction in fishing costs (figure O.4). This reduction, however, would impose very high adjustment costs on both the fishing industry and the upstream and downstream

industries and services, with displaced vessel owners and fishers bearing the brunt of the costs.

Climate change will have additional negative impacts on global marine fisheries, calling for quicker action

Sea-level rise, higher ocean temperatures, increasing acidification, and changes in the ocean current patterns will all have tremendous impacts on global fish stocks and the related ecosystems, in ways that are not yet fully understood (Alison and others 2009). They add a sense of urgency to long overdue fisheries reforms, because they threaten the ability of depleted stocks to recover from overexploitation, as they had done in the past.

Reform will require financial and technical assistance at many levels

This report makes a very clear case for the need for reform. It does not analyze policies, financing, or the socioeconomic impacts of embarking on such reform.

Many case studies have shown that different strategies are called for in different circumstances (Worm and others 2009). Whichever strategies are chosen, fishing capacity will have to be reduced, jeopardizing the livelihoods of millions of fishers. Financing will be needed to fund the development of alternatives for them, to provide technical assistance at all levels, and to conduct additional research on ecosystem changes and related ecological processes.

This report poses important questions. If the sunken billions wasted annually at sea are to be recovered, and fisheries put on a sustainable pathway, policy makers will need to answer these questions, and soon.

References

- Alison, E., A. Perry, M. Badjeck, W. Adger, K. Brown, D. Conway, A. Halls, G. Pilling, J. Reynolds, N. Andrew, and N. Dulvy. 2009. "Vulnerability of National Economies to the Impacts of Climate Change on Fisheries." *Fish and Fisheries* 10 (2): 173–96.
- FAO (Food and Agriculture Organization). 2011. "Review of the State of World Marine Fishery Resources." Fisheries and Aquaculture Technical Paper 569, FAO, Rome.
- . 2014. *The State of World Fisheries and Aquaculture 2014 (SOFIA)*. Rome: FAO.
- World Bank and FAO (Food and Agriculture Organization). 2009. *The Sunken Billions: The Economic Justification for Fisheries Reform*. Washington, DC: World Bank.
- Worm, B., R. Hilborn, J. Baum, T. Branch, J. Collie, C. Costello, M. Fogarty, E. Fulton, J. Hutchings, S. Jennings, O. Jensen, H. Lotze, P. Mace, T. McClanahan, C. Minto, S. Palumbi, A. Parma, D. Ricard, A. Rosenberg, R. Watson, and D. Zeller. 2009. "Rebuilding Global Fisheries." *Science* 235: 578–85.

