



Management plan for the Lake Nasser fishery

Stock assessment study

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List of abbreviations

CUEWR	Cooperative Union of Egyptian Water Resources
EAF	Ecosystem approach to fisheries
GAFRD	General Authority for Fish Resources Development
HDLDA	High Dam Lake Development Authority
NIOF	National Institute of Oceanography and Fisheries

Introduction

Background

Egypt is located in the northeast corner of Africa. The country's population has been growing in recent years at an annual rate of about 1.5 million. As of 2017, its population had reached 95 million, making it the largest population in the Arab region, the third largest in Africa and the 15th largest in the world. Egypt has a total area of 1,001,450 km², of which 6000 km² are water. The country has six coastal lagoons (Maryut, Edku, El-Burullus, El-Manzala, Port Fouad and Bardawil) on the Mediterranean coast, as well as the Bitter and El-Timsah Lake, which are connected to the Suez Canal, and three inland lakes (Nasser, Qarun and Wadi Al-Rayan).

Lake Nasser is the northern part of High Dam Lake, located in the south of Egypt. It was formed from the construction of the Aswan High Dam on the Nile River in the 1960s. The dam was built to protect Egypt from drought and flooding as well as to generate electricity.

At 292 km long, 9–18 km wide and with a surface area of more than 5000 km², Lake Nasser is Egypt's largest artificial lake. Most fishing activities take place 5.4–7.9 thousand km from the shore, depending on the lake's water level, which ranges from 160 to 180 m above sea level (Van Zwieten et al. 2011; Halls et al. 2015). The lake consists of a main channel and inlets or side extensions called *khors*. There are four landing sites along the lake: Aswan in the north, Garf Hussein in the middle, and Abu Simbel and the newly constructed Tushka in the south.

Fish production of the lake

Until 1998, fish production from Lake Nasser had increased steadily over the years to more than 50,000 metric tons (t). Afterward, however, it began to decline, and by 2016 it had dropped to less than 19,000 t (GAFRD 2018). About half of the lake's fish production is consumed in Upper Egypt (Aswan and neighboring governorates), while the other half goes to the El-Obour market to be consumed in Cairo and the surrounding area (Nasr-Allah et al. 2016).

According to Lake Nasser fisheries value chain analyses conducted in 2015 (Nasr-Allah et al. 2016), the market value of the lake catch in 2014 was around USD 34.6 million, with an average market price of USD 1.65/ kg of fish. If the catch amount remains at the same level, the market price will be EGP 617.7 million in 2018. Around 15,000 fishers using over 3000 boats operate on the lake, using trammel nets, gill nets and longlines (Nasr-Allah et al. 2016; GAFRD 2016).

Fish production in the lake consists mainly of three tilapia species (67%)—Nile tilapia (*Oreochromis niloticus*), mango tilapia (*Sarotherodon galilaeus*) and red belly tilapia (*Tilapia zillii*)—followed by salted fish (18% pebbly fish, *Alestes baremoze*, and 6% tiger fish, *Hydrocynus vittatus*) and Nile perch, *Lates niloticus* (8%) (GAFRD 2018). Production per boat ranged from 24 to 31 kg, with an average of 27 kg per day (YEAG 2017).

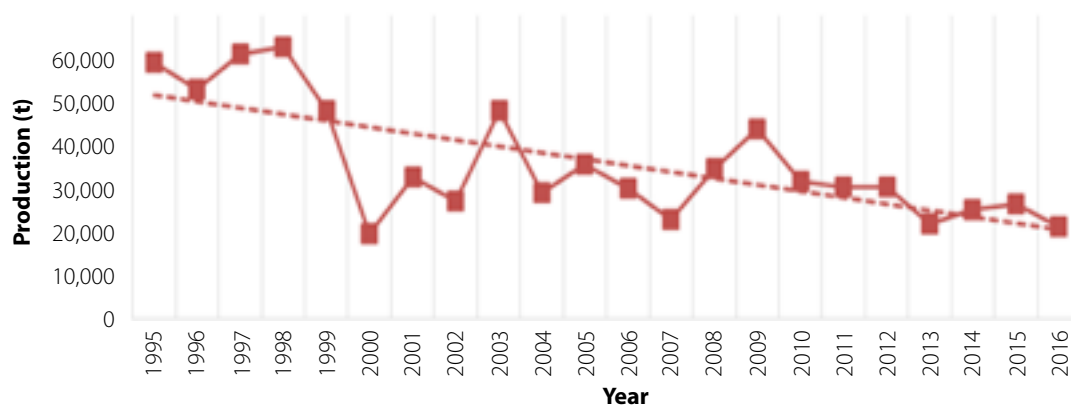


Figure 1. Development of fish production in Lake Nasser from 1995 to 2016 (GAFRD 2018).

Preparing the management plan for the Lake Nasser fishery

In light of new information on the resources in the Lake Nasser fishery that emerged from the stock assessment study by the Youth Employment in Aswan Governorate: Extension of Fisheries and Aquaculture Interventions (YEAG) project, three stakeholder workshops were held to develop a management plan. Stakeholders participating in these workshops included Fishers Association, fish traders, the General Authority for Fish Resources Development (GAFRD), National Institute of Oceanography and Fisheries (NIOF), water bodies and environment police in Aswan, Cooperative Union of Egyptian Water Resources (CUEWR), High Dam Lake Development Authority (HDLDA), Egyptian Environmental Affairs Agency and WorldFish Egypt.

The management plan was developed following an ecosystem approach to fisheries (EAF) and takes into account the long-term management objectives of the fishery. In addition to the biological aspect, the plan covers the social, economic and institutional aspects related to the Lake Nasser fishery and the operational objectives of prioritized issues that need to be addressed. The management plan is based on the following processes:

- key goals relating to management, sustainability of fishstocks, impacts of fishing operations on the ecosystem and governance of the fishery;
- a set of agreed-upon objectives, understood by stakeholders, which are measurable and relate to the goals of the management plan;
- a set of cost-effective management performance indicators aligned with the objectives;
- an assessment and evaluation of each objective through limit reference points, and/or other standards as appropriate;
- validation by stakeholders and legitimization.



Purpose of the management plan

Fish from Lake Nasser are an important source of animal protein in Upper Egypt. However, stocks are overfished, and scientific studies recommend reducing fish mortality resulting from fishing operations. Generally, fishery management in Egypt is challenging because of the complex nature of the associated socioecological systems. The EAF could therefore help to sustainably manage the Lake Nasser fishery.

This management plan was developed to (1) ensure fishery resources are exploited within biologically acceptable levels as well as for social and economic purposes and (2) provide a foundation for managing the fishery to continue moving toward a more integrated management framework of shared responsibilities between the GAFRD and other stakeholders in the sector.

Implementation of the plan will ensure that the values obtained from the sustainable use of the fishery's resources and the protection of the environment are maximized.

This plan will be the blueprint agreed on by all stakeholders (fishers, managers, nongovernmental organizations, etc.) that describes the key objectives of the sector and how the main issues identified during the planning process will be addressed to manage the fishery.



Fisherman on his boat leaving one of the fishing camps on Lake Nasser.

Policy objectives and values

Key policy drivers for the management plan

Article 30 of Egypt's constitution states, 'The state shall protect fish resources, as well as protect and support fishers and empower them to carry out their work without jeopardizing ecosystems, as regulated by law.' This is consistent with the ecosystem approach to fisheries.

The main fisheries legislation in Egypt is Law No. 124 from 1983 on Catching Fish and Aquatic Organisms and Organizing Fish Farms. The legislation deals with administrative issues in the first section, water pollution and obstructions to fishing operations in its second section and the regulation of fish farms in the third.

The Lake Nasser management plan is also consistent with the Food and Agriculture Organization's Code of Conduct for Responsible Fisheries, Ecological Sustainable Development, and the 2002 Plan of Implementation of the World Summit on Sustainable Development (as amended at the Rio+20 summits in 2012 and 2018).

Broad objectives for the Egyptian fisheries sector

Management of the Lake Nasser fishery is based on a strategy for developing fisheries, which is one of the most important goals of Egypt's agricultural plan for 2030. This strategy includes:

- maximizing fish production from aquaculture and wild fisheries;
- raising the quality of fish and fish products to international standards and to access new markets for Egyptian fish exports;
- optimizing the use of natural and human resources by increasing employment opportunities for youth in the sector.

Specific objectives for the Lake Nasser fishery

The specific objectives for the Lake Nasser fishery are illustrated in Table 1.

Category	High-level objective
Food security	Maintain access to sufficient resources for the local population and ensure food security
Fishstock sustainability	Keep biomass of all species impacted by fishing practices at levels above B_{msy} and minimize waste
Economic values	Maximize revenue from the fishery and economic benefits to the community
Social effects	Maximize social benefits for the fishing community

Table 1. Specific objectives for the Lake Nasser fishery.

Rationale

Egyptian fishing communities and the entire economic sector supported by fisheries resources are at stake. Considering the current state of the fisheries sector in Egypt, it is necessary to reverse this situation. Appropriate management strategies and plans are needed to improve the current situation, monitor the success of these strategies and enforce regulations. As a pragmatic approach, the EAF can facilitate the practical translation of high-level sustainability goals into implementation on the ground. Implementing the EAF is an opportunity to enhance the effectiveness

of fisheries management in Egypt, despite challenges that can be overcome if supported by stakeholders with political determination.

The most important rationale for this management plan is that the Lake Nasser fishery is not currently making the social and economic contribution of which it is capable. Although there are a number of reasons for this, the key issue concerns the operational requirements under which the fishery is currently being exploited.



Photo credit: Sara Fouad/WorldFish

Nile tilapia displayed in a metal tray by a fish retailer in Aswan.

Scope of the plan

The scope of the management plan and societal values from the Lake Nasser fishery as agreed upon by all stakeholders is summarized in Table 2.

Category	Details
Fishery	Most economic fish species in Lake Nasser
Fishers included	Fishing efforts on the lake
Fishing methods included	Trammel nets (<i>duk</i>), gill nets (<i>kobok</i> and <i>sakarota</i>) and longlines
Fishing methods not included but impactful	Illegal fishing gear (traps, electricity, gas, harpoons and illegal mesh sizes)
Main species	Tilapia (<i>Oreochromis niloticus</i> , <i>Sarotherodon galilaeus</i> and <i>Tilapia zillii</i>), Nile perch (<i>Lates niloticus</i>), pebbly fish (<i>Alestes baremoze</i>) and tiger fish (<i>Hydrocynus vittatus</i>)
Species not directly included	Bagrus, Nile carp, catfish, pufferfish
Areas included	Fishing areas in Lake Nasser (<i>khors</i> and shallow waters of the main channel)
Areas not included but could impact resources	The main channel
Values – objectives to achieve and priorities	Food security (of fishers and communities), ecological sustainability, livelihoods (of people in the fishery sector, local employment (of fisheries-related activities, import substitution)
Primary agencies/groups	Fishermen's associations, wholesalers, traders, scientists, water bodies and environment police in Aswan, GAFRD, HDLDA
Other agencies/groups	Ministry of Environment, Ministry of Tourism, Ministry of Transport, Ministry of Commerce, Ministry of Supply and Internal Trade, Ministry of International Cooperation
Timeframe (implementation)	Three years

Table 2. Scope and values of the fishery.

Description of the fishery

Lake Nasser is located about 1000 km south of Cairo and extends for 292 km. It consists of the main channel and more than 85 side embayments called *khors* (Figure 2). The lake has good water quality and is relatively abundant in nutrients, which provide good conditions for growing high-quality freshwater fish. Most fishing operations are intense in the shallow areas of the *khors* and on both sides of the main channels. Lake Nasser is the main source of fish for Upper Egypt, and because of limited production from the Nile River and an absence of fish farms in this area, it is an important part of the fisheries sector as it provides significant employment opportunities.

Fishing activities on Lake Nasser

Fishing on the lake is geographically divided between one company and four fisheries associations: Misr Aswan Company, Aswan Sons Cooperative Society, Fishermen Cooperative Society (Mother), Nubian Cooperative Society and El-Takamol Cooperative Society. The shoreline assigned to each group extends to about 187 km, 300 km, 800 km, 370 km and 66 km, respectively (Table 3).

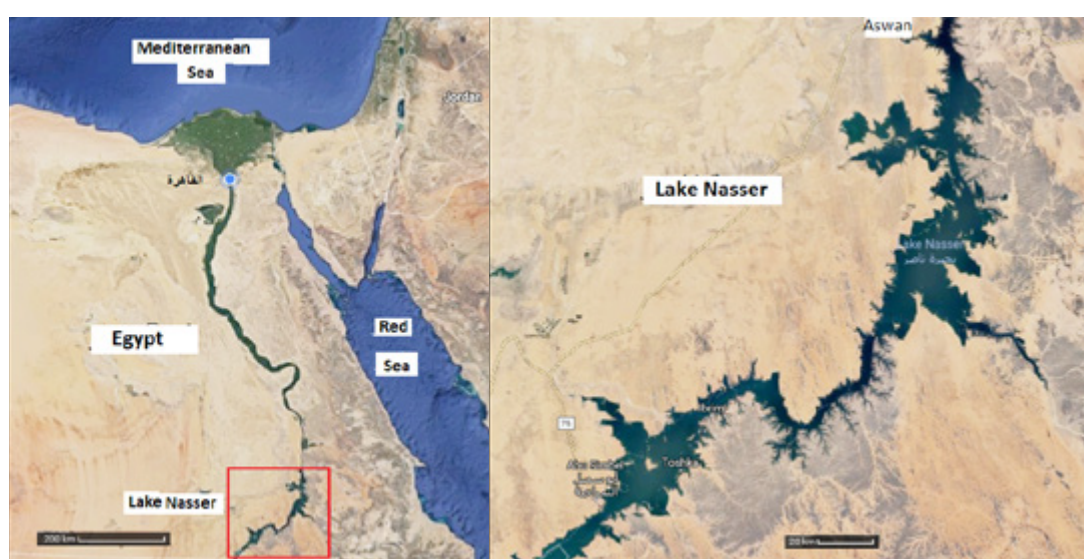


Figure 2. Lake Nasser and its location in Egypt.

Society		Mother Society	Aswan Sons Society	Nubian Society	El-Takamol Society	Total
Members		1,588	178	375	36	2,177
Licenses	First class	1,703	331	388	54	2,476
	Third class	161	286	146	7	600
	Total	1,864	617	594	61	3,136
Fishers		9,320	2,513	2,378	291	14,502
Carrier boats		70	26	27	2	125
Shoreline (km)		800	300	370	66	1,536

Table 3. Societies working on Lake Nasser, number of members, licenses, fishers, boats and assigned shoreline length (Halls et al. 2016; GAFRD 2018). The table does not include the 187 km of shoreline assigned to Misr Aswan Company.

There are 3136 fishing boats operating on Lake Nasser (GAFRD 2018), most of which are motorized (9.9–25 hp motors), though a few use paddles. The boats are 4.5–9 m long and 1–2.5 m wide (YEAG 2017). About 15,000 fishers in total work on the lake (GAFRD 2018).

Three main types of fishing gear are used in the lake:

1. Trammel nets (*duk*), which target tilapia using different specifications depending on the size of the fish: *ghazel bolti* target tilapia over 500 g and 25 cm long, while *ghazel shabar* target those under 500 g and 25 cm.
2. Gill nets, including four different designs according to the target species and sizes: *ghazel tasteer* target tilapia under 500 g, while *ghazel kobok* target large tilapia and large Nile perch; *ghazel muluha* target large tiger and pebbly fish, while *ghazel nasha* target small tiger and pebbly fish.

3. Two types of hook and line, which target Nile perch and tiger fish: (1) longline (*sennar*), which is a group of hooks (about 12) connected to a main line, and (2) handline (*haddafa*), which is formed from one hook (YEAG 2017). Some species of low economic value, such as electric catfish, black-spotted catfish and pufferfish, are considered bycatch and are often thrown back into the water (discards) (ibid.).



Photo credit: Sara Fouad/WorldFish

Nile tilapia caught in Lake Nasser.

Main process for the management plan

The management plan was developed using a baseline study and an ecological risk assessment (ERA) carried out by WorldFish Egypt in cooperation with the GAFRD and other stakeholders. A baseline report on the fishery was prepared to provide relevant information in support of the development of the management plan. An ERA workshop was held, with the participation of all stakeholders, at which issues relating to the fishery were identified and prioritized. Management measures were proposed to address issues of medium and high priority.

Outcomes from the ERA

Underpinning the management plan are the outcomes from the ERA. The ERA permitted participants to determine the level of risk not only to the ecological sustainability of key target species but also many other areas of the fishery—target and nontarget fish species, human well-being, environmental and external factors and governance—and to suggest management actions to address the identified issues.

To help determine the issues for this fishery, a set of component trees covering each of the seven key areas of the EAF was used (Figure 3). For each of the key areas, a detailed component tree was produced. These included potential issues that were based on information contained in the baseline report and stock assessment study by WorldFish, other documentation available for the fishery and stakeholder feedback on what issues were relevant.

This exercise also prioritized the main issues to be addressed in a cost-effective manner. The risk associated with each identified issue was assessed and categorized as low, medium or high. Issues classified as medium or high risk are highlighted in this plan. (The outcomes of these processes are summarized in the log frame provided in the tables at the end of the plan.)

Management and operational objectives

The management and operational objectives of this plan are as follows:

Management objective 1: Revitalize fish production to reach the maximum sustainable yield (MSY) and ensure the sustainability of the fishery.

Operational objectives:

- 1.1 Keep stock levels above the MSY.
- 1.2 Conserve fish fry.
- 1.3 Protect spawners and nursing grounds.
- 1.4 Restore the species and size composition of the catch.

Management objective 2: Improve governance of the Lake Nasser fishery.

Operational objectives:

- 2.1 Develop clear and relevant policies.
- 2.2 Increase the penalty for violations.
- 2.3 Provide various facilities to executive authorities.
- 2.4 Improve the accuracy of statistics.
- 2.5 Activate participatory management.

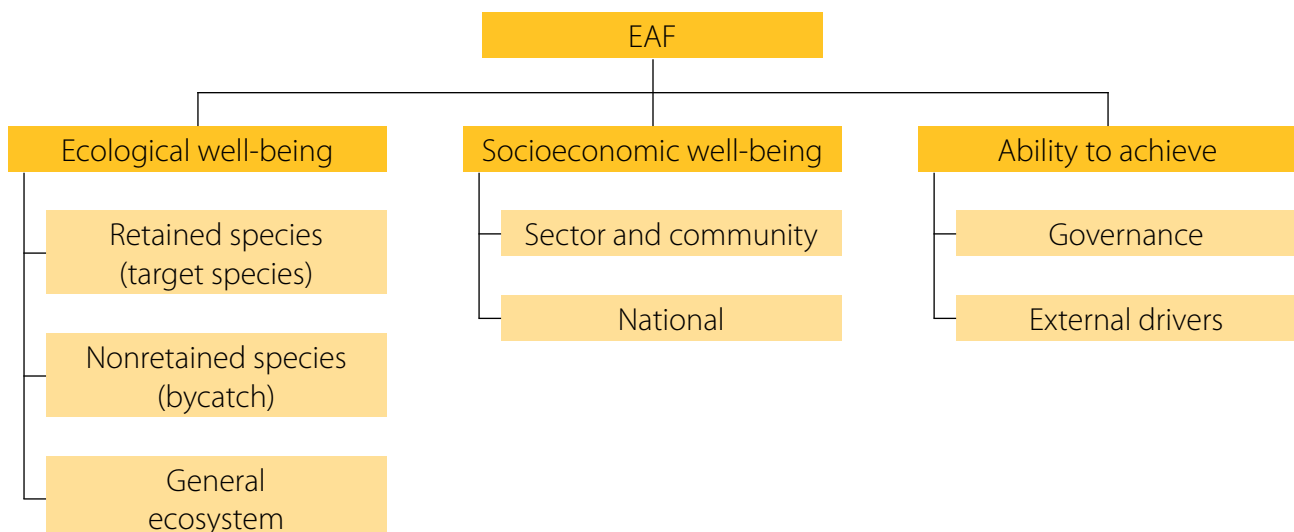


Figure 3. A generic component tree for issue identification under the EAF framework.

Management objective 3: Maximize the social and economic benefits for the fishing community.

Operational objectives:

- 3.1. Enhance appropriate social structures and outcomes.
- 3.2. Maintain or enhance economic activity.
- 3.3. Increase added value and facilities in ports.
- 3.3 Ensure safe and healthy work practices.

Management measures

The potential management measures discussed and agreed upon by the stakeholders are given in the log frame. In general, the range of measures provides the necessary scope and flexibility required to manage the fishery and its impacts on fishstocks and the ecosystem, within a natural yet dynamic environment.

Specific details of the proposed measures will be discussed and agreed upon during the first year of the implementation of the management plan.

Performance indicators

The extent to which the management plan achieves the established management objectives will be assessed using a combination of performance indicators. These are designed to measure the performance of the fishery, the status of individual primary species and the overall condition of the environment. Performance indicator values will be estimated using conventional stock and ecosystem assessment methods as well as social and economic criteria. With time and through collaborative research



and monitoring of ecological risk, it will be possible to develop performance indicators for the ecosystem.

Implementation and review

As per the laws of Egypt, management of all fisheries resources, including the implementation of any management plan, is the primary responsibility of the GAFRD. However, as indicated earlier, the plan for the Lake Nasser fishery is to provide a foundation for the management of the fishery to continue moving toward a more integrated framework of shared responsibilities between the GAFRD and other stakeholders in the sector. This management plan is a living document, reflecting the current understanding of the Lake Nasser fishery and the resources exploited,

and as such it will be improved as knowledge and management advances. An annual review of the management plan is the responsibility of the GAFRD, but it must be passed through other stakeholders for their consideration and endorsement. However, no major departure from the stated management arrangements for a given year will occur unless directed by the minister in charge of fisheries.



Photo credit: Sara Fouad/WorldFish

WorldFish team member interviewing fish retailers about their daily challenges, Aswan.

Management objective 1: Revitalize fish production to reach the MSY and ensure the sustainability of the fishery.

Issue	Effects	Probability ¹	Consequences ²	Severity level ³	Justification	Operational objectives	Indicators	Administrative management	Means of verification	Responsibility and timeframe
Decline of fishstocks	Reduction of fish production	3	3	9	Reduction in production	Keep stock levels above the MSY	Increase production	Develop landing observation system; improve the accuracy of fish statistics; revise tariffs by landing fish through ports only; increase net mesh sizes and gear specifications	Stock assessment studies	GAFRD; HDLDA; supply police; water bodies and environment police; cooperative associations; CUEWR; NIOF; WorldFish Egypt
	Variation of species composition	4	3	12			Improve species compositions			
	Overfishing	3	3	9						
Fishing for small fish and brood stock	Overfishing	3	4	12	Reduction of Nile tilapia quantities	Restore species composition	Increase catch sizes	Strengthen monitoring; increase mesh sizes and gear specifications; release Nile tilapia fry; protect nursery areas; enforce closed season (15 March–15 May)	Statistics of production from landing sites and species composition	GAFRD; HDLDA; supply police; water bodies and environment police; cooperative associations; governorate
	Weakening Nile tilapia	3	4	12						
Illegal fishing and fishing using electricity	Reduction in fish quality	3	3	9	Impact of electric fishing	Keep stock levels above the MSY	Reduce illegal fishing	Strengthen monitoring; increase police patrols; levy extensive penalties	Reduction of the amount of fish smuggled	GAFRD; HDLDA; supply police; water bodies and environment police; cooperative associations; governorate; border guards
	Impact on ecosystem	3	3	9						

Note: The management plan priorities are determined depending on the risk levels as described in the Ecosystem Approach to Fisheries (EAF).

Management objective 2: Improve governance of the Lake Nasser fishery.

Issue	Effects	Probability ¹	Consequences ²	Severity level ³	Justification	Operational objectives	Indicators	Administrative management	Means of verification	Responsibility and timeframe
Policies	Unclear policy	3	3	9	Direct effect on fisheries sector	Develop a clear vision and applicable policies	Activate participatory work, ending with individual decisions	Create a specific management plan, including an appropriate timetable that all stakeholders agree on	Declare an official fishery management plan and a new fishery law	The cooperation of all actors involved
	Conflict in policies among different organizations	4	3	12						
Legislation	Lack of adequate legislation	4	3	12	Direct effect on decision-making	Set clearer and more applicable legislation	Modify laws	Amend legislation and prepare legislative document agreed upon by all actors	Modify state laws	The cooperation of all actors involved
	Conflicts of the current legislation	3	3	9						
Implementation	Punishments inappropriate to the offense	3	3	9	Obstruction of the application of current laws	Increase the penalty for violations	Increase human and physical resources	Change the present penalties (financial – administrative) to include individuals and/or entities	Introduce legislation to include perceptive penalties	The cooperation of all actors involved as well as government authorities
	Weak financial and human resources for fisheries authorities	3	4	12						
Monitoring	Weak technical abilities of observers	3	3	9	Impact on the implementation of decisions	Provide technical training for observers		Hold training courses for observers and specialized courses for cooperative supervisors	Create an official training program	GAFRD; CUEWR; governorate; WorldFish Egypt; universities and research centers

Note: The management plan priorities are determined depending on the risk levels as described in the Ecosystem Approach to Fisheries (EAF).

Management objectives 3: Maximize the social and economic benefits for the fishing community.

Issue	Effects	Probability ¹	Consequences ²	Severity level ³	Justification	Operational objectives	Indicators	Administrative management	Means of verification	Responsibility and timeframe
Handling practices	Traders control fish prices	3	2	6	Poor quality and low value of some of the fish in the lake	Improve handling and marketing	Increase fisheries value	Develop carrier boats and refrigerated cars; establish a system for transport and local marketing; establish a fish market in Aswan	Establish a marketing mechanism	GAFRD; governorate; investors and businesspeople
	Absence of marketing options	3	3	9						
Added value	Low product value	3	2	6	Increase added value	Increase added value	Increase availability of port services	Promote the manufacture of fish meal from fish waste	Increase added value of the product	Fish companies; WorldFish Egypt
	Low product quality	3	2	6						
Port services	Insufficient port facilities	3	2	6	Increased smuggling, lack of statistics	Develop and improve ports and eliminate smuggling	Increase availability of port services	Develop port services; form a port committee that has different governmental and fish representatives	Presence of facilities in ports	GAFRD; HDLDA; associations; governorate
Education level	Low level of some fishers' education	2	2	4	Educational infusion of some young fishers; inability to adapt proper fishing methods or handling	Increase educational awareness; develop professional performance	Increase the number of educated fishers; Increase the percentage of fishers	Increase awareness by organizing training courses for fishers; increase the role of associations	Create an official training program; GAFRD reports	GAFRD; WorldFish Egypt; CUEWR
		3	3	9	Direct impact on all fishing operations	Increase fishers' commitment to decisions	adapting proper fishing methods			
Social insurance	Retirement age of 65	4	2	8	Increased desire to leave the sector	Support campaign to include fishers in the governmental insurance for temporary workers	Decrease the retirement age to 60; ensure fishers are covered by state social insurance	Issue an official social document for fishers (governmental insurance for temporary workers)	Provide insurance (e.g. <i>Aman</i> document)	GAFRD and CUEWR (as representatives of fishers), Ministry of Social Solidarity
Health insurance	Lack of health insurance for the fishers	4	2	8	Fishers are not covered by state health insurance	Support campaign for fishers to be covered by state health insurance	Ensure fishers are covered by state health insurance	Issue an official decree for fishers to be covered by state health insurance	Ensure medical coverage is provided by the state	CUEWR; associations; Ministry of Health; Fishermen's Welfare Association

Note: The management plan priorities are determined depending on the risk levels as described in the Ecosystem Approach to Fisheries (EAF).

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Notes

- ¹ Probability of occurrence is scored as (1) Remote, (2) Unlikely, (3) Possible, and (4) Likely.
- ² Consequence of a particular risk is scored as (1) Minor, (2) Moderate, (3) Major, and (4) Extreme.
- ³ Risk level= Likelihood × Consequence, and it is scored as (0-2) Negligible, (3—4) Low, (6-8) Medium, and (9-16) High.



Photo credit: Back to work, Sam Ibrahim/WorldFish

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