

Fishing harbour planning, construction and management



Cover photograph:
Marsaxlokk fishing port, Malta; courtesy of Joseph Alan Sciortino.

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FAO
FISHERIES AND
AQUACULTURE
TECHNICAL
PAPER

539

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ISBN 978-92-5-106696-6

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Preparation of this document

This manual was prepared by Mr Joseph Alan Sciortino, MICE, M. ASCE, C. Eng., the Food and Agriculture Organization of the United Nations (FAO) Consultant on Harbour Design and Management. The manual reflects the provisions of the FAO Code of Conduct for Responsible Fisheries in relation to fishing harbours and is an extension of Annex VI, No. 1, in the series of FAO Technical Guidelines for Responsible Fisheries. It contains proposals and guidelines to be followed with regard to the design, development, management and maintenance of ports and landing places for fishing vessels. It also provides guidance on the conduct of environmental auditing in relation to new construction and the upgrading of existing facilities. It was based on a manual prepared in electronic format in 1999, and updated and revised to integrate new guidelines, ideas, experiences and lessons from projects in different parts of the world.

The manual was technically edited by Mr John Fitzpatrick, C. Eng., C. Mar. Eng., MIMAREST, former Director of the FAO Fish Products and Industry Division. The draft of the manual was reviewed by Mr B.N. Krishnamurthy, FAO Consultant on Harbour Management and Institution Building and Mr V. Venkatesan, FAO Consultant on Community Participation in Fisheries, both under the Technical Cooperation Project on Capacity Building in Support of Cleaner Fishing Harbours in India; and Mr Simon Diffey, Chief Technical Advisor of the project on the Restoration and Improvement of Fish Landing Centres with Stakeholder Participation in Management funded by the Canadian International Development Agency in Sri Lanka.

The manual was edited by Maria Giannini. Susana V. Siar, Fishery Industry Officer, Fishing Operations and Technology Service (FIRO) of the FAO Fisheries and Aquaculture Department, provided overall supervision in the preparation and publication of this manual. The publication contributes to the achievement of the following organizational result: the operation of fisheries, including the use of vessels and fishing gear, is made safer, more technically and socio-economically efficient, environmentally-friendly and compliant with rules at all levels.

Abstract

The role of the fishing port may be considered as the interface between the netting of fish and its consumption. In many cases, the fishing harbour is also the focal point of pollution, both of the surrounding environment and the fishery products it produces. Many fishing harbours are also the source of major impacts on the physical and biological coastal environment.

Although the bulk of fish landed in fishing harbours in developing countries is destined for the local markets, it is every country's wish to improve the health hazard-free quality of its landed catch in order to increase exports of seafood products to more lucrative overseas markets. In the not-too-distant future, the growth in local consumer rights advocacy will also increase demand for health hazard-free fish.

In today's world of increased environmental awareness, a fishing port must be planned, designed and managed in harmony with both the physical and biological coastal environments. At each stage of the process, whether it is planning, design or management, both technical and non-technical persons become involved in the process. Within government departments, whether they be technical (fisheries or public works) or non-technical (budget or finance), it is not uncommon for non-technical persons to affect the outcome of technical decisions. Fisheries Departments worldwide generally have to manage and maintain harbours and landing places using non-engineering civil servants. The following manual was produced in order to tackle fishing harbours in a holistic approach.

This manual is useful to both technical and non-technical planners, both at national government level and at departmental level. It provides non-engineering staff within such departments with enough technical knowledge to better understand certain basic design requirements, which could otherwise be interpreted as superfluous and not cost effective.

The manual is of particular use to local independent consulting engineers and architects with no ports or fisheries experience involved in the design of locally tendered projects for the various international funding agencies. To technical staff of such firms, it provides a handy reference and the means for integrating Hazard Analysis and Critical Control Points (HACCP) and European Union Directive recommendations on hazard-free seafood directly into the fishing port's design.

The fishing industry as a whole can ill-afford the economic losses from lower prices received for contaminated fish. Recent European Union rulings have even gone one step further by banning outright all fish imports from certain countries.

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Fishing harbour planning, construction and management.

FAO Fisheries and Aquaculture Technical Paper. No. 539. Rome, FAO. 2010. 337p.

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Abbreviations and acronyms

AC	alternating current
AISI	American Iron and Steel Institute
BOBP	Bay of Bengal Programme
CFC	community fishery centre
CFCs	chlorofluorocarbons
COFI	Committee on Fisheries
DC	direct current
DGPS	Differential Global Positioning System
EC	European Community
EEZ	exclusive economic zone
EIA	environmental impact assessment
EIS	environmental impact studies
EPS	Electronic Positioning System
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FMO	fisheries management organization
GHG	greenhouse gases
GPS	Global Positioning System
GT	gross tonnage
HACCP	Hazard Analysis and Critical Control Points
HDPE	high-density polyethylene
HHWL	Higher High Water level
HHW	highest high waters
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IATA	International Air Transport Association
IEE	Initial Environmental Examination
IMO	International Maritime Organization
IPCC	International Panel on Climate Change
ISO	International Organization for Standardization
ISPS	International Ship and Port Facility Security Code
IUU	illegal, unreported and unregulated
LAT	lowest astronomical tide
LDPE	low-density polyethylene
LED	light-emitting diode
LLW	lowest low waters
LLWS	Lower Low Water Spring
LUX	1 lumen per square metre
MARPOL	International Convention for the Prevention of Pollution from Ships
MCS	monitoring, control and surveillance
MLLW	Mean Lower Low Water
m/s	metres per second
MSL	mean sea level
MSY	maximum sustainable yield
N/mm ²	Newtons per square millimetre

NGO	non-governmental organization
PAH	polynuclear aromatic hydrocarbons
ppb	parts per billion
ppm	parts per million
PVC	polyvinyl chloride
PVN	Private Virtual Network
PV	photovoltaic
RO	reverse osmosis
SAR	search and rescue
SOLAS	International Convention for the Safety of Life at Sea (IMO Convention)
SWL	safe working load
UHMW	ultra-high molecular weight
UKC	under keel clearance
UNCED	United Nations Conference on Environment and Development
UNCLOS	United Nations Convention on the Law of the Sea, 1982
uPVC	unplasticized PVC
UXO	unexplored ordinance
W/C	water-cement ratio
WGS84	World Geodetic System 1984
WHO	World Health Organization

Executive summary

The unrelenting pressure on the world's coastal resources and its coastal ecosystems is threatening the viability of fisheries as an industry. By its very nature, an ill-conceived port or fish landing structure has the potential to place a disproportionately large demand on both the local physical and biological resources and, in today's world of increased environmental awareness, a fishing port or fish landing site must be planned, designed and managed in harmony with these environments.

Fishing ports and fish landing sites are complex dynamic interface zones involving the mixing of environmental, ecological, economic and social activities and problems. This heterogeneous mix of activities demands strong cross-sector interaction at the planning stage to ensure that the resulting infrastructure may be managed in a sustainable manner. This manual is not the first effort by FAO to set forth a set of cross-sector guidelines for the planning and/or management of a fish landing site or fishing port. In various forms, information related to fishing ports design has been available since 1976, the most recent being FAO Training Series 25 on the construction and maintenance of artisanal fishing harbours and village landings (1995).

In recent years, world fisheries have become a market-driven sector of the food industry and many coastal states have striven to take advantage of this new opportunity by investing heavily, and sometimes haphazardly, in fishing port infrastructure. When, in the early to mid-1990s various international conventions and importing country directives on food safety came into force, much of this same infrastructure was found to be non-compliant, requiring further investment. Also, in the intervening period, the requirement for proper Environmental Impact Studies became mandatory in most States, further complicating the added investments required to make such infrastructure compliant.

Why this manual? The manual builds on the earlier work by FAO and introduces for the first time the international conventions and importing country directives that have a direct influence on both the planning and design of fishing port infrastructure. It is intended as a reference not only for engineers and architects involved in the design and rehabilitation of fishing ports but also for non-technical staff at departmental level in government institutions that may influence technical decisions in the field. These institutions may comprise, directly or indirectly, policy and planning, budget and finance, export and public health authorities. It may also be of use to donor agencies and non-governmental organizations when planning fisheries-related investments.

The use of this manual should enable consultants, architects and contractors involved in any stage of design or construction of a fish landing or port to avoid the mistakes of old. This manual covers all the aspects of fishing port infrastructure, from inception to final design as well as the construction and management of the fishing port or landing once constructed. This manual does not replace the textbooks required to design the single elements that constitute the fishing port, such as the breakwaters, the quay walls, etc. Any costs quoted in the manual refer to United States dollars and generally apply to any country with good connections. Operational costs in some developing countries may differ significantly due to logistics. To technical staff in general, it provides a handy reference and the means for integrating HACCP and importing country directive recommendations on hazard-free seafood directly into the fishing port's design.

The previous version of this manual was the basis of a distant-learning course. This edition is a good handbook based on the author's extensive experience in the design, construction and operation of fishing ports in many developing countries.

There are twelve chapters and five reference annexes in this manual. Each chapter deals with a particular topic and is a stand-alone document.

The first chapter presents the technical guidelines to the Code of Conduct for Responsible Fisheries. It also lists the relevant international conventions to which a State may be a party, together with third country directives that jointly will have a direct bearing on the overall design of the port and its components. These include compliance with basic engineering principles regarding the morphological degradation of the coastal zone in respect of erosion and siltation (UNCED 92), compliance with the relevant conventions concerning pollution of the aquatic environment (MARPOL 73/78) and the provision of adequate monitoring of the effects of operations on the environment (UNCED 92). The Code also addresses post-harvest practices setting out minimum standards for food safety and quality assurance.

The second chapter describes how to plan shore-based facilities and fishing ports that are commensurate with the targeted resources, within the exclusive economic zone (EEZ) of a coastal State and distant water fisheries, as the case may be, that would be environmentally sustainable and financially justifiable. It addresses the major issues that influence the size of a new port and describes in detail the classification of fishing ports, from artisanal beach landings to coastal fishing ports, offshore fishing ports and distant water fishing ports. Guidelines on the preferred siting of a fishing port vis-à-vis land use are also discussed. The chapter also dwells on post-conflict reconstruction procedures and on overcapacity (redundant vessels) and potential income diversification for fishermen faced with an ever-dwindling catch.

The third chapter tackles port management, from the simple fish landing on a beach to a proper deep water fishing port. It stresses the need for a stakeholder approach to port management whereby all the port users are represented on the management body. Typical port management bodies are described in detail covering all scenarios, from the simple village landing to a sophisticated fishing port. It also highlights the importance of a fish quality assurance regime inside the port and lists best management practices for port and boatyard operators and the prevention of pollution.

Chapter four reviews the environmental auditing procedures to be followed for all new designs. Degradation of the marine environment can result from a wide range of activities on land. Coastal erosion and siltation are of particular concern. Hence, rational use and development of coastal areas as well as conservation of the marine environment require the ability to determine the present state of these ecological systems and to predict future conditions. Systematic collection of data on marine environmental parameters is needed for an integrated management approach to sustainable development and to predict the effects of the construction of a port on the marine environment. This chapter should be of use to government institutions involved in fisheries-related development seeking international investment funds. The guidelines are also useful for the development or expansion of commercial ports which may impact fishing operations.

Hydrography is the foundation for all coastal work and chapter five covers the topic in great detail. In the past, many artisanal shelters and fishing ports were built at convenient locations, with no particular attention paid to the underwater environment. Many such ports are now plagued by erosion and siltation problems that could have been identified earlier had proper hydrographic surveys been conducted. This chapter should provide planners and engineers with cost-effective options when faced with tight budgetary restrictions and difficult logistics. It describes the amount of hydrographic detail required for a project from inception stage to construction phase.

Dredging and underwater excavation, chapter six, are an important aspect in the design and construction of key elements in a fishing port. Dredging may be required to develop a port basin or to maintain a navigation channel open, but may also be undertaken for other purposes such as land reclamation, beach nourishment and environmental remediation of contaminated sediments. Dredging may be of a permanent nature, also known as capital dredging, or of a transient nature, also known as maintenance dredging. The nature of the

material to be dredged determines the type of dredging equipment required or method to be adopted but, on the whole, dredging practice is site specific. Also, in recent years, the screening for the presence of potentially harmful chemical agents in the material to be dredged has become mandatory in many countries influencing not only the method of dredging but also the method of disposal. This chapter may be used as a guide to assist in the decision-making process for the selection of appropriate dredging and disposal techniques.

Chapter seven is dedicated exclusively to breakwaters. The sea is unforgiving and wave action continually degrades human-made structures erected in the sea and breakwaters form the bulk of this construction. Therefore, engineers are normally entrusted with the design and maintenance of large deep water breakwaters. However, cases also arise when artisanal structures are required at the local level and when engineering assistance is either not available or not with the right experience. This chapter is intended primarily for non-technical staff coming to terms for the first time with marine construction and purposely does not include advanced design aids for structures in deep water, the realm of professional engineers.

Chapter eight covers quays and slipways in detail and should provide the reader with a wide range of options for both quays and maintenance structures, such as slipways and boat gantries.

Chapter nine condenses the subject of materials knowledge and suitability into a single chapter while eliminating superfluous coverage. The chapter is confined to the properties of those materials and treatments or variations thereof that are applicable to port structures. Emphasis is placed on full coverage of the basic materials that have proved most durable in the highly aggressive marine environment inside port structures.

The tenth chapter is a comprehensive overview of all the mechanical fittings and quay furniture required to run a port efficiently, from bollards and fenders all the way to marker beacons, winches and fish boxes. It provides an ideal reference guide to both technical and non-technical readers.

Chapter eleven reviews the shore-based infrastructure typical in a port operation, from water supply, power, refuelling, ice, port buildings and paved areas. Any reader will find this chapter useful, either as a reference or as a guide on how to integrate HACCP and third country directives into a port's infrastructure design.

Chapter twelve provides a holistic approach to public health issues in fisheries ranging from water and water-borne contaminants to sewage and sewage treatment options. The comprehensive detail of this chapter will enable the reader to better understand the ease with which fish, meant for human consumption, is contaminated. The chapter will also assist port planners in dealing with the prevention of pollution in fishing ports.

The manual also has a list of annexes for use as reference material. Annex 1 reproduces the text from the FAO Technical Guidelines, No. 1, Fishing Operations, on the procedures for the development and management of harbours and landing places for fishing vessels. Annexes 2 and 3 are checklists for port hygiene and port hygiene deficiencies, respectively. The fourth annex is a training manual on seafood handling prepared by Francisco Blaha, formerly FAO Fishery Industry Officer for the Technical Cooperation Project on Capacity Building in Support of Cleaner Fishing Harbours in India. The fifth annex is a useful tool already used with success in public awareness campaigns on the prevention of pollution in fishing harbours.