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ISLAMIC REPUBLIC OF PAKISTAN

BALUCHISTAN NEEDS ASSESSMENT

DEVELOPMENT ISSUES AND PROSPECTS

PART II - FISHERIES

JANUARY 2013

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ABBREVIATIONS

CO	Community Organization
EEZ	Exclusive Economic Zone
EU	European Union
FA	Fishers Association
FAO	Food and Agriculture Organization (of the UN)
FDB	Fisheries Development Board
GDP	Gross Domestic Product
GIFT	Genetically Improved Farmed Tilapia
GMP	Good Manufacturing Practice
GoB	Government of Balochistan
HACCP	Hazard and Critical Control Point
IFAD	International Fund for Agriculture Development
IOTA	Indian Ocean Tuna Commission
IUU	Illegal, Unreported and Unregulated (fishing)
MCS	Monitoring Control & Surveillance
MEY	Maximum Economic Yield
MFD	Marine Fisheries Department (Federal)
MSY	Maximum Sustained Yield
NGO	Non Government Organization
NIO	National Institute of Oceanography
NORAD	The Norwegian Agency for Development Cooperation
PkR	Pakistan Rupee
RIB	Rigid Inflatable Boat
SMEDA	Small and Medium Enterprise Development Authority
T	Tonnes = 1000 kg
TVETA	Technical and Vocational Education and Training
UNIDO	United Nations Industrial Development Organization
VLAO	Village Level Apex Organization
WWF	World Wildlife Fund (for Nature)

A note on currencies

In March 2012 the Pakistani Rupee was worth 0.011 US\$

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SUMMARY

1. Globally, fisheries are recognized as valuable capital assets capable of generating significant and sustainable economic, social and environmental benefits under appropriate policy, institutional and management regimes. At the same time, global marine fisheries in particular are an under-performing asset; recent estimates (World Bank 2008) suggest that the difference between potential and actual net economic benefits could be as high as US\$50 billion annually. At a global level, this situation warrants better governance, stronger policy legal frameworks and more effective management systems leading to increasing productivity, reducing overcapacity of fishing effort and enhancing the real value of landed fish.

2. The fisheries sector in Balochistan provides direct employment to an estimated 400,000 people, and perhaps an equal number in ancillary industries such as marketing, boatbuilding, etc. In coastal areas, fisheries can account for up to 70% of the local employment. Fish product exports from Pakistan account for approximately US\$8 million; this ranks fourth among export commodities, with a significant share originating from Balochistan.

3. Pakistan's fishery sector also follows global trends with these values not being fully realized. The sector can clearly generate greater net benefits and become a stronger engine for rural economic growth and social development. However, to achieve this potential, a program of reforms and investments, must be carefully implemented over an extended period of time at both national and state levels; the latter in Balochistan, which accounts for the bulk of fish production in the country.

4. The fisheries of Balochistan can be divided into four main sub-sectors. These are 1) marine capture; 2) brackish coastal water (coastal aquaculture); 3) inland open water capture; and 4) inland closed water (freshwater aquaculture).

Marine Capture Fisheries

5. Almost all of the fish produced in Balochistan come from marine capture fisheries along the 1,130 km long coastline from Sindh in the East to Iran in the West. These are based on the fisheries resources of the thin continental shelf that characterizes the majority of the coast. More than 135,000 Tonnes (T) of fish was caught in 2011 by an estimated 52 thousand fishermen operating 7,186 boats. This represents a third of the total Pakistan catch; Sindh, with its much wider continental shelf accounts for the remainder of the marine catch.

6. The major species caught were sea catfish (20,518 T), hairtail (14,661 T) and sardines (10,918 T). There have been considerable variations in catch of individual species groups over the years, though the total catch has not varied more than about 7% in the last 10 years. The catch is worth more than PKR12,698 million, contributing less than 1% to Pakistan's Gross Domestic Product (GDP). It is estimated that 300,000 people are dependent on the industry. Fishing activity is concentrated in eight larger ports/landing sites, with another 30 smaller sites. Of these, Gwadar and Pasni are the most important; both are in the Gwadar District.

7. There is a serious problem of poaching in Balochistan's territorial sea (out to 22 km or 12 nautical miles) with trawlers from Sindh Province. These vessels tend to use gears such as trawls and seines, which are banned in Balochistan and are very destructive. The catch of these vessels is not recorded as part of the Balochistan catch. Monitoring, Control and

Surveillance (MCS) is very weak in Balochistan, mostly due to a lack of funding, but also other resources and skills. MCS needs to be improved.

8. Appropriate infrastructure is lacking in all landing sites. Nearly all of the fish catch is landed across beaches. Jetties, quays and auction halls are urgently needed to improve the quality and value of landings.

9. Fish receiving stations and processing centers, as well as associated services, such as ice plants, boat repair and engine maintenance facilities exist all along the coast in the major landing sites. The fish receiving stations often act as satellite stations for processing plants based in Karachi, where any value addition will take place to the catch.

10. Most of the catch landed in Balochistan is sent by road to Karachi along the newly constructed Makran highway, where it then enters the Pakistan market or is exported. There is little direct export from Balochistan to international markets, though some fish goes to Iran.

11. Fisheries statistics are collected by Fisheries Department in all the major landing sites, but the collection system needs improvement to be more comprehensive and better interpretation of the data will lead to better management tools.

12. Over time, the fishing effort (crudely measured in numbers of boats) has risen roughly in line with the country's population increase (2-3% per year) while the catch has remained roughly the same. This is indicative of the major problem facing the capture fisheries of the province, which is overfishing, and its likely long term effects on biological and economic sustainability. The fishery is currently characterized as an open access resource. The last stock assessment was completed 25 years ago. The FAO, in conjunction with the Federal Marine Fisheries Department (MFD) and the Norwegian Agency for Development Cooperation (NORAD), are currently undertaking a survey of fisheries resources in the 320 km (200 mile) EEZ. Even at this early stage, the new data have largely confirmed the parlous state of many of Pakistan's marine offshore fishery resources and leave little doubt that overexploitation is the principal reason for this. More work is needed, and much is already under way, to provide clear and specific management recommendations, but the direction and scope of the action needed is already clear (FAO 2011). In particular, further assessment work is needed for the inshore area within 22 km of shore, where the majority of fishing effort (by smaller vessels) takes place.

13. In Balochistan there is a significant fleet of oceanic gill net vessels. These vessels fish in international waters and the Exclusive Economic Zones (EEZ) of other states in the Indian Ocean. Their activities often constitute Illegal, Unregistered and Unreported (IUU) fishing, which is forbidden by international agreements. A priority of the Fisheries Department is therefore to bring these vessels within an effective reporting and regulatory system so that this practice can be eliminated as far as possible.

14. A key priority for the GoB is to address overfishing in marine capture fisheries, and its negative effects on fishing rents, returns and biological sustainability. Without action to restrict new entry into the fishery, there is likely to be a collapse in fish catches and with it, the subsequent economic and social crises that have characterized Sindh fisheries in recent years and led to many undesirable outcomes. To address the overfishing issues, a shift in fisheries management approaches are required, away from the present day laissez-faire practices to a more structured approach of co-management with the users of the resources. This requires a revision of marine fisheries policy, legislation and supporting regulatory

frameworks. Both the fisheries policy and the underlying legislation and regulations for all fisheries are out of date and urgently need revising to reflect modern fisheries management principles (including co-management) and Pakistan's international fisheries treaty obligations.

Coastal Aquaculture

15. There is virtually no large-scale commercial coastal aquaculture in Balochistan. However, coastal aquaculture is widely perceived as having good potential in the future. The major attraction for aquaculture is the long coastline with plenty of land that may be suitable and relatively unpolluted water. Various attempts at shrimp farming have been undertaken or are ongoing on a small scale. None have resulted in significant commercial enterprises. Recently the erstwhile Fisheries Development Board (FDB) attempted to identify pond sites and establish a shrimp hatchery at Jiwani. This has not been successful however, there are many other types of aquaculture and species that could likely be farmed in Balochistan.

16. There are many constraints to successful coastal aquaculture in Balochistan, and before large scale private investment in the sub-sector can be expected, these issues will have to be overcome. They include uncertainty over land tenure, feed availability, a severe skills shortage, financing options, and security. Currently a lack of confidence to invest, mostly due to the security situation, is the major constraint.

17. An appropriate initial response to the lack of development in coastal aquaculture established would be to produce an aquaculture masterplan detailing the opportunities and covering the ways to overcome the main constraints.

Inland Fisheries

18. **Inland fisheries produce about 5.7% of all the fish production of Balochistan,** and almost entirely from open-water capture fisheries. In this system, fish are caught in small dams, often stocked with fry of Indian and Chinese carps provided free from government hatcheries. Tilapia farming is one activity that holds promise for the future. Public water bodies are fished under a contract system whereby the rights are auctioned off. The current system of auctioning short-term fishing rights with inland open water fishing is not ideal from a sustainability and equity point of view. It also does not encourage investment by rights holders to increase yields. Options for improved the leasing mechanism and exploring various co-management regimes should be evaluated.

19. There is virtually no commercial production from freshwater aquaculture in managed ponds. In Pakistan generally, average production per hectare from inland freshwater aquaculture is very low by world standards and reflects the lack of skills and investment in the sub-sector. Increased production could result from efforts to improve productivity from farmed fish and also to increase the number of fish ponds in areas of waterlogged or salt intruded land.

Post harvest and marketing

20. The catch which is not consumed locally (8% of the catch) is sent chilled or frozen to Karachi where it is processed and marketed in Pakistan or exported. A small amount of fish is sent to Iran directly from Balochistan. More than 30 fish receiving stations and processing units service the sector in Balochistan, mainly situated in or near the 8 large landing centers.

There is cold storage and ice production available at these sites. Limited infrastructure at most sites is a major factor in quality control since beach landings and auctions are not ideal. It is estimated that 25% of the potential value of the catch is being lost by a failure to maintain quality from sea to market as well as poor value addition. There are no sanitary controls in Balochistan and the Competent Authority's¹ reach does not currently extend beyond Karachi. Due to the lack of export facilities in Balochistan, much of the value of the catch does not remain in the province, since value adding and export is done from Karachi.

21. The priorities in post harvest are to try to develop the capacity of the Fisheries Department and the private sector for improved fish quality control and fish processing to reduce losses in value through poor handling, and where possible add value. This will have to be done in tandem with infrastructure development and the extension of the Competent Authority's activities to the province, initially in Gwadar.

22. Additionally direct exports direct from Gwadar to the Gulf region (fresh fish by air) and to the rest of the world (frozen by sea) are desirable, though the Fisheries Department has only limited ability to improve the infrastructure and transport links that are required to achieve this.

Institutional arrangements, research, and current sector support

23. Fisheries in Balochistan out to 22 kilometers (12 nautical mile) are defined as Territorial Waters, and are the responsibility of the provincial government, and the Fisheries Department is the main responsible agency. This is a well staffed agency with a reasonably clear vision of its responsibilities though it suffers from severe funding constraints for development activities, and has problems with insufficient recurrent expenditure for routine activities. There is a serious skills shortage throughout the sector, and the Fisheries Department is no exception.

24. Research into Fisheries in Balochistan is very limited. There are few institutions capable of this kind of work. The University of Lasbella at Uthal has planned postgraduate programs and which will include research, and some relevant work has been done in Universities and other institutions in Sindh. Establishing a formal fisheries research coordination body for the whole of Pakistan would be an appropriate first step to addressing research needs in the province. Similarly for training and skills development, a plan covering the needs of the province and how to achieve it needs to be written to guide budgeting and human resource planning in the sector.

25. The Government of Balochistan is attempting to address many of the constraints and priority activities in the fisheries Sector. The major development activity at present is the six-year, US\$35.5 million International Fund for Agriculture Development (IFAD)-supported Gwadar-Lasbella Livelihoods Support Project, which is expected to start in late 2012. This is a multi-activity project, which includes many inland communities. In fisheries, the inputs are many and varied including:

- Community development (establishment & strengthening of community organizations, training, capacity building); fisheries development (construction of jetties and infrastructure in eight sites, support to fishing communities;

¹ The Government Body, administered under the Federal Marine Fisheries Department, with responsibility for fish quality control

- Institutional strengthening through the Fisheries Training Centre in Surbadar, strengthening the quality control system, support for sustainable fisheries management and credit systems;
- Rural infrastructure (rural roads and community physical infrastructure – water, sanitation etc)

26. The Fisheries Department is relying on the IFAD project to cover much of its intended development requirements, but the project is aimed at the poorer regions of the province and will not cover many of the other landing sites on the coast. Project support for sustainable fisheries management and strengthening capacity in the Fisheries Department is insufficient; much more support is needed to address IUU fishing, MCS, in infrastructure provision and in other areas. Since the Fisheries Department cannot possibly fund all these activities itself, further international help will be required through development funding and projects.

27. The United Nations Industrial Development Organization (UNIDO), through its Trade Related Technical Assistance program will be providing help in establishing the Competent Authority in Gwadar, but again the assistance provided is limited and supplementary funding is going to have to be sought.

28. The training centre in Surbandar is to be completed in 2013, and assistance from many quarters will be needed to ensure that it operates effectively, is staffed with trained trainers, and is adequately equipped.

29. In coastal aquaculture, the Government of Balochistan (GoB) is trying to create a more enabling business environment, rather than developing the industry directly. Despite this, there are some costs involved, and assistance in writing an Aquaculture Master Plan is needed.

1. FISHERIES OF BALOCHISTAN - DESCRIPTION AND KEY ISSUES

1.1 Background

1.1 Globally, fisheries are recognized as valuable capital assets capable of generating significant and sustainable economic, social and environmental benefits under appropriate policy, institutional and management regimes. At the same time, global marine fisheries in particular are an under-performing asset; the World Bank (2008) suggests that the difference between potential and actual net economic benefits could be as high as US\$50 billion annually. At a global level, this situation warrants better governance, stronger policy and legal frameworks, and more effective management systems leading to increasing productivity, reducing overcapacity of fishing effort, and enhancing the real value of landed fish.

1.2 Pakistan's fishery sector also follows global trends with these values not being fully realized. However, the sector can clearly generate greater net benefits and become a stronger engine for rural economic growth and social development. Balochistan accounts for the bulk of fish production in the country and is therefore a region of great importance with respect to fisheries sector development.

1.3 The fisheries of Balochistan can be divided into four main sub-sectors; 1) marine capture; 2) brackish coastal water (coastal aquaculture); 3) inland open water capture; and 4) inland closed water (freshwater aquaculture)². These are discussed below.

1.2 Importance to the National and Balochistan Economies

1.4 In many coastal areas, fishing is the only activity available to the inhabitants since there is little agriculture nor extractive industries, and only near the coastal towns is there light industry or service industries offering alternatives to fishing for income. In any case, the educational level of the majority of fishers and their families is insufficient to allow them to enter alternative occupations requiring literacy or numeracy. Child labor rates of 30% in the coastal belt of Balochistan are a reflection of the lack of educational, development and employment opportunities.³

1.5 The sector provides direct employment to an estimated 400,000 people, which is approximately 3% of the total population of Balochistan (though naturally proportionately more in the coastal areas – up to 70%⁴ and the sector contributes less than 1% to Pakistan's

² **Inland open water bodies**, where capture fishing is mainly carried out, comprise rivers and estuaries, *beels* (small lakes, low-lying depressions, permanent bodies of floodplain water, or bodies of water created by rains or floods that may or may not dry up in the dry season; in the wet season, *haors* or shallow lakes may be formed as smaller water bodies are joined up), and floodlands (annually flooded, low-lying areas associated with rivers). **Inland closed water bodies**, where aquaculture (fish farming) at various intensities is carried out, include ponds, oxbow lakes, and also some coastal waters. **Brackish water bodies** (coastal aquaculture) involves contained waters in coastal areas, mainly for shrimp aquaculture. **Marine waters** under the authority of Balochistan are limited to 20 km from shore. Beyond this, fisheries are under the jurisdiction of the Federal Marine Fisheries Department.

³ Hai A.A. et al (2010) Socio-economic conditions of child labor: A case study for the fishing sector on Balochistan Coast. International Journal of Social Economics Vol 37 Iss 4 pp 316-338

⁴ Competitiveness Support Fund (2008) Balochistan Fisheries Development Study: Options for Balochistan Coastal Fisheries & Aquaculture.

GDP; this compares to 8% contribution to GDP from livestock.⁵ Fish product exports from Pakistan account for approximately PkR727 million (US\$8 million). This ranks fourth among export commodities, with a significant share originating from Balochistan.

1.6 In addition, another 400,000 people are employed in ancillary industries. Service industries, including boat repair and engine workshops, transport and net supply are generally privately run (though Fisheries Department has some engine workshops) and provide employment to artisans all along the coast in the fish landing sites. Boatbuilding has been suggested as a potential future major industry for the province, and Small and Medium Enterprises Development Authority⁶ (SMEDA) has identified several areas in fisheries that could provide opportunities in the future, one of which is boatbuilding.

1.3 Marine Capture Fisheries

1.3.1 Resources and catch

1.7 Pakistan's coastline of 1058 kilometers is divided into two provincial coastlines, Sindh and Balochistan. The Sindh Coast, about 313 km in length, extends from Karachi to the Indian border. Here the continental shelf is broad, extending to a distance of 110 km from the coast, partly due to the Indus River deltaic fan. The Balochistan Coast extends for 745 km from just west of Karachi to the Iranian border and possesses a much narrower continental shelf (15 to 50 km). Since the size of the continental shelf determines the production of shallower living species (the bulk of the current fish catch), the catch from the Balochistan part of the coast is much less than that of Sindh despite its longer coastline.

1.8 Estimates for the Maximum Sustainable Yield (MSY) for Pakistan are not split up between Sindh and Balochistan and are 25 years old. They give a potential figure (for fish excluding mesopelagics⁷) of 606,400T. This estimate is too old and inaccurate for management purposes and is currently being revised by FAO⁸ through a stock assessment program.

1.9 Figures provided by the Balochistan and Sindh Fisheries Departments to the MFD in 2011 give catch estimates for Pakistan, split between Sindh and Balochistan for the last 11 years (Table 1). The data collection process is very likely to have underestimated the actual fish harvest by anything up to 30%,⁹ since small landing sites and traders are not included, there may well be significant underreporting by processors, and the Department does not have a strong capacity for MCS. Some catch is also landed to Karachi Fish Harbor direct by Balochistan registered vessels. It is also apparent that quite a large quantity of sardine caught in the Eastern areas, near to Karachi is not being recorded. This is dried and goes to fish meal for chicken feed and does not pass through the processing and handling facilities for fresh fish that are monitored. It is frequently alleged that up to 80,000T of fish origination from the territorial sea of Balochistan is caught by Sindh based trawlers and landed in Karachi; though this figure is conjectural so cannot be corroborated.

⁵ Raza S.A, Mehboob, F and Ali Y (2012) Role of Agriculture in Economic Growth of Pakistan. International Research Journal of Finance and Economics. ISSN 1450-2887 Issue 83 (2012)

⁶ <http://www.smeda.org/index.php>

⁷ Living deep in the water column in the open ocean (and very difficult to catch economically since they do not aggregate into dense schools)

⁸ FAO. Fisheries Resource Appraisal Project, MFD, Karachi

⁹ Competitiveness Support Fund (2008) Balochistan Fisheries Development Study: Options for Balochistan Coastal Fisheries & Aquaculture. (Page 13)

1.10 In Balochistan the apparently small variations over time of the total harvest mask some very considerable changes in the composition of various species of fish. The sardine catch has declined from more than 17,000T in 2007 to just over 10,000T in 2011 (a drop of 36%), the catfish catch has nearly doubled in the same period to 20,000T and the Indian mackerel catch has declined by more than 60%.¹⁰ How much of these changes are due to the vagaries of the data collection system and how much is real variation in catch is not clear. The value of the harvest has increased greatly with time, nearly doubling between 2007 and 2011. Some of this is due to the reduction in the value of the Pakistani Rupee, and some to real increases in value of the catch as the Makran Highway opened and it was possible to ship out fresh product instead of salted and dried. The Indian mackerel from Balochistan in recent years gave exports a great boost, as new and better markets were found in Southeast Asia and catches initially went up responding to better prices, and more fish receiving stations opened along the coast. Similarly tunas, which used to be shipped salted to Sri Lanka, now have a fresh and frozen market. Relevantly the export of fresh high value products from Karachi to the Gulf Region has also impacted on prices received. The catch is seasonal with a distinct low period between July to September due to rough weather, and a ban on catching shrimp in July and August (to conserve breeding shrimp).

Table 1. Marine catch (fish and shellfish) and exports x 1000 T 2001–2011 Pakistan, Sindh, Balochistan

Year/Province	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Catch Pakistan	401	400	400	386	339	349	342	344	338	337	351
Catch Sindh	278	274	270	259	221	216	205	223	218	210	216
Catch Balochistan	123	124	126	124	112	128	137	121	120	127	135
Exports (Pakistan)	85	80	101	93	106	115	104	129	98	106	112
Value Balochistan Catch PKR x10 ⁶							6,988				12,698

Source: MFD Figures & Balochistan & Sindh Fisheries Departments Figures (2012).

1.11 The marine capture fishery is based in eight large coastal sites (Figure 1) and approximately 30 smaller ones, some very small. Data are provided (Table 2) showing recent catch levels, number of vessels and number of fisherfolk across the eight largest landing sites. **The towns of Gwadar, Jiwani, Pasni and Ormara are the largest landing sites and account for almost 80% of the total catch, 59% of the total vessels and 58% of the total fisherfolk.** There are no statistics available for the 30 or so smaller landing sites. Fishing vessels are mostly gill netters, since trawling and seining is banned in Balochistan. Lines are also widely used. Near Gaddani in the east, many old ships' lifeboats are used as fishing boats. These originate from the nearby ship breaking yards. More and more fiberglass boats are entering the fleet as affordable timber becomes scarcer.

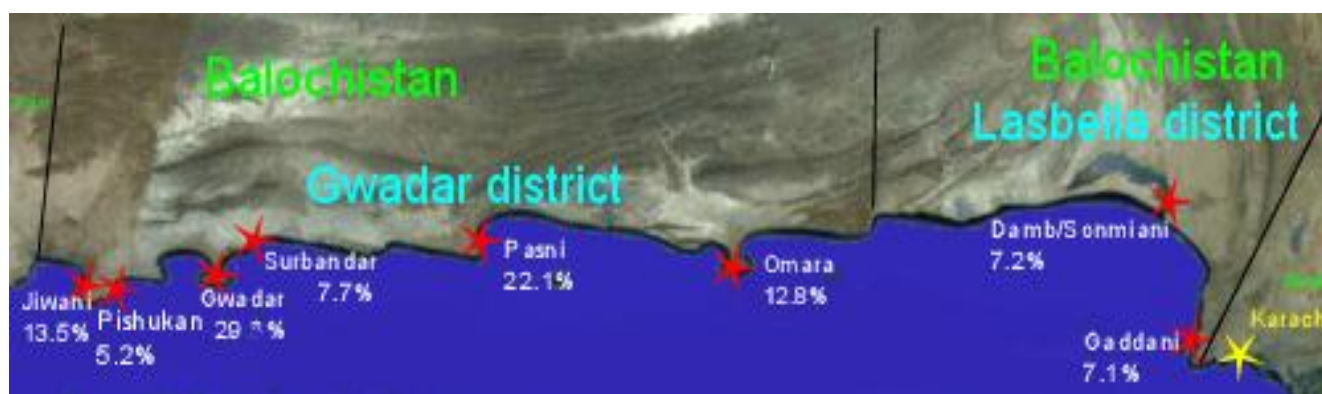
¹⁰ All figures provided by Department of Fisheries, Balochistan

Table 2. Catch and numbers of fisherfolk and vessels - eight largest landing sites

Year	Jiwani	Pishukan	Gwadar	Surbandar	Pasni	Ormara	Damb	Gaddani
Catch (T) (Total 135,115T) & % by location	10,270 13.5%	7,180 5.2%	40,470 29.6%	10,455 7.7%	29,944 22.1%	17,297 12.8%	9,869 7.2%	9,626 7.1%
Numbers of vessels (Total 7,176)	664	503	1,280	651	1,344	922	989	833
Numbers of fisherfolk (total = 52,812)	5,233	4,598	9,066	4,820	10,550	5,708	7,037	5,800

Source: Balochistan Fisheries Department Figures.

Figure 1. Balochistan coast showing major fish landing sites and % of total catch for 2011



Source: Drawing from CSF 2008 with modifications

1.12 The numbers of fishing vessels in Balochistan has increased by 21% over the past 11 years (Table 3). In particular, the number of mechanized vessels, which have greater capacity to catch fish, has increased by 33% over the same period.

Table 3. Numbers of fishing vessels in Balochistan 2001-2012

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Mechanized Vessels	1,369	1,677	1,487	1,330	1,501	1,635	1,670	1,708	1,866	1,747	1,831
Sail/outboard vessels	4,382	4,205	4,455	4,692	4,632	4,611	4,638	4,662	4,701	5,105	5,345
Totals	5,917	5,882	5,942	5,559	5,652	5,917	6,308	6,370	6,567	6,852	7,176

Source: Balochistan Fisheries Department Figures.

1.13 The smaller vessels are restricted to inshore coastal areas, and use mainly small gill nets, long lines and handlines on day trips, returning each day to port with relatively fresh fish. Ice is not generally used, unless shrimp are targeted in which case an ice box with ice may be taken for that part of the catch. These vessels are typically between 1 and 2 T. Larger vessels with inboard engines are much larger, up to 35 T, and do much longer trips, taking ice and staying away for up to 3 weeks. The quality of the fish caught in the first few days of the trip is not good on these larger vessels, due to the time that the fish will have been kept aboard before unloading. Some of the very largest of the vessels have on-board refrigeration and are capable of extremely long trips of 2-months in international waters using gill nets for tuna.

1.14 Balochistan has a significant fleet of large (to 35m long) gill netters, probably more than 100 vessels in all. Some of these have been implicated in IUU fishing as far afield as Somalia, Sri Lanka and in international waters. The fleets' activities are said to have declined in recent years, but the very nature of their fishing methods and where they fish means that they are not monitored by the Balochistan Fisheries Department. The catch from these boats is usually landed to Iran, either directly or trucked west over the border though some fish destined for Iran is transhipped at sea. IUU fishing is forbidden by international treaty.

1.15 The greatest significance of the figures given in the tables above is that the catch in Balochistan has not increased appreciably over time. (note that in Sindh the catch is greatly below that of 11 years ago). In that time, a significant amount of additional effort has entered the fisheries of Balochistan. Catch per unit effort, when measured by catch/vessel/year, is dropping, anecdotally the sizes of fish recorded in the catch is declining and various species have disappeared from the catch.¹¹ The coastal marine capture fisheries of Balochistan are certainly overfished. There is no room to expand the catches significantly from the existing resources being exploited. This is not uncommon in the region. In India for example, the government estimated that 61 percent of capture fish stocks are overexploited and most of the other commercial stocks are fully exploited (World Bank 2010).

1.3.2 Infrastructure for marine capture fisheries

1.16 Marine capture fisheries are presently not well provided with infrastructure. Most fish landing is done straight over a beach, even when there are some other receiving facilities available. In some places (notably Pasni) some fisherfolk have avoided the local facilities due to the costs involved in using them. Minor landing sites, approximately 30, have no significant landing infrastructure at all (Table 4).

1.17 Some Balochistan based boats land their catch in Iran, where fish prices are regularly higher, and some also land to Karachi Fish Harbor.

1.18 Apart from Pasni, there is no large fishing port in Balochistan that now offers unloading facilities to fishing boats directly to a quay or jetty. Gaddani and Sonmiani/Damb have harbor facilities that are becoming silted up and all other harbors, whilst offering shelter and mooring, do not have jetties. Pasni itself is seriously silted up and many vessels now land on a beach nearby. This lack of adequate landing facilities has major implications for fish quality control (see below). There are fish receiving stations and ice making facilities at all the eight major landing areas.

1.19 The Gwadar Port Authority¹² has control over the Port of Gwadar and has moved the small fishing boats away from the port area so they now land to the beaches east and west of the peninsular. The long term plan is to move all fishing boats out of Gwadar to Pishukan and Surbandar, where there are harbors. There are also outline plans for a "Seafood City", in Gwadar in the future. With overcapacity in processing and the fleet already overfishing, the plans may be optimistic.

¹¹ WWF (2005) Study on Knowledge, Attitude, Practices of Fisherfolk communities about Fisheries and Mangrove Resources. Kalamat Khor [Balochistan]. PLA (Participatory Learning and Action) Final report.

¹² <http://www.gda.gov.pk/index.html>.

Table 4. Fishing ports available to Balochistan fishing boats

Location (W to E)	Port & Infrastructure	Comment
Major Landing Sites in Balochistan		
Jiwani.	A mole made of large cement blocks giving shelter to a beach. Several fish receiving plants. Ice available.	Mole damaged in a cyclone and never properly repaired. Beach landing.
Pishukan	Beach protected by mole. Beach landing. Fish receiving plants.	Beach landing. A tender for a fish landing jetty has been put out in 2012 for Pishukan by GDA.
Gwadar	Large commercial port. At least 4 ice plants operating. Fish receiving plants. Large & small. Airport. Commercial port facilities. Many service industries.	Beach landing. Donkey carts used to transport fish from beaches to fish receiving stations. Fisherfolk have been exclude from the port area and are now landing on East and West Gwadar beaches, on neck of the Gwadar peninsula.
Surbandar	Large area protected by moles behind a headland. Very good natural harbor. Ice. Fish receiving plants.	Beach landing. A tender for a fish landing jetty has been put out in 2012 for Surbandar by GDA.
Pasni	Large harbor. 3 jetties. Breakwater. Greatly silted up. Many vessels moved out to nearby beach due to silting and high fees. Ice plant and fish receiving stations. Problems with fresh water. Service industries.	To be dredged 2012 – apparently. Beach landing to the South of the main port.
Omara	Naval port from which fisherfolk are excluded. Ice and fish receiving stations.	Beach landing on a sheltered area to the East of Omara peninsular.
Sonmiani/Damb	Small harbor. Ice. Fish Receiving stations. Large areas set aside for sardine drying meadows.	Greatly silted up. Most fishing boats land to nearby beaches
Gaddani	Small harbor. Ice Fish receiving stations	Silted up. Almost unusable. Boats now use nearby beach
Other Major Landing Centers Available		
Karachi Fish Harbor, Karchi, Sindh	West Karachi. Ice production, 16 large fish receiving & processing factories on site. 3 Auction halls. Major fish harbor in Pakistan. Owned by Sindh Government. Ultimate destination of much of Balochistan fish, either iced or frozen.	Some Balochistan vessels land directly to KFH to obtain better prices that they would get further West.
Karachi: Korangi Fish Harbor. Sindh.	East Karachi in the suburb of Korangi. Relatively modern with a quay and processing facilities etc on site. Owned by Federal Government.	Not much used by Balochistan Boats. Wharfs too high for many artisanal vessels
Karachi. Ibrahim Hyderi. Sindh	East Karachi. A suburb of Karacvhi. Urban area. Series of unsealed moles. Auction halls, services	Not used by Balochistan boats. Very much in the grip of powerful fish traders and moneylenders

Source: CSF 2008, authors observations, Google Earth 2012, Balochistan Fisheries Department.

1.20 Two tenders for fish landing jetties have been put out in 2012 for Pishukan and Surbandar. This does illustrate some of the confusion over who does what, with Gwadar Development Authority, Fisheries Department and the Balochistan Coastal Development Authority all claiming some jurisdiction over activities in the coastal zone (see Section 1.3.3 below).

1.3.3 Marine fisheries management

1.21 The GoB is responsible for all fisheries within the 12 nautical miles zone; outside that the Federal Marine Fisheries Department is responsible for issuing vessel licenses (between 20 and 200 miles) and collecting revenues from licensing. It would appear that licensing of Foreign Fishing Vessels (FFVs) by MFD has reduced in the last 4 or 5 years. Despite the passing of the 18th Amendment to the Constitution in 2011, this division of responsibilities will not change since the Federal Legislative List Part 1. 36 allocates “fishing and fisheries beyond territorial waters” as a federal responsibility.

1.22 Only Balochistan licensed vessels can legally fish in the 22 km Balochistan Territorial Sea. The Fisheries Department licenses local boats and processing facilities, and is tasked with enforcing regulations on illegal or destructive gear types and the ban on trawling and the use of seines. Seines and trawling are banned in Balochistan as it is acknowledged these methods are destructive to the fisheries resources. Enforcement of gear restrictions has been somewhat ineffective, particularly in the East of the Province near to Sindh, where the trawlers based in Karachi and environs regularly encroach into Balochistan waters. One of the reasons for this is that Sindh waters are very heavily overfished and the returns for fishing boats there are low, so there is an economic stimulus to poach in Balochistan waters. Fisherfolk in Balochistan are aware of this “poaching” and resent it, but the Fisheries Department has few resources to effectively police its coastline and territorial sea, and encroachment continues. Although the Department has small patrol boats to police fisheries in the territorial sea, their use is limited by funding and staff constraints. Fisheries department patrol vessels occasionally arrest boats from Sindh which have encroached. Poaching by Iranian boats from the West is also reported. With shared stocks of resources it would be useful to have some sort of resource sharing agreements with both Sindh and Iran, possibly through comprehensive management plans for the affected stocks. These have not yet been created.

1.23 Given these weak control measures the marine fishery is a de facto open access situation. With low entry costs, anyone can start fishing in inshore waters, and this is reflected in the increasing numbers of boats recorded by the Fisheries Department. There are no formal access rights established, though traditionally fishermen have fished in the coastal areas near to where they live. Even this limited traditional restricted access is becoming strained, as fishermen poach on neighbors, and illegal fishing boats from the larger ports and from Karachi and Iran fish along the shallow coastal areas (often at night). Open access fisheries are undesirable and lead to overfishing and ultimately the decline and collapse of fish stocks, and subsequent loss of economic rents, as has been shown in many other parts of the world.

1.24 In Sindh, a fisheries and human catastrophe is presently unfolding due to lack of gear and catch controls, open access, and subsequent overfishing. In Balochistan there are growing signs of overfishing, increasing effort, open access to entrants, reducing catches, disappearance of some species from the catch and reductions in the size of long-lived fishes being caught. The Fisheries Department must implement measures to stop the growth of effort in the fishery. This is priority number one for the department. Whilst the Fisheries Department has insufficient trained staff and has little capacity either in equipment or funding to intervene and actively manage the fisheries, wider acknowledgement that overfishing is a serious problem that must be addressed would be an important first step towards obtaining

the resources required. This suggests a major information campaign, supported by good science and data.

1.25 The present status of inshore marine fisheries in Balochistan and growing challenges, call for early implementation of appropriate policy measures to gradually shift the focus from harvesting increasing volumes of fish in a de facto open access resource situation, to a more holistic approach based on a long-term goal of maximizing net economic, social and environment benefits from sustainable fish production. The status quo with current fisheries management is clearly not working as is the case in many other regions of the world. Loss of the inherent value or ‘wealth’ of the resource is the first consequence of ineffective management of fisheries; excessive levels of fishing capacity may also lead to fishing effort beyond the biological MSY, contributing to declining catches and in extreme cases, stock collapse. The outcome of not reforming current management systems may be seen in continued resource depletion, poor net returns, reduced food security, and a growing poverty trap for the more marginalized stakeholders. A fisheries development model for inshore marine waters needs to be developed that is characterized by more productive fish stocks, more effective fisheries management, and improved equity. This will require strengthened policy, legal, regulatory and management systems around a more holistic approach, supported by appropriate economic and financial incentives, and above all, stronger access and use rights for resource users.

1.3.4 Legal, policy and regulatory framework

1.26 Fisheries policy generally is not sufficiently elucidated to provide a clear view of what the Fisheries Department is trying to achieve in the sector, nor broader fisheries sector development goals. Whilst the Fisheries Department has a clear mandate, a budget, a series of objectives and is active in statistics collection and development, given the changing emphasis in the coastal fishery towards co-management, the international commitments and development in the other sub sectors, the policy to be followed needs updating through a participatory process with key stakeholders.

1.27 The major piece of legislation relating directly to Balochistan Fisheries is the Balochistan Sea Fisheries Ordinance No. IX, 1971. This law provides authority for control of fishing craft, fishing licenses and processing of fish and fishery products in the territorial water of Pakistan along the coast of Balochistan. The Act has been amended several times and new regulations enacted, most recently in 2010, when penalties were increased significantly to prevent fishing trawlers based in Karachi from fishing within the inshore waters of the province. Several pieces of federal fisheries legislation provide regulation of fishing outside the 22 km Territorial Waters (into the EEZ), catching of turtles, a closed season for shrimp fishing, fish quality and inspection rules and environmental protection.

1.28 The provincial legislation does not specifically allow for co-management of resources, which is now considered essential to proper resource management of inshore waters, nor the precautionary and ecosystems approaches to fisheries management as overarching principles which are enshrined in the FAO Code of Conduct for Responsible Fisheries. Additionally, post harvest issues and coastal aquaculture are insufficiently covered.

1.29 Pakistan, like many other coastal countries, is bound by a series of international agreements and treaties, including the Rio Convention on the Environment and its subsequent protocols and sub-treaties, the FAO Code of Practice for Responsible Fisheries, the Convention on Biodiversity, the FAO International Plan of Action to Prevent, Deter and

Eliminate Illegal, Unreported and Unregulated Fishing (IUU Fishing), and agreements under the auspices of the Indian Ocean Tuna Commission. Non-fisheries treaties related to gender, HIV and AIDS, the rights of the child and climate change also have relevance to the sector. The obligations placed upon Balochistan by these and other international treaties are not adequately addressed in the current legislation or through active fisheries management.

1.3.5 Key issues in marine capture fisheries

- i. As in most regions of South Asia and globally, overfishing is the most important issue facing marine capture fisheries in Balochistan, and the fact that this is not widely understood and promulgated needs to be addressed. There are investment opportunities, but they will not be found in simply trying to increase the catch.
- ii. Insufficient attention is being paid to management of the marine fisheries of Balochistan, even though there are clear signals of stress in the fishery and an urgent need for action. A clear first series of initiatives would be to cease to license new entrants to the fisheries of the province, undertake expanded research on stock levels and sustainable yields, pilot co-management in coastal areas, and fully implement international marine fishing obligations.
- iii. Better Monitoring Control and Surveillance is needed to reduce illegal and destructive methods being used, and control poaching from Sindh and Iran.
- iv. The legislation, policy and regulatory framework are outdated and inadequate for management of a modern fishery. While acknowledging ongoing amendments, the overall Act needs to be reviewed and revised to support progressive reform of marine capture fisheries.
- v. Existing infrastructure (harbors, jetties, etc.) need improvement or repair, and investments in new infrastructure is required, particularly at those sites with beach landings.

1.4 Coastal Aquaculture

1.30 Coastal aquaculture includes cage culture in the coastal shallow waters, shellfish culture and pond culture in the coastal land area adjacent to the sea, and sea ranching. In Balochistan and Sindh there has been much interest in shrimp farming in recent years, but with little investment on the ground. Other marine and brackish species may be more suitable though efforts to date have been sporadic and not commercially orientated.

1.31 Globally, coastal aquaculture is generally presumed to be a sector with great potential, particularly as marine capture fisheries are increasingly exploited and overexploited. Balochistan has a coastline of more than a thousand km and much of this is indented with bays and shallow lagoons conducive for aquaculture. The water quality along the coast is generally excellent, with little pollution (apart from the extreme eastern areas where there is ship breaking and discharges from industry). These are the two main attractions for investors to support aquaculture in Balochistan and if it develops, it could be expected to provide significant direct employment directly, and indirect employment ancillary industries, such as feed production, processing and export.

1.32 Currently, there is virtually no commercial marine or coastal aquaculture being undertaken in Balochistan. One attempt was made to establish prawn farming by an

industrialist in Hub in 2005-7. This entrepreneur spent considerable funds establishing an inland shrimp farm using foreign expertise and recirculation systems, bringing in the salt water required by lorry. Although this exercise proved that under certain conditions it was possible to produce the Giant Tiger Prawn (*Penaeus monodon*) at a marketable size, he was unable to find land in the region to increase the size of his operation to a more economic scale and move it closer to a supply of salt water, so he abandoned his efforts. It was estimated that each shrimp produced had cost him PkR636 (US\$7).¹³

1.33 A small shrimp pilot project has been established in Lasbella near Sonmiani, but is not at a commercial scale. A hatchery has been established in Sindh by the Balochistan government, and together with its grow-out facility has demonstrated that shrimp farming is technically possible (though it has not yet demonstrated economic viability). A shrimp farm nearby in Iran is often held up as a model for Balochistan but is not run on commercial lines, so the comparison is not appropriate.

1.34 The Fisheries Development Board (FDB) established in 2007 as a federal initiative had a program in Balochistan. This was expected to establish eight model shrimp farms, develop marine aquaculture in the coastal zone, build a fish market in Gwadar, build a hatchery near Jiwani (exact location to be decided) and promote investment in aquaculture. Additionally it was to provide technical assistance, advice and the creation of an enabling environment for aquaculture generally throughout Pakistan. The FDB program envisaged large subsidies to shrimp farming during the establishment of farms and early operation period.

1.35 The FDB was dissolved in 2011. In Balochistan, nothing significant was achieved, except that 2,800 ha of land was earmarked for aquaculture in five areas. This land is now available to Fisheries Department, though the appropriateness for use for coastal aquaculture is not proven. A hatchery near Jiwani was also started but not completed. The ineffectiveness of the FDB's activities in Balochistan is unfortunate since its programs promised many things which might have benefited the development of commercial aquaculture. Subsequently, the FDB has been reformulated as a private-led company as a "bridge between the government and the private sector".¹⁴ It has taken over the role of the old FDB. The effectiveness of the new setup remains to be ascertained, but its basic objectives in aquaculture remain the same.

1.36 There would appear to be much potential in Balochistan for various sorts of coastal aquaculture. Examples might be barramundi and bream in cages, cobia in deep cages, crab grow-out in ponds, barramundi and other species in coastal ponds, shrimp in ponds, and oysters and mussels in shallow coastal locations. No trials have been carried out at all on all these except shrimp, and even those have not been financially successfully.

1.37 Despite all the publicity about what a wonderful place for aquaculture Balochistan is, which has been the main characteristic of the sector for many years, the fact is that nobody has successfully invested in coastal aquaculture up to now. There are several reasons (Table 5).

1.38 Given these constraints, there is little possibility in the short term of enticing overseas investors to come to Balochistan and invest in aquaculture. Investors will continue to look elsewhere, and even areas of Sindh Province in the Indus delta area to the east, with its

¹³ Mr Gaffar A Habib pers com 2009.

¹⁴ Iftikhar. F (2012). Presentation of Fisheries Development Board (FDB).

proximity to Karachi with its industries, port, processors and feed suppliers, appears at the moment to offer better opportunities than most of the Balochistan coastline.

Table 5. Constraints to coastal aquaculture in Balochistan

Key Constraint	Comments
Land issues	Although land is presumed to be available, the only investor so far who sought land for shrimp farming in Balochistan was unable to obtain it. The question of who is responsible for developments in the Coastal Zone needs to be clarified. The Balochistan Coastal Development Authority claims responsibility for development in the Coastal Belt and the Gwadar Development Authority over that area near Gwadar. Fisheries Department claims responsibility for coastal aquaculture.
Feed	There are no supplies of feed in Balochistan, though feed is probably available through Karachi and imports. This is only a limitation during the first start up phases.
Skills	There is a limited pool of skilled labor in the sector. Investors will have to bring in nearly all skilled labor for hatcheries and grow out facilities from overseas. Local people will only participate as laborers in the first few years. There are no training institutions offering appropriate training in Pakistan, and even if established there are few, if any, qualified local tutors available to staff them.
Seed	There are no commercial hatcheries in Balochistan. An investor will have to build his own, but this is not a serious long term constraint. Importing seeds provides a short term solution, though expensive.
Security	Lawlessness, even if in perception only, is not an incentive to investment. The current need for a <i>No Objection Certificate</i> to visit areas of potential along the coast is a serious block to investment. Investors will also be looking at the other aspects of security, such as; <ul style="list-style-type: none"> a. security of tenure on the lands or coastal areas where they have made their investments; b. protection from pollution and water contamination, and bio-security; c. knowing the feeds they buy from local feed manufacturers are pure and unadulterated; d. the security of being part of an export orientated industry that conforms to HACCP and EU quality control rules, and other import regulations regarding residues and contaminants
Environment	Despite shrimp farms being established in Saudi Arabia and Iran, with similar environments to Balochistan, the success of these enterprises is dependent on considerable subsidy, through greatly reduced costs for some inputs (eg: electricity, finance). South East Asia is climatically different. It is not appropriate to assume that the technology and economic model for shrimp can be transferred to Balochistan from these places. For other species there has been no research to ascertain suitability of conditions for aquaculture though there are several candidate species.
Finance	Finance would presumably be available initially from overseas. It is unlikely that local financial institutions will be prepared to fund start-ups in this relatively new field.
Confidence	Investors do not have the confidence to invest in this sector in Balochistan for the reasons given above. In addition nobody has done it successfully as a model to follow. The investor will have to be a pioneer along with all the risks that follow.

Source: Adapted from Competitiveness Support Fund (2008) Discussion Paper. Shrimp Farming in Sindh.

1.4.1 Key issues for coastal aquaculture

- i. The need to define and demonstrate what aquaculture is technically and economically possible in the Balochistan coastal zone;
- ii. Attracting the private sector to invest in aquaculture in Coastal Balochistan, given the obvious constraints.

1.5 Inland Freshwater Capture Fisheries and Aquaculture

1.39 Inland freshwater capture fisheries and aquaculture is generally overlooked, partly because Balochistan is perceived to be very arid with little water. It is however, quite important in places where there is irrigation and inland water bodies, particularly dams. Freshwater fish production makes up 5.7% of all fish production in Balochistan (Fisheries Department, 2012) and is not included in the generalized fish production figures quoted above in Table 1.

1.40 Inland freshwater capture fisheries production in 2011 was an estimated 8,435T of which 5,650T (67%) came from one small division – Nasirabad, in the East of the province, where there is available water. Half of the inland fish production is Indian and Chinese carps, from fingerlings provided by the province’s hatcheries, and the other half (particularly in dams and natural water bodies) is mixed local species of wild origin. The GoB owns five fresh water hatcheries, four of which are operative. These produce fingerlings of Indian and Chinese carps to fish farmers (for free) and for stocking natural and artificial water bodies.

1.41 In dams and natural open water bodies, the rights to harvest fish are auctioned off by Fisheries Department to private individuals usually for 3 years; a long-established system that is not conducive to good management practice since it encourages fishing practices aimed at maximizing catches in the short term without a longer-term incentive for sustainability and re-investment. In terms of poverty and equity, these leases are often captured by more powerful and politically connected people, which is not uncommon in South Asia. Approaches involving both private and public open and closed water bodies can be developed in Balochistan, based on regional and global experience to improve sustainable yields, product quality, income and equity.

1.42 With freshwater aquaculture, the total area of fish ponds across Pakistan is about 60,470 ha. The majority of the ponds are located in Sindh (49,170 ha) and Punjab (10,500 ha). The remaining 800 ha are spread across KPK (560 ha) and Azad Kashmir, Gilgit, Baltistan and Balochistan (combined total of only 240 ha). Balochistan has virtually no commercial production at this time.

1.43 In general, freshwater aquaculture in Pakistan is poorly developed and the farmers use basic methods with consequently low yields of less than one tonne per hectare. Feeding of the fish is not practiced and skill levels are low. There has been no take up of Tilapia farming, as has been tried successfully in Punjab under the auspices of the FDB, and with the lack of husbandry skills and reluctance to feed farmed fish, Tilapia would be unlikely to succeed in any case. Yields are typically around one 1,000 kg per hectare per year, a very low figure compared even to some other parts of Pakistan and which is typical of extensive aquaculture with limited husbandry. Comparing Pakistan to other countries in the region further underscores the low productivity from extensive freshwater aquaculture systems in the country (Milne, 2009). For example, the current average productivity of similar aquaculture systems in Bangladesh is about 1,500 kilograms per hectare per year. Where monoculture of certain species (catfish, tilapia, perch) occurs, average production can reach 2,500 kg/ha/year (Curry 2006). Some of the critical factors contributing to low productivity include: weak technical understanding of modern pond management by fishers, leading to poor management practices; lack of high quality inputs such as brood stocks, fish seeds (or fingerlings) from hatcheries, and blended fish feed. At the same time however, the profitability of these extensive systems is quite good, mainly because of low input costs. Accounting for fully-costed labor, annual profits on carp polyculture systems have been estimated at PkR68,181

(US\$750) per ha, representing a margin of 57 percent, and for monoculture systems at PkR100,000 (US\$1,100) per ha, with a margin of 42 percent. Intensively managed ponds, using improved fingerlings, commercial feed and good pond management practices can generate up to 10,000 kg/ha/year of fish through two crops annually. In addition, these ponds can often be integrated with livestock production to generate waste for building up pond nutrients. Productivity can also be improved through the use of genetically improved stock.

1.5.1 Key issues for inland fisheries and aquaculture

- i. A very low skill level in the sub-sectors, particularly within the private sector
- ii. Sub-optimal leasing system for public open water bodies, and unclear policy goals
- iii. Lack of investment in inland aquaculture and low productivity

1.6 Post Harvest and Marketing

1.44 Balochistan fisheries generate a range of species for markets (Table 6). All of the catch from Balochistan that is not sold locally or consumed by the fishers and their families themselves (8% of the catch) is sent to Karachi, where it enters the general Pakistan market, or is exported. Some fish does find its way to Iran, mostly tuna for canning, and some fish is landed directly in Iran. Fish landed in Iran does not appear in the Balochistan catch fisheries, nor that poached by Iranian or Sindh based vessels.

1.45 The Balochistan fishmeal industry is concentrated in the East, nearer to Karachi, and is based on the Indian oil sardine. Better processing of these fish could offer opportunities for production of fish oils as well as meal, and is indicative of the failings of the industry to take advantage of opportunities presented. With trawling banned there is theoretically no “trash fish” industry, utilizing undersized fish of marketable species and by-catch from prawn trawling as raw material for fishmeal as there is in Sindh, though poaching Sindhi trawlers are involved in the industry.

1.46 A significant proportion of the catch is still processed into low value salted and dried products. This is in part due to the lack of market and marketing structures, internally and for exports.

1.47 There are now more than 30 processing and fish receiving units and 15 working ice factories in Balochistan. Many of these are sub-stations of processing plants based in Karachi, and are intended to provide raw material to processing and export operations based there, which are suffering overcapacity due to declines in catches from Sindh waters. Some of the processing plant are now mothballed, because of: a) declining catches of some of the major species (Indian mackerel particularly); b) over-optimism when set up (the plants were too big); and c) broken down equipment. Approximately 20,000 tonnes of cold storage are available.¹⁵ All the major fish landing sites have fish processing plants and ice available. The processing plants with rare exceptions, actually do very little processing of fish; they mainly store and ship fresh-chilled fish on ice or prepare the product for freezing, freeze it, store for short periods in cold stores and then ship in containers along the relatively newly constructed coastal Makran highway to sister processing plants in Karachi, where any value addition from processing takes place. From there a large proportion of the fish, particularly mackerel, is exported to Southeast Asia. Higher value fish and shrimp are often exported to the Middle East by air. Hairtail and cuttlefish/squid are usually destined to China, Japan and Korea.

¹⁵ Goulding. I (2012) Briefing Note. Fisheries Issues in Balochistan.

Exports through Gwadar, by air of fresh fish and shrimp to the Gulf Region, and by sea of frozen bulk product to the SE Asia and China are perceived to be an option to enable the processing industry to create greater value from the catch. In any case many of the Balochistan landing sites and fish receiving stations will continue to use Karachi as a conduit to markets even if the transport links in Gwadar improve, since the many of the parent processing plants are in Karachi, and for the central and western sites, Karachi is nearer and more accessible than Gwadar.

Table 6. Catch & value of Balochistan fish by type of product (2011)

Product	Fresh weight (T)	Value (PKR) x 10 ⁶
Shell fish		
Fresh & chilled Shrimp	1,321	864
Fresh & chilled Kiddi (small shrimp)	2,340	447
Fresh & chilled Lobster	784	700
Fresh & chilled cuttlefish	560	258
Fresh & frozen crab	220	38
Ivory shell	328	33
Jelly fish	180	4
Shell fish subtotal	5,739	2,347
Fin Fish		
Chilled & frozen fish (35% chilled, 65% frozen))	93,385	13,383
Dried salted	6,128	643
Wet salted	7,303	584
Fish maws and fins	240	122
Fishmeal	11,674	261
Total Fin Fish (86% by value, 87% of total catch)	118,731	14,996
Local Consumption (8% of total catch)	10,645	
Grand total	135,115	17,344

Source: Fisheries Department 2012.

1.48 The European Union (EU) is no longer a direct destination for Pakistani product since all the processing plants were delisted from export to the EU due to serious quality control concerns in Karachi processors and at the Karachi Fish Harbor. This is unfortunate since Pakistan has now lost the opportunity to export to the most valuable, closest, and largest western market for fish. It is hoped that efforts by the Federal Marine Fisheries Department and the Karachi Fish Harbor Authority, with assistance from UNIDO and others, will allow this situation to be reversed.

1.49 There are few sanitary controls in place, and the only facilities for monitoring and guidance (laboratory, inspectors, etc) are in Karachi (called the “Competent Authority” and run by MFD), and do not extend into Balochistan. Local standards do not exist for fish quality and there are no local codes of practice. International standards such as Hazard Analysis and Critical Control Points (HACCP) and GMP (Good Manufacturing Practice) are not enforced. In the future these will have to be established and enforced so that basic sanitary requirements and quality control apply to all fish produced in Pakistan (including Balochistan), and particularly to fish destined for export. Balochistan has currently no internal capacity at all in fish safety and quality assurance.

1.50 There is very little infrastructure at most of the landing sites, beyond a sheltered beach and harbor for the vessels to land their catch. Most sites have no clean water for processing or to make ice, and no unloading jetties or quays. Few service roads reach to the more remote

landing sites and a limited supply of fish boxes, refrigerated transport vehicles, and a dramatic skills shortage characterize the processing sector. Fish handling at the landing sites does bring modest benefits to Balochistan. These benefits could be larger however, if value addition presently done in Karachi, could be shifted to Balochistan. The profits from export and local sale (within Pakistan) also accrue mostly to Karachi fish merchants and processors, many of who own the plants in Balochistan as an extension of their Sindh based operations.

1.51 It is generally accepted¹⁶ that 20-25% of the value of the catch in Balochistan is lost directly due to avoidable poor handling (reducing the value of the catch), and furthermore considerable opportunities exist in value adding post harvest.

1.6.1 Key issues for post harvest and marketing

- i. Much of the value of the fish catch of Balochistan does not remain in the province; the majority of value addition is done outside the province and various opportunities for value adding are not being taken;
- ii. A significant loss of value of the catch occurs post harvest, due to improper handling, and temperature and time abuse of the catch, from capture in the sea (or to a lesser extent from inland ponds or open waters) to the moment it leaves the province. A lack of appropriate infrastructure and maintenance of existing infrastructure, inadequate skills and knowledge, are the cause of much of this problem;
- iii. The province has no formal capacity to control fish quality, either internally or for export.

1.7 Balochistan Fisheries Department

1.52 The Balochistan Fisheries Department is based in Quetta with branch offices in all the eight main fish landing sites on the coast. Smaller sites have no department representation. The Pasni Fish Harbor Authority, responsible for Pasni Harbor, is an autonomous body under the Fisheries Department. The Additional Secretary of Fisheries is supported by two Deputy Secretaries, a Director General of Fisheries, and two Directors of Fisheries. The department has an establishment of 1,383 staff, mostly low grade support staff. The budget for 2012 is PkR 309 million (US\$3.4 million), up slightly from PkR 298 million in 2011 (US\$3.3 million). This mainly covers staff salaries and minimal departmental operating costs. There are few resources available for investment in new support programs in the sector.

1.53 The stated objectives¹⁷ of the department include:

- i. Encouragement of the private sector
- ii. Assistance with finance to the sector
- iii. Training and skills development for fishing communities, and establishing training centers
- iv. Promote conservation and preservation of the environment, and awareness raising on these issues, including the closed season for shrimp in May, June & July
- v. Enforcement
- vi. Assisting with fish export zones
- vii. Responses to disaster
- viii. Management of conflicts over resource use
- ix. Control IUU fishing

¹⁶ Dr Nasim Akhtar, UNIDO pers comm. 2012.

¹⁷ Data adapted from the Fisheries Department web site <http://www.balochistan.gov.pk/fish-home.html>.

- x. Conduct resource surveys, species stock assessments in marine waters.
- xi. Establish artificial reefs, protected areas and marine parks along Balochistan coast.
- xii. Extend sea search and rescue
- xiii. Restock fresh water bodies with seeds/ fingerling
- xiv. Build landing facilities along Balochistan coast & improve existing harbor facilities,
- xv. Assist in installation of quality ice making machines on board of fishing vessels and refrigeration systems on board of fishing boats involved in longer fishing operations.
- xvi. Improve hygienic conditions in all fish markets.

Specific objectives for aquaculture are:

- xvii. Establish fish disease diagnostic laboratories and services
- xviii. Conversion of waste lands (Saline, water-logged) for inland aquaculture
- xix. Facilitate the lease of land for fish/ shrimp farming under land policy along the Balochistan coast.
- xx. Establishment of fish and shrimp hatcheries in Balochistan.
- xxi. Establish environmental friendly demonstration pilot scale shrimp farming operations in Balochistan.

1.54 Current development projects include establishing a fisheries training centre in Surbandar near Gwadar, some fisheries infrastructure, and the development of fisher colonies on the coast. These are all held up due to shortages of funds. The training centre is expected to be completed in 2013.

1.55 Various other development schemes are planned but are not yet approved. The Fisheries Department has little capacity to do much more than it does at present, due to the chronic shortages of funds (which affects both already approved projects and any future plans), a skills shortage amongst its staff, and deficiencies in equipment and materials. Based on present resources, the department cannot undertake the skills development, fisheries management and conservation strengthening and development activities that are necessary in the sector. Technical assistance, training for staff (locally and overseas) and development funding are going to be required for the foreseeable future.¹⁸

2. FUTURE GOALS IN BALOCHISTAN'S FISHERIES

2.1 Marine capture fisheries

2.1. The GoB and the Fisheries Department are committed to managing the fisheries of the province, primarily the marine fisheries, for the benefit of the people. As in other regions, Balochistan's fisheries sector has the potential to develop a more valuable asset base (building more productive fish stocks); generate a higher level of sustainable net economic, social and environmental benefits in the future (capturing the inherent value of more

¹⁸ (Whilst Fisheries Department is the major institution with responsibility in the sector, other institutions and bodies operating in Balochistan with programmes that affect fisheries are listed in Sections 3.3 and 5 in the report).

productive fish stocks); and improving the distribution of these benefits (providing for better equity among stakeholders). The sector can build on the strengths provided by an experienced labor force, a long history of fishing, good local examples of fisheries management, and expanding global and domestic demand for high quality marine fish products. Marine fisheries in particular could become more highly integrated with Pakistan's growing rural economy and the wealth generated can help provide coastal dwellers with new opportunities to engage in this growing economy. Yet, as this research has shown, Balochistan's marine capture fisheries, along with many other regions, could show better performance.

2.2. The present status of marine fisheries in Pakistan, and for this specific study, Balochistan, particularly within 22 km of shore, calls for a better implementation of appropriate reforms through consultative and analytical processes that could lead to improved awareness, more efficient legal and policy frameworks, stronger institutions and stakeholder participation, and more effective fisheries management systems. Any reform process must gradually shift the policy, institutional and management focus from what could be termed a more 'conventional' goal (harvesting increasing volumes of fish through expanded capacity and changes in technology, where users operate in an open access system, to one based on improving the productivity of fish stocks, maximizing net benefits, and improving equity with a management system that has well-defined fishing rights. This second approach has a goal of achieving the Maximum Economic Yield (MEY) from sustainable fish production, supported by more effective management systems including well-defined resource access rights for stakeholders. It also builds on progressive management prescriptions associated with Eco-System Based Fisheries Management, promoted by the FAO.

2.3. Taking into account this broad reform approach, it is recommended that the GoB's long-term objectives for marine capture fisheries include the following:

Create a comprehensive policy, legislative and regulatory framework for marine capture fisheries

2.4. This will have to be coordinated to be compatible with federal legislation, international treaties and other obligations including the Precautionary Approach to Fisheries Management. Must also include aquaculture and post harvest. Only a certain amount of the required legislative changes can be achieved by provincial regulation. These changes will require a comprehensive review process and analytical framework, supported by stakeholder participation at specific points in a process spanning a few years at least.

To better match sustainable production with fishing effort

2.5. To do this, the first priority is to address overfishing, and attempt to first maintain the catch at the current level, and then reverse the decline in catch per unit effort. This means a gradual end to open access in the fishery, supported by appropriate policies, legislation and regulation. The target is for initial production to remain at approximately 130,000 thousand tonnes per year and the numbers of vessels limited initially to existing numbers (~7200). As improved knowledge is available on key fish stock levels, a series of other measures can then be implemented over time to strengthen sustainable in the longer term, to reduce effort to an ideal level, and improve rents for existing fishers. This would include establishing more concrete and enforceable fishing rights for key stocks, developing fisheries management units and management plans, and ensuring use of less destructive fishing gear.

Eliminate IUU fishing by Balochistan vessels

2.6. IUU fishing is illegal under international treaty and also generally environmentally unacceptable. The Pakistan IUU fleet is based in Karachi, Pasni and Gwadar and uses gill nets to catch tuna and shark in international waters and the EEZs of other countries. Combating this problem will require improved MCS in Pakistan and cooperation with other fishing territories to track Pakistan registered vessels fishing outside national waters.

Improve Monitoring Control and Surveillance in Balochistan territorial seas

2.7. Vessels from Iran and Sindh fish illegally in Balochistan waters, and some destructive methods are also used by Balochistan fishers. This should be addressed through improved monitoring by using remote sensing and increased levels of fishing patrols (implying additional Fisheries Department vessels), better enforcement by the Fisheries Department (based on additional equipment and training); and improved verification of fish being landed on shore.

Increase sustainable production from unexploited stocks

2.8. There are some fish resources that may offer opportunities for extra harvesting. Research is first required however, to identify the potential stocks and quantify the level of bio-economic space that may exist for increased harvesting.

Improve the data collection system to make it more relevant to fisheries management decision making

2.9. The fisheries management information system used in Balochistan is fragmented and needs improving in terms of data capture, verification, storage and reporting. This should be extended to include harvesting data from the smaller landing sites and to produce better statistics on which management decisions can be made.

2.2 Coastal Aquaculture

2.10. There is virtually no coastal aquaculture being practiced in Balochistan at commercial scale, though GoB is anxious to promote it, and it is seen as having good future potential. The GoB's objectives for coastal aquaculture could include:

Attract increased private investment to coastal aquaculture

2.11. The private sector has proved to be very reluctant to invest in coastal aquaculture in Balochistan. There are a wide range of constraints to private sector investment and GoB will have to work to remove those constraints before the industry develops. A reasonable approach would be to support pilot projects by the private sector that can demonstrate the activity can be technically and economically viable.

Incorporate the principles of sustainable aquaculture into the legislation and regulations

2.12. As part of increasing private investment, there are many regulatory aspects to sustainable coastal aquaculture, which need to be incorporated into the legislation, covering, inter alia, feed, environment, land tenure, introductions and species transfers and registration and licensing of aquaculture. A process is needed to reform the regulatory framework and harmonize it with the enabling legislation.

2.3 Inland Fisheries and Aquaculture

2.13. Although a small part of the fisheries sector in Balochistan, freshwater fisheries and aquaculture are locally important and produce an estimated 5% of the total production of the province.

2.14. The GoB's long term objectives for inland freshwater capture fisheries and aquaculture should include:

Increase productivity from inland aquaculture and scale of operations

2.15. Production per hectare is very low relative to other countries in the region (and globally). Investment and training, coupled with demonstration projects could greatly improve productivity, possibly by as much as 200%, to be comparable to other areas in Pakistan and other countries. This will require investments in training, demonstrations, improved feed and fingerlings, and supporting research. Freshwater aquaculture can be a profitable activity if managed properly, and is useful where land is waterlogged or salt intruded, and therefore unsuitable for agriculture. Demonstrations on affected lands can help farmers make decisions to invest in this activity.

Increase production from inland capture fisheries in freshwater water bodies

2.16. Better management of the inland fisheries resources will lead to higher production but this is predicated on more efficient leasing arrangements on public water bodies that provide incentives for sustainable fisheries and investments, new production models on private water bodies, and training in better management techniques.

2.4 Post Harvest and Marketing

2.17. Fish produced in Balochistan should be handled and processed at all times to minimum enforceable standards, both for local consumption and for export.

2.18. The GoB's long term objectives for fisheries post harvest and marketing should include:

Improve the quality and value of fisheries products in Balochistan and for export

2.19. Balochistan needs a system of fish quality control that reaches from the moment of capture to the moment of consumption of the product or its export from the country (water to plate). There is a need to increase the use of ice at sea, even in smaller-vessels to prevent loss of quality (and value) from spoilage. To address quality issues onshore, investments are needed to improve landing facilities and market infrastructure in key coastal areas – the latter through fish marketing sheds, platforms for hygienic display and sale of fish, refrigeration facilities for storing the fish in a hygienic condition, freshwater supply, sanitation, etc. Value addition can be obtained through improved quality as well as market studies to explore potential product lines that could be developed. Studies are also needed to assess the potential for exportation of high quality fish products directly from Balochistan (Gwadar), to the valuable markets of the Gulf and Far East which would ensure a larger share of employment and economic benefits would remain in Balochistan. These studies could be linked to fish products meeting EU or HACCP standards.

3. PRIORITY FISHERIES ACTIVITIES AND ONGOING PROGRAMS

3.1 Legal and Policy Reform

3.1 **Marine fisheries** policy must follow the inescapable fact that there is no room for expansion of harvesting through increased investment in fishing effort, or incentives offered by subsidies. The fishery is already at, or is exceeding Maximum Sustainable Yield; catch per unit effort has been falling for years and all the signs of a fishery in distress are evident. The recent rapid decline in the Indian Mackerel fishery is indicative of what is happening more widely. The misconception that capture fisheries production can be expanded, though ever increasing investment in vessels, gear and landing facilities is widely held.

3.2 Instead, the marine sub-sector must move towards better conservation of resources, co-management approaches for inshore fishing with the resource users, and the application of the principles of sustainable and ecosystems approaches to fisheries management; (as laid down in the FAO Code of Practice for Responsible Fisheries, which Pakistan is obliged to implement). While Pakistan's marine fishing sub-sector has many positive features to build on, a new approach is needed with an increased focus on maximizing economic, social and environment benefits, improving productivity, and providing better equity.

3.3 This policy direction needs to be underpinned by appropriate policy, legal, and institutional frameworks, and a more effective fisheries management system for both inshore and offshore stocks. The current marine fisheries legislation must be reviewed and revised through a comprehensive and consultative process. The current legislation is very top down in its approach to management of fisheries, does not readily allow for co-management, largely ignores aquaculture and post-harvest issues, fails to address environmental issues in fisheries and aquaculture, and is silent on international obligations. A certain amount can be done by introduction of new regulations, but fundamental principles of modern fisheries management require the delegation of government powers to the users of the resources, something that needs the approval of all the elected representatives of the people and not just the cabinet. The legal and policy framework also needs to consider more effective approaches for allocation of fishing rights, which is essential for improved economic performance.

3.4 Such a policy approach will eventually require the allocation of fishing rights; this will mean some challenging political and economic decisions on how to allocate limited stocks among different groups currently operating in the sub-sector, particularly between larger mechanized fleets (mainly trawlers) and smaller motorized and non-motorized boats operating in inshore coastal waters. These decisions must be highly sensitive to the political and economic environment in Pakistan, particularly with equity considerations and pro-poor growth.

3.5 There must also be tangible policy shifts to ensure that fishing effort is initially at least maintained at the current levels and then gradually reduced. This will require fixing the numbers of licenses for trawlers, undertaking an inventory of small-scale, inshore vessels, and limiting new entry into the sub-sector. It will also require reducing the numbers of vessels (and associated fishing effort) as they become more efficient through continued technological advances. The same applies to any other activity that increase fish catches through increasing efficiency, whether it is improved landing sites, better unloading jetties, measures to improve fish preservation so as to enable boats to make longer voyages (ice boxes, on-board ice machines etc). All of these increase the effort going into the fishery and must be compensated for by reductions in overall fishing effort.

3.6 These kinds of policy transformations will cost money to develop and then implement. A major parallel priority would be to develop viable, alternative opportunities for the coastal communities who currently rely on capture fisheries to soak up their expanding labor force. It will also take considerable time to effect this kind of change.

3.7 In brief, a transitional reform process is needed in marine fisheries to:

- (a) Build awareness of the potential opportunities and policy options, and gain broad support for change (from civil society at the community level to senior policy makers);
- (b) Develop a new policy framework (including objectives and roles and responsibilities);
- (c) Establish the supporting institutional framework (legal framework, management systems and processes, accountabilities, organizational design);
- (d) Strengthen the required human capacity to implement more effective fisheries management, particularly around co-management;
- (e) Put the framework and capacity into practice through pilot programs in selected communities; and
- (f) Monitor progress and use an adaptive process to continually improve sub-sector performance.

3.8 Coastal aquaculture has been hailed as a miracle curative for the effects of overfishing in the marine sub-sector, underinvestment, and poverty in coastal areas of Balochistan. The constraints alluded to above in Table 6 will need to be addressed if the sub-sector is to develop further. The competitive advantage of Balochistan over other investment destinations for aquaculture is far from obvious; and whilst land and clean water are attractive prerequisites, they are insufficient on their own to guarantee that the sub-sector will become established. GoB has to adopt a generally more proactive policy in the sector. The major policy question is whether GoB policy should now be to take over from where the FDB left off and spend money on site selection, demonstration farms, hatcheries and research to encourage the private sector to invest? This form of development has not proven successful in the past and may not be an appropriate use of scarce government funding. The private sector needs to be the engine for growth, and will have to find its own investment resources for coastal aquaculture. The GoB can act to create a more effective enabling environment that can be supportive of the private sector's initiatives, but will not directly invest in the sector. A policy review is required as a starting point to develop a collective way forward.

3.9 For inland fisheries, broad policy goals need to be reviewed and clarified in terms of alternative and sometimes conflicting outcomes around economic growth, poverty alleviation, equity and biodiversity conservation. Policy reform with respect to leasing arrangements, particularly on public water bodies would then need to be undertaken. A priori, the auctioning of short term fishing rights on inland waters is undesirable and requires modification, so as to better include the local users of the water bodies in their long-term management. With private water bodies (for example seasonally flooded farm lands), the current production model(s) may need to be reviewed to determine how productivity can be improved and whether the model serves broader pro-poor, equity and biodiversity conservation goals.

3.10 In post-harvest, there is a general policy towards better quality, locally based exports and certification, better landing areas and better preservation at sea, which is to be encouraged since it improves the value of the catch. Care here must be taken so that policy acknowledges that increasing the value of fish will also increase the pressure to catch more fish and for increased fishing effort.

3.2 Priorities and Ongoing Programs

3.2.1 Marine capture fisheries

3.11 Improving management of the fish resources of the province is not going to be achieved overnight. Introducing co-management, though desirable, is difficult in practice. It requires a long term transition from an existing command and control management regime to more collaborative management through a concerted push to establish local institutions such as Fishing Associations (FAs) and Community Organizations (COs) with whom the GoB and Fisheries Department can work. If pilot projects can successfully demonstrate this approach and be scaled up, these FAs and COs would form the bedrock of coastal, inshore fisheries management in the future. Up to now, Non-Governmental Organizations (NGOs) have been active in the sector but have had little success, partly because the principle of co-management is not fully understood by all actors and is indeed inimical to traditional patterns of management of the sector. Co-management requires better fundamental information on fish stocks. It is important that key fish stocks where co-management could be applied in coastal areas are identified and stock assessments undertaken. In addition, fisheries management units need to be established and fisheries management plans developed through a consultative process. Co-management requires allocation of fishing rights to participating communities for selected fisheries and enforcement of these rights to prevent encroachment.

3.12 A large PkR3.2 billion (US\$35.2 million) project, the IFAD Gwadar-Lasbella Livelihoods Support Project (the “IFAD Project”), which is due to begin in 2012, will establish under its Component 1 PkR358 million (US\$3.94 million), 1,555 COs and 382 Village Level Apex Organizations (VLAOs) in Lasbella and Gwadar. These will provide conduits for the rest of the project’s activities, which includes a large amount of fisheries related inputs. The COs and VLAOs are not all going to be coastal areas, and the program is not solely fisheries related, but they will provide an early example of what can be done. The members of the COs will also receive technical and vocational skills training which will include fisheries activities such as the use of ice and good hygiene practices. Fisheries Department must however ensure that the VLAOs and COs do provide the interface expected between the communities, the rest of the IFAD project activities and the Department itself. In the short term therefore Fisheries Department is fortunate that initial efforts in developing COs is going to be covered by the IFAD project. There will be much to learn from this and it provides time for the Department to develop the next interventions to cover the rest of the coastline and urbanized areas.

3.13 The IFAD Project is going to invest in fisheries development under Component 2 worth PkR1.3 billion (US\$14.65 million), notably in the construction of jetties and allied infrastructure. Eight potential sites have been identified, and after appropriate surveys, user issues sorted out and a value chain analysis done to ensure the correct inputs are being provided the chosen infrastructure will be built and the COs and VLAOs in the selected areas supported so that they can manage the facilities. The project will also provide ice boxes to about 2000 fishing boats and assistance with developing operating procedures to maintain quality control at the facilities. It should be noted that the IFAD Project documentation mentions overfishing as a possible risk from its activities.

3.14 Rural Infrastructure is another component of the IFAD Project PkR1.1 billion (US\$12.18 million), which will build rural roads linking fisheries and agricultural production points. The idea in fisheries is that the roads will link the sites where other infrastructure, like jetties, has been installed. A total of 100 km of road links in all are expected to be

constructed; the sites have not yet been finalized since they depend on the infrastructure. Small Community Physical Infrastructure is also anticipated, depending on COs feedback on needs, but could include drinking water, sewage and similar schemes.

3.15 The IFAD Project will also support sustainable fisheries management through improving the data systems, and through working to propose policy options for management of the fisheries of the province. These will lead to further detailed proposals for modifications to the legislation.

3.16 The Fisheries Department is relying on the IFAD Project to provide necessary inputs to capture fisheries in co-management and infrastructure which will support some of its immediate objectives in capture fisheries and post harvest: however the project is far from geographically comprehensive, in that larger and richer towns and landing sites will not be covered by the project's infrastructure and community development activities. In the short term it is sufficient for the Fisheries Department to accept this, but further projects to extend the same sort of activities over all the fishing communities in Balochistan will have to be designed in the next few years, and funding sources identified.

3.17 Apart from the geographical limitations of the IFAD Project much of what is generally required to be done in capture fisheries is being covered at least in part by the projects components.

3.18 The elimination of IUU fishing in Balochistan is important in improving fisheries management. The World Wide Fund for Nature (WWF), as part of its Smart Fishing initiative, is campaigning against IUU fishing worldwide, and is expected to prepare a report on Global IUU fishing 2012. When this comes out, the Fisheries Department should act on its recommendations. A problem is that the vessels and crews who rely on this form of fishing will be adversely affected if it is stopped, and mitigation measures to ensure alternative employment may need to be implemented. The cost of these measures is unknown, and it will require an executive-level political decision as to what steps are to be taken. This may include insisting that the owners convert the vessels to longlining to fish the EEZ, or are simply taken out of production.

3.19 Similarly the problems of poaching by Iranian and Sindh based vessels often using banned methods (small mesh trawls and seines) must be addressed by the Fisheries Department. Banned methods are also used by Balochistan fishers, particularly in coastal lagoons and shallower coastal areas. Whilst co-management will in time provide some of the answer through the COs and FAs established to assist in managing the fisheries of the country, enhanced patrol activity is necessary in the short term. This costs money, and money has been the main problem in MCS in recent years. A larger budget for MCS and enforcement needs to be allocated annually to the department (a proposal to use Italian Debt Swap funds to procure new Rigid Inflatable Boats (RIBs) for MCS purposes has lapsed since the Debt Swap funds have been allocated to fresh water supply).

3.20 The Fisheries Department needs better facilities for its operations in the coastal area. The central office in Gwadar, which is planned, needs to be built and the expected budget for this is PKR 26.5 million (US\$291,000).

3.2.2 Coastal aquaculture

3.21 GoB has to create an enabling environment for aquaculture, and allow the private sector to get on with investing and developing the sector if it makes technical and economic sense. GoB cannot afford, and is not the correct body, to undertake trials, demonstrations and set up commercial hatcheries merely to attract investment. The example of government interventions in coastal aquaculture in Sindh gives adequate explanation as to why this is undesirable.

3.22 The new, private sector led FDB, has indicated¹⁹ that it may be capable of making some interventions in aquaculture in Balochistan, following on from the various programs pursued previously (to 2011). These were at no cost to the Balochistan Government except through the allocation of land.²⁰ While there is no firm plan by FDB to invest in this sub-sector, it should be encouraged to examine the feasibility.

3.23 As part of encouraging private investment, the GoB must develop a medium term plan for coastal aquaculture. This will set out how it is to create the enabling environment for the private sector, clearly detail the opportunities and identify the constraints and how to overcome them. GoB will have to commission a realistic “Masterplan” for Aquaculture for Balochistan. This is where the FDB could provide funding; though a suitable external donor might be more appropriate. It would be important that the consultants used to undertake the study are carefully chosen so as to provide a balanced view of the likely potential and constraints. Legislative changes necessary for Coastal Aquaculture would be included in any general review of the legislation.

3.2.3 Inland fisheries and aquaculture

3.24 Inland fisheries and aquaculture activities by Balochistan are based on hatcheries providing seed to stock water bodies and dams, and fish ponds/seasonally flooded lands owned by the private sector. Inland capture fisheries from public water bodies have largely been unsupported by donors. Expanding inland fisheries activity could include comprehensive training to fish farmers and support through advice and provision of other facilities is to be achieved by making four hatchery units larger, into model farms, with demonstration ponds and training facilities. Plans are already in place for some expansion of three hatcheries, at DM Jamali, Zhob and Mirani, and for a training centre at DM Jamali; these plans and the schedules of training activities anticipated need to be firmed up, better costed, and incorporated into departmental budgets.

3.25 Tilapia is a suitable fish (among others) for more intensive culture in inland areas of Balochistan. Previous initiatives by the FDP concentrated on Sindh and Balochistan using fry of Genetically Improved Farmed Tilapia (GIFT) imported from Thailand, and only worked with progressive fish farmers who incorporated improved feeding regimes into their husbandry practices. The skills level of the fish farmers in Balochistan is still low and so whilst Tilapia farming remains an objective, in the medium term no new activities are anticipated without external support.

¹⁹ Iftikhar, F (2012). Presentation of Fisheries Development Board.

²⁰ Faisal Iftikhar, pers comm. 2012.

3.2.4 Post harvest

3.26 The most critical area requiring interventions in post harvest is extending the quality control system so that it encompasses an increasing scope of the fisheries products produced in Balochistan, the objective being to ensure the safety of aquatic products and increase the value of the catch. There is no quality control system at all at the moment.

3.27 The conditions at landing sites have to be improved so that quality can be maintained through the cool chain. All of the landing sites in Balochistan except Pasni and Somiani rely at least in part on beach landings, which is undesirable. Ideally, every landing area should have jetties and quays, with suitable landing facilities such as auctions, and the fish should be boxed rather than handled loose.

3.28 The IFAD Project will be providing 2000 insulated boxes to small scale fisherfolk to encourage the use of ice at sea and will also build jetties and roads to 8 of the poorer landing sites. There are more than 30 smaller landing sites in Balochistan as well as the 8 major sites, so this project will not solve the infrastructure needs related to post harvest, but it will contribute to quality improvement through these interventions. Further large scale investment is required in the future, in jetties, quays, auction halls, and other infrastructure.

3.29 The IFAD Project will also support the improvement of fish quality through its capacity building activities. Part of this is training through the Fisheries Training Centre (incomplete, but to be finished in 2013 using local funds) at Surbandar, which is focusing on curricular for post harvest activities; but also the project will support the Sanitary and Phytosanitary (SPS) Compliance System of the Fisheries Department by assisting the Department in acquainting stakeholders in sanitary and quality requirements related to onboard handling and processing. The project also proposes to assist with regulating the trade with Iran, the domestic and export trade and regional and international markets. Testing kits for inspectors and a sampling system for fisheries products will be provided as well as vehicles and training. A detailed program is yet to be produced for this activity though the costs for all the capacity building for Fisheries Department are given as PkR33.1 million (US\$364,000).

3.30 There is a critical need for a headquarters for the Quality Control activities of the Fisheries Department. This would include offices and a laboratory in Gwadar (which is presumed to be the export point for fish products from Balochistan in the future) where a Competent Authority branch could be located. This is not funded, though the Department is in the process of submitting a request (PC1) internally. There is also a need for basic equipment for the laboratories and inspection, and training of the staff. Some of the requirements will come from the IFAD project, but some will not, and the GoB has submitted a request to UNIDO through the Trade-Related Technical Assistance II funded by the EU to assist in identification of equipment needs, training and Technical Assistance to establish the control system. Once this is prepared, appropriate extra funding can be sought.

3.31 Although there is a great desire to see direct exports from Balochistan to overseas markets, this depends on aircraft passing through the airport to suitable destinations and sea traffic increasing through Gwadar port. It is not really the business of the Fisheries Department to invest directly in improving these links. The department should merely add its weight to promoting any relevant developments.

3.2.5 Research, Training and Human Resource Development

3.2.5.1 Research

3.32 Research is critical to support the development of fisheries in Balochistan. Unfortunately, there is no dedicated fisheries research station in Balochistan, neither for capture fisheries nor aquaculture.

3.33 The University of Lasbella at Uthal has a Faculty of Marine Sciences which runs a degree course in Marine Science and Oceanography. It hopes to establish a Department of Marine Biology, Fisheries Management and Aquaculture, a Department of Physical Oceanography, a Department of Marine Chemistry and Marine Environment and a Department of Marine Geology and Geophysics so as to be able to offer MSc and PhD courses in the future. These courses would include some research activity. Research institutions within universities exist in Sindh, which do work on fisheries. Their work is generally quite theoretical in nature, however. The National Institute of Oceanography (NIO) of the Ministry of Science and Technology has facilities in Karachi and an office in Gwadar. A current project awarded by GoB has assisted with the rehabilitation of Pasni Harbor. Some of the other recent work of the NIO has covered fisheries biology, marine ecology and aquaculture, but again the work is mostly theoretical and of little practical use to commercial fisheries and aquaculture operators.

3.34 The FAO is currently undertaking a stock assessment program with the MFD to update the resource estimates, last made more than 20 years ago.

3.35 Two shrimp hatcheries are established in Karachi at Hawks Bay, one, the “Federal Hatchery” is non-functional despite having had a lot of money spent on it by the FDB. The other is owned and operated by Sindh Province. Its work is mainly on the production of seed shrimp, though it would be capable of other research type activity. The results of the work done at the Sindh Hatchery would presumably be applicable to shrimp farming in Balochistan coastal zone, as would other work done in Sindh. It could also possibly be used as a training centre for Balochistan private sector hatchery staff.

3.36 No inland fisheries research is undertaken in Balochistan. Research on inland fisheries is undertaken in Sindh and in Punjab, and the results of this work would also be applicable to Balochistan. Similarly the results of work done in other regional countries on freshwater fisheries and aquaculture are also applicable in Balochistan.

3.37 There is no formal mechanism for improving links with overseas research institutions and institutions in Balochistan, and with the FDBs activities curtailed, even national links appear to be very weak. There is no coordinating body for research in fisheries and aquaculture in Pakistan.

3.38 As a first step, the Fisheries Department should lobby for a formal fisheries research coordination body to be established covering all research on fisheries in Pakistan, perhaps through the newly created “Consortium for Pakistan Aquaculture and Fisheries”, which seeks to use their collective expertise to “evaluate, develop and implement practical solutions to enhance aquaculture and fisheries productivity in Pakistan”. This consortium is very much an embryonic body, though it encompasses, in theory, the major research universities in

Pakistan²¹ and some overseas universities. A second major priority would be to undertake a synthesis of recent and relevant research work and distill the results into practical guidelines for better uptake by policy-makers and operators.

3.2.5.2 Training and Human Resources

3.39 The Fisheries Department of GoB is based in Quetta with large offices in Gwadar and Pasni and a presence at all the larger landing sites. The overall knowledge and skill level in both GoB and the private sector is insufficient. Staff and operatives in every sub-sector require skills and knowledge upgrading as a matter of urgency. In some priority development areas, such as coastal aquaculture, private sector skills development is necessary if Balochistan is to see the fruits of future development.

3.40 There appears to be no overall training plan, nor staff development plan in the Fisheries Department. Records of past training are not kept centrally in an accessible format. There is little fishery training in schools and no technical and Vocational Education and Training (TVET) institutions offering training in fisheries, though the University of Lasbella at Uthat does have its academic courses, current and planned.

3.41 A fisheries training centre at Surbandar near Gwadar is incomplete. The time for completion has been continually put back due to non availability of funds. Completion date is now said to be 2013. The project cost is now estimated to be 473 million PKR. It is not clear where the trainers to staff the training centre will come from, since there is such a serious skills shortage throughout the province. Both of these cost centers are unfunded, and will require the GoB to source external funds. The IFAD Project is proposing to support the fisheries training centre, though the provision of assistance in capacity building, through curriculum development, specification of pilot plans and laboratories, and training of trainers, though the curriculum development component will focus on post harvest only. There are many other aspects of fisheries training that are not covered by the IFAD project and for which funding will have to be found.

3.42 There is some expectation²² that the Consortium for Pakistan Aquaculture and Fisheries may be able to address fisheries staff skills in Balochistan and in Pakistan generally, but the program is in its infancy and needs both funding and a crystallization of objectives and strategies.

3.43 Whilst the training centre in Subandar will hopefully be finished and the training staff recruited and trained, it is appropriate that the Fisheries Department commission an in-depth report on Human Resources and Training in Fisheries, covering both GoB and the private sector. This will provide a guide to future needs to assist on budgeting and Human Resources planning generally. Although not specifically included in the IFAD project activities, the Department of Fisheries should request through the project steering committee that this is included in the IFAD inputs to fisheries training.

²¹ 1) University of Karachi (UofK), Karachi; 2) Lasbela University of Agriculture, Water and Marine Sciences (LUAWMS), Lasbela; 3) University of Agriculture, Faisalabad (UAF); 4) Government College University, Faisalabad (GCUF); 5) Bahria University National Center for Maritime Policy Research (NCMPR), Karachi; 6) Sindh Agriculture University (SAU), Tandojam; 7) University of Veterinary & Animal Sciences (UVAS), Lahore; 8) University of Idaho, (UIIdaho), Moscow, ID, USA; and 9) Washington State University, College of Agricultural, Human, and Natural Resource Sciences (CAHNRS), Pullman, Washington, USA.

²² G Bledsoe pers comm. 2012.

4. PROPOSED ACTION PLAN - TARGETS AND NEEDS

Marine Capture Fisheries						
	Objectives <ul style="list-style-type: none"> i. Build knowledge, capacities and systems for improved fisheries management and sustainable production ii. Rationalize fishing effort i. Improve monitoring, surveillance and control ii. Implement sustainable fisheries management iii. Improve onshore infrastructure for fish landing 					
Targets and needs	Priority	Target groups & beneficiaries	Outline Strategies	Time scale	Potential Costs and Funding	Indicators and sources of verification
1. Build knowledge, capacities and systems for improved fisheries management and sustainable production		Key government institutions, and relevant private and civil society organizations.				
a) Consultation, Review and Strategy Development	High	<ul style="list-style-type: none"> • As above 	<ul style="list-style-type: none"> • Strategic assessment of the marine fisheries sector and build a knowledge base of Pakistan's marine fisheries, programs • Produce a provincial Fisheries Development Strategy to 2030 • Computerize the management information system and expand the data system to those areas not presently covered 	<ul style="list-style-type: none"> • 12 -18 months 	<ul style="list-style-type: none"> • The IFAD project will assist with the improvement of the data collection system, though training and provision of equipment, stock assessment • No immediate extra costs 	<ul style="list-style-type: none"> • Fisheries Department reports particularly the catch data • IFAD monthly and other project reports of activities
b) Capacity Building	High	<ul style="list-style-type: none"> • As above 	<ul style="list-style-type: none"> • Training needs assessment and then build capacities for fisheries development 	<ul style="list-style-type: none"> • Training programs can begin within 12 months and continue for 3-5 	<ul style="list-style-type: none"> • IFAD project will assist Balochistan initially within the next 2 or 3 years but 	<ul style="list-style-type: none"> • Provincial fisheries development strategy • Revised provincial

			and fisheries management	years	additional funding is required (\$500,000 +)	marine fisheries policy
c) Policy and Legal Development	Medium	<ul style="list-style-type: none"> As above 	<ul style="list-style-type: none"> Revise 2006 National Fisheries Policy and Balochistan Guidelines Revise National Fisheries Act and State Guidelines. 	<ul style="list-style-type: none"> Policy and legislative work will take 5 years. Regulations can be revised and/or new ones developed. 		<ul style="list-style-type: none"> Revised provincial Fisheries Act and supporting regulations Central and Balochistan governments Gazettes Fisheries Dept. Reports.
<p>2. Rationalize Fishing Effort</p> <p>Catch initially maintained at current levels of ~130,000 tonnes/year but later adjusted in line with updated catch, effort and stock assessments.</p> <p>Licensed boat numbers to remain at ~7,200 in 2013 and then reduced with time</p>	High	<ul style="list-style-type: none"> 50,000 fishers dependent on the fishery Possibly another 300,000 dependents of fisherfolk and ancillary workers in the industry 	<ul style="list-style-type: none"> No new licenses issued for fishing boats after 2012. Numbers to initially remain at 2012 levels. Develop functional vessel registration system, initially for trawler and then inshore vessels Strategy on new licenses to be promulgated. Develop strategy for comprehensive alternative livelihoods program to address declining employment in fisheries sector from fleet reduction 	<ul style="list-style-type: none"> Initial restrictions of fishing effort can be introduced immediately but Fisheries Department will need investments to strengthen MCS to enforce the rules Vessel registration could take 1-2 years Livelihoods strategy development could take 1 year 	<ul style="list-style-type: none"> Mostly administrative FDB may be able to assist. 	<ul style="list-style-type: none"> Fisheries Department reports on vessel numbers, fishing gears, numbers of fishermen Processors reports Production of strategy documents.

<p>3. Improve Monitoring, Control and Surveillance</p> <p>a) Control of illegal & destructive fishing methods, and poaching in Balochistan territorial waters</p>	High	<ul style="list-style-type: none"> Coastal fishing communities and fishers 	<ul style="list-style-type: none"> All vessels active in Balochistan licensed to fish with approved gear Catch reported more accurately at sea for larger vessels and on landing sites for all vessels Improved MCS, investment in equipment and training, operations 	<ul style="list-style-type: none"> 2-3 years 	<ul style="list-style-type: none"> Initially recurrent funding for Fisheries Department. Potentially PKR100 million per year (ring-fenced) Investment in new patrol vessels, tracking by remote sensing, etc. 	<ul style="list-style-type: none"> Numbers of illegal gears destroyed. Numbers of illegal fishing boats apprehended. Levels of court fines. Fisheries department reports. Court judgments.
<p>b) IUU fishing by Pakistani vessels (including those registered in Balochistan) in other jurisdictions</p>	Medium	<ul style="list-style-type: none"> Global benefits 	<ul style="list-style-type: none"> Executive decision on level of response and coordination with other jurisdictions 	<ul style="list-style-type: none"> Begin in 2013, then allow 5 years to set up systems to reduce IUU fishing to acceptable levels 	<ul style="list-style-type: none"> Depends on strategy decided upon. Costs will vary depending if affected crews compensated (may be very expensive several million US\$) 	<ul style="list-style-type: none"> Numbers of IUU fishing boats. Arrests internationally of Pakistani vessels. WWF reports Fisheries Department reports IOTA reports
<p>4. Implement Sustainable Fisheries Management</p> <p>a) Gradually engage coastal fisheries to be managed in a more sustainable manner involving the resource users through co-management</p>	Medium	<ul style="list-style-type: none"> Coastal Fishing Communities 	<ul style="list-style-type: none"> Development of Fisheries Management Units and plans for all discrete stocks and geographic areas. Scale up co-management in 1-2 key fisheries involving formation of co-management organizations, development of management tools such 	<ul style="list-style-type: none"> Introduced in some areas by the IFAD project 2013 – 2019. Other areas will require extra inputs from Fisheries Department with the assistance of NGOs and donors 	<ul style="list-style-type: none"> IFAD – already funding for limited pilot areas. Other areas – no less than US\$5 million over the next 10 years. Most of this will have to come from aid funding, though perhaps some can be provided through recurrent budget 	<ul style="list-style-type: none"> Numbers of co-management units set up. Numbers of protected areas etc set up IFAD reports Fisheries Department Reports NGO reports Fisheries Department reports on catches

			as closed areas, protected areas, breeding reserves etc.			
b) Potential increased sustainable production from unexploited species (mesopelagics)	Medium	<ul style="list-style-type: none"> Coastal fishing communities, large fishing vessel owners, exporters & processors 	<ul style="list-style-type: none"> Await FAO assessment on mesopelagic stocks and Iranian sea trials If stock data and trials are positive, encourage private sector activity, but carefully monitored 	<ul style="list-style-type: none"> Stock assessment currently underway for mesopelagics with FAO support 	<ul style="list-style-type: none"> Private sector activity, requiring careful management and control 	<ul style="list-style-type: none"> Stock assessment results MFD licensing figures (mesopelagics) Landing data for new fish stocks
5. Improve Onshore Infrastructure for Fish Landing a) All major landing sites to have jetties and other improvements for loading and unloading	High to Medium	<ul style="list-style-type: none"> Coastal fishing communities, large fishing vessel owners, exporters & processors 	<ul style="list-style-type: none"> Gradual construction of jetties and harbors at landing sites All sites need facilities where boats can tie up to load and unload Concurrent steps to control effort in the fisheries so as to avoid overfishing. 	<ul style="list-style-type: none"> IFAD supporting investments for six years in six sites Ongoing program is needed 	<ul style="list-style-type: none"> IFAD will build jetties at several sites (to be decided upon) in poorer areas Other locations need another project or series of projects Many millions of US\$ These will not be funded by Balochistan Government directly Aid funds will have to be sought 	<ul style="list-style-type: none"> Numbers of jetties and harbors etc built. IFAD reports. Fisheries Department reports

Post harvest and marketing						
Objectives						
i. To improve the quality and value of fisheries products in Balochistan and for export						
Targets and needs		Target groups & beneficiaries	Outline Strategies	Time scale	Potential Costs/funding	Indicators and sources of verification
a) Inspection coverage widened to cover fish produced in the major fishing ports of Balochistan	High	<ul style="list-style-type: none"> • Fish consumers in Pakistan and overseas that will eat higher quality Balochistan produced fish • All fisherfolk in Balochistan through higher fish prices • Fish processors and exporters 	<ul style="list-style-type: none"> • Extend the reach of the Competent Authority to Balochistan by establishing a fully staffed branch office and equipped laboratory at Gwadar • Develop Codes of Practice for local and export fish • Train staff and fisherfolk in QC • Greater participation of private sector in self regulation of fish quality 	• 5 years	<ul style="list-style-type: none"> • PKR30 million to establish the office and laboratory. • IFAD project will assist with training components and in training of private sector • UNIDO TRTAII will also assist with specifying equipment needs and in training and administrative issues 	<ul style="list-style-type: none"> • Construction of laboratory & offices • Delivery of equipment • Numbers of officers trained • IFAD reports • UNIDO reports
b) Reduce the losses in value of Balochistan caught fish Currently 25% of value is lost, equal to a possible saving of PKR 3.147 billion/year	High to Medium	<ul style="list-style-type: none"> • Fisherfolk, fish processors and exporters. 	<ul style="list-style-type: none"> • Build link roads and provide clean water and sanitation at landing and processing sites • Increased ice production capacity • Improve fish handling on fishing vessels through vessel improvements and the provision of ice boxes • Train fish processors and fisherfolk in proper fish handling techniques from capture to landing 	<ul style="list-style-type: none"> • 7 years initially for the IFAD project. • Other development will be ongoing depending on sources of finance 	<ul style="list-style-type: none"> • IFAD will fund jetties, ice boxes and training in selected sites • Other locations need another project or series of projects. Many millions of US\$ • Aid funds will have to be sought 	<ul style="list-style-type: none"> • Progress of construction of infrastructure • Delivery of ice boxes • Numbers of people trained • Value of catch and exports • % losses reported • IFAD reports • Fisheries Dept reports • Fisheries Training Centre reports • Export figures from State Bank

<p>c) Increase the amount of fish exported directly from Balochistan by air and sea</p> <p>Possibly 30% of the catch of Balochistan ~ 40,000T</p> <p>This might increase the value of the catch to Balochistan by PKR571 million</p>	<p>Low</p>	<ul style="list-style-type: none"> Fisherfolk, fish processors and exporters 	<ul style="list-style-type: none"> Encourage the improvement of transport links through Gwadar. Lobbying in Government, increased publicity, etc 	<ul style="list-style-type: none"> External factors will influence this and stakeholders have to wait for these improvements to occur 	<ul style="list-style-type: none"> No direct costs to Fisheries Department 	<ul style="list-style-type: none"> Export figures Airline manifests Port shipping records Fisheries Department Reports Fish processor records
<p>d) Increase value adding to fisheries products</p>	<p>Medium</p>	<ul style="list-style-type: none"> Fisherfolk through higher fish prices Fish processors and exporters 	<ul style="list-style-type: none"> Private sector to value add 	<ul style="list-style-type: none"> The private sector will do this in Balochistan when direct markets are available. Otherwise value adding will remain in Karachi. 	<ul style="list-style-type: none"> No direct costs to Fisheries Department of GoB 	<ul style="list-style-type: none"> Export Figures Fish processor data.

Coastal Aquaculture						
	Objectives <i>i. to attract private investment to coastal aquaculture</i> <i>ii. to incorporate the principles of sustainable aquaculture into the legislation and regulations</i>					
Targets and needs	Priority	Target Groups and Beneficiaries	Outline Strategies	Time scale	Potential Costs/funding	Indicators and sources of verification
a) Coastal aquaculture established in Balochistan at larger commercial levels To take advantage of: <ul style="list-style-type: none"> • Land and clean water available • High potential benefits • Various constraints to investment must be addressed 	Medium to Low	<ul style="list-style-type: none"> • Coastal communities • Investors • Exporters • Feed suppliers • Coastal communities 	<ul style="list-style-type: none"> • Produce masterplan for coastal aquaculture that will identify possible sites, and how main constraints can be resolved – security, feed, capacities, attracting investment, etc. • Note that IFAD is funding NRSP to do general survey in coastal districts. 	<ul style="list-style-type: none"> • Masterplan could be completed in 2 years. • Depending on masterplan and results of IFAD survey, there may be a need for a program to address identified constraints • Output from new production could emerge within 3 years after investments in production facilities 	<ul style="list-style-type: none"> • US\$150,000 • FDB may be able to assist • Not yet known • NRSP survey results may assist in planning. 	<ul style="list-style-type: none"> • Production of masterplan • Export figures • Fisheries Department Reports
e) Legislation supporting aquaculture updated	Medium to Low	<ul style="list-style-type: none"> • Coastal communities • Investors • Exporters • Feed suppliers 	<ul style="list-style-type: none"> • Build into broader legislative reform process for fisheries 	<ul style="list-style-type: none"> • 2-3 years 	<ul style="list-style-type: none"> • \$500,000 minimum 	<ul style="list-style-type: none"> • Draft bill developed and reviewed by stakeholders • Bill promulgated into law and supporting regulations developed

Inland Freshwater Capture Fisheries and Aquaculture						
	Objectives <i>i. To increase productivity from inland aquaculture</i> <i>ii. To increase the total area of fish ponds in Balochistan</i> <i>iii. To increase production from inland fisheries in freshwater water bodies and dams</i>					
Targets and needs	Priority	Target groups and Beneficiaries	Outline Strategies	Time scale	Potential Costs/funding	Indicators and sources of verification
a) To increase the production of fish from inland fisheries Currently 4,000 tonnes: <ul style="list-style-type: none"> • 12,000 tonnes by 2020 • 20,000 tonnes by 2025 • At least a doubling of annual output per hectare of open and closed water fishing through better husbandry practices • Tilapia to be half of production by 2020 	Medium	<ul style="list-style-type: none"> • Fish farmers and their dependants • Consumers of farmed fish in Balochistan • Fish farmers and their dependants • Consumers of farmed fish in Balochistan 	<ul style="list-style-type: none"> • Development of the four working hatcheries in Balochistan into “Model Fish Farms”. These to become both model farms for demonstration and training, as well as retaining primary function of seed hatcheries. • Training of fish farmers at the Model Fish Farms • Introduction of GIFT Tilapia to fish farmers through the hatcheries and model fish farms • Probably wait and see how Tilapia progresses in Punjab and Sindh, the apply technologies. 	<ul style="list-style-type: none"> • 8 years to raise production to 12,000 tonnes 	<ul style="list-style-type: none"> • Improve four hatcheries could cost up to US\$480,000 • FDB will be able to assist • Training programs for fish farmers could be ongoing and will need donor support; may require external trainers, study tours, etc. • Predominantly a private commercial activity 	<ul style="list-style-type: none"> • Fish production figures • Fish hatchery figures • Fisheries Department Reports • Fish production figures • Fish hatchery figures • Fisheries Department Reports
b) Area of managed fish ponds to be increased to 8,000 ha by 2020	Medium	<ul style="list-style-type: none"> • Fish farmers and their dependants • Consumers of farmed fish in Balochistan 	<ul style="list-style-type: none"> • Farmers encouraged, though the model farms (and example of successful farmers) to convert waterlogged or 	<ul style="list-style-type: none"> • 8 years 	<ul style="list-style-type: none"> • Should be a natural process by the fish farmers themselves as they begin to see the opportunities. 	<ul style="list-style-type: none"> • Fish production figures • Fish hatchery figures • Fisheries Department Reports

			salt intruded land to fish farming			
c) Improved management system for inland waters	Medium	<ul style="list-style-type: none"> • Fishers on local water bodies • Legislators, land owners, groups and individuals leasing water bodies, users of public water bodies, communities, farmers 	<ul style="list-style-type: none"> • Review leasing policy and supporting legislation, evaluate returns from alternative production systems relative to goals tied to output, poverty reduction, equity and biodiversity conservation • Undertake a process to revise leasing policy and legislation • Introduce improved co-management of inland water with the users of the resources on pilot basis, dealing with both private and public water bodies. This will involve training, study tours, NGO support, etc. 	<ul style="list-style-type: none"> • 1 year • 2-3 years • Up to 5 years 	<ul style="list-style-type: none"> • \$250,000 • \$300,000 • US\$5-10 million depending on number of pilot sites 	<ul style="list-style-type: none"> • Numbers of COs created on inland water bodies. • Fisheries Department reports. • Studies completed and disseminated • Revised draft policy and legislation promulgated into law

Research						
	Objectives <i>i. To improve research planning and coordination</i> <i>ii. To improve implementation and dissemination of research results</i>					
Targets and needs		Target groups and Beneficiaries	Outline Strategies	Time scale	Potential Costs/funding	Indicators and sources of verification
a) Improve research planning and coordination	High	<ul style="list-style-type: none"> • Coastal communities and fishers • Potential investors • Exporters • Fisheries Department • Other relevant government departments • Universities and other research institutions 	<ul style="list-style-type: none"> • Develop strategic plan for fisheries research, development and technology transfer. This will involve strategic review (involving critical stakeholders) of key fisheries sector issues, research and development requirements, set priorities, identify main players, etc. • Identify more effective approaches for transfer of research and technology to clients ranging from policy level to field level • Establish an effective coordination body for Pakistan fisheries research 	<ul style="list-style-type: none"> • 18 months for strategic planning process to be completed, plan developed and debated, and technology transfer approaches identified • 6 months to establish new coordinating body and 1-2 years of support 	<ul style="list-style-type: none"> • Strategic planning will require external technical support, travel and meeting costs. Estimated at \$200,000 • The Consortium for Pakistan Aquaculture and Fisheries may be able to assist. 	<ul style="list-style-type: none"> • Establishment of a Fisheries Research Council • Council Minutes & decisions • Fisheries Department reports • University reports
b) Improve implementation and dissemination of research	Medium		<ul style="list-style-type: none"> • Compilation of existing research from national and provincial research institutions • Synthesis of key research on priority 	<ul style="list-style-type: none"> • 2 years • 2 years 	<ul style="list-style-type: none"> • FAO carrying out stocks assessment • Compilation process could cost \$100,000 • Synthesis process 	<ul style="list-style-type: none"> • Numbers of research projects. • University research reports

			topics <ul style="list-style-type: none"> • With guidance from strategic review, implement R&D, and technology transfer programs 	<ul style="list-style-type: none"> • Ongoing 	could cost \$100,000 <ul style="list-style-type: none"> • R&D implementation and dissemination is open ended, depending on needs and budget 	
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Human Resources and Training						
	Objectives <i>i. To improve training infrastructure and capacities</i> <i>ii. To improve understanding of training needs and implement appropriate programs</i>					
Targets and Needs	Priority	Target groups and Beneficiaries	Outline Strategies	Time Scale	Potential Costs/Funding	Indicators and Sources of Verification
a) Improve training infrastructure and capacities	High	<ul style="list-style-type: none"> Coastal communities Investors Exporters Fisheries Department 	<ul style="list-style-type: none"> Complete fisheries Training Centre in Surbandar Equip the Training Centre in Surbandar Implement a train the Trainers program to build up staffing at these facilities Curriculum development 	<ul style="list-style-type: none"> Training Centers completed by end of 2013 Staffing over 5-6 years then ongoing 	<ul style="list-style-type: none"> Construction funded from PCI and will be PKR473,000 Operating costs from recurrent budgets @ PKR15 million/year Consortium for Pakistan Aquaculture and Fisheries and FDB may assist. Train the Trainers funded by IFAD project. Curriculum development funded by IFAD for post-harvest only Other curricula development from GoB budgets/ donors ~PKR150,000/year 	<ul style="list-style-type: none"> Building construction progress Equipment supply contracts IFAD reports Fisheries Department Numbers of trainers trained Training centre reports IFAD reports Fisheries Department Reports
b) Improve understanding of training needs and	High	<ul style="list-style-type: none"> Coastal communities and fishers Exporters 	<ul style="list-style-type: none"> Comprehensive training needs assessment across the fisheries sector 	<ul style="list-style-type: none"> Needs assessment completed by end of 2013 Implementing 	<ul style="list-style-type: none"> IFAD project will fund extensive training in some geographic areas 	<ul style="list-style-type: none"> IFAD reports Fisheries Department Reports

implement appropriate programs		<ul style="list-style-type: none"> • Fisheries Department • Operatives in processing factories • Technical colleges 	<ul style="list-style-type: none"> • Use Training Centre to deliver the skills necessary to the sector • TVET in colleges for Technical fisheries subjects 	training programs from 2013, scaling up based on staff levels and budgets	<p>and in some subjects in the training centre.</p> <ul style="list-style-type: none"> • • Other training from recurrent budgets ~PKR80 million per year 	
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The Action Plan for the Marine and Inland Fisheries, the version of post-Workshop is presented as under:

Priority Action/ Intervention	Description	Unit of Measure	Time Span			Estimated Costs (US\$ in million)	Implementing Institutions	Expected Changes/benefits resulting from action
			Short Term (<2 years)	Medium Term (>2 & <5 years)	Long Term (>5 years)			
Marine capture fisheries - sub-sector development	Develop overall strategy for marine fisheries built on updated stock assessment and participatory processes	Strategy document	X			1.0	Fisheries, private sector, fishermen	Sustainable fish harvest
	Human resource development and institutional strengthening	Number of experts trained, number of projects formulated and implemented	X	X		0.50	Fisheries, private sector, fishermen	Improved capacity of manpower, institutional capacity enhanced in project formulation and implementation
	Reform Balochistan fisheries policy and guidelines reform National Fisheries Act	Policy document, revised National Fisheries Act	X	X		1	Fisheries, private sector, fishermen	Focused development of sub-sector
	Controlling overfishing, MCS Vessel Registration system, co-management, licensing	Number of licenses issued, transparency in issuing of licenses	X	X		5	Fisheries, private sector, fishermen	Regulatory aspects of safe fishing implemented
	Pilot and scale-up for small-scale coastal fishing	Volume of small-scale coastal fishing	X	X		5	Fisheries, private sector, fishermen	Increased income of small fishermen and their organisations

Marine capture Fisheries - Infrastructure and Marketing	Major harbor development in priority sites	Number of sites, harbor facilities developed	X	X		1.0	Fisheries, private sector, fishermen	Better harbor facilities will result in development of marine fisheries
	Smaller-scale onshore infrastructure development (fish landing sites, market centres, ice plants, clean water supply etc.)	Number of landing sites developed, number of market centres developed, number of ice plants installed, number of water supply schemes constructed	X	X		3	Fisheries, private sector, fishermen	Improved production of fisheries, improved marketing of the fisheries, improved quality of fisheries captured, access for export
	Improved quality inspection, quality standards, supporting laboratory	Quality standards prepared, quality standards enforced	X	X		0.5	Fisheries, private sector, fishermen	Effective regulatory system is in place
Coastal Aquaculture - Sub-sector Development	Development of Master Plan to identify potential sites, constraints, key actions and investment costs	Master Plan	X	X		0.15	Fisheries, private sector, fishermen	Master Plan for investment of cost-effective interventions at potential sites
	Legal and Policy reforms to support development of coastal aquaculture	Legal and policy document	X			0.5	Fisheries, private sector, fishermen	Coastal aquaculture developed as a new source of livelihood and for export

Farm Fisheries	Private sector fish hatcheries Model fish farms Fish Farmers' Interest Group and linkages with private sector, trainings of farmers, legal reforms for inland capture, pilot management of participatory fishing by communities	Number of hatcheries developed, farmers interest groups developed, number of farmers trained	X	X	X	6	Fisheries, private sector	Increased income of farmers, new livelihoods, private sector developed
Policy and Institutional Reforms and Strengthening	Formulation and signing of protocol between Fisheries, Livestock, Agriculture and Irrigation Departments and University of Lasbela	Protocol signed	X			-	Fisheries, livestock, agriculture, irrigation, University of Lasbela	All the potential sites for marine and inland fisheries would result into additional income to provincial GDP
	Reforming existing institutions through: training and education, career structure and cadre, strengthening of laboratory facilities for quality control and export	Number of trainees, number of staff educated in higher degrees, equipment purchased, diagnostics conducted and reported		X	X	5	Fisheries, private sector	Improved implementation of development schemes, less turnover of staff
Total Cost						28.65		

5. CURRENT SECTOR SUPPORT IN BALOCHISTAN FISHERIES

5.1 Provincial and other Pakistan based

5.1.1 Balochistan Fisheries Department

5.1 The Department of Fisheries reports the following ongoing local Development Projects²³

1. Fisheries Training Centre at Gwadar will be completed by June, 2013 presently the work is suspended due to non availability of funds. Approved Cost PKR Million 361. Proposed Revised Cost PKR Million 473
2. Fisheries Infrastructure (Auction Hall, Certification Laboratory, Fiber Glass Boat Building Yard and Nets etc. Approved Cost PKR Million 200
3. Development of Fisherfolk Colonies on Balochistan Coast. Approved Cost PKR Million 180

5.1.2 Future Development Schemes

1. Modification of boats and provision of insulated ice box, plastic crates, onboard flake ice plant & life jackets PKR Million 372
2. Construction of jetty at Tak, Ormara PKR Million 1400
3. Institutional strengthening and capacity building on concerned Government agencies and stake holders. PKR Million 150
4. Up gradation of 100 fishing boats as per European Standard PKR Million 250
5. Construction of 09 boat repairing workshops PKR Million 20
6. Training program for the capacity building of Fisheries Department PKR Million 20
7. Development of fish hatchery at Sabakzai Dam at Zhob PKR Million 60
8. Trout fish raceway system at Kalat, Ziarat and Rod Mulazai. PKR Million 39
9. Fisheries Research Centre at Pasni PKR Million 190
10. Inland Fisheries Training Centre at D.M Jamali PKR Million 250
11. Fish Market at Quetta 1 PKR Million 120
12. Fisheries Offices & accommodation facilities on different stations PKR Million 550

5.1.3 Development Budget

5.2 The following ongoing development schemes will be functional within short span of time.

²³ Adapted from Fisheries Department web site. <http://www.balochistan.gov.pk/fish-home.html> with inputs from discussions with Fisheries Department staff.

Gwadar training center.	Rs.361-154 Million
Fish hatchery at D.MJamali.	Rs.12 Million
Fish hatchery at Mirani Dam District Kech.	Rs.27 Million
Offices & accommodation facilities at Gwadar.	Rs. 26.5 Million

5.1.4 Marine Fisheries Department (Federal)

5.3 Apart from licensing of FFVs in the 200 mile EEZ the Department is also implementing the “Stock Assessment Survey Programme in EEZ of Pakistan through Chartering of Fisheries Research Vessel and Capacity Building of Marine Fisheries Department”. This is closely associated with the NORAD and FAO programs listed below. All the activities of these projects are closely linked and interdependent and resource surveys are central to all three project components to provide the information needed for stock assessment and advice to managers, including management recommendations for the priority fisheries and the resources supporting them.”

5.4 The MFD is also responsible for development of the Competent Authority and in the past has sponsored, with assistance from outside, production of the Fisheries and Aquaculture Policy for Pakistan MFD also collates annual statistics for fisheries in Pakistan.

5.1.5 The Balochistan Coastal Development Authority

5.5 The Balochistan Coastal Development Authority is a corporate body established in 1998 by the Balochistan Coastal Development Authority Act. It has its objective to “To make the Balochistan Coastal Belt a Developed and Prosperous area Contributing with its Immense Potentials and resources to the National Economy and Socio-economic Development of the Area.” It is responsible for the development of coastal areas inland to 30km. Although the BCDA is executing at least 3 projects (reference PSDP 2012-13, page 12).

5.1.6 The Gwadar Development Authority

5.6 The Gwadar Development Authority (GDA) is responsible for implementing the development masterplan of the port of Gwadar and surrounding areas. It has two fisheries related projects ongoing, the construction of the fish landing jetty in Pishukan with a budget of Rs.184.165 Million and a fish landing jetty in Surbandar with a budget of Rs.288.752 Million. Invitations to tender for these two projects were sent out in early 2012.

5.7 The GDA envisages a Gwadar port without small fishing vessels, and the fishing boats are all expected to move to Pishukan and Surbandar to allow for cargo activities in Gwadar. Smaller fishing vessels have already been moved out of the port area and now land to beaches on the Gwadar peninsular.

5.8 GDA also envisages a “Fishermen’s Town”, comprising processing, housing and other services in Gwadar. This is a very long term vision.

5.1.7 Fisheries Development Board

5.9 The Fisheries Development Board was a not for profit company established under Section-42 of the Companies Ordinance 1984, by the Ministry of Livestock and Dairy Development, Government of Pakistan. The Board is Governed and managed by the Board of Directors. It aimed to provide and maintain a platform for enhancing and promoting fisheries sector in Pakistan, where the participants, professionals and intermediaries may discuss issues of common interest, identify new solutions that enhance the efficiency of that sector, initiate development programs, promote regional and global integration and to undertake activities in Pakistan and / or abroad. It was abolished in 2011. In Balochistan the FDB funded the part construction of a Shrimp Hatchery in Jiwani and the identification of 2800 Ha of land for aquaculture, much of which is not suitable, but has now been passed to Fisheries Department.

5.10 The FDB has now been re-constituted as a private sector organization, with a new board and basically similar mandate. It is expected to continue its work in the sector, but with more emphasis on the private sector.

5.1.8 NGOs

A variety of NGOs have had inputs to Balochistan fisheries and in the coastal zone over the years. These include the World Wildlife Fund (WWF), International Union for Conservation of Nature (ICUN), Balochistan Education Foundation (BEF), and the Pakistan Fisherfolk Forum. Of these the WWF has an active worldwide IUU fishing program which will include Pakistan and ICUN is currently involved in Sustainable Conservation in the coastal areas of Balochistan through its Balochistan Partnership for Sustainable Development.

5.2 International Support

Program Title: Gwadar Lasbella Livelihoods Support Programme

Duration:	2012 (?) for 6 years. Project yet to receive go ahead.
Donor:	IFAD Loan US\$ 30.000.000 85% Government of Pakistan US\$4.700.000 13.4% through waiving/foregoing duties & taxes Beneficiaries US\$544.000 1.5% (in kind)
Districts:	Lasbella & Gwadar
Objectives of the project:	To contribute to the reduction of poverty in Gwadar and Lasbella, by enhancing the access by the poor rural men and women to productive assets, skills, services and technologies for productivity enhancement.
Accomplishment:	Work on various connecting roads is underway and tenders have been floated for some other works too..

	<p>Community development (12% of base costs). Baseline survey, capacity building of COs/VOs, Technical and vocational skills training, and asset creation for women (goats & chickens)</p> <p>Fisheries development (45% of base costs). Construction of jetties and allied infrastructure (8 sites potentially). Support to fishing communities. Institutional Capacity Building (Fisheries Department, SPS and fisheries management). Community managed financial services.</p> <p>Rural Infrastructure (37% of the base costs). Rural roads (100 km, 16 feeder roads to communities). Community Physical Infrastructure (water, irrigation, drainage etc)</p>
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Program Title: Rehabilitation of Pasni Fish Harbor in Balochistan

Duration:	Start 2010 and expected to be completed by October 2013.
Donor:	Japan. PKR 800 million grant provided out of the 'Counter Value Fund' maintained by the Federal Government under Japanese assistance
Districts:	Gwadar
Objectives of the project:	To rehabilitate Pasni Fish harbor. Includes studies, dredging and modification of breakwater. Navigation aids.
Accomplishment:	Scoping studies have been undertaken. Major activities, dredging etc should start in 2012.

Program Title: - Italian Debt Swap. Fisheries

Duration:	Cancelled
Donor:	Italy
Districts:	Lasbella & Gwadar
Objectives of the project:	<ol style="list-style-type: none"> 1) Modification of boats and provision of insulated box, plastic crates, on-board flake ice plants & life jackets. 2) Provision of fisheries infrastructure on Balochistan coast (Auction Halls, Floating Jetties and repairing workshops).
Accomplishment:	The fisheries components have been cancelled and the money reallocated to improving water supplies. This followed a needs assessment where the stakeholders identified water as a priority requirement.

Program Title: - Support to the Fishery Resources Appraisal in Pakistan

Duration:	2009 - 2014
Donor:	FAO Assistance
Districts:	Pakistan waters
Objectives of the project:	<ol style="list-style-type: none"> 1) Obtain acoustic biomass estimates for the major small pelagic and mesopelagic fisheries resource species 2) Obtain swept-area biomass estimates for continental shelf demersal fisheries resource species 3) Obtain oceanographic observations of the marine environment as related to the fisheries resources 4) Obtain exploratory fishing information on the demersal fisheries resources in deep sea areas such as the Murray Ridge and deep continental slope 5) Train scientific personnel from Pakistan
Accomplishment:	<p>In October and November 2010, the R/V Dr. Fridtjof Nansen conducted two offshore fisheries resource surveys in Pakistan's waters. These included sampling by acoustics, pelagic trawling, and demersal trawling and collected a suite of concurrent biological and physical oceanography observations. Report prepared: - SURVEYS OF THE OFFSHORE FISHERIES RESOURCES OF PAKISTAN – 2010</p> <p>Ongoing surveys. Ongoing training and data collection.</p>

Program Title: - Assistance in Planning and Implementing a Marine Fisheries Resources Survey

Duration:	2009-13
Donor:	NORAD
Districts:	Pakistan waters
Objectives of the project:	<ol style="list-style-type: none"> 1) Supports the FAO program noted above.
Accomplishment:	Onboard training and cruises. Ongoing.

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6.3 Contacts/Interviews

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7. GLOSSARY

Aquaculture	The cultivation of aquatic organisms. Aquaculture implies the cultivation of aquatic biota under controlled conditions. It includes algaculture (the production of kelp/seaweed and other algae); fish farming; shrimp farming, shellfish farming, and the growing of cultured pearls.
Beel	A term for a pond (wetland) with standing water (as opposed to moving water in rivers and canals. Generally found in the Ganga-Brahmaputra flood plains of the eastern Indian states of West Bengal and Assam, and Bangladesh.
Bottom trawling	An industrial fishing method where larger, mechanized vessels drag large, heavy nets across the seafloor.
Community	A group of habitations or hamlets, managing its affairs in accordance with customs and traditions.
Demersal fish	A fish that feeds on or near the bottom of the ocean or a deep lake in the demersal zone. Demersal fish are also known as bottom feeders or groundfish. Examples include some species of catfish, such as the members of the genus <i>Corydoras</i> , cod, haddock, whiting, halibut, perch, snapper, eel, grouper, bream, bass, flounder, plaice, sole, and demersal shark.
EEZ	Under the law of the sea, an Exclusive Economic Zone (EEZ) is a sea zone over which a state has special rights for exploration and use of its marine resources. Generally a state's EEZ extends to a distance of 200 nautical miles (370 km) out from its coast.
Economic Rent (Resource Rents)	Economic rent is generally defined as the difference between the income in the current use of the factor and the absolute minimum required to draw a factor into a particular use (from no use at all, or from the next best use). Resource rent is abnormal or supernormal profit which derives from the exploitation of natural resources. There are two main reasons of the existence of resource rent: The scarcity of the natural resource and the possible impact exploitation will have on natural growth of the resource in future. If the scarcity is reflected in a market price as in a perfect market, resource rent may be obtained.
Fisheries Management Unit	The FMU usually can be characterized and constituted by identified fishing vessel categories, which target resources consisting of one or, more probably, of a species

assemblage. Given this, the identification of an FMU involves the prior identification of key fisheries, which at the initial disaggregated level may be locally structured according to the resource, the local fishing grounds and related ports from where the fishing vessels operate and where the economics of production originate (e.g. access to local/regional markets, trading, processing, vessel-related activities and costs, etc.).

Hazard Analysis and Critical Control Point Food production, storage, and distribution monitoring system for identification and control of associated health hazards. It is aimed at prevention of contamination, instead of end-product evaluation. In place of relying on food inspectors to detect food safety problems, HACCP shifts the responsibility to the food producer to ensure that the product is safely consumable.

Mariculture The culture of fish or other aquatic organisms in the marine environment, either for food or profit (specifically aquaculture or fish farming in the sea); in its simplest form, juvenile fish are captured and allowed to grow for several months, with regular feeding, in a simple floating net cage until they reach harvest size. More complex systems can employ a range of technologies to produce young fish (fingerlings) using artificial breeding techniques, with grow-on stages involving formulated feeds and various designs of aquaculture structures (ponds, cages and raceways).

Maximum Economic Yield (MEY) In fisheries economics, MEY is, theoretically, the largest economic yield that can be taken from a fishery over an indefinite period of time. It represents in basic terms the difference between gross economic earnings and costs relating to fishery activity. MEY occurs at a lower level of fishing effort than MSY, and as a consequence fisheries with high and expanding levels of fishing effort, often under open access conditions, tend to yield low economic returns, and are economically inefficient.

Maximum Sustainable Yield (MSY) In fisheries ecology, MSY is, theoretically, the largest yield or catch that can be taken from a species' stock over an indefinite period. MSY is extensively used for fisheries management. MSY in most modern fisheries models occurs at around 30% of the unexploited population size. Unfortunately errors in estimating the population dynamics of a species can lead to setting the maximum sustainable yield too high (or too low), leading to stock depletion.

Mesopelagic fish	Fish living deep in the water column in the open ocean, typically below 200 meters.
Monitoring, Control, Surveillance (MCS)	Part of the overall composition of a fisheries management system, MCS focuses on the collection of appropriate data, licensing and enforcing systems, and provision of management information systems relative to fisheries management objectives and legal frameworks. MCS is essential to counter illegal, unreported and unregulated (IUU) activities within a fishery. Approaches and tools range from logbook data collection on boats, to inspection and regulation by fishery patrols, and more recently the design and operation of Vessel Monitoring Systems (VMS) using modern electronic and satellite technology.
Pelagic fish	Fish that swim near the surface, compared with demersal fish, which live closer to the sea bottom. Pelagic fish are mostly of the oily type such as herring, mackerel, and pilchard, containing up to 20% oil.
Purse-seining / Seining	In commercial tuna fisheries operated on the high seas, modern fishing vessels use large seine nets (a long curtain of nylon net that hangs from floats at the surface and is weighted below) to encircle schools of surface-living tuna such as skipjack or yellow-fin. The end of the net is often fed out using a supporting launch, and then circled back to the fishing boat. The net is drawn back to form a huge bag, which can be reduced in size and lifted by mechanical crane on larger vessels. While seine netting for tuna is highly effective, it has the disadvantage of also taking other organisms including dolphins which accompany and prey on the tuna. Various tactics are used to scare away or even release the dolphins, but it remains a problem.
Shellfish	Soft bodied aquatic invertebrates having exoskeletons as shells such as mollusks, crustaceans, and echinoderms, used as food. Both saltwater and freshwater invertebrates as mentioned above are considered shellfish. The term finfish is sometimes used to distinguish ordinary (vertebrate) fish / true fish from shellfish.
Trawl	A tapering bag-like fish net towed at the stern of the fishing vessel.