D1 POTENTIAL INITATIVES AND PERFORMANCE INDICATORS UNDER THE FOUR KEY THEMES OF THE FMP

D1.1 POTENTIAL INITIATIVES

D1.1.1 Support Measures that Help to Achieve Sustainable Management and Enhancement of Fisheries Resources

Development of Sustainable Fisheries

Under this initiative, funding will be provided to support studies that explore and examine practicable management measures that could be implemented by the fishery sector to enhance the sustainable use of fisheries resources. These may include studies that look at fishing gear and method modification to reduce capture of non target species and fish fry, the identification of seasonal fishing grounds which may be species-specific and warrants control and management, measures to support the management of catch of particular locally endangered/ vulnerable species, etc.. Overall this facilitates the development of more targeted fisheries for the protection of juveniles and vulnerable species, enabling the conservation and enhancement of fisheries resources in a long term. It is expected that findings of this initiative can contribute to making an informed decision by regulators and the industry with regards to the enhancement of fisheries resources in a long term.

A potential enhancement initiative example is provided in more detail in *Figure D1.*

Capacity Building of Fishing Operators

This initiative will support the provision of capacity building to fishing operators to ensure that they possess up-to-date knowledge on fisheries management to sustain and enhance fisheries resources in a long term. Capacity building may be in the form of seminars, overseas study tours, training courses or education programmes.

It is suggested to enhance fishermen's understanding of sustainability under this initiative which would help to promote sustainable fisheries in Hong Kong in the long-term. Training can be provided to fishermen on the concept of sustainable fisheries in order to raise their awareness of the ecological and economic importance of conserving and enhancing fisheries resources in Hong Kong. The capacity building may cover modern and efficient fisheries, management practices, energy saving and environmental protection. With better understanding of the importance of a sustainable fishing industry it is hoped that the fishermen will be more proactively involved in managing, conserving and enhancing fisheries resources and that the fisheries industry would be properly managed and sustained for the long-term.

Figure D1

Development of Sustainable Fisheries (Example Initiative Case Study)

Rationale and Objectives

The Government pursues a number of fisheries management and conservation measures to conserve the fisheries resources in Hong Kong waters and promote the sustainable development of the Hong Kong fisheries industry. Since 31 December 2012, trawling is prohibited in Hong Kong to protect the marine resources and ecosystem. To further enhance sustainable fisheries, fishing gear and method modification to reduce capture of non target species and fish fry, the identification of seasonal fishing grounds which may be species-specific and warrants control and management, measures to support the management of catch of particular locally endangered/ vulnerable species, etc could be further investigated.

The overall aims of this Study are to:

- Facilitate the development of more targeted fisheries for the protection of juveniles and vulnerable species, enabling the conservation and enhancement of fisheries resources in a long term.
- Contribute to making an informed decision by regulators and the industry with regards to the enhancement of fisheries resources in a long term.

Scope and Methods

The scope of work will include:

- Review the current fishing operation status in Hong Kong.
- Conduct a feasibility study of developing fishing gear / modifying method to reduce capture of non target species and fish fry.
- Conduct surveys and stakeholder consultation to facilitate the identification of seasonal fishing grounds.
- Develop legislative measures and voluntary code of conduct to promote sustainable fisheries management.

Outputs

A variety of outputs could be generated by the Study including:

- Development of fishing gear to reduce capture of non target species and fish fry
- Identification of seasonal fishing grounds
- Measures to support the management of catch of particular locally endangered/ vulnerable species

Schedule and Cost

The Study is scheduled to last for **18 months**

The estimated cost is **HK$ 2 million**

Funding Themes

Support Measures that Help to Achieve Sustainable Management and Enhancement of Fisheries Resources

Support and Enhance On-going Fisheries Operations

D1.1.2 Support and Enhance On-going Fisheries Operations in a Sustainable Manner

Optimisation of Mode of Fishing Operation

With the loss of fishing grounds in the coastal north Lantau waters due to the 3RS Project and new Marine Park establishment, it is considered that fishing grounds in marine environments (e.g. offshore waters, deep sea waters) that are relatively unexploited by local fishing fleet in north Lantau waters should potentially be explored to allow for continuity of the affected fishing operators. Such exploration of fisheries sources by the fishing operators in alternative marine environments would require the fishing operations / fleet to be optimised. The process of optimisation will require the following to be undertaken:

- Purchase of new fuel efficient design vessels [(1)] with modern technology / facilities (i.e. including better navigation instrument, communication instrument, fishing handling equipment such as bailers and fish pumps, storage facilities, accommodations, waste treatment facilities , life-saving equipment etc) to allow for effectiveness, safe and sustainable operation in fishing grounds not targeted by the fishing operators before, such as the offshore and deepwater environments;

- Purchase of new engines with improved power to efficiency ratios to improve the ability of the fishing vessel to explore alternative areas of operation in an energy efficient and environmental friendly manner;

- Purchase of advanced fishing gear and equipment to allow for more efficient operation in the new environment. For example, advanced fish detection sonar for more reliable and accurate detection of fish aggregations; and

- Training of fishing operators to the use of advanced fishing instrument / equipment / technology as stated above.

This initiative supports funding for such optimisation to allow the fishing operators to develop their operations in new fishing areas of interest. The initiative will firstly support pilot studies to be implemented and trialled by a small number of operators. This would allow for more efficient use of the fund for targeting viable optimisation options. If results of the pilot studies are found encouraging, full-scale implementation and knowledge sharing to other interested operators will be supported at the subsequent stage.

Improvement in Operation Efficiency and Environmental Performance

Besides exploration of alternative areas of operation, improving the efficiency and cost-effectiveness of fishing operations is another initiative that can help the fishery sector to sustain their livelihood despite the loss of fishing grounds and other challenges in Hong Kong waters. It is noted that the technology currently employed

(1) Department of Fisheries and Aquaculture 2015. New Vessel Considerations. Energy Efficiency Fact Sheets. Available at:http://www.fishaq.gov.nl.ca/research_development/research/energyefficiencyfacts.html

by the local capture fisheries is outdated which results in high operating costs, low efficiency and consequently low competitiveness. For example, most of the large fishing vessels are still equipped with high-powered and high fuel-consuming engines which have increased their operating cost. As such, it is expected that operation efficiency can be enhanced through upgrading of vessels / equipment, for example using engines of lower horsepower / higher energy efficiency, nets with lower resistance, to help fishermen reducing their fuel and thus operating costs [(1)(2)]. It is expected that the environmental performance can also be improved under this initiative with the replacement of less energy efficient old equipment and potential use of green energy (e.g. wind or solar energy). In addition, energy audits / energy profiling to identify solutions for cutting fuel consumption on board fishing vessels during operations could also be undertaken [(3)(4)]. The aspect of promotion of environmental performance will thus also be encouraged under this initiative through funding of vessel / equipment maintenance and installation of green energy technology on vessels (e.g. small wind turbine or solar panel) and energy audits.

Capacity Building of Fishing Operators

This initiative will support the provision of capacity building to fishing operators to ensure that they possess up-to-date knowledge on fishing technology to sustain and improve their operations. Capacity building may be in the form of seminars, overseas study tours, training courses or education programmes.

In addition, it is noted that the family mode of operation has restricted the development of the fisheries industry in Hong Kong. If fishermen need to develop new fisheries projects in future, more comprehensive knowledge and considerable financing will be required. It is therefore suggested that the initiative should also support the capacity building on formation of cooperative enterprises by fishermen organisations to improve their capacity in development of fisheries projects. The formation of cooperative enterprises may also offer more job opportunities to fishermen and attract interested parties to join the fishery sector.

D1.1.3 Support Measures that Assist in Shifting Fisheries Operations

Development of Aquaculture Technology / Techniques

The major mode of mariculture in Hong Kong is the culturing of marine fish species on simple, traditional mariculture rafts. There has been little technological advancement in aquaculture operations due to the lack of growth in mariculture due

(1) CNR-ISMAR 2012. Effects of engine replacement on the fuel consumption reduction in fisheries. Information Collection in Energy Efficieny for Fisheries (ICEEF). Available at: http://energyefficiency - fisheries.jrc.ec.europa.eu/reports

(2) Department of Fisheries and Aquaculture 2015. Fishing Gear Efficiency. Energy Efficiency Fact Sheets. Available at: http://www.fishaq.gov.nl.ca/research_development/research/energyefficiencyfacts.html

(3) CNR/IMAR 2012. Energy audits on board fishing vessels: Energy profiling can lead to reduced fuel consumption. Available at: http://energyefficiency-fisheries.jrc.ec.europa.eu/reports

(4) Danish Fishermen's Associations 2011. Energy Reduction in Fishing Vessels. http://energyefficiency-fisheries.jrc.ec.europa.eu/reports

to the government's moratorium on releasing more licences. Most culture operations remain small in scale.

With operational and technological advancement in fish culture, there are advanced management measures and technologies which could be considered for aquaculture in Hong Kong. For example, fallowing could be a management option to be considered for the operation of the fish farm to allow for carrying capacity recovery while the possibility of Integrated Multi-trophic Aquaculture could be explored for multi-species culture in a self-sustained manner. Also, there is the possibility of the adoption of recirculation aquaculture systems to reduce the amount of water and space required for fish culture and these can be explored. Under this initiative, it is proposed to fund projects to help fishermen who have changed their livelihood to aquaculture to develop such advanced aquaculture technologies.

In addition to the above, the development of hatcheries may also be encouraged. Hatcheries development can potentially help to secure the source of, and lower the cost of, fish fry supply to the industry. More choice of fry species may also be made available to the industry as a result. Activities that can be supported include pilot studies of hatchery trials as well as subsequent support on commercial scale implementation.

A potential enhancement initiative example is provided in more detail in *Figure D2.*

Development of New Cultured Species

Under this initiative, studies on the culture of new marine fish species with good market potential will be supported. Pilot studies may firstly be funded to look at the potential feasibility and market potential of the new species identified to be cultured. Following the successful completion of pilot studies, knowledge transfer will be undertaken to convey the skills and techniques to the fish farmers through training workshops. Funding may also be provided to help set up the culture system for the new cultured species.

Operation and Management Improvement

With increasing public concerns over food quality and safety and rising demands for quality fisheries products, the competitiveness of local aquaculture can be enhanced through improvement in the aquaculture management and culture techniques to produce high quality and safe aquaculture products.

Under this initiative, funding support will be provided to fish farms to implement good aquaculture practices for improving quality and safety of aquaculture products. Reference could be made, but not exclusive to the ten good mariculture practices developed by the AFCD which hare summarised and briefly described as follows [(1)]:

1) Maintaining appropriate stocking density

(1) AFCD. (2009) Environmental Management of Aquaculture. Good Aquaculture Practice Series 2. 32pp.

Figure D2
Advanced Aquaculture Technology Study (Example Initiative Case Study)

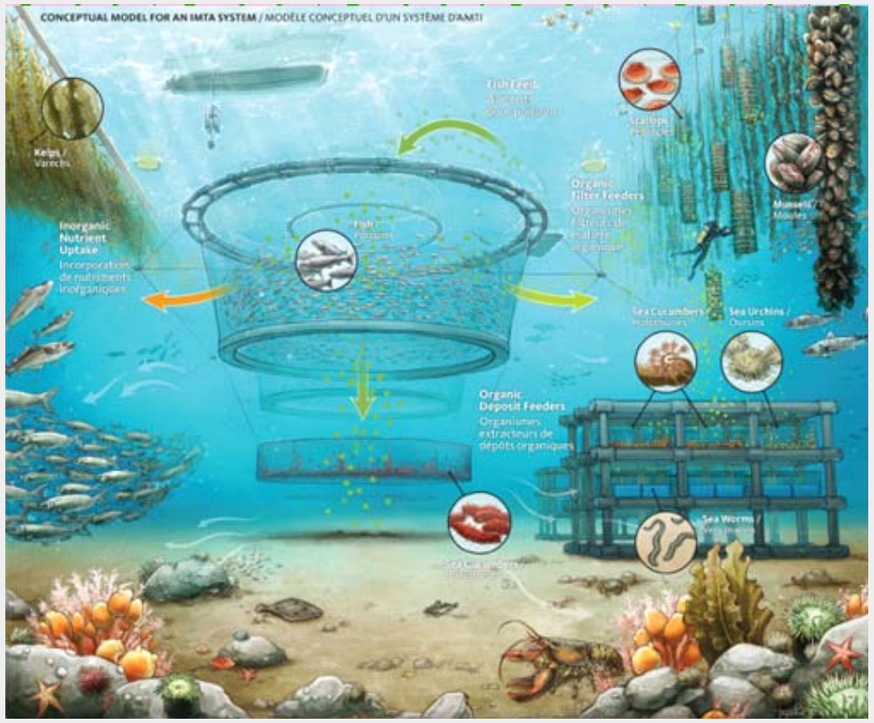
Rationale and Objectives

With operational and technological advancement in fish culture, there are advanced management measures and technologies which could be considered for aquaculture in Hong Kong. For example, fallowing could be a management option to be considered for the operation of the fish farm to allow for carrying capacity recovery while the possibility of Integrated Multi-trophic Aquaculture could be explored for multi-species culture in a self-sustained manner. Also, there is the possibility of the adoption of recirculation aquaculture systems to reduce the amount of water and space required for fish culture and these can be explored.

The Study aims to :

- Review available advanced aquaculture technology as well as best practices and experience in aquaculture operation worldwide.
- Develop a management plan to improve the current practice of the existing FCZs, including the use of advanced aquaculture technology.

Source: http://oceandoctor.org/



Source: http://www.dfo-mpo.gc.ca

Scope and Methods

The scope of work will include:

Standardized methodology will be used.

- Collate, review and assess all information available worldwide relative to the best practices and experience in aquaculture operation and advanced aquaculture technology.
- Conduct stakeholder consultation with relevant stakeholders, including the academics, mariculturists, etc to understand the feasibility of developing advanced aquaculture technology in Hong Kong.
- To develop a management plan to recommend new management and enhancement measures aiming at environmental conservation and sustainable development.

Outputs

A variety of outputs could be generated by the Study including:

- Case Studies of best aquaculture practices
- Options to enhance aquaculture activities in Hong Kong
- Management plan for enhancing the existing aquaculture operation

Schedule and Cost

The Study is scheduled to last for **10 months**

The estimated cost is **HK$ 1 million**

Funding Themes

Support Measures that Assist in Shifting Fisheries Operations

Support the Promotion and Enhancement of Fisheries-related Business Opportunities

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- Check the growth rate of fish and sort them into different cages according to their size to reduce stocking density.

- Use the "Appropriate culture density chart" to estimate the appropriate density.

2) Remove fouling organisms on the fish cages regularly

- Clean fish nets regularly to prevent deposit of fouling organisms which will affect water current exchange.

- Inspect fish nets regularly and repair any torn or damaged parts.

3) Good feeding management measures

- Use dry pellet feed instead of trash fish to reduce the content of organic matters in water.

- Apply feed in phases and in appropriate quantities. Stop feeding if fish are not eating to avoid water pollution by residual fish feed.

4) Proper disposal of dead fish and garbage

- Remove all rubbish, residual feed and fish carcasses on and in the water and put them in a garbage bag in a rubbish bin with lid to avoid water contamination and spreading of germs. When the garbage bag is full, deliver it to the nearest refuse collection point.

- Dead fish should be collected immediately and put in a garbage bag for delivery to the nearest refuse collection point.

- In the event of extensive fish kill, seek assistance from the AFCD or the Marine Department.

5) Regular disinfection of culture gear

- Disinfect gear thoroughly and regularly by bleaching, streaming and drying them under strong sunlight.

6) Quarantine for newly stocked fish/fry

- New adult fish and fry should be isolated for a few days to observe their health condition. If abnormal behaviour or infection symptoms are detected, isolate and disinfect immediately.

7) Isolation/proper treatment of sick fish

- Any fish found infected must be isolated immediately for proper treatment or destroyed.

- Use fish drugs prescribed by the AFCD or a registered veterinarian.

8) Proper use of feed additives and drugs

- Apply feed additives and drugs as instructed by the registered veterinarian.

9) Regular monitoring of water quality and fish health

- Carry out a simple health check on the fish every day. See if the fish are reducing feed intake or showing abnormal swimming habitats. Check the body surface, fins and gills for parasites or disease symptoms.

- Measure water quality parameters across waters where marine fish culture zones are situated at specified times every day.

- Appropriate feeding can prevent seawater from turning acidic.

- When seawater pH value is low, stop feeding.

- Monitor dissolved oxygen levels more closely if suspect any fish behavioural changes or when there are sudden weather changes or extended cloudy periods.

- Refer to special markers on the mariculture calendar for anoxic days and keep close watch of fish stock during such periods. If necessary, stop feeding, reduce the stocking density and turn on an aerator or jet water along the borders of rafts with a blast pump to increase dissolved oxygen level.

- Select species that can adapt to local climate.

- Feed sparingly and add sun screens to reduce direct sunlight.

- When water temperature is low, move the fish less frequently.

- Depending on the temperature tolerance range of fish species under culture, harvest whenever possible before the onset of winter or before water temperature drops.

- Stay alert to water temperature changes. If it falls below 18°C, monitor fish activities closely. If necessary, harvest and sell the fish stock.

- Highly nutritious feed must be given to prepare fish for winter. Add vitamins C and E appropriately to boost immunity and cold tolerance.

10) Maintenance of farm management records

Brand Development and Marketing

Under this initiative, activities related to the brand development and marketing of aquaculture products will be funded. With the increasing public awareness on food safety and quality, it is expected that the brand development and marketing may be related to development, promotion and publicity activities of green or organic culture operations. For instance, applicants may be funded to upgrade their operations so that their products are able to be registered under the Accredited Fish Farm Scheme, which is a recognition of high quality and safe aquaculture products.

D1.1.4 Support the Promotion and Enhancement of Fisheries-related Business Opportunities

Development of Fisheries Based Eco-tourism

Although it is considered possible to develop fisheries based eco-tourism as an alternative livelihood for fishermen, during consultation with the fishery sector it is revealed that such development is still subjected to restriction imposed by the existing regulations and inadequate local experience. For example, while tourists can observe fishing operations and harvesting of fishery resources onboard, they will not be able to enjoy the experience of seafood banquet on the vessel since the operators are not licensed to provide food / beverages. The eco-tourism is thus limited to sight-seeing activities. Therefore, this initiative is proposed to support feasibility studies of fisheries based eco-tourism which would at least cover the following aspects:

- Legislation review to identify current restrictions on development of fisheries based eco-tourism;
- Review of overseas experiences of fisheries based eco-tourism to identify the contributing factors for the success or failure of this business;
- Evaluation of the feasibility and limitations on developing fisheries based eco-tourism in Hong Kong; and
- Recommendations of the way forward to develop fisheries based eco-tourism in Hong Kong.

In addition to the above, funding may be provided under this initiative to support measures recommended in the feasibility study or by the fishing community to develop the fisheries based eco-tourism locally. This may include engagement of a consultant to assist in further liaison with appropriate parties (e.g. government departments) on implementation of fisheries based eco-tourism, support to upgrade / purchase equipment for the business as well as capacity building activities.

A potential enhancement initiative example is provided in more detail in *Figure D3.*

Figure D3

Development of Fisheries Based Eco-tourism (Example Initiative Case Study)

Rationale and Objectives

During consultation with the fishery sector it is revealed that development of fisheries based eco-tourism is still subjected to restriction imposed by the existing regulations and inadequate local experience. In order to facilitate the fishing industry in their business opportunities in a sustainable manner, it is considered that a comprehensive package of fisheries based eco-tourism should be developed, including fishing culture interpretation, seafood banquet, souvenirs as well as sight-seeing activities.

The Study aims to :

- Promote fisheries-related business opportunities.
- Promote sustainable fisheries management.

Scope and Methods

The scope of work will include:

- Legislation review to identify current restrictions on development of fisheries based eco-tourism.
- Review of overseas experiences of fisheries based eco-tourism to identify the contributing factors for the success or failure of this business.
- Evaluation of the feasibility and limitations on developing fisheries based eco-tourism in Hong Kong.
- Recommendations of the way forward to develop fisheries based eco-tourism in Hong Kong.

Outputs

A variety of outputs could be generated by the Study including:

- Case studies of fisheries-based eco-tourism
- Training materials and code of conduct for fishermen to develop fisheries-based eco-tourism

Schedule and Cost

The Study is scheduled to last for **12 months**

The estimated cost is **HK$ 1.5 million**

Funding Themes

Support the Promotion and Enhancement of Fisheries-related Business Opportunities

Support Measures that Help to Achieve Sustainable Management and Enhancement of Fisheries Resources

Development of Recreational Fishing and Eco-tourism for Dolphin Watching

Some fishermen in Hong Kong are already involved in recreational fishing business through renting of their boats to, and taking recreational fishers, out for fishing. In addition, given their familiarity with the CWD habitats in the western Hong Kong waters, it is also possible for fishermen to engage in dolphin watching business. Considering that a relatively low level of technical skills and capital input is required, these businesses should be suitable for fishermen to operate in general. Under this initiative, support will be provided to fishermen to help them develop their business in recreational fishing and dolphin watching eco-tourism. This will include potential funding support to:

- Upgrade of fishing vessels to be used for recreational fishing / dolphin watching;
- Purchase of pleasure crafts or passenger-carrying boats; and
- Identify and upgrade scenic spots and routing design for recreational fishing and dolphin watching as well as strengthen publicity to attract more tourists.

Provision of Training to Diversify Skills of Fishermen

Since fishermen related businesses are identified, it is possible to provide training to fishermen to diversify their skills so that they will not be solely dependent on fishing operations to earn their living. It is expected the training may include "Code of Conduct for Dolphin Watching Activities", CWD ecology, boat operations, marine safety and knowledge on touring techniques. Overseas trips to study and exchange experience on recreational fishing and fisheries-based ecotourism may also be funded under this initiative.

D1.2 POTENTIAL PERFORMANCE INDICATORS

D1.2.1 Support Measures that Help to Achieve Sustainable Management and Enhancement of Fisheries Resources

Some potential performance indicators envisaged at this early stage could include the following:

- Completion of feasibility study on fisheries management and sharing of findings;
- Number of training offered to fishermen and number of participants;
- Number of seminars, overseas study tours, training courses or educational programmes organized for capacity building and number of participants; and
- Modes of fisheries operations used.

D1.2.2 Support and Enhance On-going Fisheries Operations in a Sustainable Manner

Some potential performance indicators envisaged at this early stage could include the following:

- Number of pilot studies completed for optimisation of modes of fishing operations, and the outcomes of these pilot studies, eg whether the expected outcomes and milestones have been achieved, continuity to full-scale implementation, etc;
- Number of operators participating in full-scale implementation of optimisation of modes of fishing operations;
- Number of participants involved in Improvement of Operation Efficiency and Environmental Performance initiatives; and
- Number of seminars, overseas study tours, training courses or educational programmes organized for capacity building and number of participants.

D1.2.3 Support Measures that Assist in Shifting Fisheries Operations

Some potential performance indicators envisaged at this early stage could include the following:

- Number of trainings offered to fishermen and number of participants;
- Number of new aquaculture technologies adopted;
- Number of new cultured species developed;
- Number of fish farms participating in operation and management improvement initiatives; and
- Number of fish farms participating in the brand development and marketing initiative.

D1.2.4 Support the Promotion and Enhancement of Fisheries-related Business Opportunities

Some potential performance indicators envisaged at this early stage could include the following:

- Number of training offered to fishermen and number of participants;
- Number of overseas trips organized for knowledge sharing and number of participants;
- Completion of feasibility study on fisheries-related eco-tourism and sharing of findings;

- Implementation of fisheries-related eco-tourism;
- Number of fishing vessels upgraded for recreational fishing / dolphin watching;
- Number of pleasure crafts or passenger-carrying boats purchased for recreational fishing / dolphin watching ; and
- Completion of routing design for recreational fishing and dolphin watching.