D1 POTENTIAL INITATIVES AND PERFORMANCE INDICATORS UNDER THE THREE KEY THEMES OF THE MECP

D1.1 POTENTIAL INITIATIVES

D1.1.1 Marine Habitat & Resource Conservation & Enhancement Theme

An indicative list of example initiatives, which is not intended to be exhaustive, demonstrates the range of opportunities under the MEFES and is provided in *Table D1*.

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

Table D1 Example Initiatives under the Marine Habitat & Resource Conservation & Enhancement Theme

	MARINE HABITAT AND RESOURCE CONSERVATION AND ENHANCEMENT
PROJECT AREA	**Areas outside land formation works** ■ Deployment of biofilters (Biofilters are specially designed ARs with abundant hard surfaces for development of mainly filter-feeder assemblages for improvement of water clarity. Previous example deployments in Hong Kong include Shum Wan in Sai Kung and Lo Tik Wan at Lamma Island. Other examples include oyster reefs in New York)
HONG KONG WIDE	**North Lantau Soft Shores** ■ Ecological Enhancement Measures for Intertidal Habitat of High Potential Value and Associated Species (San Tau, Tung Chung Bay, Tai Ho Wan, Sham Wat Wan, Yam O) such as through mangrove planting, seagrass restoration and horseshoe crab breeding and release ■ Deployment of biofilters near intertidal habitats to improve water clarity ■ Rehabilitation of the environment near intertidal habitats to improve conditions for mangrove growth and migratory pathways for fish into streams **Hong Kong waters** ■ Baseline Biodiversity Studies to support establishment of other new proposed MP in Hong Kong ■ Baseline Ecological Surveys on CWD for other new proposed MP in Hong Kong ■ Baseline Fisheries Surveys to support other new MP ■ Seascape Studies to understand habitat preferences of CWD in terms of underwater bathymetry and features ■ Hydrology and Water Quality Studies for other new MP ■ Feasibility Study of Artificial Reef Programme within other new proposed MP ■ Feasibility Study of Fish Restocking Programme within other new proposed MP ■ Feasibility Study of Artificial Reef and Fish Restocking in other Hong Kong waters (eg SW Lantau) ■ Eco-enhancement design /retrofitting of jetties in Hong Kong ■ Eco-enhancement design of seawall at other Hong Kong shores ■ Coral translocation/restoration efforts at other Hong Kong waters ■ Ecological enhancement measures such as mangrove planting and seagrass restoration at other Hong Kong waters ■ Control of Invasive Marine Species (eg exotic mangrove and cordgrass species)

Figure D1
Seagrass Restoration Project (Example Initiative Case Study)

Rationale and Objectives

Seagrasses are specialised marine flowering plants. Three species inhabit soft shores in sheltered bays along the North Lantau coast (Japanese Eel Grass *Zostera* japonica and Spoon grasses *Halophila* ovata and H. *beccarii*).

Seagrass communities can play an important role in marine ecosystems. They are highly productive, transferring energy into the marine food web, mainly via their decaying leaves but also via herbivory on their live leaves. They are involved in trapping detritus, cycling nutrients from sediment and providing substrate stability. Their leaves and stems are used as an attachment surface by algae and invertebrate larvae. They serve as nursery and foraging grounds, shelter early life stages of fish and invertebrates such as crustaceans, molluscs and horseshoe crabs.

Given their role in enhancing biological productivity and biodiversity and serving as nursery habitat including for fish, a seagrass restoration project is proposed for habitat enhancement efforts in North Lantau waters. As the only perennial (long-lived) species, *Zostera japonica* will be the subject of the restoration efforts. The species is rare in Hong Kong and disturbance to existing populations will be minimized.

Given the complexities of seagrass restoration, the study will be divided into stages and is expected to involve trials to establish appropriate methods for local situation. The project will be conducted in liaison with AFCD. Objectives are:

- Identify appropriate locations for enhancement by seagrass restoration.
- Establish appropriate methods and protocols.
- Carry out the restoration methods and monitor the success.
- Make the methods and findings publically available.

Schedule and Cost

The project is scheduled to last for **4 years**

The estimated cost is **> HK$3.5 million**

Japanese Eel Grass *Zostera japonica*

Scope and Methods

The project will involve a number of components including:

- Carry out environmental and seagrass surveys to identify potential donor and receptor sites.
- Review previously used methods for keeping *Zostera japonica* in aquaria and examine feasibility of cultivation.
- Review previous research and translocation works on *Zostera japonica* including in Hong Kong and elsewhere (if available) to develop appropriate methods for seagrass transplantation (eg sediment plug and anchored methods).
- Conduct transplantation of seagrass stock at identified suitable receptor locations in North Lantau.
- Conduct long-term monitoring of the survival and condition of transplanted seagrasses to inform the success of the restoration efforts.

Funding Themes

Habitat Enhancement

Scientific Research and Studies

Outputs

Successful outcome of the project may include:

- Development of methods and facilities for seagrass restoration
- Increase in size of *Zostera japonica* beds in Hong Kong western waters
- Establishment of seed populations of *Zostera japonica* in new locales.

Tung Chung Bay

Zostera japonica transplantation in Hong Kong (source: AFCD)

Zostera japonica bed at San Tau

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HONG KONG / PRE	**PRE waters** ■ Long-term Ecological Surveys on CWDs in PRE waters ■ Baseline Ecological Surveys on CWDs in PRE waters for any future new proposed Marine Protected Area ■ Support for Dolphin Stranding Response initiatives ■ Ecological Enhancement Measures for Intertidal Habitat of High Potential Value and Associated Species such as through mangrove planting, seagrass restoration and horseshoe crab breeding and release ■ Baseline Biodiversity Studies for Marine Protected Areas and Intertidal Habitat of High Potential Value ■ Baseline Fisheries Surveys for Marine Protected Areas ■ Feasibility of Artificial Reef Programme within Marine Protected Areas ■ Feasibility Study of Fish Restocking Programme within Marine Protected Areas ■ Feasibility Study of Artificial Reef and Fish Restocking in Marine Protected Areas ■ Eco-enhancement design of jetties ■ Eco-enhancement design of seawall

D1.1.2 Scientific Research & Studies Theme

An indicative list of example initiatives which is not intended to be exhaustive but rather to demonstrate the potential range of opportunities under the MEFES are provided in *Table D2*.

Some potential research initiative examples are provided in more detail in *Figures D2* to *D3.*

Table D2 Example Initiatives under the Scientific Research & Studies Theme

PROJECT AREA	SCIENTIFIC RESEARCH AND STUDIES
HONG KONG WIDE	**Western Hong Kong Waters** ■ Acoustic studies to evaluate marine construction activities noise impacts ■ Behavioural studies incorporating behavioural observations and acoustic monitoring to monitor the behavioural reactions of dolphins to anthropogenic activities / disturbances ■ Research Programme on Marine Mammals for Western Hong Kong Waters and Wider PRE (population monitoring and behavioural studies) ■ Research Programme on Fisheries Resources for Western Hong Kong Waters and Wider PRE ■ Conduct comprehensive cumulative impact assessment of marine anthropogenic activities ■ Develop and hold a workshop(s) on innovative methods of evaluating cumulative impacts from marine development projects on CWDs ■ Analysis of long-term CWD stranding data to better understand the threats and factors affecting fecundity and survivability of CWD ■ Underwater acoustic monitoring of CWD activities and behavioral studies in the Northwest Hong Kong waters ■ Research to better identify sources of pollution in CWD habitats and make recommendations on appropriate mitigation measures ■ Promote eco-tourism and support NGOs to conduct education programme ■ Artificial seawall performance monitoring to study the effectiveness of the eco-enhancement seawall design in providing suitable habitats for marine fauna re-colonization ■ Modeling Studies of CWD activities and fisheries resources

Figure D2

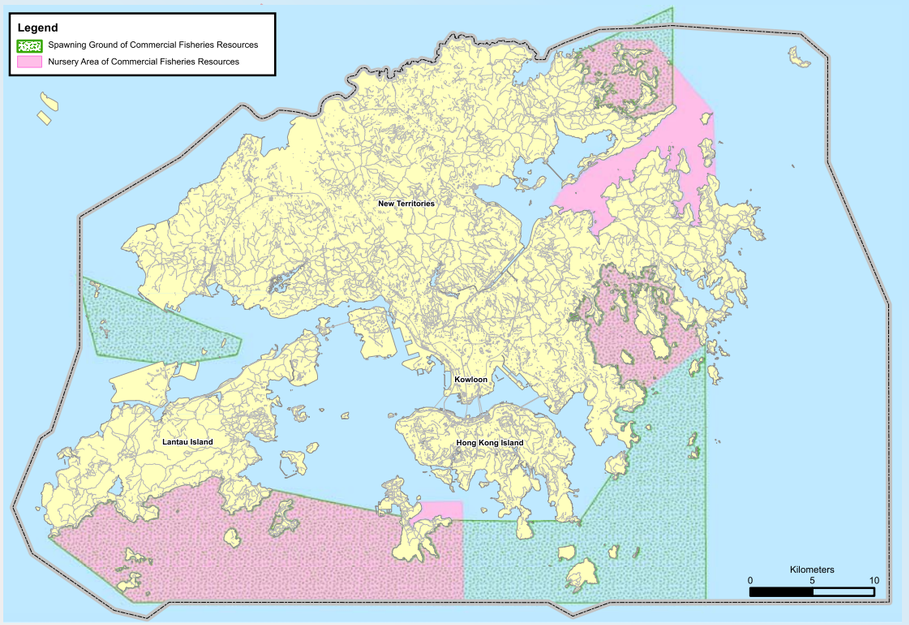
Fish Spawning and Nursery Study (Example Initiative Case Study)

Rationale and Objectives

Understanding the status of Hong Kong marine waters as spawning and nursery grounds of commercially-important fisheries (fish and crustaceans) species provides valuable information to fisheries managers and planners and the long term monitoring of Hong Kong fisheries resources. Surveys to assess the juvenile fisheries resources (ichythoplankton and fish post-larvae) spanning all of Hong Kong waters were first conducted in the mid-1990s, with results used to identify nursery and spawning grounds. As part of EIA studies, surveys were later conducted across Hong Kong western waters in the mid-2000s and more recently in North Lantau waters for the 3RS EIA.

A Hong Kong-wide survey on juvenile fisheries resources is proposed. Objectives are:

- Update the status of Hong Kong marine waters as spawning and nursery grounds.
- Make the findings publically available.



Scope and Methods

The scope of work will be to use standard methodologies to:

Standardized methodology will be used.

- Conduct tows of bongo net with mesh sizes for collection of ichthyoplankton and fish post-larvae from the water column in predefined survey transects in the different regions of Hong Kong.
- Conduct the surveys at intervals throughout the year to capture seasonality.
- Analyse the collected samples for the abundance, composition and diversity of ichthyoplankton and fish post-larvae.
- Review and update the status of Hong Kong waters as nursery and spawning grounds.

Outputs

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

- Species inventories and abundance data
- Analysis of seasonal patterns
- Multivariate statistical analyses to identify biodiversity patterns
- Update on areas of importance to spawning adults and to juvenile stages of commercially important fish and crustaceans.

Schedule and Cost

The survey programme is scheduled to last for **20 months**

The estimated cost is **HK$3 million**

Funding Themes

- **Habitat Enhancement**
- **Scientific Research and Studies**

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Figure D3
Coastal Ecology Study (Example Initiative Case Study)

Rationale and Objectives

Corals are most diverse northeast waters of Hong Kong. Other communities or patches of coral occur in southern, southeastern waters with less found in western waters of Hong Kong. In general, the location of main coral areas in Hong Kong are known through various academic and consultancy studies (including AFCD commissioned) but information gaps remain and there is scope to improve the detail of scientific knowledge of the occurrence, distribution and ecological attributes of these communities and associated fish.

A Coastal Ecology Study is proposed for the purpose of contributing to conservation efforts and planning decisions including for use in future EIA studies and coastal management planning as well as long term monitoring purposes. The study will be divided into stages to cover different geographies of Hong Kong using available funding. Objectives are:

- Survey the selected region of Hong Kong including providing coverage of previously unsurveyed coastlines.
- Update information on distribution and status of coral communities.
- Establish fixed sites for long-term monitoring of coral status.
- Characterise the abundance and diversity of fish assemblages at coral areas.
- Make the data publically available.

Schedule and Cost

The survey programme is scheduled to last for **12 months**

The estimated cost is **HK$5million**

Funding Themes

- **Habitat Enhancement**
- **Scientific Research and Studies**
- **Education and Eco-tourism**

Coral Specialist

BRUVS

Scope and Methods

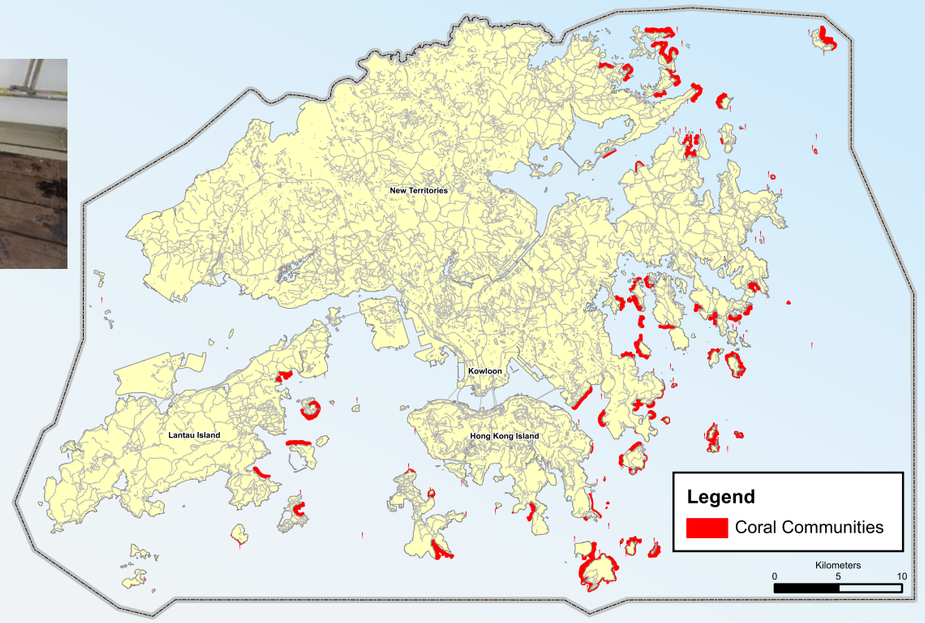
Coral Surveys will be conducted along the coast by coral scientists on SCUBA with underwater cameras, creating a permanent record of observations.

Baited Remote Underwater Video Station (BRUVS) are stationary seafloor camera stations used to attract and record fish. BRUVS can be used at night with lights. BRUVS is a common fish-surveying tool worldwide and increases number of sampling hours compared to diving and records large species which normally avoid SCUBA divers.

Standardized methodology will be used.

- Divers will deployed to desired depth/position, data recording (geo-referenced photo and footage).
- BRUVS deployed for set times.

Imagery is analysed post-survey by coral and fish specialists using Coral Point Count (CPC) software, photogrammetry (3D reconstruction and image mosaicking) software, fish analysis software (eg. SeaGIS software EventMeasure)



Outputs

Avariety of outputs could be generated by the study

- Coral diversity
- Coral cover and seabed attributes
- Size frequency distribution of coral populations
- Coral distribution mapping
- Coral health and condition / disease and predators

- Seabed imagery mosaics and models
- Geo-referenced imagery database base
- Shared database
- Statistical analysis to research biodiversity patterns

- Fish diversity
- Fish abundance
- Fish biomass
- Fish Distribution mapping

HONG KONG WIDE	■ Research on sediment quality status of North Lantau soft shores **Hong Kong waters** ■ Research to identify and characterize fish spawning and nursery grounds in Hong Kong waters ■ Coastal ecology study on the composition, abundance, distribution and attributes of corals and reef fish in Hong Kong ■ Seabed ecology study on attributes, recovery and succession of benthic organisms in Hong Kong waters ■ Research on composition, distribution ecological attributes and status of Hong Kong mangrove habitats ■ Research on Intertidal and Subtidal Habitats and Species such as Seagrass; Corals; Horseshoe crabs; Estuarine fauna; Marine fishes such as seahorse and pipefish; Amphioxus; Intertidal assemblages at mudflats and mangrove areas; Intertidal assemblages at sandy shore and hard substrates; Subtidal (including both hard and soft substrate assemblages ■ Underwater sound exposure level mapping study of Hong Kong waters ■ Study on light attenuation and Photosynthetically Active Radiation (PAR) availability in Hong Kong waters to understand light limitations on benthic primary producers (e.g. corals, seagrass, macroalgae and microphytobenthos) ■ Genetic study to research connectivity and larval dispersion patterns (e.g. coral populations) ■ Satellite tagging studies on marine mammals or turtles ■ Research on octocoral taxonomy and diversity in Hong Kong waters ■ Ecotoxicological research on the sensitivity of Hong Kong marine species to spilled hydrocarbons ■ Research on effectiveness of Marine Parks (e.g. enhancement of fisheries resources) ■ Marine Science Technology Innovation (e.g. Acoustic monitoring of pelagic fish assemblages, Baited Remote Video Stations (BRUVS) for fish surveys, ROV surveys for benthic habitat survey, night vision/thermal imaging for CWD survey, noise modelling
HONG KONG / PRE	**Hong Kong/Pearl River Estuary** ■ Underwater noise modelling of marine vessel traffic and implications with reference to dolphin and fish hearing and other sensitivities ■ Information sharing on CWD studies and status on both sides of HK / PRE border ■ CWD Conservation Framework for the PRE including training programme, consultation with relevant researchers, workshops/scientific conference, cumulative impact assessment, action plans to curtail and potentially reverse decline of CWD in Hong Kong and PRE in the form of a conservation strategy (if a decline is identified) and workshops ■ Research programme on marine mammals for western Hong Kong waters and wider PRE (population monitoring and behavioural studies) ■ Research programme on fisheries resources for western Hong Kong waters and wider PRE

D1.1.3 Environmental Education & Eco-tourism Theme

An indicative list of example initiatives, which is not intended to be exhaustive but demonstrates the potential range of opportunities under the MEFES are provided in *Table D3.*

An education and ecotourism initiative example is provided in more detail in *Figure D4*.

Figure D4
Eco-tourism Project (Example Initiative Case Study)

Rationale and Objectives

Ecotourism is “environmentally responsible travel to natural areas, in order to enjoy and appreciate nature (and accompanying cultural features, both past and present) that promote conservation, have a low visitor impact and provide for beneficially active socio-economic involvement of local peoples” (IUCN Ecotourism Programme 1993 definition). Conducted properly, ecotours can foster an appreciation of nature and encourage people to be more conservation-minded in day-to-day life.

The North Lantau coast has many marine sites of recognized eco-tourism potential for interest local and overseas recreational users. Sites vary in accessibility and suitability for different potential user groups (eg hikers, school groups), ranging from relatively easily accessible (eg Yam O and Tung Chung) to more distant locations that are accessible by longer hikes or by boat (eg San Tau, Sham Wat Wan).

As ecotourism develops in this part of Hong Kong, there is an expressed need to ensure quality eco-educational resources are in place to ensure the success of the visitor experience and low impact of this activity on the environment they come to see. It is proposed to develop innovative eco-educational material to support ecotourism along the North Lantau coast. The project will be conducted in liaison with e-NGOs, tertiary education institutions and educationalists, software developers and in consultation with local residents. Objectives are:

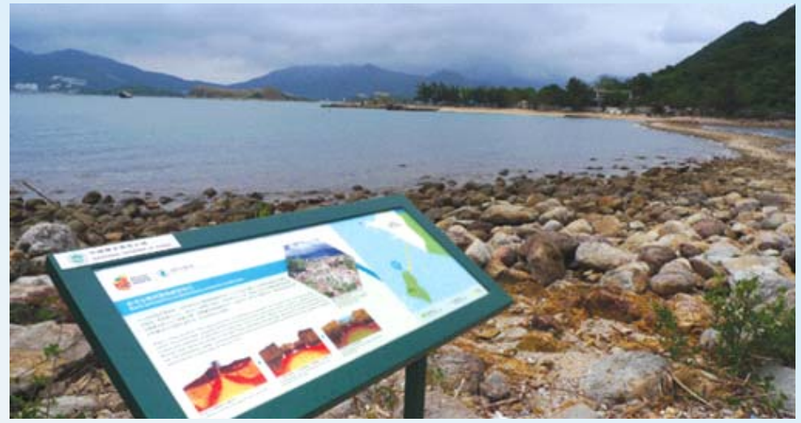
- Identify suitable locations of interpretative signs and panels.
- Develop quality digital media for mobile devices to convey site and conservation information to enrich the visitor experience (eg apps, augmented reality app, QR code accessible multimedia segments).
- Develop eco-educational resources for teachers (eg example lesson plans and nature explorer activity sheets).
- Publicize and make resources freely accessible online.

Schedule and Cost

The project is scheduled to last for **2 years**

The estimated cost is **HK$2.5 million**

Example of Eco-education interpretative board in Australia



Example of Eco-education interpretative board in Hong Kong

Example of Eco-education interpretative board in the United States

Scope and Methods

The project may:

- Develop and deploy interpretative signage (eg ecosystem functioning, species of special interest, commonly-seen marine and bird species, does and don'ts, conservation issues and threats, information on recent infrastructure development projects, heritage values and history etc).
- Develop video and commentary segments on environmental and heritage aspects of sites with QR code signage for on site access.
- Develop apps (eg species identification guide and maps with route guides, augmented reality, does and don'ts etc).
- Provide “nature explorer treasure hunt” points for children activities (eg animal picture etching boards, punch-stamps)
- Provide selected materials in a range of languages – Chinese (Cantonese, Putonghua), English and other Asian languages (eg Japanese, Korean)
- Develop dedicated website.

Funding Themes

Education and Eco-tourism

Available on the App Store

ANDROID APP ON Google play

Outputs

Successful outcome of the project may include:

- Development of informative and engaging eco-education resources for enhancement of visitor experience on ecotours or private visits.
- Positive reviews of the visitor experience and educational materials

Table D3 ***Example Initiatives under the Environmental Education & Eco-tourism Theme***

PROJECT AREA	**EDUCATION AND ECO-TOURISM** ■ Dolphin Stranding Response and Education Programmes ■ Eco-tourism (marine-based) to convey information on marine ecological resources and conservation messages
HONG KONG WIDE	**North Lantau coast and Northwest Lantau Waters** ■ Support AFCD / NGOs to conduct training programmes for frontline protection staff as capacity building on dolphin conservation ■ Skipper Workshop on Dolphin-Friendly Measures ■ Eco-trails / Interpretative Trails Design and Implementation (e.g. routing design considering different user groups, accessibility facility upgrades, landscape planting, trail interpretative boards and signage) ■ Eco-tourism and Eco-trekking Programmes (e.g. guided tours either land-based or marine-based to convey information on marine ecological resource and conservation messages, training activities for capacity building to eco-tour guides) ■ Marine and Coastal Cleanup Campaigns to improve public awareness and cleanup habitats. Marine litter and ecological surveys could be co-conducted ■ Public education programme and publication of education materials (e.g. exhibitions, roadshows, school and outreach programmes, community volunteer programmes and guided eco-tours) ■ Promotion of eco-tourism in the Marine Protected Areas with valid permits and daily quota (e.g., dolphin watching adhering to dolphin watching codes of conduct) ■ Collaborations with AFCD and NGOs to provide training to local dolphin watching tour operators (for example at Tai O) with brochures for visitors to educate them on the code of conduct to be observed during dolphin watching and CWD conservation ■ Development of eco-tourism to raise public awareness on sustainable fishing operations (e.g. development of fisheries museum, arrangement of guided tour for experiencing of fishing operation) ■ Horseshoe crabs breeding and release programme at North Lantau soft shores. ■ Public Education Programme and Publication of Education Materials ■ Dolphin Stranding Response and Education Programmes ■ Adopt a Dolphin Campaign (e.g. receive regular updates about an adopted animal to raise public awareness)
HONG KONG/ PRE	■ Public Education Programme and Publication of Education Materials ■ Collaborations with NGOs to provide training to PRE dolphin watching tour operators ■ Skipper Workshop on Dolphin-Friendly Measures

D1.2 POTENTIAL PERFORMANCE INDICATORS

D1.2.1 Marine Habitat & Resource Conservation & Enhancement Theme

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

Baseline Biodiversity Studies

- Completion of baseline monitoring studies and provision of a database of the findings obtained;
- Publication of materials detailing baseline findings and implications on the new Marine Park design and designation; and
- Development and implementation of usage zoning plan and management plan within the new Marine Park and new marine park matrix.

Enhancement Measures Design

- Number of appropriate enhancement measures identified;
- Number of pilot schemes / trials conducted and performance outcomes;
- Number of recommended enhancement measures for full implementation;
- Completion of design of the artificial reef programme and provision of a database of the findings obtained;
- Completion of design of the fish restocking programme and provision of a database of the findings obtained;
- Completion of design of the eco-enhancement of seawall and provision of a database of the findings obtained; and
- Completion of design of ecological enhancement at potential recipient site for coral translocation.

Enhancement Measures Implementation

- Number of enhancement measures fully implemented; and
- Performance outcomes, alterations and recommendations (including longevity, sustainability and success).

D1.2.2 Scientific Research & Studies Theme

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

- Regular (e.g. quarterly) reporting / presentation of research progress / findings;
- Number of research studies completed;
- Number of publications released from the research studies;

- Number of workshops / trainings / scientific conferences organized and number of participants involved ;
- Number of innovation technologies successfully developed and adopted; and
- Derivation of and regular (e.g. quarterly) progress reports on the implementation of CWD Conservation Framework for the PRE.

D1.2.3 Environmental Education & Eco-tourism Theme

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

- Number of eco-trails / interpretative trails designed and implemented;
- Number of eco-tourism and eco-trekking programmes completed and number of participants;
- Number of cleanup campaigns completed and number of participants;
- Number of public education programmes completed and number of participants;
- Number of published education materials;
- Number of skipper workshops completed and number of participants;
- Number of frontline staff trainings completed and number of participants;
- For Dolphin Stranding Response and Education Programmes:
  - Reduce response time dolphin stranding;
  - Number of veterinary programmes supported and number of participants;
  - Develop and set up of a centralised laboratory for dolphin necropsy and pathological investigations;
  - Completion of a standardised dolphin necropsy protocol; and
- Number of regional marine mammal stranding response workshops completed and number of participants.