Ministry of Fisheries and Aquatic Resource, Sri Lankan Government.

Asian Development Bank (ADB).

மீன்பிடி மற்றும் நீரியல் மூலவளங்கள் அமைச்சு, இலங்கை அரசாங்கம்.
ஆசிய அபிவிருத்தி வங்கி (ஆ.அ.வ).

Annexes

ඇමුණුම

பின்னிணைப்பு

Environmental Impact Assessment Report
පාරිසරික බලපෑම් ඇගයීම් වාර්තාව
சூழல் தாக்க மதிப்பீட்டு அறிக்கை

27.01.2020

Northern Province Sustainable Fisheries Development Project- Point Pedro Port Development Project

උතුරු පළාත් තිරසාර ධීවර සංවර්ධන ව්‍යාපෘතිය - පේදුරුතුඩුව වරාය සංවර්ධන ව්‍යාපෘතිය
வட மாகாண நிலைபெறுதகு மீன்பிடி அபிவிருத்தி கருத்திட்டம் - பருத்தித்துறை துறைமுக அபிவிருத்தி கருத்திட்டம்

Submitted to:
Coast Conservation and Costal Resources Management Department, 4th Floor, New Secretariat Building, Maligawatte, Colombo.
වෙරළ සංරක්ෂණ සහ වෙරළ සම්පත් කළමණාකරණ දෙපාර්තමේන්තුව, 4 වන මහල, නව ලේකම් කාර්යාලය,මාළිගාවත්ත.කොළඹ.
கடற்கரை பாதுகாப்பு மற்றும் கடலோர மூலவளங்கள் முகாமைத்துவ திணைக்களம், 4வது மாடி,புதிய செயலக கட்டிடம், மாலிகவத்தை, கொழும்பு.

EML Consultants
6/10 Rajamahavihare Road, Pitakotte, Sri Lanka
Telephone: +94 115535880/5535881
Fax : +94 112854762, +94 115535887
E-mail : info@emlconsultants.com

Annex 01 - TOR

ඇමුණුම 01 – TOR

பின்னிணைப்பு 01 - ஆய்வு வரையறைகள்

වෙරළ සංරක්ෂණ සහ වෙරළ සම්පත් කළමනාකරණ දෙපාර්තමේන්තුව
கரையோரம் பேணல் மற்றும் கரையோர மூலவள முகாமை திணைக்களம்
COAST CONSERVATION AND COASTAL RESOURCE MANAGEMENT DEPARTMENT

මහවැලි සංවර්ධන හා පරිසර අමාත්‍යාංශය
மகாவலி அபிவிருத்தி மற்றும் சுற்றாடல் அமைச்சு
Ministry of Mahaweli Development and Environment

නැ. පෙ. 556, නව මහලේකම් කාර්යාලය, මාලිගාවත්ත කොළඹ 10.
த. பெ. இல. 556, புதிய செயலகம் மாளிகாவத்தை, கொழும்பு 10.
P.O. Box. 556, New Secretariat, Maligawatta, Colombo 10.
Web : www.coastal.gov.lk E-mail: info@coastal.gov.lk

මගේ අංකය / எனது இல. / My No. PA/10/ms/16/871

ඔබේ අංකය / உமது இல. / Your No.

08.03.2018

General Manager,
Ceylon Fishery Harbour Corporation
Rock House Lane,
Colombo 15

Dear Sir,

The Terms of Reference for Environmental Impact Assessment (EIA) Report on proposed Fishery Harbour at Point Pedro ,Jaffna

This has reference to your application submitted to this department regarding the above subject.

As requested, the Terms of Reference (TOR) including comments given by the Asian Development Bank is submitted herewith for necessary action. You are kindly requested to submit an Environmental Impact Assessment (EIA) Report for the proposed Fishery Harbour at Point Pedro, Jaffna.

The EIA report must address all matters referred to in the TOR and submit the report together with 20 copies in English language to this department to review the report in the Technical Evaluation Committee. Final EIA report should be translated into Sinhala / Tamil copies of them need to be submitted with the soft copy (digital copy) to forward public comments.

Yours faithfully,

A.H. Gamini Hewage
Director (Coastal Resource Management)
For Director General / Coast Conservation & Coastal Resource Management.

Letters - Jaffna

දුරකථන / தொலைபேசி / Telephone
අධ්‍යක්ෂ ජනරාල් பணிப்பாளர் நாயகம் Director General 011 2449197
කාර්යාලය அலுவலகம் Office 011 2449754
ෆැක්ස් අංකය பெக்ஸ் இல. Fax No. 011 2438005

Terms of Reference for Environmental Impact Assessment (EIA) for the Proposed Construction of Fishery Harbour at Point Pedro in Jaffna District

Under the Coast Conservation & Coastal Resource Management Act No 57 of 1981

Project Title	-	Construction of Fishery Harbour
Project Proponent	-	General Manager , Ceylon Fishery Harbour Corporation Rock House Lane , Colombo 15.
Project Location	-	Point Pedro , Jaffna
Project Approving Agency	-	Coast Conservation & Coastal Resource Management Department

Validity

This Terms of Reference is valid only for one and half year period from the date of issues. The Environmental Impact Assessment report should be submitted within the validity period.

Out Line of the EIA Report

- Executive summary

Chapter	1	Introduction
Chapter	2	Description of the project and analysis of alternatives
Chapter	3	Description of the existing Environment of the study area
Chapter	4	Assessment of anticipated environmental impacts
Chapter	5	Proposed Mitigatory measures
Chapter	6	Information Disclosure, Consultation, and Participation
Chapter	7	Grievance Redress Mechanism
Chapter	8	Environmental Management Plan
Chapter	9	Evaluation of Environmental Cost Benefits
Chapter	10	Conclusion

Annexure

- Terms of Reference
- References
- Persons responsible for the study including their work allocations (report should be authenticated by preparers)
- List of work plan, budget time schedules complete set of relevant maps, tables charts, lay out plans and other details.
- List of consultants, acceptance with the signatures.
- And any other supporting annexures required for the main report

Executive Summary

This should be a brief and non – technical summary of the vital features of the report including proposal in a very brief description of its nature, size and location of the project and its importance to the country, description of environment including physical, ecological resources, environment impacts and proposed mitigatory measures. Further summary should also mention about how this project fits into overall national fisheries development plan and its expected contribution to national economy.

Chapter 1 : Introduction

This chapter should include following

1. **Main objectives of the proposed project**
2. **Justification of the project**

   This section should be present the case for justification for implementation of the proposal. Comparison of the social and economical status of the community before the project and after the project should be presented with clear indicators of growth and benefits. Complementary benefits to fisheries and other industries created by the project has to be analyze more.

3. **Objectives of the EIA report**
4. **Aim and scope of the EIA study**

   The purpose of calling for an EIA report, concerns of project approving agencies and the scope within which EIA report which is expected to assess the environmental impacts should be elaborated in this section for the benefit of general public and other readers. Any limitations or any constraints experienced in complying with the Terms of Reference to this EIA should be stated in this section.

   It should be noted that the study area proposed for the EIA study should cover project site , an area extending up to 500m periphery from the boundary of the port , 02 k.m on either sides on coastal belt and 1k.m. toward sea from the boundary of the project site.

5. Brief outline of the Methodologies and Technologies adopted in EIA report preparation
6. Main Beneficiaries
7. Applicable Laws and Regulations- Policy, Legal, and Administrative Framework – should describe national and local legal and institutional framework within which the EIA is carried out. Also should identify any project relevant international environmental agreements to which SL is party to.
8. Conformity to Coastal Resources Management Plan
9. Contingency plan of Marine Environmental Protection Authority and any other conservation/development plans

10. **Approvals and permits required to implement the proposed project**
State all the approvals required for implementing the project and any permits required to be obtained. Furthermore, any initial clearances or consents given by any authority should also be stated here (please include copies of approvals in the annexures- as far as possible provide English translations of it). Clearance obtained or should be obtained from relevant agencies including Marine Environmental Protection Authority, Land Commissioner's Department should be mentioned here.

11. Environmental requirements of donor agencies.

Chapter 2 : Description of the Project and analysis of alternatives

This Section should describe details of the proposed project under following section. The project description should include information about the project at a degree of detail comparable to that obtained for feasibility level reports with necessary maps/charts.

2.1 Description of the project including major components, size and magnitude of each component with permanent and temporary structures including
- Details of breakwaters, quay wall, jetties, harbour basin, entrance canal with justification of geometric features (levels, beam widden etc.).
- Summary of designed features
- Details of shoreline facilities such as loading and unloading areas, Storage, refueling details of other infrastructure facilities
- Details of Dredging and Reclamation

2.2 Detailed drawings (drawings to be provided) indicating all project components indicating breakwaters, jetties, quay walls , harbour basin, entrance canal , proposed dredging areas and dumping sites, access roads to the site, reservation etc. in order to get a clear picture of the project (Sale 1:1000)

2.3 Time period for the development and construction

2.4 Financial allocation and investments

2.5 All other natural resources consumption

2.6 Details of Construction and Operational Activities under following aspects

2.6.1 Water Requirement (Constructional and operational Phase)

- Water requirements / Water Supply system
  - Amount (m^3 / d) / source of water required for the project
    - Construction stage
    - Operation stage
  - if extraction of surface water is envisaged , submit the approval obtained from the relevant Divisional Secretariat Office/ Department of Irrigation
  - If extraction of ground water is envisaged, provide a report from the Water Resource Board / National Water Supply & Drainage Board . This report should include the availability , quality of ground water and safe extraction limits

2.6.2 Waste water (Constructional and operational Phase)

- Type of effluents
- Quantity and quality of waste water to be generated
- Arrangements for disposal of sewage (both during construction and operation),
- Proposed method of treatment and disposal of waste water
- Provide a conceptual plans of waste water treatment methodology with details
- Final point of discharge of treated waste water, methodology according to the National standards.

2.6.3 Solid Waste

- Type and quantities of solid waste generated
- Proposed method of disposal of solid waste,
- Locations identified for temporary collection.
- Proposed sites of disposal
- Sludge disposal method
- Disposal of construction wastes
- If solid waste is disposed through the local authority system , provide the agreement between the relevant Local Authority and the project proponent
- Any attempts for reduce, recycle or reuse of solid wastes

2.7 Requirement of labour during construction and operation period.

- Availability of labour, labour requirement
- Proposed employment of local people during construction and operation

2.8 Details of the methodologies to be adopted during the construction.

Description of the methodologies to be adopted during construction, operation and long term maintenance of major components including land clearing, excavations, dredging, earth moving, filling, construction of access, other facilities and equipments to be used.

2.9 Sources of construction materials and transportation ,Traffic Management plan

Description of sources of construction materials (eg. Armor rocks) and mode of transportation, location of stock piling capacity of access, frequency of transportation , Traffic Management plan

2.10 Infrastructure facilities required / provided

(i) Details of Infrastructure facilities provided by the project

(ii) Electricity requirements / Electricity Supply during construction and operation stages separately

- Source
- Availability
- Alternative source
  - Proofing document from the Ceylon Electricity Board regarding the supply of electricity for the development.

(iii) Details of Access / parking facilities

- Availability of access roads
- Details of any access road to be built/ improved (existing condition and anticipated improvement)
- Beach Access

(iv) Communication

(v) Infrastructure facilities provided by the project to the community and other benefits to the local community

2.11 Occupational health and safety

2.12 Operation and Maintenance

- Requirement of water and sources
- Proposed methods to be adopted in sewage and solid waste discharges
- Waste Oil reception facilities to be employed
- Details pertaining to maintenance dredging

2.13 **Aesthetic and visual environmental**

(i) Whether the view in the immediate vicinity would be altered, improved or obstructed as a result of the proposed structure

2. 14 **Financial Commitments**

Financial commitments to proposed project should be mentioned and fund availability for mitigatory measures and compensation should be stated. Improvements to the social infrastructure in the vicinity if proposed their financial commitments too are expected to be indicated in this section.

2.15 **Future Expansion**

Any future additions, expansion envisaged, if so give details.

2.16 Evaluation of Alternatives

This section should briefly state the basic environmental, engineering and economic parameters and criteria used in the investigation and evaluation of site alternatives. The probable adverse impacts for each alternative site should be summarized. State the criteria for elimination of other alternatives and selection of the proposed site. It may also consider the alternatives to the project site, technology and also include the no project alternative

Chapter 03:

Description of the Existing Environment of study area:

This Chapter should provide information on physical features, ecological resources, and socio-economic aspects, archaeological and cultural considerations likely to be affected by the proposed project during the construction or operational phases.

The information should be presented in a comprehensive format using tables, maps and diagrams. The methods used to collect data should be clearly stated under each category. Any technical terms used should be defined. The boundary for describing existing environment (physical and ecological) should cover an area extending upto 2km periphery from the proposed harbuor.

3.1 Physical Features

3.1.1 Topography and Drainage/Geology/Soil

Information of the project site should be provided to the extent to understand the topographical aspects of the area and most recent topographical map clearly indicating drainage channels , water bodies , marshy area, adjacent land areas at a suitable scale

3.1.2 Geology /Soil

-General geology and bathymetry of the area and unique geological features of the area.

-Soil types/soil profile and distribution

-Present land use of the area

- Present land use of the study are(provide land use map indicating, water bodies, marshy area, drainage canals, access roads, archeological/ cultural important area)
- Zoning (if any)
- Other development projects envisaged in the area.

3.1.3. Hydrology

- Surface water bodies and surface drainage pattern of the area
- Quality and present uses of surface water
- Ground water levels, quality and present uses of ground water
- Whether the area is subjected for flooding and level of flooding
- Areas inundated by such floods (if any)

3. 1. 4. Coastal Features (Environment)

- Coastal bathymetry and sediment transportation
- Coastal features including beach profile
- Beach and nearshore sea bed characteristics
- Relevant oceanographic information including near shore wave height and direction, near shore current velocity, tidal and current characteristics
- Coastal erosion possibilities and coastal erosion records of last ten years
- Prior action which is taken to cope with any severe erosion

- Coastal structures, coastal protection system
- Coastal water quality
- Details of coastal hazard events in the past – Tsunamis, cyclones, storm surges etc. in the region

3.2 Noise Inventory of existing noise sources and noise levels , noise standards

3. 3 Ecological Environment

i Land based Ecological Environment

- Details of existing natural habitats/ecosystems/ coastal vegetation
- List of rare, threatened, endemic flora and fauna within the project site and surrounding area
- Classification and mapping of all habitats
- A report on their ecological statues within the area
- Distribution pattern of vegetation along the coastal area

ii Aquatic Ecological Environment

Details of the coastal environment including coastal and marine habitats, such as coral reef , sea grass beds, fishing grounds, breeding grounds, fishing activities and interactions with coastal protection structures.

Affected fishing grounds due to propose project should be addressed

3.4 **Historical and Archeological significant sites**

-Describe any land marks or evidence of historic, religious, archeological, scientific or cultural importance known to be within the project area and the study site.

- States of their conservation programs (if any)
- Approval obtained from the Archeological Department

3.5 **Social and Economic Aspects**

The section will cover all the areas that may have impacts by the projects and it is activities.

- Brief socio-economic profile of the area
- Nature of households and principle economic activities
- Existing infrastructure facilities
- Description of existing fishing activities in the area including type of fishing activities, no of fishermen , number of fishing crafts etc.
- Transportation , communication, power
- Housing /sanitation, water supply, agriculture
- Other main economic activities
- Existing beach access

3.6 **Detail of Disaster**

Presently experienced disasters and their frequency

3.7 Existing Environmental Issues and Social Conflicts

4. ASSESSMENT OF ANTICIPATED ENVIRONMENTAL IMPACTS

This chapter should show the overall effects of the project on the individual environmental components. Impacts should include the direct and indirect, long and short-term positive and negative effects. Significance of impacts should be assessed using appropriate techniques. When describing the impacts, indicate which are irreversible or unavoidable and which can be mitigated to the extent possible. Impacts should be discussed in the order of severity.

Impacts shall include project – environment interactions (impacts of the project activities on the environment) and environment – project interactions (impacts of the environment on project activities)

Special attention should be given to following aspects;

4.1 Physical Resources

Impacts to the beach and shoreline

- Erosion of adjacent beaches lands due to change of current wave height regimes attributed to the habour structures,
- Erosion effects in either sides of the coastal stretch during construction period as well as in long term.
- Coastal erosion / accretion and bathymetric changes (on either sides of the harbour breakwaters) in the area
- Changes in drainage patterns,
- Changes in hydrological pattern such as currents and wave patterns, wave height and direction, near shore current velocity, direction and tides,
- Changes Sediment transport patterns on both periods(short term and long term)
- Impacts on sewage or waste water, solid disposal, waste oil spills, surface runoff on coastal environmental and coastal waters,
- impacts on water quality
- Impacts due to coastal hazard events- tsunami, cyclones, storm surges etc. in the area and sea level rise.

4.2 Transportation of materials- Impacts on buildings, roads and other properties during transportation of material from the source location to the construction site.

4.3 Handling and stock piling of materials- Impacts of material handling stock piling at the site or in the vicinity.

4.4 Impact of sewage , waste oil spills, surface runoff , waste water disposal on the environment

4.5 Anticipated problems related to solid waste disposal

4.6 Ecological Resources (Land based and Marine)

Impacts on fauna and flora and their distribution

- impacts on vegetation in the coastal belt and special habitats / ecosystems including coral reef in the study area
- impacts to any rare, threatened, endemic flora and fauna in the study area

4.7 Impacts related to noise, vibration, dust, and air quality generation.

4.8 Impacts due to changes of land use

4.9 **Socio-Economic Aspects**

- An assessment of direct and indirect impacts of the project on other development project within the area
- Impact on fishing industry including beach scene fishery related activities. and fishing community (during construction and operation)
- Impacts to present beach users in the area
- Impacts in relocation and loss of livelihood
- Impacts on existing fishery activities during the construction stage of the proposed project and the methodologies of operating of fisheries activities in alternative places.
- Details on generate more employment to the local community in the vicinity

4.10 **Impacts on Archeological Cultural Resources**

Potential impacts which may effect to the qualities and value of any archaeological cultural resources should be discussed.

4.11 Any other impacts not listed here but may be significant.

5. PROPOSED MITIGATION MEASURES

This chapter should set out the proposed measures to minimize the impacts identified in Chapter 4 to acceptable levels including conformity to Sri Lankan standards. In Chapter 5 mitigation measures should be given in the same order the impacts appeared in the Chapter 4. Alternative methods of mitigation should be discussed and the effectiveness of the proposed measures that are to be provided should be stated. Mitigation methods should be defined in specific practical terms. A rationale should also be presented for selection of chosen mitigatory measures.

6. ENVIRONMENTAL MANAGEMENT PLAN

An Environmental Management Plan (EMP) should be submitted including the followings:

i) A summary of the anticipated significant adverse environmental impacts together with the mitigation measures for each anticipated significant adverse environmental impacts.

ii) Monitoring plan including;

   a) parameters to be monitored
   b) proposed locations of sampling points
   c) frequency of monitoring
   d) responsible agency / agencies
   e) facilities available with such agencies
   f) availability of funds, expertise and facilities

iii) Implementation arrangement including;

a) implementation schedule of the impact mitigation plan showing, facing and co-ordination with overall project implementation.
b) institutional framework, namely who is responsible for carrying out the mitigation and monitoring
c) capital and recurrent costs to implement mitigation and monitoring measures described above. Identify the availability of source of funds to implement the mitigation measures.

7 INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

Should describe

(i) The process undertaken during project design and preparation to engage stakeholders, including information disclosure and consultation with affected persons and stakeholders
(ii) Summarize comments and concerns received and describe how these comments have been addressed in project design and mitigation measures, with special attention paid to the needs and concerns of vulnerable groups, including women, the poor, and indigenous peoples; and
(iii) Describe the planned information disclosure measures (including type of information to be disseminated and method of dissemination) and the process for carrying out consultation with affected people and facilitating their participation during project implementation

8. GRIEVANCE REDRESS MECHANISM

This section describes the grievance redress framework (informal and formal channels) setting out the time frame and mechanism to resolve complaints about environmental performance.

9 CONCLUSION AND RECOMMENDATIONS

The environmental acceptability of the proposed project and key findings and recommendations of the assessment should be given. Any programme to improve general environmental conditions can also be stated here.

Annex 02- Project

Related International and Regional Agreement

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பின்னிணைப்பு - 02

கருத்திட்டம் சார்ந்த சர்வதேச மற்றும் பிராந்திய ஒப்பந்தம்

Annex 2: Project relevant International and Regional Agreements to which Sri Lanka has acceded to or ratified.

Agreement	Ratification Date	Objective
Atmosphere		
Montreal Protocol on Substances That Deplete the Ozone Layer (1987).	12 Dec 1989	Reduction and the eventual elimination of the consumption and production of Un-anthropogenic Ozone Depleting Substances.
Vienna Convention for the Protection of the Ozone Layer (1985).	15 Dec 1989	Protection of the Ozone Layer through international cooperation in the areas of scientific research, monitoring and information exchange.
United Nations Framework Convention on Climate Change (UNFCCC-1992).	23 Nov 1993	Stabilization of greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climatic systems.
Kyoto Protocol (1997).	3 Oct 2002	The Annex 1 parties (Developed Countries) to reduce their collective emissions of greenhouse gases by at least 5% of the 1990 level by the period 2008 –2012.
Biodiversity		
International Plant Protection Convention (1951).	12 Feb 1952	To maintain and increase international co-operation in controlling pests and diseases of plants and plant products, and in preventing their introduction and spread across national boundaries.
Plant Protection Agreement for Asia and Pacific Region (1956).	27 Feb 1956	To prevent the introduction into and spread within the region of destructive plants.
Convention on Fishing and Conservation of the living resources of the high seas (1958).	30 Oct 1958	To solve the problems involved in the conservation of the living resources of the high seas through international co-operation considering that through the development of modern techniques some of these resources are in danger of being over-exploited.
Convention concerning the protection of the World Cultural and Natural Heritage (1972).	6 Jun 1980	To establish an effective system of collective protection of the cultural and natural heritage of outstanding universal value organized on a permanent basis

		and in accordance with modern scientific methods.
CITES - Convention on International Trade in Endangered Species of Wild Fauna & Flora (1973).	4 May 1979	To protect certain endangered species from being over-exploited by adopting a system of import/export permits, for regarding the procedure.
Convention on the Conservation of Migratory Species (1979).	6 Jun 1990	To protect those species of wild animals which migrate across or outside national boundaries. This includes a number of bird species, marine (e.g. whales, sharks) and terrestrial mammals, marine turtles and bats.
Convention on Biological Diversity (CBD-1992).	23 Mar 1994	Conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including appropriate access to genetic resources and by appropriate transfer of relevant technologies and appropriate funding.
Agreement to implement the provisions of the United Nations Convention on Law of the Seas relating to the conservation and management of straddling and migratory fish stocks (1995).	24 Oct 1996	To ensure long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks through effective implementation of the relevant provisions of the United Nations Convention on the Law of the Sea.
Convention on Wetlands of International Importance especially as Waterfowl Habitat (RAMSAR)	15 Oct 1990	To ensure long-term conservation and sustainable use of wetlands and the flora and fauna that live and utilize these systems. Sri Lanka has six designated RAMSAR sites, one of which is the Vankalai Sanctuary, which is located with the NPSFDP (Manner district). No project investment is located within or in close proximity to this site.
Marine and Coastal		
Convention on the Continental Shelf (1958).	30 Oct 1958	To define and delimit the rights of States to explore and exploit the natural resources of the continental shelf

Convention on the High Seas (1958).	30 Oct 1958	To codify the rules of international law relating to the high seas
United Nations Convention on the Law of the Sea (1982).	19 Jul 1994	To protect the economic, environmental, and national security concerns of coastal states and strengthen state sovereignty over enforcement of environmental regulations up to 200 miles offshore (the Exclusive Economic Zone, EEZ). To protect the marine environment, promote the maintenance of international peace and security, protect the freedom of navigation on the high seas as well as the right of innocent passage, including non-wartime activities of military ships.
Agreement relating to implementation of part XI of the United Nations Convention on the Law of the Sea (1994).	28 Jul 1995	To provide for revised modalities for the implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982, in particular the International Seabed Authority.
The international convention and protocols for the Prevention of Pollution from ships (MARPOL), (1973) .	Still ratifying different articles.	It was developed by the International Maritime Organization in an effort to minimize pollution of the oceans and seas, including dumping, oil and air pollution. The objective of this convention is to preserve the marine environment in an attempt to completely eliminate pollution by oil and other harmful substances and to minimize accidental spillage of such substances
Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter at sea (London Convention and Protocol) (1974)	1996	Its objective is to promote the effective control of all sources of marine pollution and to take all practicable steps to prevent pollution of the sea by dumping of wastes and other matter.
The International convention for safety of life at sea – SOLAS (1974).	In effect since 1974.	Sets minimum safety standards in the construction, equipment and operation of merchant ships. The convention requires signatory flag states to ensure that ships flagged by them comply with at least these standards.

FAO Code of Conduct for Responsible Fisheries (CCRF)	Since 1998	The code is voluntary though it may contain legally binding provisions. The code includes a range of guidelines for fishing activities and for aquaculture. The FAO also acts as secretariat for a number of species International Plan of Action (e.g. Sea birds, Sharks, sea turtles and Illegal, Unreported and Unregulated (IUU) fishing).
Terrestrial		
United Nations Convention to Combat Desertification (UNCCD- 1994).	9 Dec 1998	To combat desertification and to mitigate the effects of drought in countries experiencing serious droughts and/ or desertification with the final aim being to prevent land degradation in the hyper arid, arid, and semi-arid, dry sub humid areas in the countries that are parties of the Convention.
Chemicals		
International Convention for the Prevention on Pollution from Ships (MARPOL 1973).	24 Jun 1998	To preserve the marine environment by achieving complete elimination of international pollution by oil and other harmful substances and the minimization of accidental discharge of such substances.
Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and Their Disposal (1989).	28 Aug 1992	To reduce trans boundary movements of hazardous waste; to dispose of hazardous and other waste as close as possible to the source; to minimize the generation of hazardous waste; to prohibit shipments of hazardous waste to countries lacking the legal, administrative and technical capacity to manage & dispose of them in an environmentally sound manner; to assist developing countries in environmentally sound management of the hazardous waste they generate.
Rotterdam Convention (1998)	19 Jan 2006	To promote shared responsibility and cooperative efforts in the international trade of certain hazardous chemicals, to protect human health and the environment; to contribute to the environmentally sound use of those hazardous chemicals by facilitating information exchange, providing for a

		national decision- making process on their import/export.
Stockholm Convention on Persistent Organic Pollutants (POPs) (2001).	22 Dec 2005	To protect human health and the environment from persistent organic pollutants (POPs).

Annex 2.1

Approval from National Water Supply and Drainage Board

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பின்னிணைப்பு 2.1

தேசிய நீர்வழங்கல் மற்றும் வடிகாலமைப்புச் சபையிடமிருந்தான அனுமதி

National Water Supply & Drainage Board
Regional Manager's Office, Jaffna

7305

Email: rmjaffna@yahoo.com

Regional Office,
Sivan Pannai Road,
Jaffna

Tele : 021-222 3742
: 021-222 8962
Fax : 021-222 7965

My No: RM-J/COM/2018/01 **Date** : 28.09.2018

Acting Project Director,
Development and Rehabilitation of Fishery Harbours, Anchorages & Landing Site Projects.

Water Supply Requirement for Point Pedro Fishery Harbour in Jaffna District

This refers to your letter No. MFARE/ADB/NPSFDP/OCB/Output 1/CP-01 dated 20.09.2018 regarding the above,

The estimated water requirement for consumption, harbour operations and vessels (40 000 l/day - 50 000 l/day) could be supplied by 2023 by the existing water supply scheme or through ongoing Jaffna Kilinochchi Water Supply and Sanitation Project.

Eng. E. Jegatheesan
Regional Manager (Upper)

Eng. E. Jegatheesan
Regional Manager (Upper) (J)
NWS & DB
Jaffna

Cc:
DGM (N) - for your information pls.

Annex 2.2

DCC Approval for the NP sustainable fisheries development project

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பின்னிணைப்பு 2.2
வட மாகாண நிலைபெறுதகு மீன்பிடி அபிவிருத்தி கருத்திட்டத்திற்கான
யாழ்ப்பாணம் மாவட்ட ஒருங்கிணைப்பு குழுவின் அனுமதி

දේශීය / දිස්ත්‍රික් ලේකම්
அரசாங்க அதிபர்/மாவட்டச் செயலாளர்
Government Agent / District Secretary
දුරකථන
தொலைபேசி
Telephone } 021-222 2235

දුරකථන සංඛ්‍යා
பொது தொலைபேசி
General Telephone } 021-222 2233
021-222 2234

ෆැක්ස්
பக்ஸ்
Fax } 021-222 2355

දිස්ත්‍රික් ලේකම් කාර්යාලය, යාපනය.
மாவட்ட செயலகம், யாழ்ப்பாணம்.
District Secretariat, Jaffna.

E-mail: gajaffna@slnet.lk

මගේ අංකය
எனது இலக்கம்
My No. } JF/DPS/Sus. Fis. Dev/V/10/2018

ඔබේ අංකය
உமது இலக்கம்
Your No. }

දිනය
திகதி
Date } 23.04.2018

Project Director
Sustainable Fisheries Development Project,
Ministry of Fisheries & Aquatic Resources Development,
Colombo -10.

Approval for the Northern Province Sustainable Fisheries Development Project by the District Coordinating Committee Meeting in Jaffna

This has reference to the above caption,

As per the government intention is to support northern fishermen by developing infrastructures such as Point Pedro Harbour and several Anchorages under the Northern Province Sustainable Fisheries Development Project with taking financial support from the Asian Development Bank (ADB) in Jaffna District, the project details have been enclosed herewith.

The proposed ADB funded project therefore, aims to develop and strengthen harbour, anchorages and landing side by protection through breakwaters, dredging of basins, access channels and development off shore facilities. It is proposed to develop them in several sites in Jaffna district. That's why, the project proposals have been submitted to the District Coordinating Committee Meeting on 03.03.2018 and the approval for the projects (14 projects) have been taken from the committee on the same date to implement in Jaffna near future.

In this regard, we would be really grateful if you could consider the above matter immediately and steps be taken for the implementation of this project in Jaffna.

N. Vethanayahan,
Government Agent/ District Secretary,
Jaffna District.

N.VETHANAYAHAN
GOVERNMENT AGENT/
DISTRICT SECRETRY
JAFFNA DISTRICT

Copy:

1. Secretary - Ministry of Fisheries & Aquatic Resources Development - information please.

Annex 2.3

Approval from Ceylon Electricity Board

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பின்னிணைப்பு 2.3
இலங்கை மின்சார சபையிடமிருந்து அனுமதி

இலங்கை மின்சார சபை
CEYLON ELECTRICITY BOARD

Your ref:

My ref: NP/DGM/CE(Com)/E.01/18

Date: October 4, 2018

Eng. Prabath Ranaweera
Acting Project Director
Development and Rehabilitation of Fishery Harbour,
Anchorages & Landing Site Project,
Ministry of Fisheries & Aquatic
Resources Development and Rural Economy,
1st Floor, New Secretariat, Maligawatte, Colombo 10.

Power Requirement for Point Pedro Fishery Harbour in Jaffna District

This has reference to your letter no. MFARE/ADB/NPSFDP/OCB/Output1/CP-01 dated 20th September 2018 regarding the above please.

Your power demand requirement of 800 kVA to the Point Pedro Harbour can be provided subjected to the following please

1. Payment of CEB estimates prevail in that year.
2. Construction of a meter cubical according to the drawing furnished by CEB.
3. A Charted Engineer report is having certification.

The construction would take roughly around 3-5 weeks.
Therefore make your application beforehand bearing the Commission date in mind please.
Please contact the undersigned for any further clarification.

Eng. S. Prabaharan
Chief Engineer (Commercial) - Northern Province
CEYLON ELECTRICITY BOARD

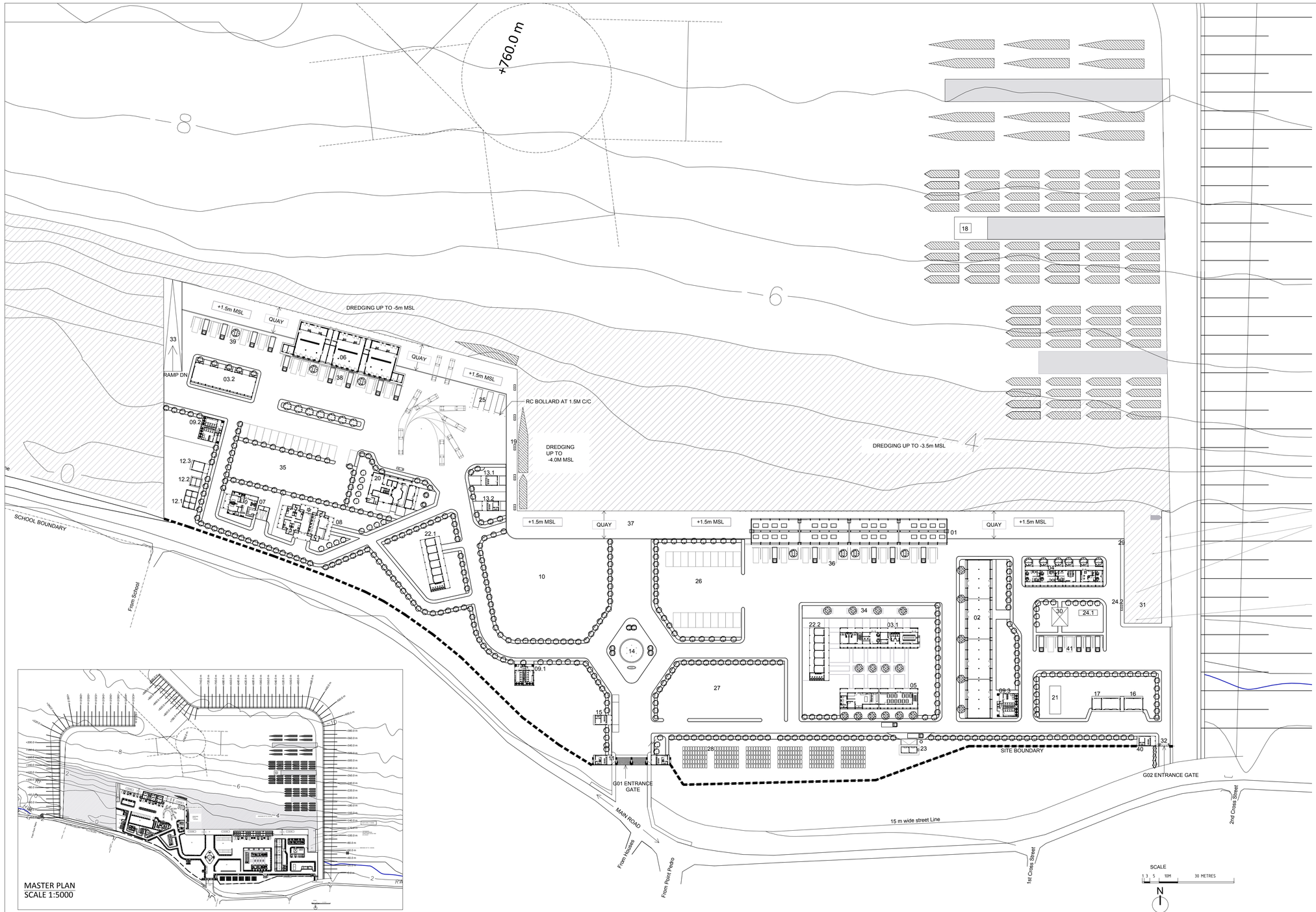
Eng. S. Prabaharan
Chief Engineer (Commercial) - NP
Ceylon Electricity Board.

OFFICE OF THE CHIEF ENGINEER (COMMERCIAL) - NORTHERN PROVINCE
First Floor, Commercial Unit, Old Park Road, Jaffna 40000, Sri Lanka.
Tel: +94 21 222 2496, 222 0887, Fax: +94 21 222 2497, 222 0887, e-mail: eccomnp@ceb.lk | www.ceb.lk |

Annex 03- Detail Layout Plan

ඇමුණුම 03 - විස්තරාත්මක සැලැස්ම

பின்னிணைப்பு 03 - விளக்க உருவரைத் திட்டம்



PPD MASTER PLAN:

REF NO: PPD-AR-R17
SCALE :- 1:1000

LEGEND

01 - AUCTION HALL
02 - NET MENDING HALL
03.1 - ADMIN BUILDING 01
03.2 - AREA FOR ADMIN BUILDING 02 (UNDER PHASE II)
04 - SURVEILLANCE BUILDING
05 - CANTEEN & COMMUNITY HALL
06 - OFF LOADING BUILDING
07 - HARBOUR MANAGER QUARTERS
08 - BACHELORS QUARTERS
09.1 - PUBLIC TOILET BLOCK-TYPE 01
09.2 - PUBLIC TOILET BLOCK-TYPE 02
09.3 - PUBLIC TOILET BLOCK-TYPE 02
10 - AREA FOR PUBLIC RECREATIONAL ZONE DEVELOPMENT WITH RESTAURANTS
11 - ENTRANCE GATE HOUSE & SECURITY OFFICE
12.1 - WATER SUMP
12.2 - WATER TANK
12.3 - PUMP ROOM
13.1 - FUEL OFFICE
13.2 - SATELLITE OFFICE
14 - CENTER FEATURE
15 - WEIGHT BRIDGE & CONTROL ROOM
16 - GENERATOR ROOM
17 - TRANSFORMER ROOM & PANEL ROOM
18 - MARSHAL POINT ROOM
19 - FUEL STATION & FUEL DISPENSER UNIT
20 - CUSTOM BUILDING
21 - AREA FOR WASTE WATER TREATMENT PLANT
22.1 - SALES OUTLETS & COMMERCIAL SPACE 01
22.2 - SALES OUTLETS & COMMERCIAL SPACE 02
23 - GARBAGE COLLECTION
24.1 - FUEL TANK (KEROSENE) SUPPLY FOR OFRP BOATS
24.2 - FUEL (KEROSENE)DISPENSER UNIT SUPPLY FOR OFRP BOATS
25 - FUEL STORAGE: 3 TANKS OF 36000L
26 - FREEZER TRUCK PARKING
27 - CAR PARK
28 - SOLAR FARM
29 - CONCRETE APRON FOR PEDESTRIANS
30 - AMBALAMA FOR FISHERMEN TO REST(GAZEBO) (UNDER PHASE II)
31 - BERTHING FOR OFRP BOATS
32 - FUTURE CONNECTION TO MAIN ROAD
33 - SLIPWAY
34 - PLANTER WITH MASONRY BUILT-IN SEAT AROUND
35 - AREA FOR COLD STORAGE & ICE PLANT
36 - LOADING AREA OF AUCTION HALL
37 - PROPOSED QUAY WALL
38 - LOADING AREA OF OFFLOADING BUILDING
39 - DEDICATED PARKING AREA FOR OFFLOADING BUILDING
40 - AREA FOR SECURITY OFFICE 01
41 - DEDICATED PARKING AREA FOR OFRP BOATS

IMPORTANT NOTE:

WHERE QUAY WALL TOP LEVEL IS INDICATED ON 1.5MSL THE FILL LAND OF SHORE FACILITIES IS INDICATED AS A SLOPE OF 1:50 TOWARDS THE QUAY. IN THIS CONTEXT WHERE BUILDING FFL'S ARE INDICATED AS ± 0.00, THE 0 LEVEL TO BE ESTABLISHED AS A +0.300m ABOVE HIGHEST GROUND LEVEL OF THE FORMULATED LEVEL UNLESS OTHERWISE MENTIONED.

GUIDE LIGHT TO BE ACCOUNTED AT A SUITABLE LOCATION BY THE SPECIALIST. A STRUCTURE TO MOUNT GUIDE LIGHT IS PROVIDED IN STRUCTURAL LAYOUT.

REFER TO DRAWING NO :NPSFDP-JAF-PPD-FH-AR-1100 FOR ENTRANCE GATE DETAILS.

TENDER

NORTHERN PROVINCE SUSTAINABLE FISHERIES DEVELOPMENT PROJECT
DETAILED ENGINEERING DESIGN OF FISHERY HARBORS, ANCHORAGES AND LANDING SITES
MINISTRY OF AGRICULTURE, RURAL ECONOMIC AFFAIRS, LIVESTOCK DEVELOPMENT, IRRIGATION AND FISHERIES & AQUATIC RESOURCES DEVELOPMENT
1st Floor, New Secretariat Building, Maligawatte, Colombo 10

Lead consultant:
EML CONSULTANTS(PVT) Ltd.
No 6/10, Rajamahavihara Lane, Rajamahavihara Road, Pitakotte.
in Association with;
Surath Wickramasinghe Associates & Sustainable Engineering Concepts (Pvt) Ltd.

CONSTRUCTION OF POINT PEDRO FISHERY HARBOUR IN JAFFNA DISTRICT

TITLE:
MASTER PLAN - POINT PEDRO FISHERY HORBOUR: ARCHITECTURAL

REV.NO	DESCRIPTION	DATE

DESIGNED BY	DG	DRG NO	NPSFDP-JAF-PPD-FH-AR-MP- 0010
DRAWN BY	DG		
CHECKED BY	UC	SCALE	1:1000 A1
APPROVED BY		DATE	2019/12/16

Cad File Path: N:\10 PROJECTS\31 FISHERY HARBORS\00 ARCHITECTURAL\00 WORKING DRAWINGS\01 PLANS\POINT PEDRO\PPD master plan 09.01.2018\2019 10 01 REVISED MASTER PLAN\ PPD CONCEPT MASTER PLAN AR.dwg

Annex 04- Waste Management Plan

ඇමුණුම 04 - අපද්‍රව්‍ය කළමනාකරණ සැලැස්ම

பின்னிணைப்பு 04 – கழிவு முகாமைத்துவத் திட்டம்

Waste Management Plan for Point Pedro Fisheries Harbor

October 2018- (Revised 23rd Dec. 2019)

Northern Province Sustainable Fisheries Development Project-Point Pedro Port Development Project

Ministry of Fisheries and Aquatic Resources
Goverment of Sri Lanka

EML Consultants (Pvt) Ltd,
6/10, Raja Maha Vihara Mawatha,
Sri Jayawardenapura Kotte

1. Table of Contents

List of Figures

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Abbreviations

ADB: Asian Development Bank

CEA: Central Environmental Authority

CFHC: Ceylon Fishery Harbour Corporation

DS: Divisional Secretariat

DS: Divisional Secretariat

EIAR: Environmental Impact Assessment Report

GND: Grama Niladari Division

MEPA: Marine Environment Protection Authority

MSW: Municipal Solid Waste

PIU: Project Implementation Unit

PMU: Project Management Unit

2. Introduction

The Northern Province Sustainable Fisheries Development project is implemented by the Ministry of Fisheries and Aquatic Resource Development and Rural Economic Affairs with the financial assistant from the Asian Development Bank (ADB). The project has three outputs. One output (output 1) is Marine fisheries infrastructure construction. Under this, two new fisheries harbors in Point Pedro, Jaffna District and Pesalai in Mannar District will be constructed. In addition, one anchorage in Mandativu in Jaffna District, and 20 landing sites (five in Jaffna, six each in Mannar and Mullaitivu, and three in Kilinochchi districts) will be rehabilitated.

The proposed development scope of works associated with the Point Pedro Fisheries Harbor Project (PPFHP) falls within the coastal zone and as such the project will require a development permit from the Coast Conservation and Coastal Resources Management Department (CCCRMD). In this regard an Environmental Impact Assessment Report (EIAR) has to be submitted and will be subject to public review. The waste management report prepared herewith, will be annexed and incorporated in the EIAR.

This waste management report is prepared for the proposed Point Pedro Fisheries Harbor. Technical Guidelines on Solid Waste Management in Sri Lanka (CEA, 2018) and ADB Safeguard Policy Statement (2009) were followed in preparation. In addition, several policies, strategies, legislation and principles related to solid waste management (see **Annex I**) were followed.

Fisheries harbors produce different types of wastes by diverse activities. Wastes from a harbor can be in liquid, solid and gaseous forms. Such wastes not only pollute the harbor complex and its waters, but also the coastline and beaches. Depending on the current and wave movements, and due to heavy wind, wastes can get transported a few to several hundred meters and damage the associated ecosystems. In addition, it would create aesthetically unacceptable conditions. Furthermore, odorous gases as results of poorly handled solid wastes will cause severe nuisances not only to the people within, but also surrounding the harbor. The adverse environmental consequences of poorly handled wastewaters are similar, and could be with more risk due to high mobility. This report discusses, management of solid and wastewater of Proposed Point Pedro Fisheries harbor, where Ceylon Fishery Harbor Corporation (CFHC) is responsible.

1.1. Study area

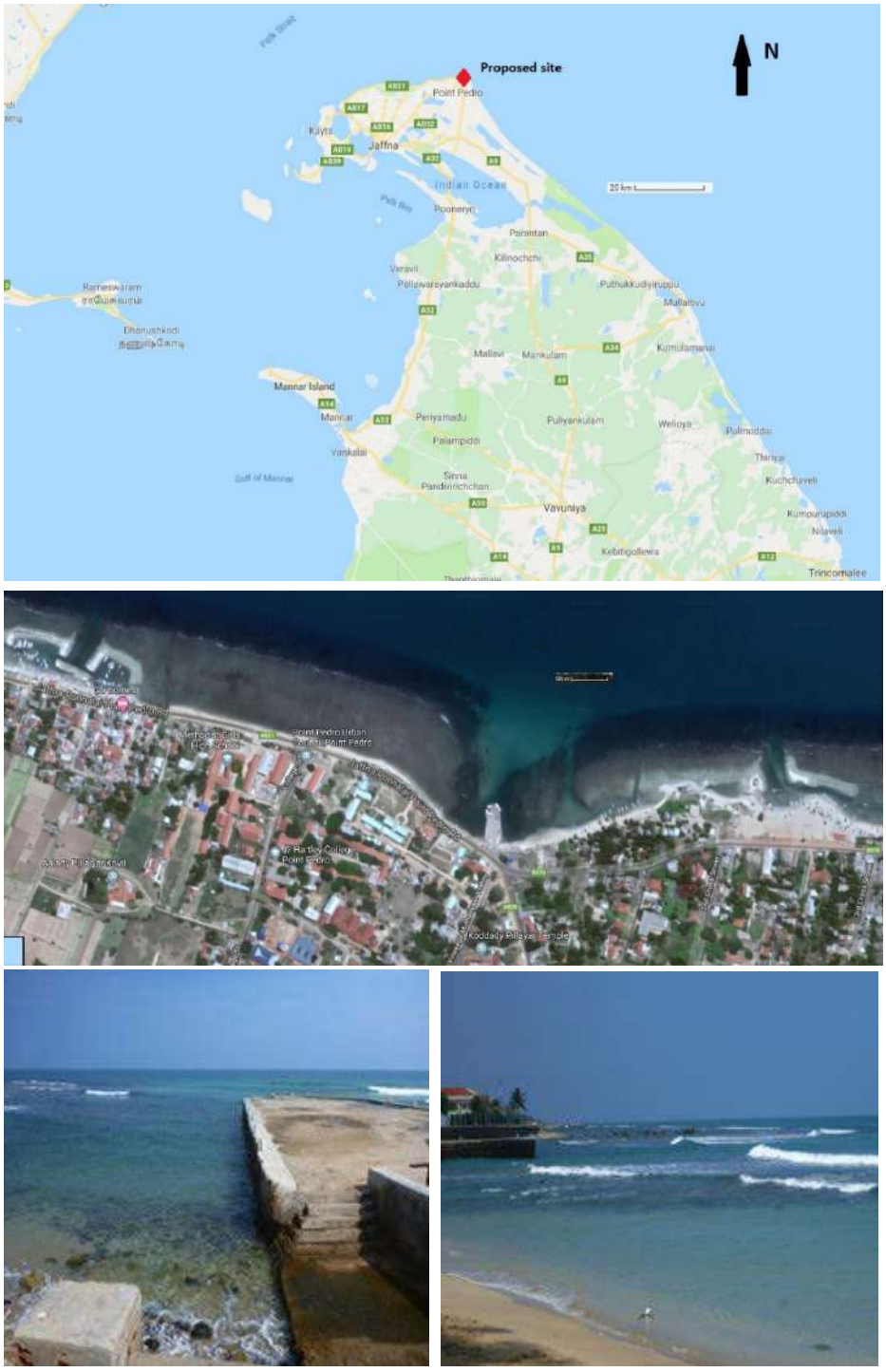

Figure 1: Project location, aerial and close up views

The proposed project site (9°49'43.43"N and 80°14'8.36"E) is located in the Vadamarachchi North Divisional Secretariat (DS) Division in the Jaffna District along the AB 21 road. The Grama Niladari Division is Point Pedro and the surrounding area includes the villages of Koddady in the east, Point Pedro and Supparmadam in the west. PPFH location currently consists of an old (constructed in 1875) and run down concrete Jetty. The Jetty is isolated and not supported by water or land-based infrastructure, and is located on a narrow coastal

fringing coral reef, which extends the entire length of the coastline that has been dredged to provide access to the dock. Therefore, the existing docking facilities are directly open to the sea and ocean weather conditions, thus provides insecure and unsafe docking facilities (EIA, 2018).

1.2. Project details with salient features and type of wastes

The project consists of off shore, near shore and back shore components. Off shore components include, breakwaters, harbor basin (areas with dredging and reclamation), berthing facilities, quay wall and slip way. These components will be mostly important during construction stage solid waste management strategies. On the other hand, backshore facilities such as shown in **Table 1** and **Figure 2** are important during construction as well as operational stages.

Table 1: On shore facilities, aerial extent and typical waste composition

Facility	**Floor area(m^2)**	**Solid waste composition**	**Wastewater composition**
Net mending hall	1050	Plastic, fibre, organic	Black water from toilets
Community hall and canteen	890	Municipal solid waste	Grey and black water
Quarters (Bachelor and management)	799	Municipal solid waste	Grey and black water
Surveillance Building	1600	Paper and Municipal solid waste	Grey and black water
Auction Hall	1200	Fish waste	Grey and black water; blood and water contaminated with flesh
Parking area	3750	Negligible/ no solid waste	No wastewater
Public toilets	82	Negligible amount of paper and plastic	Grey and black water
Wastewater treatment facility	100	Sludge	Treated wastewater
Security facilities	80	Municipal solid waste	No wastewater
Weighing bridge and control room	70	Negligible amount of paper and Municipal solid waste	Wash out water
Fuel facility	30	Negligible amount of paper and Municipal solid waste	Wash out water contaminated with fuel (hydrocarbon)
Offloading building	1100	Negligible amount of paper and Municipal solid waste	Grey and black water
Transformer and generator facility	10	Negligible amount of paper and Municipal solid waste	None
Public recreational area	4115	Municipal solid waste	Grey and black water
Commercial space	560	Municipal solid waste	Grey and black water

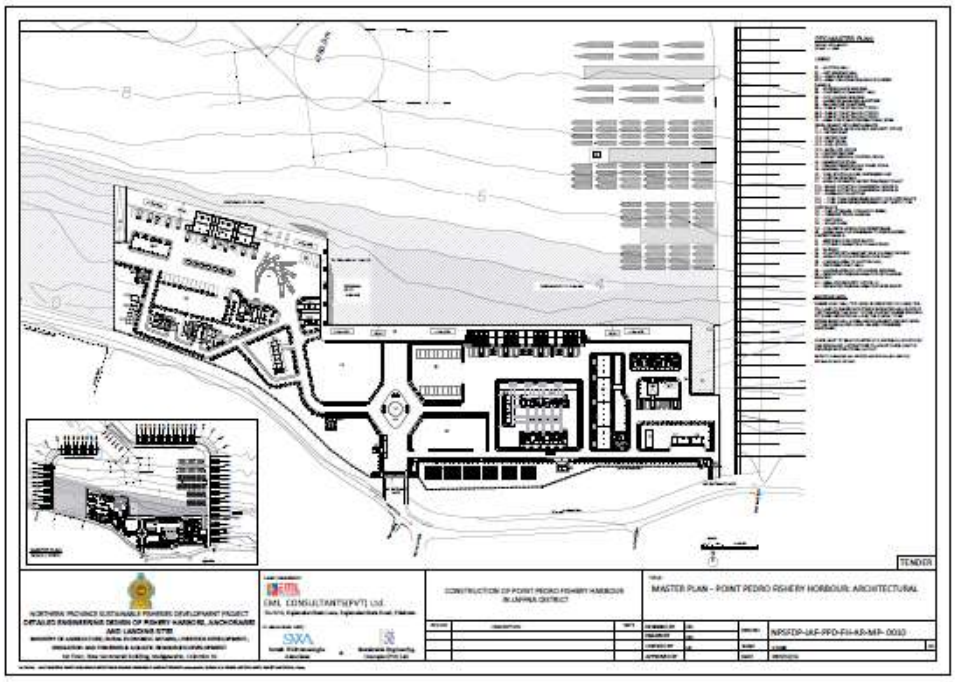

Figure 2: Project layout

1.3. Objectives of the report

The specific objectives of this report are:

i. Address solid waste management relevant to construction of the proposed development and oblige each of the contractors of the proposed construction who will carry out works on-site.
ii. Commission a solid Waste Management Plan prior to commencement of operations and maintenance of the project
iii. Commission of a wastewater management plan that cover construction, operational and maintenance periods.

2.0. Solid Waste Management

2.1 Overview of Solid Waste Management

Harbor's life includes three stages: construction, operational and maintenance and decommissioning. **Table 2 and 3** show typical solid wastes and their sources during the construction and operational stages. Construction stage and decommissioning stages solid waste generation is short term and limited to the construction and decommissioning durations (in case Point Pedro construction duration is about four years). Operational and maintenance stage includes its intended life span. However, in Sri Lankan context an extended life span by way of modifications is highly likely, therefore solid waste management for a decommissioning stage will be not discussed.

Solid wastes of a harbor can be categorized paper, glass, metal, plastic and organic; mostly in non-toxic. Nevertheless, sizable quantities of toxic solid wastes are possible too. Solid

waste can get easily dumped (intentionally or otherwise) in to the sea if not properly managed. The solid waste management plan during construction as well as operational and maintenance stages of Point Pedro Fisheries harbor, proposed herewith has been realized with the incorporation of widely used sustainability principles namely, precautionary, polluter pays, public rights, preventive action and accountability.

Table 2: Typical waste sources during construction stage

Zone	Source(s)	Type of waste
Shore facilities	Temporary staff/labor quarters	Municipal waste
Shore facilities	Construction/pre-construction activities	Excavated material, removed vegetation, sediment via surface runoff, construction refuse
Harbor basin	Construction	Dredge Materials, construction refuse

Table 3: Typical waste sources of a harbor during the operational stage

Zone	Source(s)	Type of waste
Shore facilities Main complex of buildings (non-industrial)	Canteen, staff quarters; administrative buildings	Kitchen waste, paper, plastic, glass (typical wastes of houses and offices)
Shore Facilities - Main complex of buildings (industrial)	Boat, vehicle and machinery repair areas	Paint, oil and lubricant, and other chemical cans, bottles (plastic and glass), used batteries, torn nets, ropes, Styrofoam, wood parts
Landing jetty and marketing areas	Auction hall, gutting area, storage	Fish waste, fish offal, trash fish, debris collected in nets
Harbor basin	Fishing and service vessels, barges	Floating garbage, fish waste/offal, debris

Solid waste management will follow the National Guidelines on the Solid waste Management published by the CEA.

2.1.1 National color code for segregated waste

Color code system in waste management is important in many aspects, such as in infection disease control, increasing the life time of landfills, increasing the resource recovery, and so forth. Following is a summary of the colour and respective waste. In many cases, wastes will be collected in bags (in this case inserted in bins) other than the waste is sharpen objectives.

- Biodegradable waste -colour to be used for bins and bags-green.
- Glass waste -colour to be used for bins and bags-red.
- Paper waste -colour to be used for bins and bags-blue.
- Plastics waste -colour to be used for bins and bags-orange.
- Infectious waste -colour to be used for bins and bags-yellow.
- Sharp waste -colour to be used for bins-yellow with a red stripe.
- General waste -colour to be used for bins and bags-black.

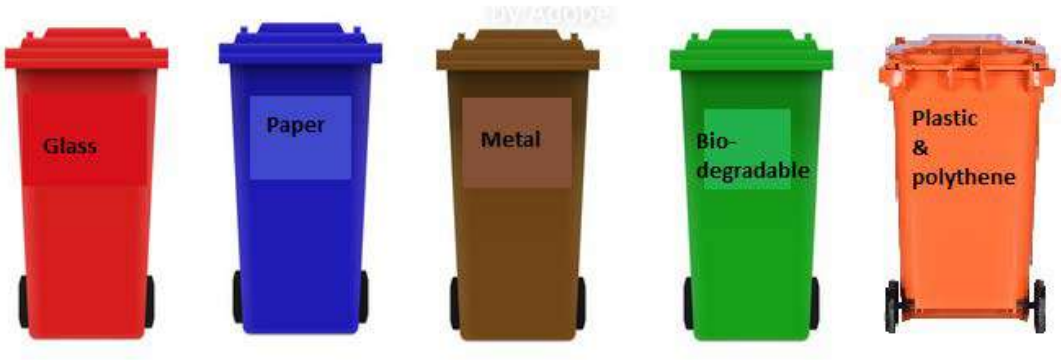

Figure 3: Color Code for solid waste

2.1. Responsibility of the Harbor Management

This PPFH will be managed by the CFHC. The CFHC will ensure the following aspects of solid waste management to comply with the national requirement.

i. Segregation of the waste a source and keeping them in color coded containers.
ii. Provide hygienic temporary storage facility until the waste is removed by the Point Pedro Urban Council
iii. Storing the waste in containers with lids to avoid spreading of waste by the rodent and scavenges
iv. Final solid waste collection center should be maintained in proper order separating recyclable waste and the organic waste. If possible provide separate compartments to these wastes
v. Providing easy access to the Urban council to collect the waste without any obstructions.
vi. Ensures that the wastes are disposed in regular intervals

In addition to the above, the CFHC will conduct awareness program on best practices in solid waste management to the staff and boat owners. Necessary instruction on how to use waste bins will be placed near the waste bins.

2.2. Solid waste management during construction stage

Individual contractors (and/or sub-contractor/s) will be responsible for the handling, treatment and disposal of all construction waste, and this report will be a part of the contract with them. Nevertheless, the final responsibility and accountability lie on the Project Management Unit (PMU) through Project Implementation Unit (PIU). The potential contractors should submit a proposal for construction waste management considering this solid waste management report as the *pro forma*, and it will be considered (given marks) in selection of the suitable contractor.

Table 4 lists typical solid waste generation quantities during the construction stage and **Table 5** lists typical management options during construction. The following are generic requirements of the contractor's solid waste management proposal.

- Practice of 4R (reduce, reuse, recover and recycle)
- Solid waste collection details (frequency, machinery used (if any), labor requirement, etc.)

- Storage, treatment and disposal of each category of waste anticipated to arise from their works
- Standards (local or international) standards of compliance

In addition, a competent person should be appointed by the contractor with the following responsibilities.

- Liaise with the PMU
- Provide waste collection bins and other containers
- Removal of solid waste from the project site to lawful dumping sites
- Pest and vermin control
- Material budgeting (mass or volumetric)

It is recommended to have workforce/labor quarters in an area designated for the solar park of the operational stage) (**Annex II)**. However, the contractor may consider provision of off-site accommodation. During the construction stage the project proponent should conduct audits: internal, by the project proponent as well as by an independent (external) auditor/consultant. Frequency of independent audits should be at least once in three months, whereas internal audits need to be monthly, in addition to weekly briefs by the contractor. The core aspects of such audits should include, but not limited to:

- Determine if wastes are being managed in accordance with the approved procedure
- Temporally assess contractor's waste management, including waste generation, storage, recycling, transport and disposal, against the agreed solid waste management plan
- Identify issues that were unidentified in the solid waste management plan, and mitigatory action
- Compliance to statutory obligations

2.2.1 Solid waste generation and Management

1. Site clearing waste

Generation

Site Clearance will be conducted as initial work of the construction activities. There are no methods to calculate the amount of waste generation during clearing activities. However, there will be some amount of wastes generated during the land clearing process.

Management options

- Cleared material (soil, debris, vegetation, etc.) will be dumped at a predetermined dumped site as soon as possible (i.e. pile up in covered vehicles and transport to the dump site).
- If direct transport as and when collected is not possible, an area or containers will be kept to store such waste. This is particularly important to stop dispersion of solid wastes due to high wind velocities and turbulences.

2. Construction

Generation

The proposed shore facilities area is 6.4 Ha. As in the **Table 4**, the estimated construction area of buildings will be 10,000 m^2. Waste generation range for new construction,[1] is approximately 40-60 kg per sq.m. Hence, it is assumed 50 kg/m^2. Therefore, waste generation during the construction period is (10,000m2 X 50kg = 500,000kg = 500 t).

Table 4: Prosed facilities and coverage land area

Proposed Buildings	Area (m^2)
Net Mending Hall	1,050.00
Community Hall and Canteen	1,780.00
Bachelor quarters	420.00
Harbour Manager Quarters	376.00
Surveilance Building	1,600.00
Auction Hall	1,200.00
Public toilet	82.00
Water Treatment Facility	80.00
Security facility	30.00
Weighing Bridge	70.00
Fuel facility	30.00
Off Loading	1,100.00
Total	**7,818.00**
Other construction Activities	2,182.00
Total	10,000.00

The composition of the construction (based on TIFAC 2001) [2] waste is given in **Table 5**.

Table 5 : Composition waste construction waste

Waste Type	**%**	**Proposed waste Generation (t)**
Soil, Sand &Gravel	36	180
Brick &Masonry	31	155
Concreate	23	115
Metals	5	25
Bitumen	2	10
Wood	2	10
Others	1	5
Total	**100**	**500**

[1] GUIDELINES ON ENVIRONMENTAL MANAGEMENT OF CONSTRUCTION & DEMOLITION (C & D) WASTES, CENTRAL POLLUTION CONTROL BOARD (Ministry of Environment, Forests & Climate Change)- MARCH 2017

[2] Technology Information, Forecasting and Assessment Council (TIFAC) of India

Management option

The construction waste has to be handled as per ISO 14001. Separate area will be designated, and separate dumpsters (ranging from metal to cardboard depending on the construction phase) will be used to store the waste (**Figure 4)**. Currently, it is common contractors adopting latest construction technologies/methods. This means the construction solid waste generation is very low as accurate estimations are done in tandem with good supervision. All wastes will be separated and reused for the construction purposes as much as possible. The possible recycling materials are sold to the people. Unavoidable construction waste about 500 t (those that cannot be reused) will be disposed at a site located in Vallipuram area about 5 km away from the project site.

Figure 4: Large dumpsters to store construction waste

3. Dredging Materials

Generation

It is estimated that about 18,000 m^3 of excavated materials will be generated from the dredging activity. Entaire quantities will be used for the refilling of shore area to construct shore facilities.

4. Work Force quarters

Generation

There will about 100 employees (assumed fulltime/resident) at the site. The waste generation will be 0.85 kg/person/day. Considering this, about 87 kg of municipal solid waste will be generated. The composition of the solid waste generation from construction staff quarter is given in **Table 6**.

Solid waste is typical municipal solid waste. Separate bins with color codes has to be kept, with daily cleaning to a central location. Agreement with the local authority will be made to collect organic waste regularly. Non-organic waste will be sold or given to recycle centers.

Table 6: Solid waste generation from construction staff quarters

Component	Weight composition (%)	Weight composition considered (%)	Solid waste (kg)	Density (kg/m3)	Solid waste volume(L)
Organic waste	63(61-71)	63	54.81	401	136.68
Paper and cardboard	5.5(4-7)	5.5	4.785	529	9.05
Plastic and polythene	20(17-23)	20	17.4	258	67.44
Metal	0.5(0.3-0.5)	0.5	0.435	417	1.04
Glass	1(0.9-1.2)	1	0.87	249	3.49
Other	10	10	8.7	371	23.45
Total		**100**	**87**		

Management Options

The waste will be collected in separate bins. The details of requirement of bins are given in the **Table 7**.

Table 7: Details of requirement of bins

Component	Solid waste volume(L)	No of Bins required	Volume (L)	Color
Organic waste	136.68	6	25	Green
Paper and cardboard	9.05	3	10	Blue
Plastic and polythene	67.44	3	25	Orange
Metal	1.04	3	10	Red
Glass	3.49			
Other	23.45			

It is assumed that the bins will be placed in three strategic locations. Each location, 2 bins for organic waste and one bin for the other each component will be placed.

The recyclable materials will be sold out for local people who are collecting recyclable materials. The organic waste will be disposed through the local authority collection system.

In this regard, the Point Pedro Urban Council has already given their consent for the collection and disposal of the waste.

2.3. Solid waste management during operational stage

Unlike construction stage, operational stage the solid waste generation is diverse. It includes typical municipal as well as fish refuse dominated wastes. Also, it needs collection of wastes from land, harbor waters (surface as well as bed), thus diverse management strategies is required.

The harbor management must ensures that adequate containers are strategically placed within the harbor complex for solid waste collection. It is necessary to have separate containers to facilitate the segregation of waste into recyclable dry waste, wet organic waste that can be composted and hazardous waste which needs special care in disposal.

The type of garbage skips and receptacles should be compatible with the waste collector (e.g. urban council). Garbage receptacles may be custom-made, as there is good chance of manual emptying into the collection truck, instead of compactors. Manual emptying means, no single container with waste should be more than 20 kg. Else, pulley aided system should be maintained to unload solid wastes from large containers. Under no circumstances, should let or expect the waste to be collected by shovels (etc.) from large containers (e.g. concrete bins). With time those will generate leachate followed by foul smell that create risky working environment for the solid waste collectors. Plastic receptacles, if used, should be u-v stabilized or protected from direct sunlight. Steel containers should be galvanized.

2.3.1 Waste generation and the management options

2.3.1.1 Fish waste

Generation

- Fish waste (heads, skins, waste fish etc.) would be prominent in the auction hall, and retail areas (if any).
- Unlike in some other countries most of the fish is used for consumption, including fish head (can be 25% of the fish weight). This means fish waste can be comparatively low. Nevertheless, if retail outlet exist there can be at least 50 kg fish per 100 kg/day of fish. These will be collected in covered plastic containers with semi-automatic lids.
- Importantly, vessels too would generate fish waste with a high chance of dumping them to the sea. This will be given critical consideration. Ceylon Fishery Harbor Corporation (CFHC) will maintain inventories to document solid waste collected from each vessel (at least in volumetric basis). This can be used to check against possible dumping to the harbor/sea.

Disposal option

Fish waste is high in protein, nitrogen, phosphorus and other minerals. Therefore, these will be collected by the private parties to produce animal feed.

2.3.1.2 Municipal Solid waste

Municipal Solid waste is generated from offices, canteens, staff quarters, common places like vehicle parks. The Solid waste will be mainly biodegradable (about 74 % on weighted average). **Table 8** shows the solid waste generation loading rates and **Table 9 to 13** show waste generation from different units for different waste categories. The management of solid waste will include internally managed separation and collection system followed by collection of waste by the local authority or another third party, where the CFHC will pay for their services.

Table 8: Solid waste loading rates and quantities of operational stage

Component	No. of people	Floor area (m^2)	Loading rate	Bulk solid waste volume (L/day)	Solid waste (kg/day)
Community hall and canteen	-	890	0.86L/m2/day	765.4	202.1
Staff Quarters	24	799	0.85kg/person	-	20.4
Public recreational area	-	4115	0.05L/m^2/day	205.7	54.3
Surveillance	-	1600	0.05L/m^2/day	80	21.1
Total					**297.9**
Sludge from treatment plant					**50-100** kg/month

Note: Bulk density of solid waste is taken as 264 kg/m^3. Sources of loading rates: Bandara (2010); City of Melbourne (2017); Randwick City Council (2017)

Table 9: Solid waste generation from all components other than auction hall and net mending hall

Component	Weight composition (%)	Weight composition considered (%)	Solid waste (kg)	Density (kg/m^3)	Solid waste volume (L)
Organic waste	63(61-71)	63	187.7	401	468.0
Paper and cardboard	5.5(4-7)	5.5	16.4	529	31.0
Plastic and polythene	20(17-23)	20	59.6	258	230.9
Metal	0.5(0.3-0.5)	0.5	1.5	417	3.6
Glass	1(0.9-1.2)	1	3.0	249	12.0
Other	10	10	29.8	371	80.3

Table 10: Solid waste generation from the Canteen and Community hall

Component	Weight composition (%)	Weight composition considered (%)	Solid waste (kg)	Density (kg/m^3)	Solid waste volume (L)
Organic waste	63(61-71)	63	127.3	401	317.5
Paper and cardboard	5.5(4-7)	5.5	11.1	529	21.0
Plastic and polythene	20(17-23)	20	40.4	258	156.6
Metal	0.5(0.3-0.5)	0.5	1.0	417	2.4
Glass	1(0.9-1.2)	1	2.0	249	8.1
Other	10	10	20.2	371	54.5

Table 11: Solid waste generation from Staff Quarters

Component	Weight composition (%)	Weight composition considered (%)	Solid waste (kg)	Density (kg/m^3)	Solid waste volume (L)
Organic waste	63(61-71)	63	12.9	401	32.0
Paper and cardboard	5.5(4-7)	5.5	1.1	529	2.1
Plastic and polythene	20(17-23)	20	4.1	258	15.8
Metal	0.5(0.3-0.5)	0.5	0.1	417	0.2
Glass	1(0.9-1.2)	1	0.2	249	0.8
Other	10	10	2.0	371	5.5

Table 12: Solid waste generation from the Public recreational area

Component	Weight composition (%)	Weight composition considered (%)	Solid waste (kg)	Density (kg/m^3)	Solid waste volume (L)
Organic waste	63(61-71)	63	34.2	401	85.3
Paper and cardboard	5.5(4-7)	5.5	3.0	529	5.6
Plastic and polythene	20(17-23)	20	10.9	258	42.1
Metal	0.5(0.3-0.5)	0.5	0.3	417	0.7
Glass	1(0.9-1.2)	1	0.5	249	2.2
Other	10	10	5.4	371	14.6

Table 13: Solid waste generation from the Surveillance section

Component	Weight composition (%)	Weight composition considered (%)	Solid waste (kg)	Density (kg/m^3)	Solid waste volume (L)
Organic waste	63(61-71)	63	13.3	401	33.2
Paper and cardboard	5.5(4-7)	5.5	1.2	529	2.2
Plastic and polythene	20(17-23)	20	4.2	258	16.4
Metal	0.5(0.3-0.5)	0.5	0.1	417	0.3
Glass	1(0.9-1.2)	1	0.2	249	0.8
Other	10	10	2.1	371	5.7

Internal collection

The waste generated from the office areas will be mainly paper and polythene. Therefore, 10 L bins will be placed for each office units. Adequate bins for separate waste category will be placed at the waste generation points. All wastes in internal unit (bins) will be collected in a common place in the same build at the end of the business day. The details of bins requirements for the common place are given in the **Table 14 to 17**.

Table 14: Requirement of no. of bins for the Canteen and Community hall

Component	Solid waste volume(L)	No of Bins required Canteen	No. of Bins required for Community hall	Volume (L)	Color
Organic waste	317.5	2	1	100	Green
Paper and cardboard	21	1	1	10	Blue
Plastic and polythene	156.6	12	1	100	Orange
Metal	2.4	1	1	10	Red
Glass	8.1				
Other	54.5	2	1	25	Black

Note: 100 L bins for the community hall has been proposed as there will be meetings and training program. In such events, large quantity of food waste and the packing materials are expected.

Table 15: Requirement of no. of bins for the Staff Quarters

Component	Solid waste volume (L)	No. of Bins require	Volume (L)	Color
Organic waste	32	2	25	Green
Paper and cardboard	2.1	2	10	Blue
Plastic and polythene	15.8	2	10	Orange
Metal	0.2	2	10	Red
Glass	0.8			
Other	5.5	2	10	Black

Note: Staff quarter is a two storied building. Hence, the bins are allocated to accommodate both floors

Table 16: Requirement of no. of bins for the Public recreational area

Component	Solid waste volume (L)	No. of Bins required	Volume (L)	Color
Organic waste	85.3	2	50	Green
Paper and cardboard	5.6	2	10	Blue
Plastic and polythene	42.1	2	25	Orange
Metal	0.7	2	10	Red
Glass	2.2			
Other	14.6	2	10	Black

Table 17: Requirement of no. of bins for the surveillance section

Component	Solid waste volume(L)	No. of Bins require	Volume (L)	Color
Organic waste	33.2	2	25	Orange
Paper and cardboard	2.2	2	10	Blue
Plastic and polythene	16.4	2	10	Orange
Metal	0.3	2	10	Red
Glass	0.8			

Other	5.7	2	10	Black

In house collection methodology

The waste bins in the common areas will be collected daily at the end of the business day by the sanitary workers. In this regard, Multi Wheel Trollies will be used (**Figures 5**). Organic wastes will be kept in 100 (L) bins until they collected by the Urban Council waste collectors. The recyclable wastes such as glass/bottles and metals will be stored in bins and the proper packing for selling to the recyclers. The list of Plastic and polythene recyclers registered with the CEA is given in **Annex III**.

Figure 5: Multi Sort Trollies

Figure 6: Wheel bins with color cods

2.3.1.3 Sludge from wastewater treatment plant:

It is estimated that about 50-100 kg of sludge will be generated from the waste water treatment plant. Which will be dried and used as a fertilizer to the gardening purposes.

2.3.1.4 Harbor Basin waste

- Irrespective of strict action it is possible some solid waste to get dumped in the harbor basin. Daily collection of floating waste by small boats using a scoop net or a floating net boom is necessary.
- Monthly monitoring of harbor bed will to be done using scuba divers; any waste present, need to be manually collected.

2.3.1.5 Waste from the Boats

The organic waste generated from the boats are normally disposed at the sea. Only plastics, empty water bottles and polythene are brought to the harbor. This will be collected by placing 25 L bins at the que wall. At least five such bins will be placed to collect plastic wastes.

2.4. Temporary storage method

A temporary storage facility will be provided to the collection of final waste. The location of the temporary storage area is given in Annex **IV**. The details of bins requirement for the temporary storage facility is given in the Table 18.

Table 18:Details of bins requirement

Component	Solid waste volume (L)	No. of Bins/day	No. of Bins for 7 days	Bin Volume (L)	Color	Remarks
Organic waste	468	3	14	200	Green	Considering the compaction during long storage average 2 bins/day considered
Paper and cardboard	31	Open compartment			Painted with Blue color	
Plastic and polythene	230.9	Open compartment			Painted with Orange color	
Metal	3.6	Open compartment			Painted with Brown	
Glass	12	1	1	100	Red	
Fish waste	100	1	7	200	Yellow	
E_waste		1	1	200		
Other	80.3	1	1	100	Black	

Note: Total Bins are considered for one week

There will be separate components for each category. The conceptual drawing for the proposed temporary storage facility is given in the **Figure 7.**

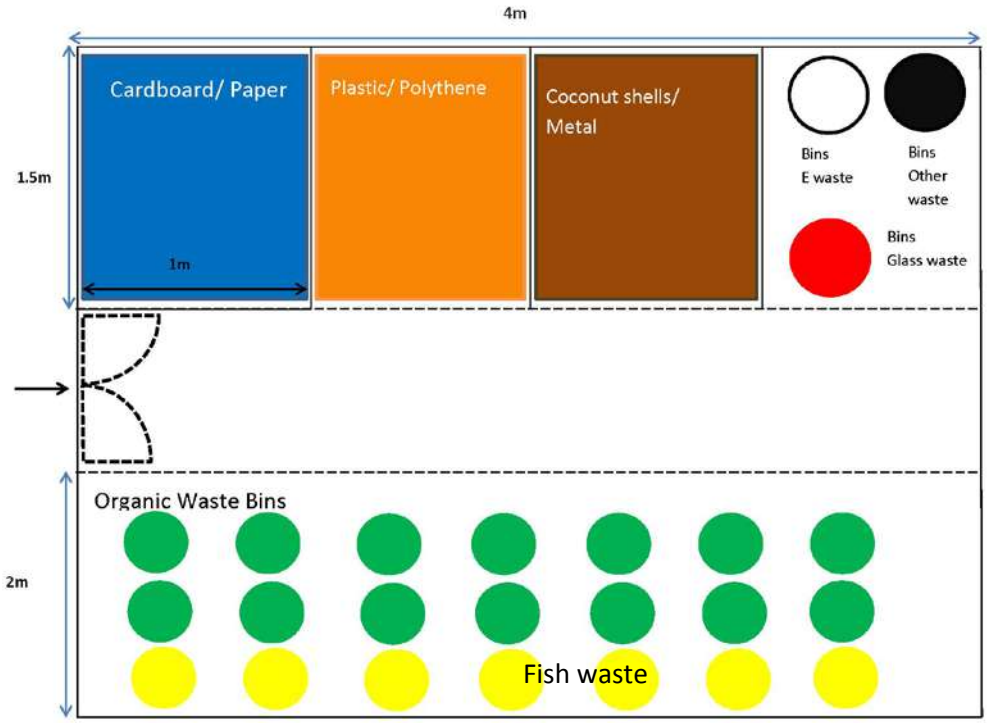

Figure 7: Conceptual design of the Temporary Storage Facility

2.5. Disposal

Recyclable can be sent to waste recyclable facilitates

i. Paper – local persons who collect waste paper for recycles
ii. Glass- Local persons/companies collect for recycling
iii. Polythene and plastics – Recyclable waste collectors registered with CEA
iv. Fish waste- collected by the private party to prepare animal feed.
v. Organic waste – disposed through the local authority collection system
vi. Treatment Plant Sludge – either composed or disposed through local authority collection system.

2.6. E- waste management

Used electrical and electronic items such as computer, television, used batteries, fluorescence incandescent, LED, light bulbs, etc, These wastes categorized as schedule wastes, and should be given to a company/organization registered with CEA (**Annex V**).

3.0. Wastewater management

3.1. Overview- wastewater generation

Wastewater generation of fisheries harbors could be discussed separately for construction, and operational and maintenance stages. Wastewater generation during construction period is short term, thus short-term strategies can be adopted. However, the operational stage not only needs methods that account the long-term nature as well as the wastewater diversity (i.e. operational stage wastewaters are a mix of black, grey and industrial wastewaters).

3.2. Policies, Strategies, Legislation and Principles Related to Wastewater Management

The wastewater management will conform the National Environmental Act and the ADB Safeguard Policy Statement (2009).

3.3. Wastewater management plan

3.3.1. Wastewater management plan – construction stage

Water requirement based on the National Water Supply and Drainage Board is 120 l/d/person and 50 l/d/person for staff who are given on site accommodation and off side accommodation, respectively. The estimated employees during the construction stage will be 100. Therefore, total quantity required is 8.5 m^3/day without the water for construction purposes.

On site accommodation = 50person x 120 L = 6,000l/day

Off side accommodation = 50 persons x 50 L= 2,500 l/day

Total = 8.5 m^3/day

The main source of wastewater generation during the construction is work staff and quality and composition will be similar to a typical household wastewater (**Table 19**) and could be further separated as grey and black waters. Quantity of generation depends on number of staff, and percent accommodated at the site.

The quantity of waste water generated is estimated based on the assumption that 80% of the consume water is discharge as waste water. Therefore, it is estimated that 10.5 m^3/day of wastewater will be generated during the construction period.

These black waters will be collected to septic tanks (**Figure 8**) followed by periodic emptying with the help of a third party (NWS&DB or local authority, etc.). Grey water can be disposed to ground via soakage trenches.

Table 19: Typical Composition of Untreated Domestic Wastewater (grey water)

Pollutant	Shower/bath	Kitchen
pH	7.6	6.3 – 7.6
BOD_5 at 20^oC (mg/L)	170	1460

COD (mg/L)	424	936
TSS (mg/L)	120	720
Total nitrogen	17	74
NH4-N (mg/L)	1.56 - 2	6
Total coliforms (MPN/100 ml)	6×10^6	6×10^6
Faecal coliforms (MPN/100 ml)	2500	10^5
Sources: Siegrist et al. (1976); Surendran and Wheatley (1998) and Erikson et al. (2002). Note that different past studies have reported different values, but a careful review would suggest most of the parameters of shower/bath is at least three times less concentrated)		

Figure 8: A hume pipe type septic tank

The contractor is responsible for the wastewater management during the construction stage. They must provide evidence of proper management (e.g. payments made to the local authority or external parties for emptying the septic tanks), and it is the PMU's responsibility to check such during audits.

3.3.2. Wastewater management plan – operational stage

Operational stage wastewater can be categorized into three groups, based on the composition. They are: (a) typical municipal (domestic wastewater), similar to the wastewater generated from staff quarters during construction stage; (b) Industrial wastewater with high BOD and (c) Industrial wastewater with low BOD and with high hydrocarbon content. Item (b) mainly includes water contaminated with blood, flesh, etc. and mainly generated in auction halls. Item (c) wastewater, includes oil spills, washouts and leaks from fuel storage, etc. Item (a) and (b) can be treated combined, but item (c) should be handled separately. The potential effect of oil spills on commercial fisheries is a serious concern as it may result in the closure of the harbor.

3.3.3. Treatment of typical domestic wastewater and fish processing wastewaters

Water requirement for the operation of the harbor is given in the following Table XX. It is estimated that about 111 m^3/day water will be required entire habor operation.

Table XX: Water requirement for the operation of the harbor

Component	**No. of persons/area/unit**	**Rate**	**Total water (L/per day)**

Auction hall/net mending	2500 m2	10 l/m2	25,000
Boats	400 unit	100l/boat	40,000
Staff – full time resident	50	120 l/d/person	6,000
Staff –fulltime, non-resident	50	50 l/d/person	2,500
Fishermen and crew	500	50 l/d/person	25,000
Visitors	500	25 l/d/person	12,500
Total generation per day			**111,000**

The management and treatment of the wastewater generated from the operational phase (**Table 20**) of the fisheries harbor may operate an activated sludge process, or a high performance anaerobic reactor system (e.g. up flow anaerobic sludge blanket reactor) (**Figure 8 and 9,** respectively).

Table 20: Wastewater generation loading rates and quantities

Component	**No. of persons/area/unit**	**Rate**	**Total water (L/per day)**	**Generation rate**	**wastewater Quantity**
Auction hall/net mending	2500 m^2	10 l/m2	25,000	100%	25,000.00
Boats	400 unit	100l/boat	40,000	0%	-
Staff – full time resident	50 persons	120 l/d/person	6,000	80%	4,800.00
Staff –fulltime, non-resident	50 persons	50 l/d/person	2,500	80%	2,000.00
Fishermen and crew	500 persons	50 l/d/person	25,000	80%	20,000.00
Visitors	500 persons	25 l/d/person	12,500	80%	10,000.00
Total generation per day			**111,000**		**61,800.00**

3.3.4 Proposed method of treatment and disposal of wastewater

There are various processes for the treatment of wastewater from the fishery harbors in all over the world. The DDT suggests the activated sludge process is more suitable treatment for the proposed Point Pedro Fisheries harbor site. The main advantage of activated sludge treatment processes is efficient and effective removal of BOD, COD and other nutrients from wastewater. This type of wastewater treatment plant is successfully operated at Dikkowita Fisheries harbor to treat the similar type of wastewater.

The conceptual activated sludge treatment flow chart is given in the **Figure 9.**

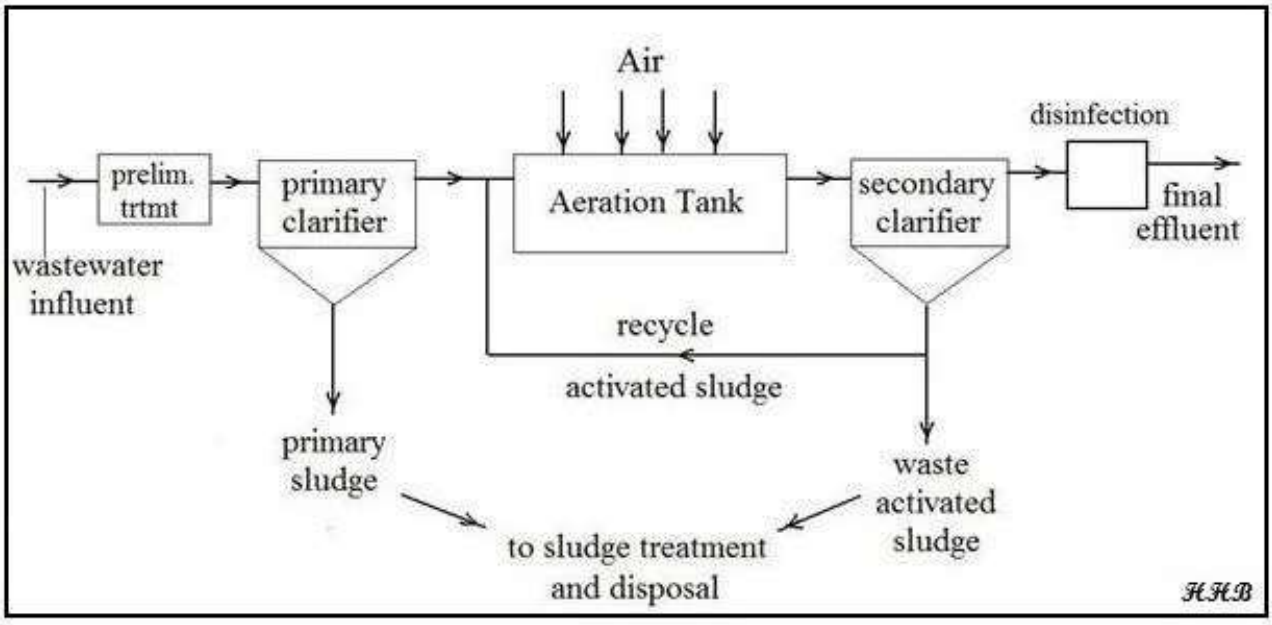

Figure 9: Activated sludge Water Treatment Flow Diagram

1. **Pretreatment**: The wastewater generated from the processing area and market area will be sent through screens to remove the scales and the other fish parts entering to the treatment plant. The scales and settle materials will be removed from the screens and disposed.
2. **Primary clarifier**: The pretreated wastewater will be directed to the primary clarifier where large particles will be settled and the settled sludges are removed at the bottom of the clarifier for disposal. The wastewater will be directed to an Aeration tank.

3. **Aeration tank:** Air is mechanically supply to the wastewater to aerobically activate the microorganism to decompose the organic matters and to form large size flocks which are easily settled at the bottom of the clarifier. The treated water (mixed liquid) is discharged to the secondary clarifier.

4. **Secondary Clarifier:** The mixed liquor is discharged into the secondary clarifier where live bacteria settle to the bottom, dead bacteria rise to the top and form a crust with a clear liquid in the middle. This clean water is then discharged into either a watercourse or a soak away. The live bacteria, called activated bacterial sludge, are returned to the Aeration tank to re-seed the new raw sewage entering the tank and the dead bacterial crust is removed as sludge in dry beds to dispose.

5. **Sludge Drying Bed**; Sludge from the primary and secondary settling tanks will be collected in a dry bed make dry solid before disposal to reduce the moisture contents. The wastewater generated from the drying beds either will be re-directed to the treatment plant or let it for soak in the dry bed itself.

3.3.4 Final point of discharge of treated wastewater, methodology according to the National standards.

The wastewater generated from the operation of the fishery harbor will be treated in accordance to the National Environmental Act up to the Tolerance Limits for Industrial and Domestic Wastewater Discharge into Marine Coastal Area. **(Annex VI).** A pipeline will be provided through the eastern side break water about 100 m away from the shore area to get adequate dilution.

The proposed wastewater collection system is given in **Annex VII.**

3.3.5 Treatment of wastewaters with high hydrocarbon content

Accident or intentional fuel or oil release to sea by vessels will form oil-wastewater, sometimes mixed with sediments. These are referred as bilge (high water content) or waste oil (high oil content). It is necessary to have facilities to receive/collect oily wastes, to be treated by oil-water separators (**Figure 10**). The oil collected by the separators may then be returned to a recycling plant operate by authorized collectors.

Figure 10: A commercial oil-water separator

Oil spills with time can get spread, evaporate, emulsify and/or deposit. Also it can form solutions with water. Therefore, it is conspicuous the importance of quick actions. The methods of treating oil spills include: mechanical recovery; dispersant use; burning; and guide oil to the shore for easy clean up. Figure 11 shows mechanical containment and recovery of oil spills. However, Separate Oil Spill contingency plan is prepared in accordance with National Oil Spill Contingency plan in consultation with the Marine Environment Protection Authority (MEPA), and is given with the EIA.

Figure 11: Mechanical containment and an oil skimmer

3.3.6 Operation and Maintenance of wastewater treatment plant.

The PPFH will be maintained by the CFHC. The CFHC will nominate a suitable technical officer and allocate require financial allocation to maintain the wastewater treatment plant.

4.0. Conclusion

It is necessary to have clear and readily accessible guidelines of solid waste, and wastewater management. Regular training for staff of all levels is also necessary. In addition compliance monitoring mechanism by way of internal and external auditing is necessary (as stated under solid waste management).

5.0. References

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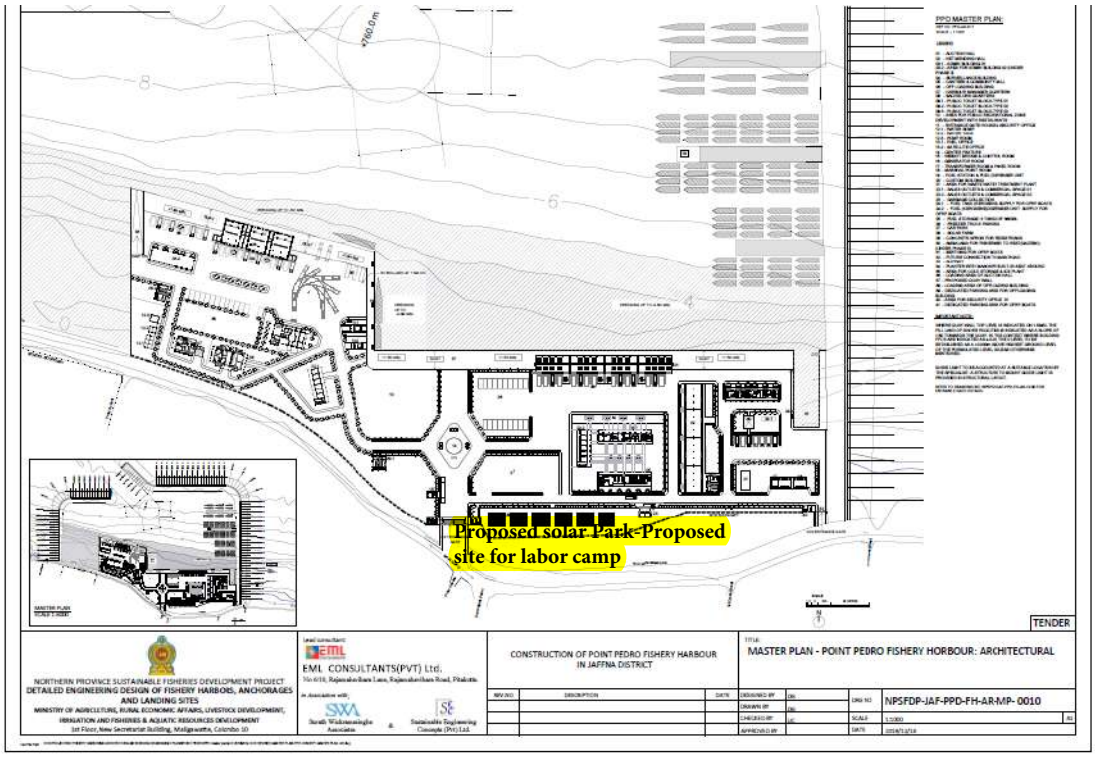
ANNEXES

Annex I: Policies, Strategies, Legislation and Principles Related to Solid Waste Management

Items 1 to 5 include National Plans, Policies, Strategies Related to Pollution and Waste, and items 6 to 13 list National Legislation Related to Solid Waste Management. Items 14 to 17 are internationally recognized/practiced standards that covers a broader spectrum, including solid waste management.

1. National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (2006)
2. National Industrial Pollution Management Policy
3. National Industrial Pollution Management Strategy
4. National Policy on Solid Waste Management (2002) – Cabinet Approved
5. National Strategy for Solid Waste Management (2002) – Cabinet Approved
6. Part IVB of National Environmental Act No. 47 of 1980 amended by Acts No. 56 of 1988; No. 53 of 2000
7. Part II of the National Environmental (Protection and Quality) Regulations No. 1 of 2008 as applicable to Scheduled Waste & Regulations for hazardous waste Management published by CEA in the Gazette Extra Ordinary No. 924/13 dated 23rd May 1996.
8. Part IVB of the above Act for regulation of Environmental Quality
9. Technical Guidelines on Solid Waste Management Published by Central Environmental Authority (CEA)
10. Municipal Council Ordinance No. 16 of 1947 with special attention on Section 129, Section 130 & Section 131 and By-laws No-1, 29, 30, 31, 32, 33, 34, 44, 45, 46, 47, 54, 58 and 61., Section 100 of the Pradeshiya Sabha Act. No. 15 of 1987 (as amended)
11. Public Nuisance under the Criminal Law: Section 261 of the Penal Code (Penal Code No. 2 of 1883 as amended)
12. Code of Criminal Procedure Act Chapter IX and Section 8(1) (Code of Criminal Procedure Act No. 15 of 1979 as amended)
13. Nuisance Ordinance No. 15 of 1982 and Police Ordinance No. 16 of 1864 (as amended)
14. ADB Safeguard Policy Statement 2009 (SPS)
15. ISO 14001: 2004. Environmental management systems-Requirements with guidance for use (ISO 14001: 2004).
16. European policies linked to waste management and protection of the marine environment, in particular the Waste Directive (2008/98/CE)
17. ISO, E. (2004). 14001: 2004. Environmental management systems-Requirements with guidance for use (ISO 14001: 2004).

Annex II Proposed Area for labor camp



Annex III The list of Plastic and polythene recyclers registered with the CEA

NATIONAL POST CONSUMER PLASTIC WASTE MANAGEMENT PROJECT

CENTRAL ENVIRONMENTAL AUTHORITY

List of Plastic Polythene Collectors and Recyclers

	Company Name/Contact Person	Address	Tele. No.	Identity card No.	Nature of the business
1	Mr.A.S.Illiyas	Plas Techs (Pvt) Ltd, 98/7, Hospital Road,Kalubowila, Dehiwala 27/15, Sedawatta Road, Wellampitiya	011-2726736, 077-7325697	681420908V	Recycler
2	Mr. Buddika Muthukumarana	VIRIDIS (PVT) LTD, Block B,Temple Burg Industrial Zone, Homagama	011-2752708	761930087V	Recycler
3	Mr. Dishan Mario Ralston	Poly-Cycle (Pvt)Ltd. 124/5, Old Ambathale Road, Mulleriyawa, Angoda	077-7261390	720782359V	Recycler
4	Mr.D.D.H.Ferdinando	Green Lanka (subsidiary of Seth Sevana Padanama), 654/4, Industrial Estate, Galle Road, Ratmalana	0777-683389, 0115558295 0115554708 0115556747	461620922V	Recycler
5	Mr. T.L.Chandrarathna	Hiden Packaging (Pvt) Ltd, No. 40,Uduwagewatta, Wethara, Polgasowita	011-2704703		Stopped
6	Mr. Anura Jasunthaliyana	Eco Sans Plastics (Pvt) Ltd, No. 128 B, Gangarama Road, Werahera, Boralesgamuwa	071-7145766	671310675V	Recycler
7	Mr.Pradeep Samarasighe	210/1, High Level Road, Nugegoda	071-4293777		Stopped
8	Mr. Mohamad Usuf Jasil	No. 17, Moore road, Dehiwala	072-2754126	802741057V	Recycler

9	Mr.Gonapinuwala Gamini	253, Serpantine Road, Borella	077-7894361 077-7908523	491874163V	Collector
10	Mr.Susil Samarasighe	Sachitha Plastic Manufacture, Block 6 & 7, Stage ii, Templeburg Industrial Zone, Panagoda	714009247/0115 746235	611962673V	Recycler
11	Mr.Nalin Manjula Perera	Ciyasa Plastics, 81, Ransiri Uyana, Korathota, Kaduwela	071-4047941	643041502V	Recycler
12	Mr.Palitha Wijerathna	Dot Line Packaging , 6/1C, Magadeniya Road, Oruwala, Athurugiriya	0777-259835	680454434V	Recycler
13	Mr. Sunil Dabare	121/42, Sapumal Pedesa, Welikada, Rajagiriya	077-7767001 077-7681972		
14	Mr.W.M.D.Lalith Prasanna	204, Himbutana, Mullariyawa New Town	075-8043625 078-6303026	772080360V	Recycler
15	Mr.R.Nimal Bandara	K.O.Plastic 5/9, Kinross Avenue, Bambalapitiya, Colombo - 04	077-9652179 077-1129917	663604414V	Collector
16	Mr.K.L.Roshan Liyanage	No.43/3, Pitipana South, Dolahena, Homagama	011-2755149 077-9164436		Stopped
17	Mr.Lakshan Madurasinghe	Manisha (Pvt) Ltd No.124, Kelani Mulla, Angoda	077-7344085		Stopped
18	Mr.J.Wijesighe	J.S.Polythene, Kosgama Village, Kosgama	077-7899361	762760282V	Recycler
19	Godigamuwa Sanasa Bank	No.68, Piliyandala Road, Maharagama	011-2850853		Stopped
20	Mr. A.K.S.K.Perera	Super Plastic Industries, No. 1/166, Kandy Road,Yakkala	033-2231355 0714073297/720 0775959	641192090V	Recycler

21	Mr.M.W.Sunil Premawansa Silva	527, Kurusawatta, Kotugoda, Ja-Ela	077-5858400	593300331V	Collector
22	Mr.N.Chandrasiri	S.L.Plastic, 442/2/A, Ahugammana, Delgoda	077-3126009 077-3047639	611251149V	Recycler
23	I.K. Rajapakse	Kalhari Enterprises, 398-E, Gunasekara Mawatha, Heyyanthuduwa	011-2401167 072-5665242	583310410V	Recycler
24	Mr.K.M.S.Chandrasiri Jayarathna	E-6, 3rd Lane, Awarakotuwa, Hendala, Wattala	060-2194003 077-4408434	713151351V	Recycler
25	Mr.S.A.P.M.Senerath	Mangala Electronics (Tannoi Plastic) 265/1, Mabima, Heyiyanthuduwa, Kelaniya	077-3035477/077396 30891	701661834V	Recycler
26	Mr.J.N.Sanjeewa Silva	S.M.N.U.PLASTIC (PVT) LTD, 487/1, Kudubollatha, Ganemulla	033-4670012 0777-238182	731830231V	Recycler
27	Mr.R.M.Jayantha Kumarasiri	Ronesha Polymer Industries, 102/1, W/Kaluwarippuwa, Katana	031-5681249 077-3852506	693663962V	Recycler
28	Mr.W.D.Vijitha	Polygun Poly recycling (Pvt) Ltd, 315, Negambo Road, Wattala	077-7314764/077985 8742	712311550V	Recycler
29	Mr.H.S.P.Silva	Emareld Industries, 181/A, Peralanda, Ragama	011-2957718 071-2200300	572740960V	Recycler
30	Mr.S.M.D.Dencil Senarathna	Senarathna Polypackaging, No.221, Warapalana, Udathunthiripitiya	033-2279203 077-7474877	750013546V	Recycler
31	Association of Sri Lanka Wildlife Conservation Program	No.15/5, St' Bernadeth Mawatha, Rilaulla, Kadana	078-5241600 011-5757252		Stopped

32	Mr.K.G.Ruwan Perera	Berny Lanka Services No.217, Welabada Road, Katunayake	077-3030816	682570822V	Recycler
33	Mr.P.K.S.Pitigala	APEX PLASTICS, 7 A/1, Horape, Ragama	011-2959777 072-3644897	630910110X	Recycler
34	Mr.Ravi Chamara Heyyanthuduwa	No.219/3, Temple Road, Heyyanthuduwa	077-9571884	752490058V	Recycler
35	Mr.M.A.Indrananda	180/3, Mabima, Heyyanthuduwa	011- 2488711/075235 4761	562500979V	Collector
36	Mr.H.J.Aththudawa	Lakpoly (Pvt) Ltd, No. 25/6, Galawila Road, Kottawa	011-2899228 071-6358057	725841302V	Collector
37	Mr.W.V.D.R.Wickrama singhe	No.01/02, Amunukumbura, Harankawa, Loluwagoda (Mirigama)	033-4904444 077-4403444	711671933V	Collector
38	D.Weerabahu	Esika (Pvt) Ltd, Lot No.67A, Export Processing Zone, (EPZ), Biyagama	011-2465280 077-7314212	442042683V	Recycler
39	Mr.A.R.Bahseer (PP)	No.370, Polo Plastics, Negambo Road, Wattala	078-5691609	543043443V	Recycler
40	Mr.M.L.A.Lukman	537/B/1, Waduwegama road, Biyagama Zone Malwana	077-9886200 060-2116445	662700371V	Collector
41	C.D. Pack (PVT) Ltd (K.K. Rasika Deepani)	No. 300E, Maygaha Junction, Batuwaththa, Ragama	011- 4811945/077391 6188	645491467V	Recycler
42	Mr.S.M.A.G. Perera	Poly Packaging Industries 197, Colombo Road,Wanduragala,Kurunegala	037- 2224703/077224 6866	411390853V	Recycler
43	Mr.Sunil Gunasekara	Silanma Pellet Manufactures, No.05, Solman Road, Wekada, Panadura	724110210	522843504V	Collector

44	Mr.P.Karthigesu	Polykar PVC Industries 18, Dumburugiriya Road, Hatton	077-7912229	493442180K	Recycler
45	Mr.Jayantha Dharmarathna	Lak-E-Friends-2R Project, 152/1, Mohottimulla, Dankotuwa	031-2258579 072-4491725	612151229V	Recycler
46	Mr.R.K.S.N.Wimalathunga	Nishara Plastic Industries Udawela Road, Agalawatta, Mathugama	060-2442011/0775218183	670721620V	Recycler
47	Mr.Damith Nishantha	Sanasuma Recycling Center, Wagawaththa Junction, Poruwadanda, Horana	034-2255451 077-3433675 0777-508483	710041970V	Recycler
48	Mr. H.R.Pallegama	317, No.98, Thalopta, Polonnaruwa	060-2277350		Stopped
49	Mr.F.M.Farshad	Fa Traders, No. 101 B, Ranmalaka, Wattapala, Pilimathalawa	077-7937557/0773300056 077-9699081/0757027035	850871116V	Collector
50	Mr. Menaka Ruwan Bandara	Lackysha Polisacks, No.561/47B, Tank Road, New Town, Anuradhapura	078-8775288 025-4914416		Stopped
51	Mr.M.P.Keerthirathna	Welimada Farm House, No.117, Badulla Road, Weilmada	072-4773529		Stopped
52	Mr.M.A.M.Nawazdeen	No.450, Negambo Road, Dampalassa, Narammala	060-2375418 077-7569694	590312835V	Recycler
53	Mr.I.Benjamin	Aldin, No.127 B, Mahaveediya, Deniyaya (Near the Bus Stand)	072-3552823/0373375418		
54	Mr.H.M.G.Sanath Bandara	New Pearl Plastics, No.197, Kandy Road, Galgediyawa, Gampola	777745610	743392140V	Recycler

55	Mr.Saman Balasooriya	Palitha Packaging (Pvt) Ltd, No.30, George E. De Silva Mw, Kandy	077-5514999		
56	Mr.N.K.M.Welikatiya	City Plasticrefts, 109, Senrathgama, Katugastota, Kandy	081-2491711 071-4430618/0777203470	698090090V	Recycler
57	Dr.D.A.P.Wijesekara	"Jayaleela", Nanathota, Kosgoda	0774809077/0774809076	631701728V	Collector
58	Mr.W.S.Edward Wimalathunga	N Zone Melters, 50B, Kurunegala Rd, Pannala	071-4155565	560660235V	Collector
59	Mr.W.K.Kapila Nandana Rodrigo	Nimitha Enterprises, Rathna-Hangamuwa, Rathnapura	071-5126133/0452232832	760911143V	Collector
60	Mr.Sachith Eleperuma	P.S.Polypacks (Pvt) Ltd, No.3/65, Thalgahawila Rd, Midellamullahena, Horana	077-7767624 034-4283652	870491239V	Recycler
61	Mr.M.A.D.K.Saliya Mallawaarachchi	Siripathi Reethast Plastic Udalawela, Galmuruwa, Madampe	032-2240821 071-8255545	641961213V	Collector
62	Mr.K.Sockkanathan	No.173, Cemetery Road, C1, Kalmunai,	077-3758335/0779375376		Stopped
63	Mr.Sisira Rohana	Nagara Pavithratha Sangamaya, 2 Kanuwa, Gonnoruwa Road, Kaliyapura, Hambanthota	0716111600/0473470404	752791619V	Recycler
64	Mr.T.Nimal Priyashantha	Ransara Plastic Bombuwala, Kaluthara	034-4933499		Stopped
65	Mr.D.K.Sarath Wimalaweera	S.W.Engineers "Paradise" Industrial Zone, Kuruwitra, Rathnapura	072-3670893		Stopped

66	Mr.K.M.Karunadasa	No.32, Palle Panguwa, Luniugala	060-2550219		Stopped
67	Mr.Kadireshan	VC Brothers, No.52, NC Road, Raththota	066-2255587 066-5684189		Stopped
68	Mr.M.W.Anuradha Priyadarshana	No.41, Alpitiya Road, Wathugedara (Balapitiya PS)	0915627885 091-2257257 0771724944	642900447V	Collector
69	Mr.A.G.D.P.Godawitharana	Bandula Sevana, Paraduwa, Akuressa	041-2292425		Stopped
70	Mr.J.B.J.K.Gunarathna	"Jayantha Recycling Services", Athuwana, Mugunuwatawana, Chilaw	077-3599555	761051296V	Collector
71	Mr.C.A.Pradiban	570/24, Werralla Tuduwa Road, Mabola, Wattala	011-4975619 077-7666210	811411736V	Recycler
72	Mr.K.G.Nihal Nanayakkara	No.974, II Step, Anuradhapura	025-2220127 071-5210155 077-3118485		Stopped
73	Mr.N.A.A.Wasantha Kumara	No.55-C, Weherahena Waththa, Hiriwala, Kal-Eliya	071-3329605		
74	Mr.Sarath Senadeera	Waste Management Center, No. 52/1, Hanwella Road, Kirindiwella	033-5611595 033-2257901	552142012V	Collector
75	Mr.M.Vijitha Perera	No. 03, Kurunda Mawela, Wadduwa	038-2294740		Stopped
76	Mr.S.H.Sisil de Silva	"Biralu Niwasa", Usmudulawa, Madampagama, Kuleegoda	077-9066058	610443869V	Collector
77	Mr.P.Nimal Karunathilaka	382/C, Dippitigoda, Kelaniya	077-7590335 011-2981308	592641470V	Collector

78	Mr.A.J.Shanaka Fernando	Sha Plastic, No. 47, C.W.Waththa, Magulpokuna, Ragama	011-2957786 071-3190394	752902283V	Recycler
79	Mr.Manoj Fernando	M & D plastic and Polymer Company, No.33, John Rodrego Road, Katubedda, Moratuwa	011-5659547 077-0794095/011265 0270	700963543V	Recycler
80	Mr.K.Piyasena	Samanthi Grinding Mill, Lake House Agent, No.3511, Hakmana	041-4923815/041490 0410		Stopped
81	Mr.E.A.Sunil Edirisinghe	Edirisinghe Polythene Recycling, 21/44B, Ambilowita Waththa, Dadagamuwa, Veyangoda	071-4834570/071920 2570 077-6272934/033721 2348	681220933V	Recycler
82	Mr.K.R.Perera	72 A, Mahabuthgamuwa, Angoda	077-4929769 011-2567637		Stopped
83	Mr.M.M.Wijedasa	Nisal Recycling Project, No.03, Nisalgama, C.P.Pura, Minneriya	077-5717282 027-5783121	581691890V	Collector
84	Mr. Waruna Wijesekara	Shanika Plastic, No.57a, Pepiliyana Road, Nadimala, Dehiwala	077-7885000		
85	Mr. J. Rajasinghe	Jayasinghe Plastic, B/2, Jayathilaka Mw, Panadura	038-2243219	550451697V	Collector
86	Mr. E.V.G.Upali Abayasiri	Upali Plastic 7/D/3, Jayanthi Place, Gangarama Road, Wearahera, Boralesgamuwa	072-3285325 060-2151170		
87	Mr.K.Palitha Fernando	Sanka Poly Recycling Center, No. 192/A, Sri Rahula MW, Katubedda, Moratuwa	071-5901692	651042208V	Recycler

88	Mr. D.K.Nilaksha Perera	Chanila Enterprise, No.04, Beddagana Road, Bangala Junction, Kotte	077-9726966	722300695V	Collector
89	Mr. B.M. Gunasiri	Jayamali Plastic, Dehiattakandiya	027-5670648	633243050V	Recycler
90	Mr. Damith D. de Silva	Seer Plastic Industries, No. 303 B, Maha Heenatiyangala, Kalutara South.	034-2235161 077-7428484	763583708V	Recycler
91	Mr. J.G. Gemunu Ranasoora	Kalpani Waste Management Project, 190A, Weediagoda Junction, Weediagoda, Bandaragama.	071-4061416	612540330V	Collector
92	A to Z Traiding Company	655/11 D 9, Samagi Watta, Elvitigala Mawatha, Narahenpita.	Tel. 0112368436 Fax. 0112368436		Recycler
93	Mr. A. L Naaz Mohomed (PVC)	Walk Lanka Industries (Pvt) Ltd, No. 57/B, Ranala Road, Habarakada, Homagama.	0777-309217/0112547385	622583402V	Recycler
94	Mr.J.T.M.Sharook	Paklanka Sole Manufacturer (Pvt) Ltd, No.404/7, Elambagahawattha, Ulahitawala Road, Walgama, Malvana.	0779397732 0113116727	511062896V	Recycler
95	Mr. Ajith Priyankara (PVC)	Senas Industries, Galle	777254303		Stopped
96	Mr.W.M Thilakarathne	"Pavithra lanka" 24/11, Vikumpura Place, Haramanis Lane, Aththidiya, Dehiwala.	778856409	633203830V	Collector
97	Mr.U.R.S.L.K Dharmasena	No.68, Parakrama Villege, Thulhiriya, Warakapola	0773956900 0354904630	773520399V	Collector

98	Mr.J.G Gemunu	No. 310/3A, Horana Road, Kahathuduwa, Polgasowita	0714061416 0112518900		Stopped
99	Mr.S.Sendur Kumaran	45/3, Main Street, Watawala	0773101237 0512237272		Stopped
100	Mr.A.A Sanath	299/D, Nadagamuwa, Kotugoda	0714404737 0112297844	843091466V	Collector
101	Mr.J.M Sampath Kumara Jayasundara	Puranagama,Kottukachchiya, Anamaduwa	0327910773 0724428792		Stopped
102	Mr.N.A.A Wasantha Kumara	Mackro Plastic, No 55/C, Weherahena watta, Hiriwela, Kal - Eliya	713329605	663112899V	Recycler
103	Mr.M.A Saudian	Uluwane, Kinchikune, Medamulana	477911258 0724292392	658442261V	Collector
104	Mr.L.W Nandika Chaminda	No.57, Kumarakanda Hardware Stores, Kumarakanda, Dodanduwa.	912267104/0775 885925	731390657V	Collector
105	Mr.Jayantha Wijesinghe	J.S Recycle Polythene, 262/16, Kosgama Villege, Kosgama.	777899361/0727 899361	762760282V	Recycler
106	Mr.Mohomed Ismail Umar Ali	20 A, 1st Cross Street, Nindavur - 18 CEP	773653393 0672250651		Stopped
107	Mr.Viraj Isura	No.119, Kaduwela Road, Oruwela, Athuruginiya	724466420		Stopped
108	Mr.W.M.R.P Wijesundara	199 A, Arambegama, Pilimathalawa	0777306340 0812575736	662941115V	Collector
109	Mr.Srimal Jayaweera	No.10, NHS, Dambaruwa, Kundasale	0718003304 0812420213	751353491V	Collector

110	Mr.Murthasa Shakrudeen	Hirani Enterprises (Pvt) Ltd, No.84, Korawella, Moratuwa	0722173236 0716520076/011 2503656	790943732V	Recycler
111	Mr.K.M.S Rodrigo	Nimal Plastics, No.127, Elpitiwala, Ragama	112960363	471421111V	Recycler
112	Mr. Jawfar Mohomed Rauff	20 Road, Third Lane, 21/2, St. Mariya Place, Welisara, Ragama.	777362256	630011132V	Recycler
113	Mr. D.V Sarath Kumudu Kumara	S.K.K. Recycling, No. 1/1, Batuwandara, Madapatha	776316013/0721 924239	752171548V	Recycler
114	Mr. W.A Nihal	A.R.W Plastic Industries, No.214, Mohottigoda, Gonapola	113160837	683220213V	Recycler
115	Mr. D. M. S. Priyankara	The Beria Enviro Solutions (Pvt) Ltd, Mawgama, Batuwita, Horana.	0342265489 0342265491 0772642934	860722380V	Recycler
116	Mr. W.G Rohitha Perera	No 211/1, Railway Mw, Maharagama.	072-2249784 0112843168 0112859346		Stopped
117	Mrs.Karupaiya Kanagasundari	No.597, Gohagoda Road, Katugasthota	0778860230/077 1885075 0812492455	658573063V	Collector
118	Mr. Asoka Weerarathne	No. 18, Uthuruwerala Road, Trincomalee	0771914063 0262220587 0262220457	560833059V	Collector
119	Mr. J.K.S. Perera	No.S/B/75/R, National Housing Scheme, Raddolugama	0717171717 0777319630 0117900009		Stopped
120	Mr. B.P. Chaminda Senadeera	No. 19/2, Loluwagoda, Mirigama	0333330255/071 7365616	742672956V	Collector
121	Mr.M.M.P.D. Asoka	No.66, North See Road, Trinco	0771914063 0112612620		Stopped

122	B.A.D.Suranga	No.9, Paththiniwatta, Ihalalunugama, Mandawala	071-6077162	772242425V	Collector
123	Mr.D.M.Thushara Jayawardhana	351, Gambirisgaswawa, Adiyagala, Kekirawa	077-9787876 071-9009379 025-5682414	793391129V	Collector
124	Suresh Sinniah	No.26 Kahantota Kaduwela, Malabe	777745859		Stopped
125	K. M. S. S. Kakulandara	Kakulandara Enterprises, 38 Kanuwa, Kandy Road, Lenadora	0665681103/077 7698108/071733 6084		Stopped
126	Sooriya Arachchige Niroshan & Irawchnadrage Sujebdran	Lanka Green Environment, LG/180/112,Peple Tred Mrakert, Colombo - 11	0114-563620 0714094866 0714094877	751647123V & 821101743V	Recycler
127	W.Sunil Silva	No,527 Koswaththa, Kotugoda	077.5858400 0113117411		Stopped
128	Paekaging (Pvt)ltd	30.George De.silva Mawatha, Kandy	077-5514999		Stopped
129	W.A.Idunil Disanayaka	65, Pilimathalawa Udannaya, Pilimathalawa	772310640		Stopped
130	H.P.P.Jayalath	Wayamba Lanka Haritha Uyana,Narawila Road,Ihala Kottaramulla	071-8013168	562722556V	Collector
131	kitsiri mayadunna Wijerathna	NO.33/1/C, 1 Patugama,Weeramal Mawatha,Kohila Watta,Angoda	011-2549044/077932 3454	612320675V	Collector
132	M.A.M.Samsam	No.52,Bathutha Road,Mathara	071-4807895 041-2222903	622212137V	Collector

133	V.Mayantha	L2 42 Realty Plaza,Ja-Ela	072-3250721	673641601V	Collector
134	S.Rajamanikkam	Ever Green Plastic Factory, Viyadiguna, Venithagama, Badulla	055-2226222	522023906V	Recycler
135	T.M.Anuradha Wijayantha	No.147/4,Ananda Bodi Mawatha,Pore,Athurigiriya	071-4322364		Stopped
136	S.P.Chandana Nishantha Senadeera	S.P.C. Plastic, No.9A Thinthapaththara	0774221106/0771918298/0114555329	713344192V	Recycler
137	G.R.Shantha Bandara	No.32/1,Gampola waththa,Gampola	077-3745522	772460511V	Collector
138	W.M.Gamini	Infornt of Mahasen Mandiraya,Guwanthotupola Road,Higurakgoda	027-2247591/0711665653	631472591V	Collector
139	D.S.V.Rajapaksha	187/26, Suhada Mawatha, Railway Road, Udahamulla, Nugegoda	0777529317/011-2836589	846883380V	Collector
140	M. G. Hileshika	S. K. PlasticNo.247, Maha Kubura	0112-948120/0777236816	765823510V	Recycler
141	S. H. Viraj Priyanga Fernando	1074, Jayasamaru Mawatha, Ihalagama, Ragama	0783418049/0114599259	810773065V	Collector
142	S.P.C.De Silva	No. 18 B, St. Shavior Road, Ja-Ela	071-4729404/0113104606	692964527V	Recycler
143	Mr. K.M. Sameera Sampath Kakulandara	Kakulandara Enterprises, Kandy Road, 38 Kanuwa, Lenadora	0777-698108, 071-2262073 066-5681103		Stopped
144	K.A.D.L.S.N. Nanayakkara	426/5, North Siyabalape, Siyabalape	0714487313/0770448319	673140947V	Collector

145	Palitha Mallikarachchi	"Mallika", Makadura, Matara	0779573207/0413418805		Stopped
146	Priyantha Madagodage	No. 01, New Town, Wallawya Road, Weerawila		710421749V	Collector
147	M.I.M. Rishad	Whiteline Industries Colombo (PVT) Ltd, 169, New Moor Street, Colombo 12	0112344821/0777307482l	733081627V	Recycler
148	G.M. Venura Pradeep Senanayake	452/2, Piliyandala Road, Maharagama	0757087344/0714991239/0112837962	763421392V	Collector
149	POLY PAP Converters (PVT) Ltd	104/11,Grand Pass Road, Colombo 14	0114796706/0777314222	442042683V	Recycler
150	Esika (PVT) Ltd	104/11,Grand Pass Road, Colombo 14	0114796706/0777314222	442042683V	Recycler
151	Eswaran Brothers Ceylon Ltd	104/11,Grand Pass Road, Colombo 14	0114796706/0777314222	442042683V	Recycler
152	Lokugamage Sunil (HIPS)	Sunil Traders, 323, Pasal Mawatha, Kalapaluwawa	0777433217/0112792912	613230947V	Recycler
153	Plastic Molds & Moldings (PVT) Ltd	No. 271/7, Kerawalapitiya, Handala, Wattala (Mr. Ruwan Weerasinghe)	0112980566/0114340721/0114340699/0714143657	620025810V	Recycler
154	T.M.C. Sumudu Priyankara Tennakoon	No. 450, Panagoda, Homagama	0777415312/0115789139		Stopped
155	Matale Recyclers & Environmental Engineers (PVT) Limited	No. 12, Temple Road, Bowatta, Ukuwela	0664928252, 0718330068, 0724821700, 0114340699, 0112980566/0714143657	620025810V	Recycler

156	"Parisara Sri Lanka", (Sisira)	2A, Sade Gall Housing, Kovila Mawatha, Dadalla, Galle	774131059	693654181V	Collector
157	Selliya Sathyanadan	163, Waizer Street, Pandarikkulam, Vavniya	024-2223244/077-9358923	572750949V	Collector
158	Joseph Raween Sheyan Jayawardena	Power Line Electrict Company, No. 382/1, Elizabath Perera Mawatha, Kadawatha	0112921111, 0773000838	831510730V	Collector
159	Starline Enterprises - Rohan B. Fernando	11, First Lane, Rathmalana	0714212121/0112622999	523102036V	Recycler
160	S.S. Sama N Company (PVT) Limited (Mr. W.G.S. Karunathilaka)	No. 258, Batapandura, Andiambalama, Negambo	0750826680/0112252629	712560401V	Recycler
161	Lakshan Group	No. 30 E, Egoda Uyana, Oruwala, Athurugiriya	0112798031/0729489382		Stopped
162	G.G. Upasena	No. 25/25 A, Siyabalagasthanna, Kandy	817925649	392440364V	Collector
163	"Arthacharya Padanama", Widanalage Sathis Pemruwan De Mel	Kotawila, Kamburugamuwa	0786083676/0413040792	500024976V	Recycler
164	H.M.D.T.S. Mernas	Smart Polypackaging, Kudagama, Hurimaluwa, Rambukkana	0777846114/0352266984	791870682V	Recycler
165	Deegoda Manage Senaka Ranjith Gunasena	208/C/04, Palugaha Godalla, Ambalanthota	0774155441/0779259020	751643110V	Collector
166	Polytrad Industries (M.J.A. Jaleel)	221/K/i/J, Enderamulla, Wattala	0113193847/0778151790	470416483V	Recycler

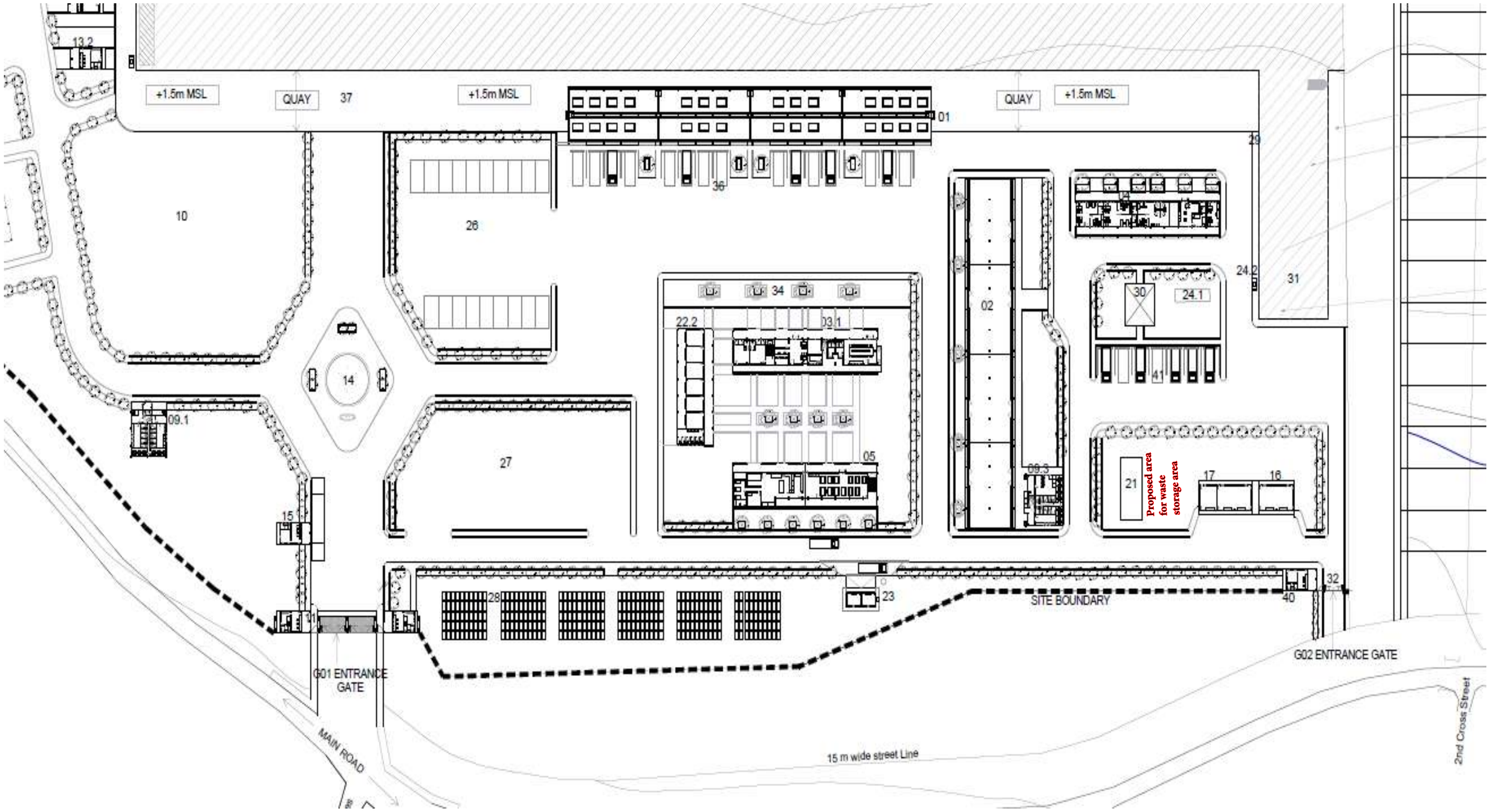
167	M.A. Sunendra	Vishal Recycling Service, 66/11, Pasal Mawatha, Mahindarama Road, Athulkotte, Kotte	0724689949/0723665199	680962642V	Collector
168	I.D. P. K. Jayasinghe	VHP Enterprises No. 309/A, Walpola, Ragama	0713074327/0724921977	695243111V	Collector
169	M. W. Ariyalatha	Parappuwa, Wilekumbura, Bentota	777840362	668423947V	Collector
170	D. D. Sunil Jayasooriya	Devmini Polyproducts, No. 137, Kurunumulla, Panadura	0382243739/0712762432	673523390V	Recycler
171	Green Step (PVT) Ltd (K. K. Vidanagama)	No. 373, Hikgahawatta, Waragoda, Kelaniya	0772121822/0718502269	763252167V	Collector
172	Marimuththu Subramaniyam	No. 62, 4th Street, Maskeliya	0522277497/0773901180		Stopped
173	R.D. Premasiri	Packaging Materials (PVT) Ltd, 20, D.B. Perera Mw, Paraththa, Panadura	382236901	591062522V	Recycler
174	L.Y. Chandrasena	Ballagas Junction, Sooriyawewa road, Hambantota	0774551087/0412227813	543294730V	Collector
175	Lead Engineering Solutions (PVT) Ltd (Mr. Nisal Ransinghe)	574/5 A, Kandy Road, Rammuthugala, Kadawatha	0113046007/0112969376	820890248V	Collector
176	Kandy Plastics (PVT) Ltd (Sri Lal Wickramarathne)	Industrial Estate, Pallekale, Kundasale	0812420260/0812421750/0777873141	520104151V	Recycler
177	K.P. Ananda	295 A/1, Pradeshiya Sabha Road, Pinnaduwa, Walahanduwa	0770275643/0917914707		Stopped
178	Anjana Malika Kumarasinghe	32/10 A, Amunukumbura, Wathurugama	0712536731/0335675546	932780470V	Collector

179	Seimans Electricals (Sajeewa Aravinda Gamage)	No. 27, Temple road, 2nd Maradana, Colombo 10	0112684361/0777171938	763333507V	Collector
180	D.P. Kathirgamanathan	743, Aluthmawatha road, Colombo 15	0112527001/0778483656	622092646V	Collector
181	Mohammed Yehiya Mohammed Siyam	160, Farm road, Ambalanduwa, Panadura	0772280197/0715363254	732360832V	Collector
182	M. Nawasiwayam	No. 745, Madan products, Meepitiya, Kegalle	0352230192/0354911938/0776100765	510482670V	Collector
183	D.M.D. Nishantha Pushpakumara	Ceylon Paper Sacks Limited, 257, Grand pass road, Colombo 14	0112498200/0112911011/0771053816	652751849V	Recycler
184	K.A. Saman Sri Nishantha	No. 500, Ihala Hanwella, Hanwella	0362253334/0723676995	650764048V	Collector
185	H.L. Hinnimahaththaya	No. 233/35, Henamulla camp, Madampitiya, Colombo 14	0755209623/0755052030	502531794V	Recycler
186	Tharunda International (PVT) Ltd (Dilan Dilruk Weerasekara)	379/5 D, Rathnarama Road, Hokandara North	011274 2968/07737 46970	77 289301 9V	R r
187	W.S.N. Perera	S.K. Pack, No, 203/5, Rukmale, Pannipitiya	071813 5541/01131 85279	75 350106 1V	R r
188	B.I.U.K. Karunadheera	Karunadhreera Suppliers, 476/4/B, Aggona, Angoda	0727000869/0112549813	620532584V	Collector
189	H.P.G. Pradeep Nishantha Karunagama	No. 18, Ibuldeniya, Handessa	0779175165/0812315792	770061555V	Collector
190	K.P.D.S.U. Kelum	No. 38/3 A, Pattiwila, Gonawala	0772304582/011	851081550V	Collector

			2907124		
191	Asanka Rathnayake	Sanjeewa Plastic Industries, 384/5, Biyagama Road, Gonawala	0714019577/0777944222/0112910697	812231138V	Recycler
192	D.L. Upul	89/2, Nadudeniya road, Rukmale, Pannipitiya	0715311390/0719696060	661830077V	collector
193	H.A. Chandana Pushpakuara	Sandari Industries, No. 226/37, Dippitigoda, Kelaniya	0112940007/0773478311	702840651V	collector
194	P.K. Premachandra	No. 226/11/F, Maha Kumbura Road, Dippitigoda, Kelaniya	0787449631/0729035098	620204439V	Recycler
195	K. Malkom	Dilshan Trade Center, No. 587/B/2, Heyyanthuduwa	0772416335/0776472781	583392297V	collector
196	W.A.P.K. Wijesooriya	Loshitha Trade Center, No.355/B/1, Bandaranayake Mw, Heyyanthuduwa	0774400878/0778024261	751760434V	collector
197	C. Kulasiri Priyarathna	No. 06, Kottawa Road, Moragahahena, Millewa	0342253213/0777166178	543462241V	Recycler
198	T.L.P. Silva	No. 422/A, Morawatta, Nagoda, Kadana	0723498207/0112059050	663532111V	collector
199	U. Dayananda Perera	Alubogahawatta, Paragastota, Horana	0777715233/0342252297	651761972V	collector
200	U.T.P. Rodrigo	Godakapalla, Paragastota, Horana	0716001985/0342252260	783342677V	collector
201	A.S.C. Perera	Randeni Solutions, No. 137/1, Asgiriya, Gampaha	0771968674/0332233622	801820255V	collector
202	K.A. Niroshana Sanjeewa	583/4, Sangabo Mawatha, Makola North, Makola	718589352/0777763531	770541115V	collector
203	P.K. Akila Prabath	Akila Institute, No. 226/11/F, Maha Kumbura Road, Dippitigoda, Kelaniya	0729035098/0787449631	902570900V	Recycler
204	G.K.W. Shiwandika	Ravindu Institute, No. 245/F, Dippitigoda, Mahawatta,	0112933612/075	878191633V	collector

	Nadishani	Kelaniya	5197132		
206	Jiffy Products S.L. (Pvt) Ltd	Plot No. 27 C, Export Processing Zone, Mirigama	0332276400/0772104562	801720234V	Recycler
207	K.D.P.M. Gunawardena	Koshena, Palpola, Galpatha	0777392975/0342231773	711430172V	Recycler
208	K.M. Nuwan Dharshana	No. 492/A, Badalgewatta, Habaraduwa	0718425578/0767428828	901871620V	collector
209	EMP PVC Technology (PVT) Ltd (Mahesh)	No. 16, Templeburg Industrial Estate, Panagoda, Homagama	714073422	878191633V	Recycler
210	DSP Dilantha Priyagith	Deegayu Enterprises,297, Bollegala, Gonawala	0773473824/0112916412	791960169V	Collector

Annex IV The location of the temporary storage area


+1.5m MSL
QUAY
37
+1.5m MSL
01
QUAY
+1.5m MSL
29
13.2
10
26
36
34
22.2
03.1
02
30
24.1
24.2
31
41
14
09.1
27
05
09.3
21
Proposed area for waste storage area
17
16
15
28
23
SITE BOUNDARY
40
32
G01 ENTRANCE GATE
G02 ENTRANCE GATE
MAIN ROAD
15 m wide street Line
2nd Cross Street

Annex V The list of Hazardous waste collectors registered with the CEA

මධ්‍යම පරිසර අධිකාරිය
மத்திய சற்றாடல் அதிகாரசபை
Central Environmental Authority

E – Waste Management

In Sri Lanka the Hazardous Waste (Scheduled Waste) Management rules were first announced under the National Environmental Act in 2008 under the Gazette Extraordinary 1534/18. As per this regulation E – Waste has been categorized as a scheduled waste and every generator, collector, storer, transporter, recover, recycler and disposer should obtain a license from the CEA.

It is essential that every citizen should understand that E –Waste is hazardous and it is their responsibility to get it managed in an environmentally sound manner. The CEA has mandated that the E – Waste should be given only to authorized collectors

Licensed Collectors of Electronic Waste Management in Sri Lanka	
Institution	**Contact Person**
Licensed collector for E waste Geocycle Holcim (Lanka) Limited 413, R A De Mell Mawatha, Colombo 03 Station; Geocycle Preprocessing facility, 25A, Spur road 3, Phase 1, Katunayaka EPZ, Katunayaka	Mr. Randeewa Malalasooriya General Manager Mobile : 0772 538 771 Office : 0117 800 800 Fax : 0117 389 239
Licensed collector for E waste Green Link (Pvt) Ltd 20/1 A, Moragasmulla road Rajagiriya	Mr. U.D.N Gunarathne Mobile : 0714 066 455/071 6305184 Office : 0115 661 731/0115661731 Mr. Oshada Weerasinghe Mobile : 0716 305 184
Licensed collector for E waste Z MAX ENTERPRISES No. 137/3, Mahena Road, Siyabalape, Sapugaskanda	Mr. P.K. Withanage Mobile : 0778 141 488 Office : 0112 401 707 Fax : 0112 401 707
CFL and Florescence Tube Bulbs Asia Recycling (Pvt) Ltd Pitipana South, Homagama Contact details : Orange Company, No. 76 Barnes place, Colombo 07.	Mr. B.G. Gunathilaka Factory Manager Mobile : 0772 342 882 Office : 0114 792 166 Fax : 0114 792 199

Licensed collector for E waste Ceylon Waste management (Pvt) Ltd 176, Godaparagahalanda, Kiriwathtuduwa, Homagama	Mr. Sudesh Nandasiri Chief Executive Officer Mobile : 0777 999 238 Office : 0114 336 336
Licensed collector for E waste Think Green (Pvt) Ltd No. 57/33, Muthuwella Mawatha, Colombo 15	Mr. Shivahar Muthuramalingam Mobile : 0773 733 301 Office : 0112 522 111 Fax :0112 520 015
Licensed collector for E waste J F Supplier No. 276, Kottawaththa, Mawnella	Mr. M.S.M Jawfer Mobile : 0777 789 496/ 0724 784 741 Office : 035 2248133 Mail : jfsuppliers@gmail.com Web : www.jfsuppliers.webs.com

Annex VI Tolerance Limits for Industrial and Domestic Wastewater Discharge into Marine Coastal Area

TOLERANCE LIMITS FOR INDUSTRIAL AND DOMESTIC EFFLUENTS DISCHARGED INTO MARINE COASTAL AREAS

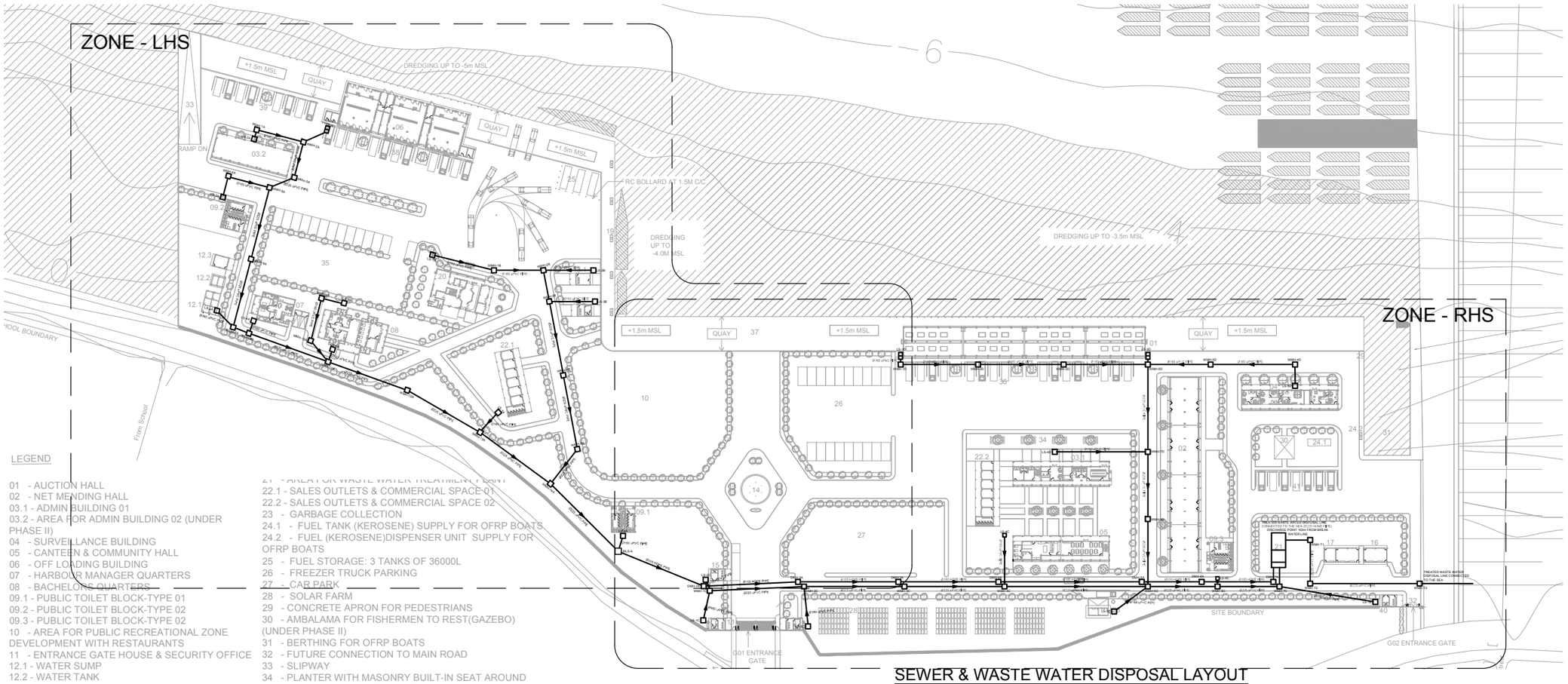
NO.	PARAMETER	UNIT TYPE OF LIMIT	TOLERANCE LIMIT VALUES
1	Total suspended solids	mg/1, max.	150
2	Particle size of- (a) Floatable solids (b) Settlable solids	mm, max µm, max	3 850
3	pH at ambient temperature	-	5.5 – 9.0
4	Biochemical oxygen demand (BOD_5 in five days at 20^0 C or BOD_3 in three days at 27^0C)	mg/1, max.	100
5	Temperature	^{0}C, max	45^0C at the point of discharge
6	Oils and greases	mg/1, max.	20
7	Phenolic compounds (as Phenolic OH)	mg/1, max.	5.0
8	Chemical oxygen demand (COD)	mg/1, max.	250

9	Total residual chlorine	mg/1, max.	1.0
10	Ammoniacal Nitrogen (as N)	mg/1, max.	50
11	Cyanide (as CN)	mg/1, max.	0.2
12	Sulphides (as H_2S)	mg/1, max.	5.0
13	Fluorides (as F)	mg/1, max.	15
14	Arsenic (as As)	mg/1, max.	0.2
15	Cadmium (as Cd)	mg/1, max.	2.0
16	Chromium, total (as Cr)	mg/1, max.	2.0
17	Chromium, Hexavalent (as Cr^{6+})	mg/1, max.	1.0
18	Copper (as Cu)	mg/1, max.	3.0
19	Lead (as Pb)	mg/1, max.	1.0
20	Mercury (as Hg)	mg/1,max.	0.01
21	Nickel (as Ni)	mg/1,max.	5.0
22	Selenium (as Se)	mg/1,max.	0.1
23	Zinc (as Zn)	mg/1,max.	5.0
24	Pesticides	mg/1,max.	0.005
25	Organo-Phosphorus compounds	mg/l, max	1.0
26	Chlorinated hydrocarbons (as Cl)	mg/l, max	0.02
27	Faecal coliform	MPN/100ml, max	60
28	Radio Active Material:		
	(c) Alpha emitters	micro curie/ml, max	10^{-8}
	(d) Beta emitters	micro curie/ml, max	10^{-7}

Note 1: All efforts should be made to remove unpleasant odour and colour as far as practicable.

Note 2: These values are based on dilution of effluents by at least 8 volumes of clean receiving water. If the dilution is below 8 times, the permissible limits are multiplied by the 1/8 of the actual dilution.

Annex VII The proposed wastewater collection system

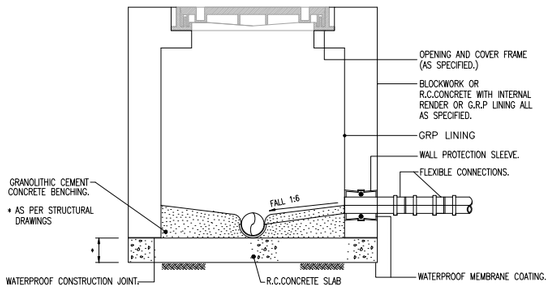


LEGEND

01 - AUCTION HALL
02 - NET MENDING HALL
03.1 - ADMIN BUILDING 01
03.2 - AREA FOR ADMIN BUILDING 02 (UNDER PHASE II)
04 - SURVEILLANCE BUILDING
05 - CANTEEN & COMMUNITY HALL
06 - OFF LOADING BUILDING
07 - HARBOUR MANAGER QUARTERS
08 - BACHELORS QUARTERS
09.1 - PUBLIC TOILET BLOCK-TYPE 01
09.2 - PUBLIC TOILET BLOCK-TYPE 02
09.3 - PUBLIC TOILET BLOCK-TYPE 02
10 - AREA FOR PUBLIC RECREATIONAL ZONE DEVELOPMENT WITH RESTAURANTS
11 - ENTRANCE GATE HOUSE & SECURITY OFFICE
12.1 - WATER SUMP
12.2 - WATER TANK
12.3 - PUMP ROOM
13.1 - FUEL OFFICE
13.2 - SATELLITE OFFICE
14 - CENTER FEATURE
15 - WEIGHT BRIDGE & CONTROL ROOM
16 - GENERATOR ROOM
17 - TRANSFORMER ROOM & PANEL ROOM
18 - MARSHAL POINT ROOM
19 - FUEL STATION & FUEL DISPENSER UNIT
20 - CUSTOM BUILDING
21 - AREA FOR WASTE WATER TREATMENT PLANT
22.1 - SALES OUTLETS & COMMERCIAL SPACE 01
22.2 - SALES OUTLETS & COMMERCIAL SPACE 02
23 - GARBAGE COLLECTION
24.1 - FUEL TANK (KEROSENE) SUPPLY FOR OFRP BOATS
24.2 - FUEL (KEROSENE)DISPENSER UNIT SUPPLY FOR OFRP BOATS
25 - FUEL STORAGE: 3 TANKS OF 36000L
26 - FREEZER TRUCK PARKING
27 - CAR PARK
28 - SOLAR FARM
29 - CONCRETE APRON FOR PEDESTRIANS
30 - AMBALAMA FOR FISHERMEN TO REST(GAZEBO) (UNDER PHASE II)
31 - BERTHING FOR OFRP BOATS
32 - FUTURE CONNECTION TO MAIN ROAD
33 - SLIPWAY
34 - PLANTER WITH MASONRY BUILT-IN SEAT AROUND
35 - AREA FOR COLD STORAGE & ICE PLANT
36 - LOADING AREA OF AUCTION HALL
37 - PROPOSED QUAY WALL
38 - LOADING AREA OF OFFLOADING BUILDING
39 - DEDICATED PARKING AREA FOR OFFLOADING BUILDING
40 - AREA FOR SECURITY OFFICE 01
41 - DEDICATED PARKING AREA FOR OFRP BOATS

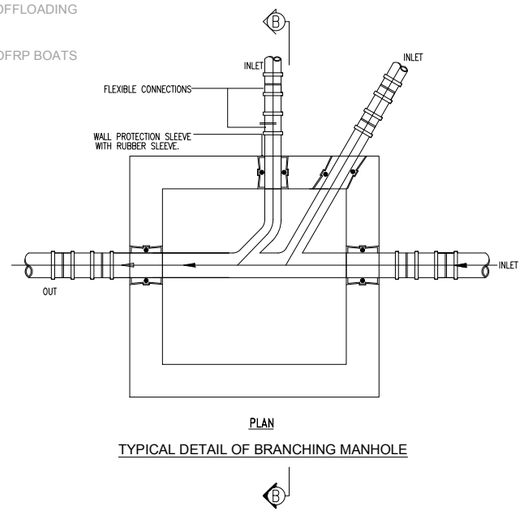
SEWER & WASTE WATER DISPOSAL LAYOUT FOR MASTER PLAN

SCALE : NTS



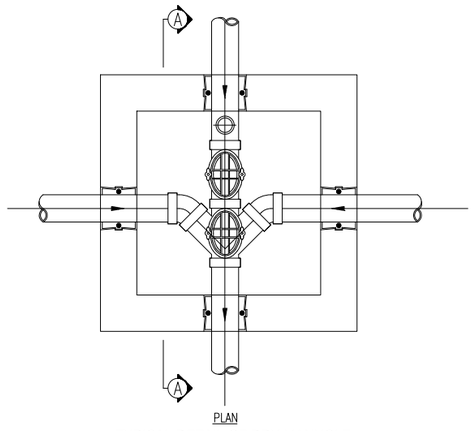
SECTION B–B

TYPICAL DETAIL OF BRANCHING MANHOLE



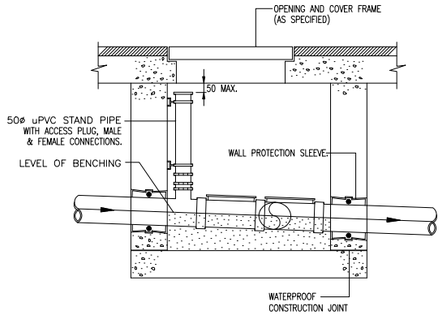
PLAN

TYPICAL DETAIL OF BRANCHING MANHOLE



PLAN

TYPICAL DETAIL OF DRY MANHOLE



SECTION A–A

TYPICAL DETAIL OF BRANCHING MANHOLE

GENERAL NOTES : DRAINAGE

1- THESE DRAWINGS SHALL BE USED FOR DRAINAGE PURPOSES ONLY , DO NOT SCALE FROM THESE DRAWINGS.

2- THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS OF DIFFERENT TRADES FOR COORDINATION.

3- ALL FLOOR DRAINS IN BATHROOM SHALL BE 63mm. IN SIZE UNLESS INDICATED OTHERWISE.

4-ALL DRAINAGE RISERS SHALL HAVE SIDE CLEAN OUTS EVERY OTHER FLOOR.

5- ALL EQUIPMENT & FIXTURES SHALL BE APPROVED BEFORE ORDERING.

6- THE CONTRACTOR SHALL SUBMIT FOR APPROVAL THREE SETS OF SHOP DRAWINGS SHOWING OPENINGS & SLEEVES IN CONCRETE WALLS & SLABS BEFORE WORK CAN BEGIN. HE SHALL ALSO PREPARE ANOTHER THREE SETS OF SHOP DRAWINGS FOR APPROVAL SHOWING THE SYSTEM EXACTLY IN PLACE.

7- ALL SLEEVES FOR SANITARY FIXTURES SHOULD BE CHECKED VERSUS THE SELECTED FIXTURES BEFORE POURING CONCRETE.

8- ALL PIPES CROSSING CONCRETE EXPANSION JOINTS SHALL HAVE PIPE EXPANSION JOINTS.

9- ALL LAVATORIES , KITCHEN SINKS , DISCHARGE PIPE SIZE ARE 40mm. SIZE UNLESS INDICATED OTHERWISE.

10-ALL VERTICALLY INSTALLED ELBOWS AT HIGH LEVEL ON WASTE & SOIL PIPES SHALL BE COMPLETE WITH ACCESS BENDS.

11- ALL UNDER / ABOVE GROUND DRAINAGE PIPES & FITTINGS WILL BE uPVC.

12- DRAINAGE PIPING SLOPE :
20mm to 63mm - 1:50
75mm to 110mm - 1:100
160mm to 225mm - 1:200
SIZE UNLESS INDICATED OTHERWISE.

13- PRESSURE CLASS FOR uPVC PIPES & FITTINGS 600kPa / 6.0 bar (Type 600)

14- USE RECOMMENDED CONNECTIONS FOR PIPE FIXING.

ABBREVIATION

FG	FLOOR GULLY
RD	ROOF DRAIN
FCO	FLOOR CLEAN OUT
MH	MANHOLE
S	SEWER DISPOSAL
W	WASTE WATER
RW	RAIN WATER
C.I	CAST IRON
GV	GATE VALVE
NRV	NONE RETURN VALVE
J	JOCKEY PUMP
P	PUMP
F	FIRE
V	AIR VENT
T	TYPE
PG	PRESSURE GAUGE
ST	STRAINER
FHR	FIRE HOSE REEL
PRV	PRESSURE REDUCING VALVE
RB	RUBBLE BELLOW
FV	FOOT VALVE
WM	WATER METER
CWS	COLD WATER SUPPLY
HWS	HOT WATER SUPPLY
DD	DROP DOWN
F/A	FROM ABOVE
T/A	TO ABOVE
F/B	FROM BELOW
T/B	TO BELOW
BS	BIDET SHOWER
SH	SHOWER
WC	WATER CLOSET
WB	WASH BASIN
AV	ANGLE VALVE
SP	SQUATTING PAN
KW	KITCHEN WASTE
WMC	WASHING MACHINE
BD	BALCONY DRAIN
PD	PLANTER DRAIN
I.L	INVERT LEVEL
UR	UNDER THE RAFT
UG	UNDER THE GROUND
US	UNDER THE SOFIT
TW	THROUGH WALL
TS	THROUGH SLAB
BR	BELOW ROOF
LL	LOW LEVEL
HL	HIGH LEVEL
OW	ON THE WALL
CP	CATCH PIT
CG	CHANNEL GRATING
RD	ROOF DRAIN
BD	BALCONY DRAIN
SAD	SUPPLY AIR DUCT
RAD	RETURN AIR DUCT
SAG	SUPPLY AIR GRILL
RAG	RETURN AIR GRILL
AHU	AIR HANDLING UNIT
OD	OUT DOOR UNIT
ID	IN DOOR UNIT
RWD	RAIN WATER DORM OUTLET

NOTES :

*ALL DRAINAGE TRENCHES ARE CONCRETE & GRATING COVERS ARE DUCTILE IRON.

*ALL COVERS ARE HEAVY DUTY DUCTILE IRON.

*ALL MANHOLES AND CATCH PITS ARE RCC (CONCRETE).

*DOUBLE SEAL MANHOLE COVER USE FOR ALL SEWER MANHOLES.

SEWER & WASTE WATER DISPOSAL SYSTEM :

LS - INDIVIDUAL BUILDING FINAL MANHOLE
WMH - WET MANHOLE - 900X900 - CONCRETE - 600X600 COVER DUCTILE IRON
DMH - DRY MANHOLE - 900X900 - CONCRETE - 600X600 COVER DUCTILE IRON
MLS - MASTER LIFTING STATION MANHOLE WITH PUMPS - 1500X1800 - CONCRETE - 600X600 COVER DUCTILE IRON

OTHERS :

A - ZONE A
B - ZONE B
C - ZONE C
D - ZONE D

TENDER

NORTHERN PROVINCE SUSTAINABLE FISHERIES DEVELOPMENT PROJECT
DETAILED ENGINEERING DESIGN OF FISHERY HARBORS, ANCHORAGES AND LANDING SITES

MINISTRY OF FISHERIES AND AQUATIC RESOURCES
1st Floor, New Secretariat Building, Maligawatte, Colombo 10

Lead consultant:

EML CONSULTANTS(PVT) Ltd.
No 6/10, Rajamahavihara Lane, Rajamahavihara Road, Pitakotte.

in Association with ;

Surath Wickramasinghe Associates & Sustainable Engineering Concepts (Pvt) Ltd.

CONSTRUCTION OF POINT PEDRO FISHERY HARBOUR AND MUNAI LANDING SITE IN JAFFNA DISTRICT

REV.NO	DESCRIPTION	DATE
A	Issued for tender	2018/09/26
B	Issued for tender	2019/12/26

TITLE:

SEWER & WASTE WATER DISPOSAL LAYOUT - FULL PLAN (MASTER PLAN)

DESIGNED BY	Chaminda	DRG NO	NPSFDP-JAF-PPD-FH - PL-0020
DRAWN BY	Indrajith		
CHECKED BY	Chaminda	SCALE	NTS A1
APPROVED BY	Pitigala	DATE	2019/12/26

Annex 05- Marine Environmental Assessment

Point Pedro

ඇමුණුම 05 - සමුද්‍රීය පරිසර ඇගයීම - පොයින්ට් පේදුරු

பின்னிணைப்பு 05 – பருத்தித்துறை கடல்சார் சூழலியல் மதிப்பீடுகள்

Northern Province Sustainable Fisheries Development Project (NPSFDP)

SRI: Loan-6011 – ADB (Project Development Assistance - PDA)

Point Pedro Marine Environmental Assessment

(IEE – ADB and EIA – Sri Lankan Government)

Proposed Fishery Harbour at Point Pedro

Marine Ecology

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Executive summery

The Northern Provincial Sustainable Fisheries Development Project (NPSFDP) is to develop the fisheries sector in the four districts; Jaffna, Mannar, Mullaitivu, and Killinochchi in Northern province. The project has planned to develop fisheries through the Climate Resilient Infrastructure, which include two (2) harbours (Point Pedro and Pesalai), eight (8) fishing anchorages and twenty-five (25) fisheries landing sites.

This report is a result of marine ecological assessment to provide the essential information for the environmental safeguard requirements of the proposed Point Pedro port development site. Present marine environmental assessment is to make recommendations for identifying and managing environmental impacts based on Sri Lankan and the ADB Safeguard Policy Statement 2009 (SPS) requirements and international best practices. Outcome of the assessment will help the project developers and environmental advisors to give due diligence for environmental safeguard. The marine assessment report will be an integral component of the projects Point Pedro environmental assessment and will support the projects development consent requirements.

The assessment looks at the critical habitats, threatened species (international or local level) existing environment and possible impacts and risks to threatened marine invertebrate and vertebrate species associated with this coastal and coral reef site and include site specific information.

A rapid underwater survey was carried out in the sampling sites to identify major habitat types, biodiversity, substrate type, sediments and to assess the overall health of the ecosystems at present. Shore-perpendicular transects of which 30 m length and 2 m wide were conducted using underwater visual survey technique in each site assisted by timed videos and still photographs to identify the community composition targeting qualitative and quantitative data.

Study area is adjoining the Point Pedro jetty where the proposed harbour to be constructed. Considering the actual project area, breakwaters and potential impact area, five locations on the shore were first selected as PPD1 to PPD5. PPD1 was a reference point to the west of the project area and PPD5 was the reference point to the east. PPD2-PPD4 were within the project area. In each location, three sampling sites were selected representing shallow waters (Intertidal), mid and deep waters. Accordingly, altogether 15 sampling sites were used for assessment. In addition, another site (PPD2-RL) was also assessed from the reef lagoon area between Jetty and PPD2.

Noteworthy marine flora and fauna, substrate types, and sensitive areas observed were recorded. In order to estimate the percent cover, belt transect method was used. Snapshot of each quadrate was obtained and all the fauna and flora encountered in the quadrates were photographed. Substrates were classified to different categories

Timed video was obtained in full length of the quadrate. In each sampling site, fauna and flora encountered were recorded on a slate by a diver observer and specimens unable to identify were later identified using photographs. Data collected from snorkeling, diving, photos and video were used to record seabed habitats and identification of ecologically sensitive habitats.

In addition, sediment sample was collected in non-reef areas for classification of sediments based on texture.

Two landing sites either side of the study area were visited, several fishermen were interviewed to collect information on the present status and issues of the fisheries. In addition, Key Informants were also met.

Coralline limestone and sandstone reefs were found running parallel the shore, protecting the shore from waves and providing habitats for intertidal biota including soft and hard corals. Sandstone, limestone and rocky reefs are one of the common features of the northern coast of Sri Lanka. Reefs found are not typical fringing reefs and rather sandstone or limestone and rock boulder reefs. Typical characteristics of a reef such as reef crest, lagoon and seaward slope are not prominent. The reef was extended about 150 m seaward and ends at 6-8 m depths maximum.

Along the shallow water sandstone reef more towards the east of the jetty, the substrate was mostly coral rubbles and newly recruiting hermatypic corals of < 30cm size were emerging and observed scattered. They were dominated by *Acropora* sp and *Montipora* sp. Deeper reefs within the reef lagoons were dominated by massive and boulder corals such as Porites sp, *Platygyra* sp and Favia sp. Towards the deeper end of the submerged reefs the boulders were mostly covered with soft corals such as Sinularia sp. Highest live coral cover found was 6% in the reef lagoon next to the jetty and in the shallow reefs highest live coral cover was 5%. However, for the rest of the areas live coral cover was 0-1%.

The reef flats are subject to expose time to time. The reefs are not very healthy and found dead corals and coral rubbles. The reef flat is smothered with sediment in most of the areas and deeper areas not exposed are mostly covered with algae dominated by *Padina* sp, *Caulerpa* sp, *Halimeda* sp and *Turbinaria* sp. Reefs are also rather low in structural complexity and diversity compared to the sub-tidal reefs elsewhere in the Island. These reefs are subject to periodic smothering by regular accreting or eroding beach lines preventing continuous colonization of hermatypic corals and thereby hampering the reef growth.

At the edge of the reef it is all sand bottom that extend towards offshore. The sandy bottom is covered with fine sand and mud on surface layers and visibility is very poor due to fine particles. The sandy bottom is devoid of any benthic communities.

The inshore reef areas harbor commercially important fish species such as Jacks (Carangidae), Snappers (Lutjanidae), Groupers (Serranidae) and Sardines (Clupeidae). The rocky reefs of the area support a lobster population. The reef habitats also support a large population of beche-de-mer (sea cucumber) dominated by Holothuria atra.

The rocky shores in the study area are typical and support diverse colonies of intertidal communities. Some of the larger pools such as one west of the jetty, are inhabited by several species of hermatypic corals as well as soft corals. Reef associated fishes as well as juvenile stages of some Butterflyfishes (*Chaetodon* sp) and Angelfishes (*Pomacanthus* sp) were also observed.

Plankton samples studied showed some common marine plankton found in coastal waters around Sri Lanka. Large aggregations of fish or invertebrate eggs or larval stages were not

recorded among samples and therefore cannot consider the project area as a breeding ground.

Coastal population around the project site is heavily depend on fisheries for their livelihood. Presently fisher use open beach use for landing without any infrastructure facilities for proper anchorage and handling of fish and fishing gear. Fishing in the area is small-scale fishing operations using traditional fishing gear and vessels. Vessels used are mostly traditional crafts such as *theppam*, and they are now been replaced by FRP boats with outboard engines. In order to develop the fishery of the area, proper infrastructure developments are imperative.

Development of a new harbours that involve dredging and construction, including breakwaters in the coastal zone, are likely to cause substantial losses to reef communities in the surrounding area. Such projects need compensatory mitigation and safeguard mechanisms for the environment. Among the potential management options available for the mitigation of impending damage to coral reef ecosystems is the development of artificial reefs submerging some structures specifically designed for coral colonization. Scientifically selected submerged structures would provide a substrate that can be inhabited by corals either through natural processes or by transplanting living coral colonies. The development of a coastal structure such as a breakwater provides an opportunity to create a large-scale artificial reef that will mitigate for lost or impacted corals. This could be achieved by either proving an artificial substrate along the breakwater that coral can colonize or carefully placing the coral bearing boulders and sandstones that are to be removed from the project area for development and placing them along the breakwaters. Example can be observed in newly constructed Hambantota port in Southern Sri Lanka, where healthy reef is naturally developing along the breakwater.

1 Introduction

The Northern Provincial Sustainable Fisheries Development Project (NPSFDP) is to develop the fisheries sector in the four districts; Jaffna, Mannar, Mullaitivu, and Killinochchi in Northern province. The project has planned to undertake detailed engineering designs and associated environmental and social safeguards requirements associated with the fisheries infrastructure in the Northern Province through the Climate Resilient Infrastructure. The project is to include the development of two (2) harbors (Point Pedro and Pesalai), up to eight (8) fishing anchorage sites and twenty five (25) fisheries landing sites.

Due to the scale of the proposed scope of works associated with the Point Pedro port development site, a comprehensive marine ecological assessment is required to be undertaken to provide the essential information for the environmental safeguard requirements for this site.

Present marine environmental assessment is to make recommendations for identifying and managing environmental impacts based on Sri Lankan and the ADB Safeguard Policy Statement 2009 (SPS) requirements and international best practices. Outcome of the assessment will help the project developers and environmental advisors to give due diligence for environmental safeguard. The marine assessment report will be an integral component of the projects Point Pedro environmental assessment (IEE – ADB and EIA – Sri Lankan Government) and will support the projects development consent requirements.

The assessment will look at the critical habitats, threatened species (international or local level) existing environment and possible impacts and risks to threatened marine invertebrate and vertebrate species associated with this coastal and coral reef site and include site specific information.

2 Survey design and methodology

2.1 Underwater Visual Surveys (UVS)

A rapid underwater survey was carried out in the sampling sites to identify major habitat types, biodiversity, substrate type, sediments and to assess the overall health of the ecosystems at present. Shore-perpendicular transects of which 30 m length and 2 m wide were conducted using underwater visual survey technique in each site assisted by timed videos and still photographs to identify the community composition targeting qualitative and quantitative data. A team of 3 scientific divers led by the Marine Biologist were involved in the study (**Error! Reference source not found.**). Noteworthy marine flora and fauna, substrate types, and sensitive areas observed were recorded.

Figure 2-1: Divers about to deploy for underwater visual survey

2.2 classification of underwater habitats

In order to identify and classify major marine habitat types, in addition to visual observations, underwater surveys were carried out through diving and snorkeling (Fig 2-1, 2-2). In order to estimate the percent cover, belt transect method was used (Fig 2-3). Quadrates of 50cm x50 cm were used for quantification and percent cover estimates. Minimum of six quadrate samples were obtained systematically along the 30 m transect 5 m apart. Snapshot of each quadrate was obtained and all the fauna and flora encountered in the quadrates were photographed. Timed video was obtained in full length of the quadrate. In each sampling site, fauna and flora encountered were recorded on a slate by a diver observer and specimens unable to identify were later identified using photographs. In addition, sediment sample was collected in non-reef areas for classification of sediments based on texture.

Figure 2-2: Snorkeling and diving for underwater visual census

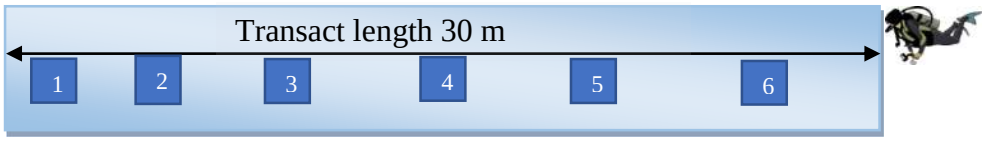


Figure 2-3: Schematic diagram of the paths of the underwater visual census over a 2 m x 30 m x 2m transect (Belt transect and quadrate) (L,W & H)

Underwater video transects were obtained along the belt transect. Canon G1X Mark II, Canon PowerShot 15 and Olympus TG-3 cameras with both video and still imaging capability was used. Digital photographs and videos documented various habitats for descriptive analysis of the communities of the benthic and vertical relief and also used for further identification and also to have a permanent visual record of the underwater habitats (**Error! Reference source not found.**, 2-7). Data collected from snorkeling, diving, photos and video were used to record seabed habitats and identification of ecologically sensitive habitats. All the images and video obtained along with GPS data for georeferencing.

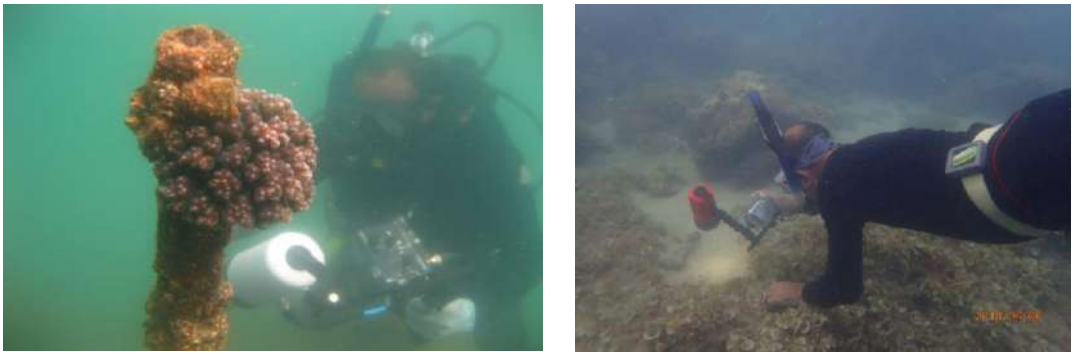


Figure 2-4: Underwater photography

In actual field work however, it was necessary to take into account the small size of local reefs, limitations in underwater visibility and the prevalence of rough seas and some slight adjustments are unavoidable.

Basic water quality parameters, including temperature, salinity, P^H, conductivity, dissolved oxygen (DO), and total suspended solids (TDS) were recorded using a multi-parameter reader (Model: YSI Pro plus) (**Error! Reference source not found.**5). In order to record the depth, a handheld depth sonar was used (Fig 2-6).

Figure 2-5: Multiparameter reader (YSI Pro Plus) used to measure Physico-chemical parameters

Figure 2-6: HawkEye® H22FX - Handheld Depth Sonar

Figure 2-7: Divers observing and recording the underwater transects

The underwater surveys were carried out under difficult conditions. Poor underwater visibility, heavy surf and strong currents restricted the number of sites surveyed, and the number of transects that could be carried out. Such conditions would also reduce the opportunity of observing fast moving and cryptic species.

Two landing sites either side of the study area were visited, several fishermen were interviewed to collect information on the present status and issues of the fisheries. In addition, Key Informants (2 Fisheries Inspectors, and two community leaders were met.

2.3 The study area and sampling design

Study area is adjoining the Point Pedro jetty where the proposed harbour to be constructed. Considering the actual project area, breakwaters and potential impact area, sampling was designed. Five locations on the shore were first selected with a prominent lankmark for easy identification from the sea as PPD1 to PPD5. PPD1 was a reference point to the west of the project area and PPD5 was the reference point to the east. PPD2-PPD4 were within the project area. In each location, three sampling sites were selected representing shallow waters (Intertidal "I", mid water ("M") and deep waters ("D"). Accordingly, altogether there were 15 sampling sites.

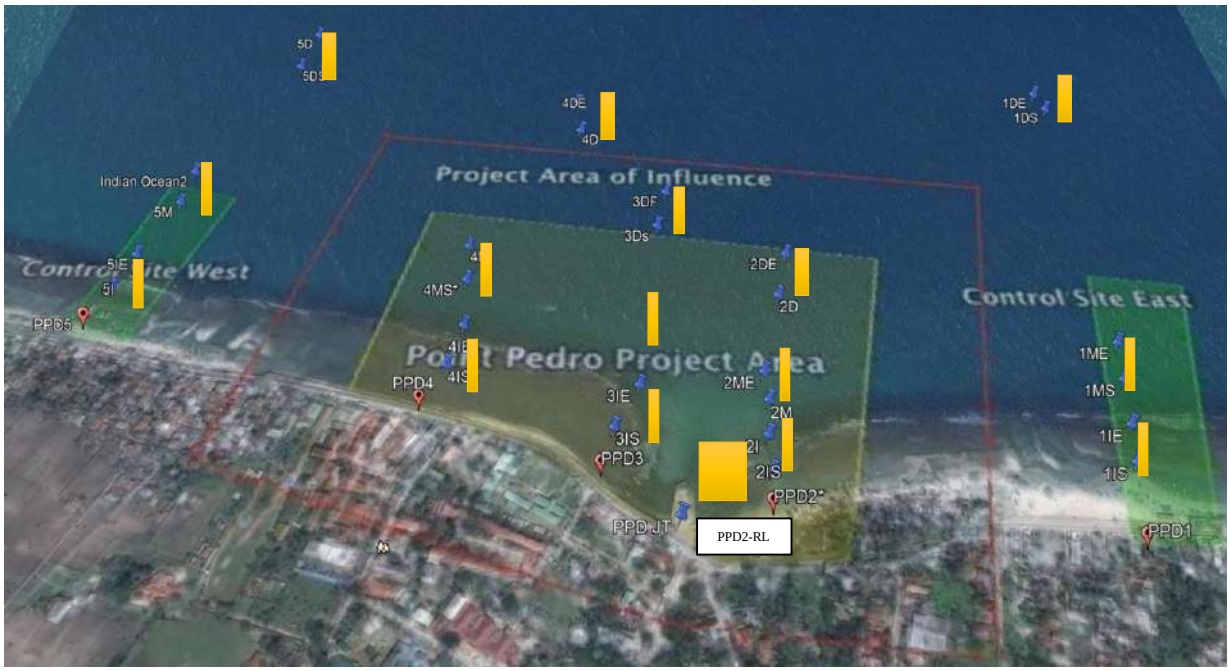


Figure 2-8: Map of the sampling sites. PPD1 to PPD5 were a prominent landmark on the shore.

In each location, three sampling sites were selected representing shallow waters (Intertidal "I" , mid water ("M") and deep waters ("D"). In each site "S" and "E" were used to mark the Start and End of the transect. PPD2-RL is the additionally studies reef lagoon area between Jetty and PPD2.

Note Survey trails (yellow lines) are not to the scale.

Table 2-1: Site descriptions

Serial #	Site #	lat	lon	Site code
1	1	9.833951	80.24012	1DE
2	1	9.833674	80.2402	1DS
3	1	9.829089	80.23982	1IE
4	1	9.828676	80.23974	1IS

5	1	9.830076	80.23999	1ME
6	1	9.829617	80.23991	1MS
7	2	9.830704	80.23658	2D
8	2	9.831288	80.23672	2DE
9	2	9.828972	80.2363	2I
10	2	9.82858	80.23629	2IS
11	2	9.829372	80.23634	2M
12	2	9.829713	80.23632	2ME
13	3	9.832236	80.23544	3DF
14	3	9.831708	80.23532	3Ds
15	3	9.829552	80.23507	3IE
16	3	9.829056	80.23481	3IS
17	4	9.833287	80.23446	4D
18	4	9.833802	80.23441	4DE
19	4	9.830301	80.23326	4IE
20	4	9.829798	80.23312	4IS
21	4	9.831402	80.23324	4M
22	4	9.830918	80.23324	4MS*
23	5	9.835142	80.23098	5D
24	5	9.834494	80.23085	5DS
25	5	9.830801	80.22947	5I
26	5	9.831282	80.2296	5IE
27	5	9.832068	80.22989	5M
29		9.828123	80.23541	PPD JT
30	1	9.827983	80.23962	PPD1
31	2	9.828181	80.23614	PPD2*
32	3	9.828626	80.23466	PPD3
33	4	9.829452	80.23273	PPD4
34	5	9.830325	80.22929	PPD5

3 General description to the project site and area of influence

The coast is low lying and coralline limestone and sandstone reefs running parallel in shallow areas along the shore. In addition to protecting the shore from waves they provide unique habitats for intertidal biota. Reefs are connected to the shore in certain areas but in some reef lagoon formations are found. Strong currents are not expected in this area between reef front and coastline. In the channels between the reef sections, there is fairly strong flows.

Figure 3-1: Reefs running along the shallow coastal area

Figure 3-2 Channels cut opened for navigation

Figure 3-3 Exposed reefs at low tide

Figure 3-4 Inundated reefs at high tide

Along the stretch to the east of the jetty virtually no sand on the beach. Along this stretch there is a 3m high man made revetment which protects land and base is also protected with large boulders. No protective seawall to the west of the jetty and most of the areas have a narrow to wide sandy beaches. Some areas of the beach to the west was seen some coral rubble aggregations.

Most of the areas contains harbour-like constructions that the locals have shaped from dislodged reef material and used to secure their crafts. Some channels are found along the coastal stretch intermittently. These are cut opened to facilitate navigation of the light fishing crafts.

Figure 3-5 Nature of the shore; To the east is a revetment and to the west sandy beaches

3.1 Sandstone/ limestone reefs

Sandstone, limestone and rock reefs are one of the common features of the northern Sri Lanka. Sandstone reefs composed of compacted sand and shell material cemented by marine organisms such as bacteria, mollusk shells, algae, and annelid worms. Deposited on ancient coastlines, these structures are found encircling the shoreline along most parts of the country at different depth regimes from above the high-tide line to depths of over 30m. However, in Point Pedro (PPD) these reefs extend only upto 8 meters. In some areas, the reef lies buried under sand and is exposed seasonally.

3.2 General area usage

The PPD jetty has constructed during the British rule in 1875 to facilitate sea transportation through the PPD harbour. The jetty has been utilized by fisher folks before the operations were restricted on security grounds in 1985 after the escalation of armed struggle in the peninsula. After the area had been cleared, the jetty has been re-opened for fisher folks. Nevertheless, its limited area for boat anchorage and without any infrastructure facilities, a large number of fishermen utilize the jetty for multiday boat operations.

Figure 3-6 The Historical Point Pedro Jetty

Figure 3-7 The Point Pedro jetty is largely used by multiday boat operators.

The area is used for single day fishing using gill nets, cast nets, etc. The inshore reef areas harbor commercially important fish species such as Jacks (Carangidae), Snappers (Lutjanidae), Groupers (Serranidae) and Sardines (Clupeidae). However, beyond the reefs is sandy bottom devoid of benthic habitats and productive fishery cannot be achieved. The coral and rock reefs of the area support a lobster population. Lobster fishing is practiced using circular traps or Bottom Set Nets. The presence of structurally diverse reef formations and the generally turbid water provide ideal conditions for lobsters. The reef habitats also support a large population of beche-de-mer (sea cucumber). However, the most common species recorded, *Holothuria atra* is not a highly valued species as well as abundance is not enough for commercial exploitation.

Figure 3-8 View of the proposed project from the jetty

4 Detailed site descriptions

Reefs found are not true (typical) coral reefs rather sandstone or limestone and rock boulder reefs are found in submerged deeper areas. The reef was extended about 150 m seaward and ends at 6-8 m depths. Seaward slope of a typical reefs not visible due to shallowness. Reef flat deep into spur and grove formation and large granite rocks, sandstones and boulder corals can be seen towards the outer edge of the reef. These rocks covered with soft and hard corals. Course sand bottom is extended thereafter and towards offshore the bottom is mostly fine sand to mud. The sandy or mud bottom is devoid of any benthic organisms and visibility is very poor due to fine particles.

The reef flats are exposed time to time. Therefore, reef flats are not very healthy and found dead corals and coral rubbles. Further, reef flat is sedimented in most of the areas and deeper areas not exposed are mostly covered with algae. Inter-tidal sandstone reef with exposed crests and rock pools runs along the stretch studied except the areas cut opened for navigation purpose. These reefs are rather low in structural complexity and diversity compared to the sub-tidal reefs elsewhere in the Island. The bio-diversity on these reefs is low due to the fact that these reefs are subject to periodic smothering by regular accreting / eroding beachlines preventing continuous colonization by corals. Smothered reef are covered by algal communities further find it difficult to recover.

Significant areas of the reefs composed of exposed rock boulders, often enclosing extensive rock pool systems. These rock pools are mostly inter-tidal and the higher sections are prone to periodic drying and exposure to wave action.

The rocky shores in the study area are typical and support diverse, colonies of Mussels, Oysters, Tubeworms, Shore crabs (*Grapsus* sp) Reef crabs. Hermit crabs and shore and reef associated fishes Some of the larger pools such as one west of the jetty, are inhabited by several species of corals. These environments act as nursery grounds for some reef fish species, and juvenile fishes including some Butterflyfishes (*Chaetodon* spp.) and Angelfishes (Pomacanthus sp).

Description on each of study site studied based on underwater visual surveys (UVS) are given in Table 1.

Table 4-1: Summery of the physico-chemical properties of the study sites

Parameter	PPD1			PPD2			PPD3			PPD4			PPD5		
	Intertidal	Mid	Deep	Intertidal	Mid	Deep	intertidal	Mid	Deep	Intert-idal	Mid	Deep	intertidal	Mid	Deep
Depth m)	1<	6.6	12.4	1-2	2.8	5.9	1-3	4.0	10.1	1<	8.8	10.6	1<	8.5	11.0
Substrate	Sandstone reef	Sand & mostly Mud	Mostly mud	Sandstone reef	Completely sand	Completely sand	Sandstone reef	Sand and mud	Sand and Mud	Sandstone reef	Sand & mostly Mud	Sand and mostly mud	Sandstone reef	Sand and Mud	Sand and mostly Mud
Visibility	Moderate	Very Poor	Very poor	Good	moderate	Very poor	Good	Non visible	Very poor	Good	Very poor	Very poor	Good	Very poor	Very poor
Water Temp C^0	31	30.2	30.2	31.3	30.1	29.8	31	30.3	30.3	30	30.2	30.0	31	30.4	30.1
DO mg/l	6.2	5.78	5.74	8.37	6.24	5.68	6.3	5.53	5.90	5.2	5.78	5.7	5.4	5.94	5.66
Salinity ppt	39.0	39.05	39.02	38.82	38.93	39.06	39.0	39.01	39.03	39.0	39.05	39.04	39.0	39.04	38.99

4.1 Description to shallow water (Intertidal) sites

4.1.1 PPD1-I (Intertidal):

This is the reference site west of the proposed project outside the direct impact zone selected for comparison. Site is in front of a fish landing center. Transect studied was shallow intertidal zone next to the exposed rocks on the shore.

Figure 4-1: Seaward and landward view of the site PPD1 from the shore

Figure 4-2: Location of the transect and nature of the benthic substrate in the site

Benthic substrate of the site is mostly dead reef some areas covered with sand and a lot of siltation. Very shallow area with depth < 1m and part of the reef expose at low tide. Biota were dominated by *Padina* Sp. And Caulerpa sp. Only one live coral *Favia lizardensis* was recorded along the transect. Visibility was moderate. Reef end at the depth of 2.5 m and sandy bottom was observed thereafter.

Figure 4-3: Noteworthy species recorded within the quadrates along the transect PPD1-I.

Please refer to the table 4-2 for species

4.1.2 PPD2-I

Figure 4-4: Seaward and landward view of the site PPD2-I from the shore

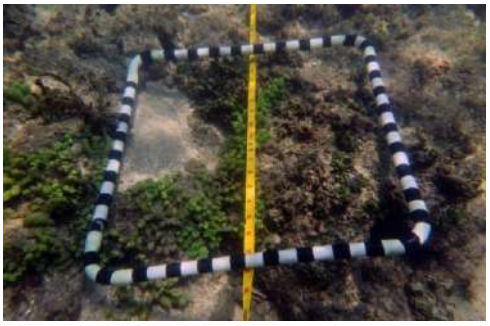


Figure 4-5: Nature of the benthic substrate in the site

Site is west of the jetty and close to a channel cut opened for navigation. Adjoining area is a reef lagoon with a sandy bottom towards the shore. Reef is dead is shallow areas with algae grown on them. Towards the sea, the reef is more diverse and live corals were observed mostly massive and boulder types. Live coral cover was around 4 percent. Sea cucumber, Holothuria atra and lobsters were observed. Sandy bottom was visible continuously at the end of reef at 4m depth.

Figure 4-6: Noteworthy species recorded within the quadrates along the transect PPD2-I

4.1.3 PPD3-I:

Figure 4-7: Seaward and landward view of the site PPD1 from the shore

Figure 4-8: Nature of the substrate of the site

This site is east and close to the jetty. Substrate is mostly dead reef and granite boulders with a lot of sediments. Most of the area covered with algae, Padina sp, Caulerpa sp and Halimeda sp. Algae were partly smothered with sediments and visibility was moderate and better towards the land. A large school of sardines were observed and ichthyofauna was higher than the other sites. A lot of marine debris were also observed. Smothered live corals were observed in some areas of the reef however the live coral cover was < 1%.

Figure 4-9: Noteworthy species recorded within the quadrates along the transect PPD3-I

4.1.4 PPD4-I

Figure 4-10: Seaward and landward view of the site PPD4 from the shore

Figure 4-11: Nature of the substrate at site PPD4-I

Substrate with mostly coral rubbles and algae growth. Towards the sea newly recruited Acropora and Montepora were observed. Most of them were <30cm. Live coral cover was about 3%.

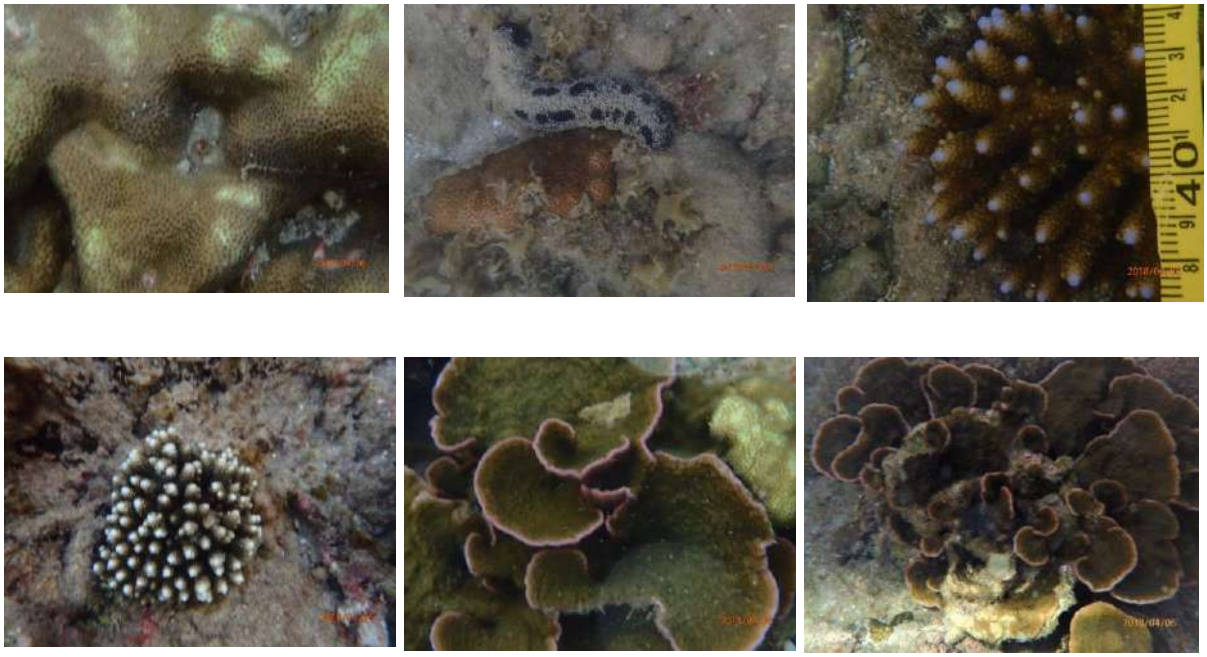


Figure 4-12: Noteworthy species recorded within the quadrates along the transect PPD4-I

4.1.5 PPD5-I

Figure 4-13: Seaward and landward view of the site PPD5 from the shore

Figure 4-14: Nature of the substrate at site PPD5-I

Benthic substrate of the area landward is mostly loose coral rubbles on top of rocky shore. New recruits of Acropora and Montipora were observed emerging among coral rubbles towards the sea and. Some of the corals were smothered with sediments while others are covered with Caulerpa Sp. 5% of the transect was covered with live corals.

Figure 4-15: Noteworthy species recorded within the quadrates along the transect PPD5-I

4.1.6 PPD2-RL (Reef lagoon)

In addition to pre-planned sites, reef lagoon between jetty and site PPD2 were surveyed using two transects since more healthy reefs were observed in a considerably larger area.

Figure 4-16: PPD2-RL- Area west of the jetty studied in addition to the systematic samples

This submerged reef start at 15 meters from the shore after a sandy seabottom. Some of the areas are totally dead reef, however, visibility was good. At the shallow area live corals were smaller and towards the deep large boulder and massive corals such as Porites sp were observed. Acropora and Montipora were less dominant. Deepest part was around 6m and mostly large boulders mostly covered with soft corals such as *Sinularia* sp.

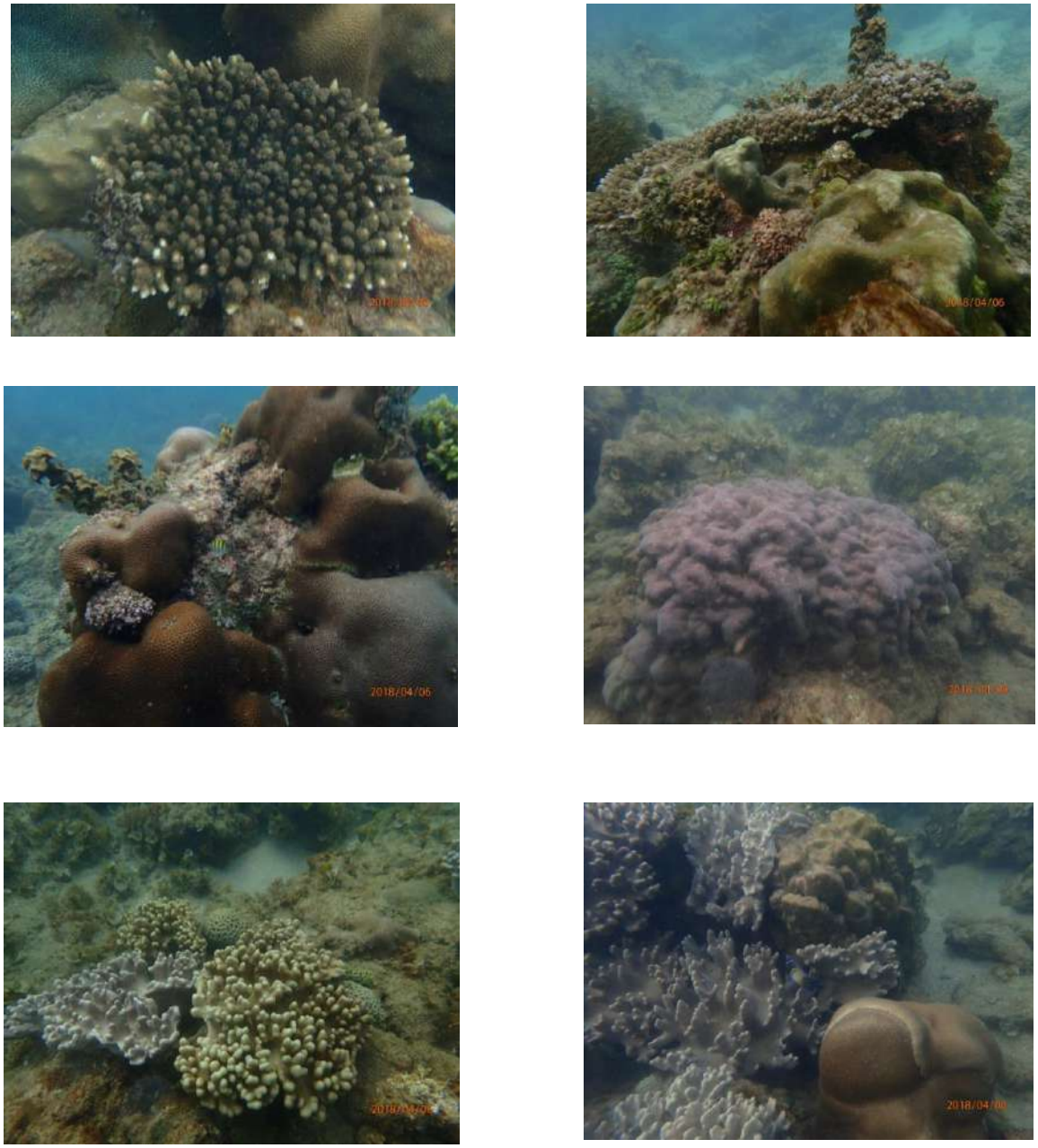


Figure 4-17: Noteworthy biota recorded in PPD2-RL site.

Table 4-2: Species identified from the survey within the intertidal reefs

Note: IUCN threaten categories are given in front of name

LC – Least Concern, NT – Near Threatened, DD – Dada Deficient

* Identification to be confirmed

Hermatypic corals

Family Acroporidae

*Acropora lutkeni** (NT)

Acropora latistella (LC)

Acropora formosa (LC)

Montipora aequituberculata (LC)

Family Faviidae

Goniastrea australensis (LC)

Platygyra daedalea (LC)

Platygyra sinensis (LC)

Platygyra sp

Platygyra sp.

Platygyra sp.

Favia lizardensis (NT)

Favia rotumana (LC)

Favia ~~veroni~~ *pallida(LC)**

*Favites flexuosa (NT)**

Family Mussidae

Symphyllia recta (LC)

Family Poritidae

Porites sp

Porites sp

Family Dendrophylliidae

Turbinaria sp

Family Alcyoniidae

Sinularia sp. (ND)

Sinularia sp.

Marine sponge

Familly Crambeidae

Monanchora arbuscula

Family Raspailiidae

Ectyoplasia forex

Seaweeds

Jania spp

Gracilaria sp*

Padina sp

Turbinaria ornata

Halimeda sp

Caulerpa racemosa

Dictyota sp*

4.2 Description to midwater sites

4.2.1 PPD1-M

Depth: 6.6 m

Figure 4-18: View of the landmark on shore from the boat

Beyond the reef areas, all the sites studied were sandy bottom devoid of any life in the benthic environment other than any breakoffs. Substrate was mostly deposited with fine sand to mud and even a small movement of a diver cause large plumes of sediments making underwater visibility very poor.

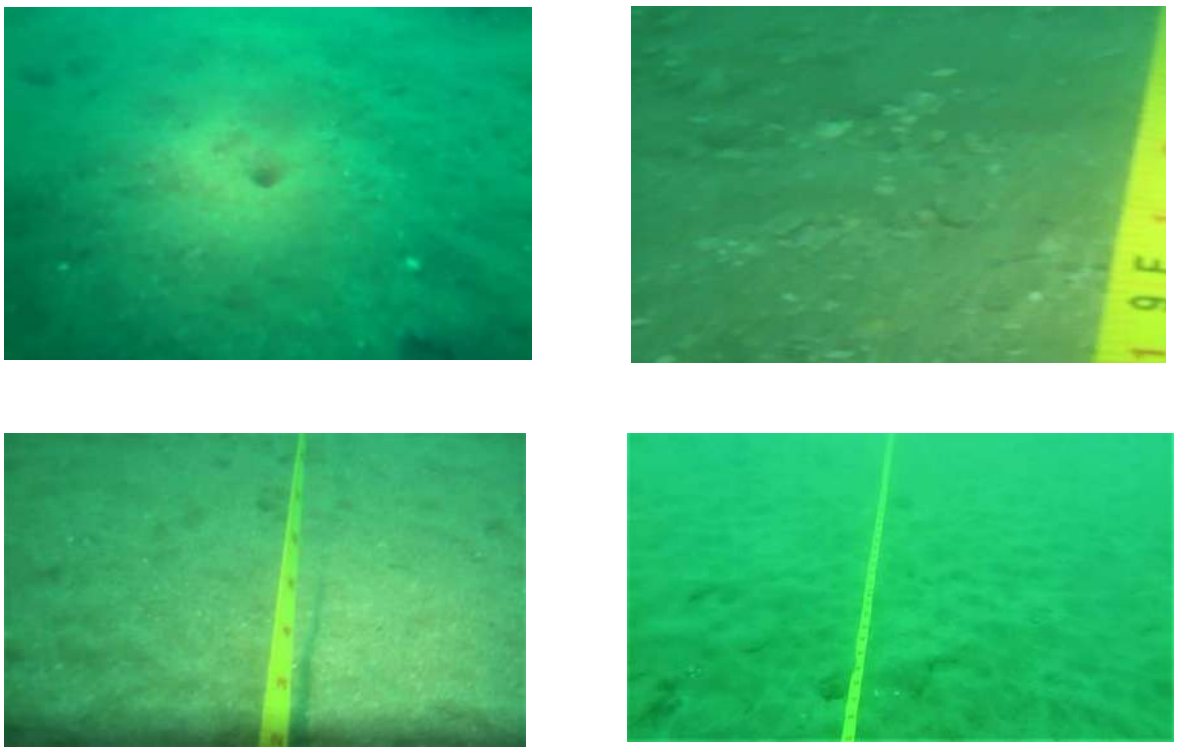
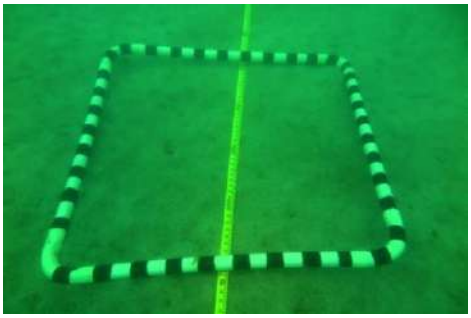


Figure 4-19: Underwater photographs of the site to show the substrate and any life form

4.2.2 PPD2-M

Depth: 2.8 m

Figure 4-20: View of the landmark on shore from the boat



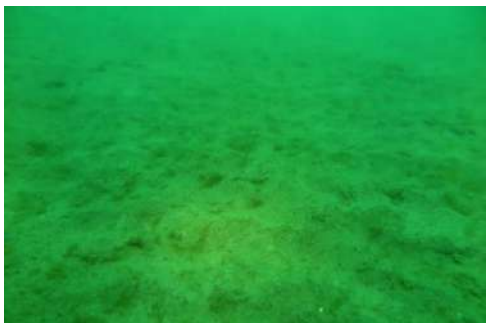


Figure 4-21: Underwater photographs of the site to show the substrate and any life form

4.2.3 PPD3-M

Depth: 4 m

Figure 4-22 : View of the landmark on shore from the boat

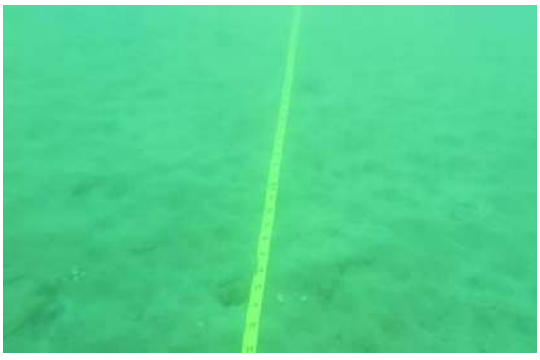


Figure 4-23: Underwater photographs of the site to show the substrate and any life form

4.2.4 PPD4-M

Figure 4-24 : View of the landmark on shore from the boat

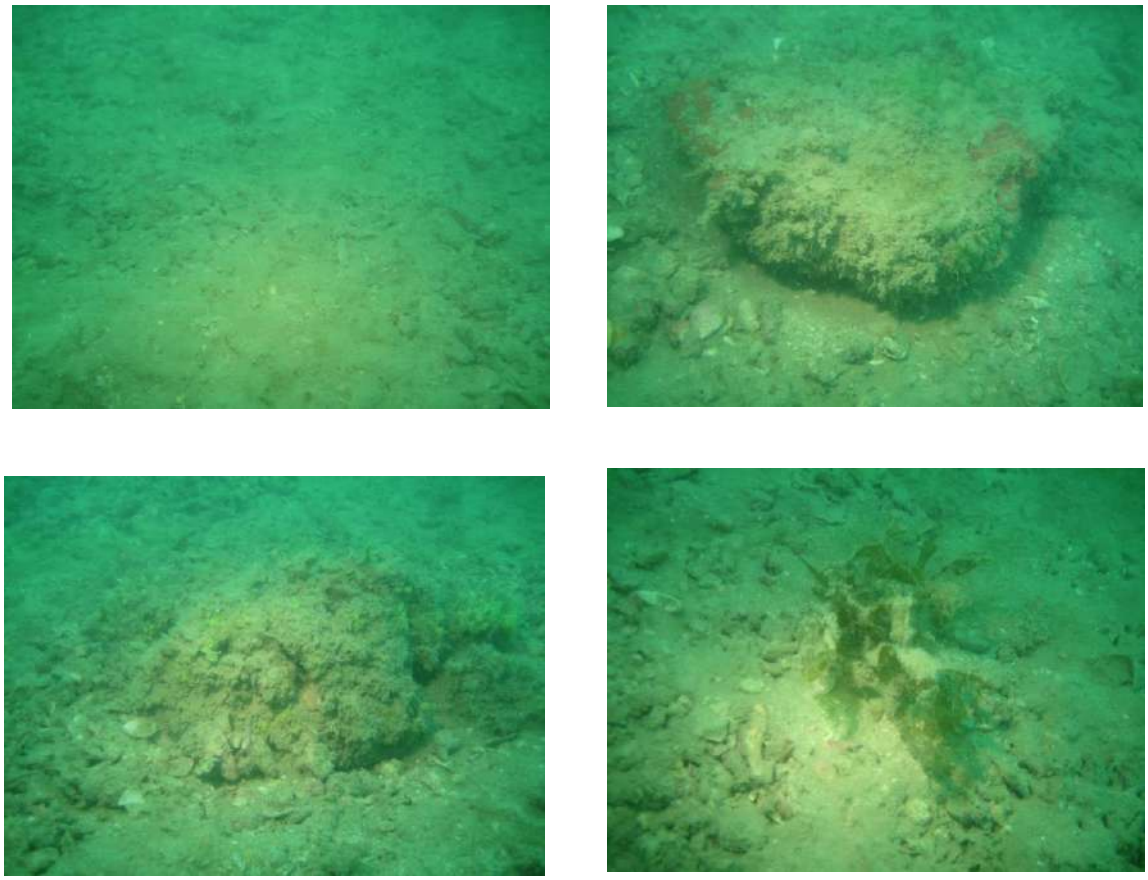


Figure 4-25 : Underwater photographs of the site to show the substrate and any life form

4.2.5 PPD5-M

Depth: 8.5 m

Figure 4-26 : View of the landmark on shore from the boat

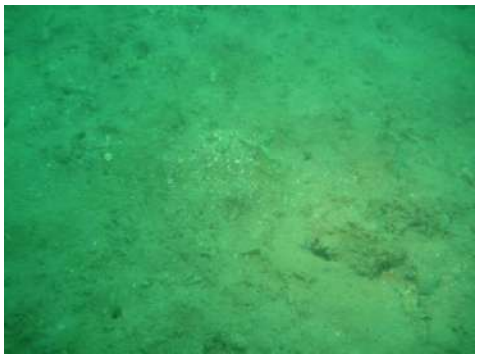


Figure 4-27 : Underwater photographs of the site to show the substrate and any life form

4.3 Description to deep water sites

4.3.1 PPDI-D

Depth: 12.4 m

Figure 4-28: View of the landmark on shore from the boat

Figure 4-29: Underwater photographs of the site to show the substrate and any life form

4.3.2 PPD2-D

Depth: 5.9 m

Figure 4-30: View of the landmark on shore from the boat

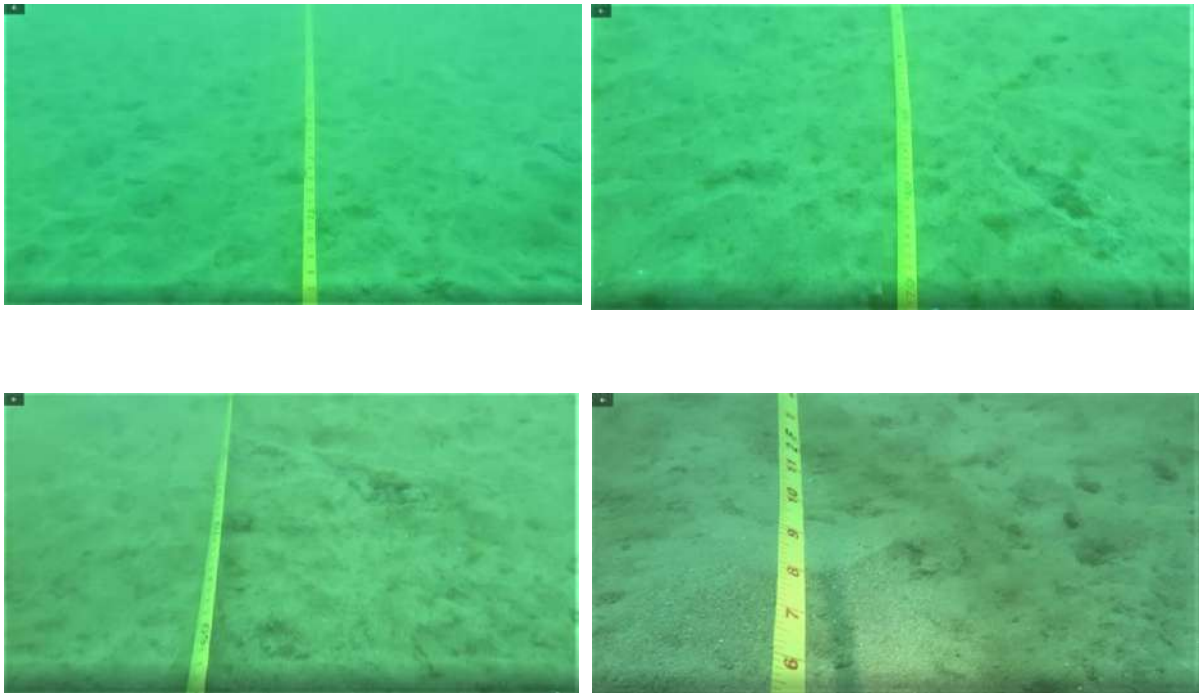


Figure 4-31: Underwater photographs of the site to show the substrate and any life form

4.3.3 PPD3-D

Depth: 10.1 m

Figure 4-32: View of the landmark on shore from the boat

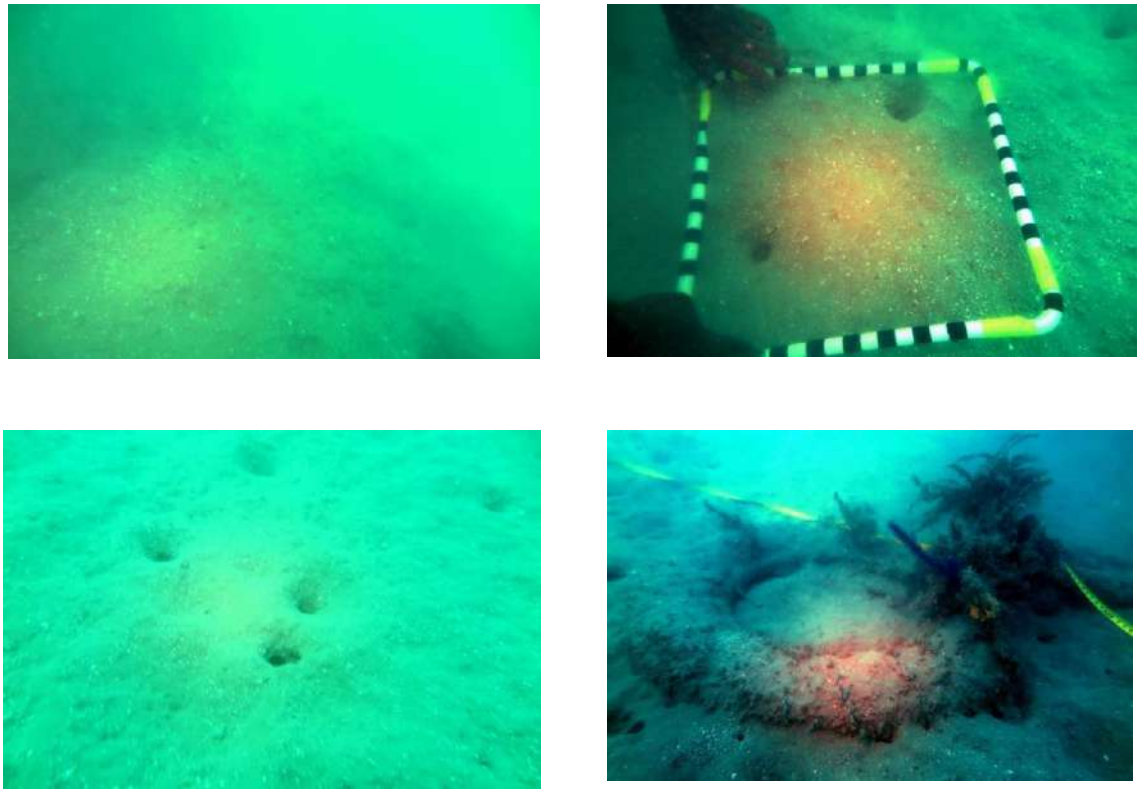


Figure 4-33: Underwater photographs of the site to show the substrate and any life form

4.3.4 PPD4-D

Depth: 10.6 m

Figure 4-34: View of the landmark on shore from the boat

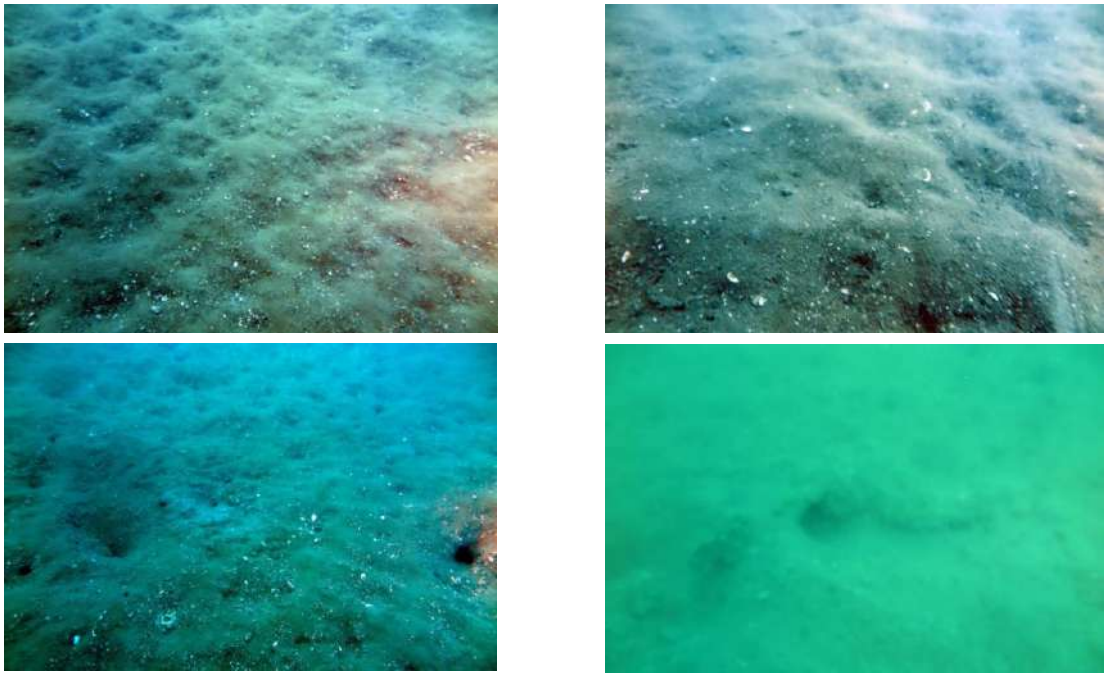


Figure 4-35: Underwater photographs of the site to show the substrate and any life form

4.3.5 PPD5-D

Depth: 11.0 m

Figure 4-36: View of the landmark on shore from the boat

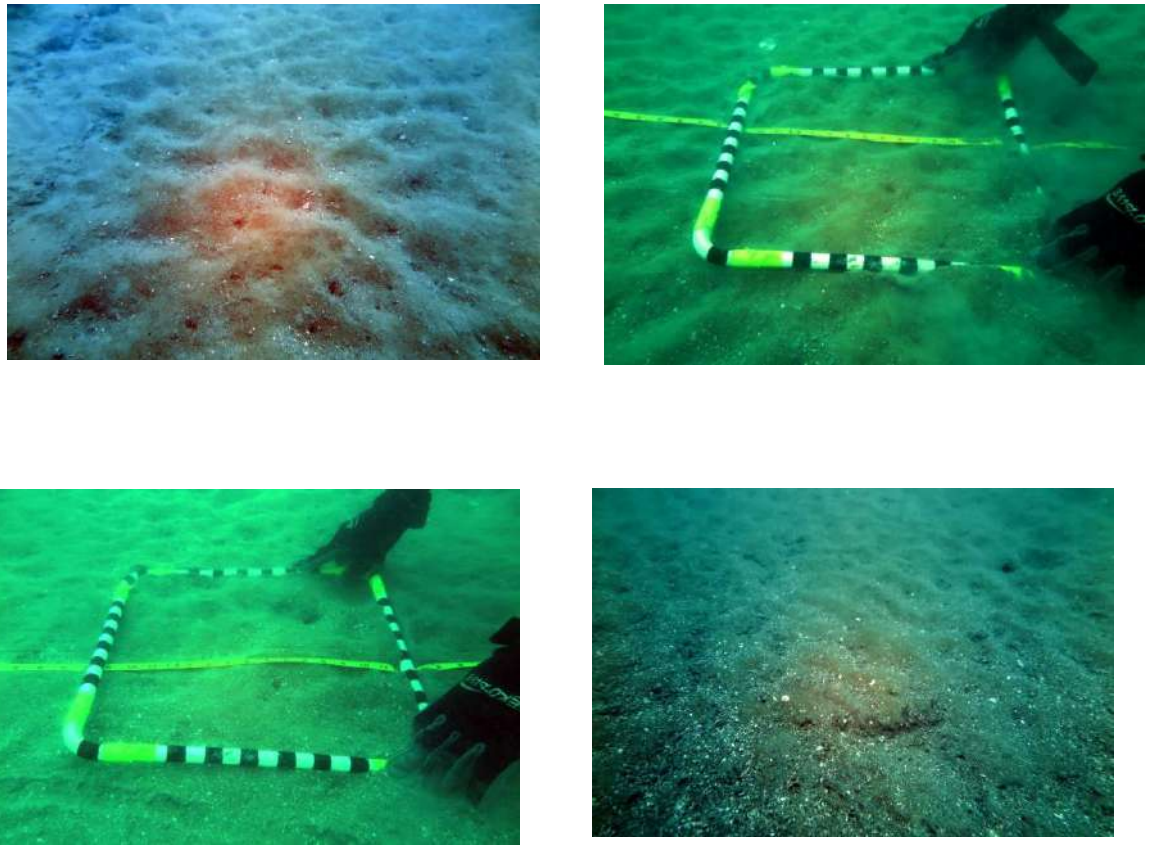


Figure 4-37: Underwater photographs of the site to show the substrate and any life form

4.4 Noteworthy fauna and flora within project impact area.

Table 4-3: List of Fauna recorded within the study area

Family	**Scientific name, common names & IUCN threaten category** (LC – Least Concern, DD Data Deficient, NE Not Evaluated)	**Underwater live image**
Fishes		
Acanthuridae	*Acanthurus grammoptilus* (Finelined Surgeonfish/ Ring-tailed Surgeonfish) LC	
Chaetodontidae	*Chaetodon andamanensis* (montage yellow butterfly fish) DD	
Chaetodontidae	*Chaetodon decussates* (Indian vagabond butterflyfish) LC	
	Chaetodon Auriga (Threadfin Butterfly fish) LC	
Chaetodontidae	Heniochus diphreutes False moorish idol LC	

Chaetodontidae	*Chaetodon octofasciatus* (Eightband Butterflyfish) LC	
Chaetodontidae	Chaetodon trifasciatus (Oval Butterflyfish) LC	
Labridae (Wrasses)	*Labroides dimidiatus* Bluestreak cleaner wrasse LC	
Lutjanidae (Snappers)	*Lutjanus decussatus* Checkered snapper LC	
Lutjanidae (Snappers)	***Lutjanus lunulatus*** Lunartail snapper LC	
Monodactylidae	Monodactylus argenteus (Diamond fish) LC	

Mullidae (Goatfishes)	Parupeneus macronema Stripe spot goatfish LC	
Pinguipedidae (Sand perches)	Parapercis schauinslandi Red-spotted Sandperch NE	
Pomacanthidae	Pomacanthus semicirculatus Blue angelfish LC	 
1. Pomacentridae	Abudefduf vaigiensis The Sergeant-major or Indo-Paific SergentFive-banded damsel fish LC	

Phylum – Arthropoda		
Palinuridae	Panulirus versicolor Painted Spiny Lobster LC	
Phylum -Mollusca Class - Bivalvia		
Cardiidae Giant clam	Tridacna squamosa* LC	
Graspidae	Grapsus sp Shore crab	
Phylum-Echinodermata Class -Holothuroidea		
Holothuriidae	Holothuria atra Lollyfish *Nari attaya* (Local name) LC	

4.5 Overview of the fishing practices of the study area

Coastal population around the project site is heavily depend on fisheries for their livelihood. Either side of the proposed site and along the coastline, boat landing sites are visible on the beach without any infrastructure facilities (Fig 4-18). Fishing in the area is small-scale fishing operations using traditional fishing gear and vessels. Major fishing gear used are gill nets, cast nets, trammel nets, handlines, etc (Fig 4-5). However, more fishers moving to longline fishing gradually. Vessels used are mostly traditional crafts such as *Theppam*, and they are now been replaced by FRP boats with outboard engines. Larger multiday boats were found in jetty area were belongs to migratory fishermen.

Figure 4-38: Fish landing site close to site PPD1

Table 4-4: Types of fishing vessels

NTRB – Non mechanized traditional boats (Theppam)

OFRP – Outboard engine single day FRP boats

IMUL – Inboard engine multiday boats

Proper infrastructure facilities for boat anchorage, fish and fishing gear handing are not available at the open beach land sites. Small and large pelagic species, demersal fishes and prawns are targeted by fishers using multiple types of fishing gear.

Fishing activities of this area are regulated by the Fisher's societies with the assistance of Department of Fisheries and Aquatic Resources governed by Fisheries and Aquatic Resources ACT, NO. 2 of 1996 and amendments thereafter.

Table 4-5: Fishing gear operated

• Longline	 Longline hooks spooled in a box
• Gill nets (drift gill nets and bottom set)	 Gill net operation using a traditional fishing vessel
• Cast net	
• Crab nets	
• Trammel nets	
• Handlines	

Table 4-6: Commercial fish and shell fishes caught by the small scale fishers around the project site

Thunnus albacares (Yellow fin tuna)
Caranx sp (prawa)
Scomberomorus commerson (Thora)
Istiophorus platypterus (Sail fish)
Shark
Katsuwonus pelamis (Small size Balaya)
Scates
Squids
Rock fishes

4.6 Plankton recorded in the study area

Zooplankton and phytoplankton recorded in the coastal waters (composite samples) of the study area are given in the tables below.

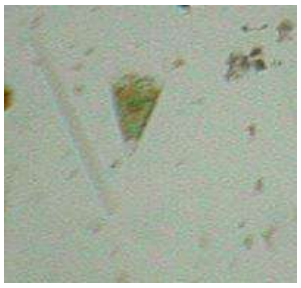
4.6.1 Phytoplankton

Ceratium sp

Peridinium sp.

Rhizosolenia sp.

Pseudoceratium sp. ?

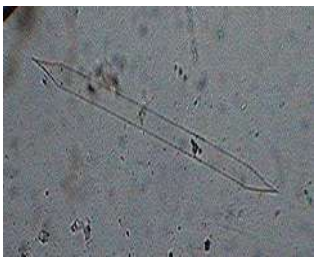


Licmophora sp

.

Nitschia sp.

Dinobryon sp.



Rhizosolenia sp

4.6.2 Zooplankton

Copipod nauplius

Copipod nauplius

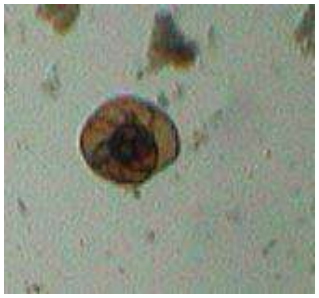
Copipod

Copipod-Order Harpacticoida

Copipod -Order Calanoida

Copipod -Order Cyclopoida

Copipod-Order Poecilostomatoida



Phylum Foraminifera

Polychaeta larvae

Plankton samples studied showed some common marine plankton found in coastal waters around Sri Lanka. Large aggregations of fish or invertebrate eggs or larval stages were not recorded among samples and therefore cannot consider the project area as a breeding ground.

5 Summary of the key findings

Coralline limestone and sandstone reefs were found running parallel along the shore. In addition to protecting the shore from waves they provide unique habitats for intertidal biota including soft and hard corals. Reefs are connected to the shore in certain areas but in some reef lagoon formations are found.

Sandstone, limestone and rock reefs are one of the common features of the northern coast of Sri Lanka. Reefs found are not typical fringing reefs and rather sandstone or limestone and rock boulder reefs. Typical characteristics of a reef such as reef crest, lagoon and seaward slope are not visible. The reef was extended about 150 m seaward and ends at 6-8 m depths.

Along the shallow water sandstone reef more towards the east, the substrate was mostly coral rubbles and newly recruiting hermatypic corals of < 30cm size were emerging and observed scattered. They were dominated by *Acropora* sp and *Montephora* sp. More deeper reefs within the reef lagoons were dominated by massive and boulder corals such as *Porites* sp, *Platygyra* sp and *Favia* sp. Towards the deeper end of the submerged reefs the boulders were mostly covered with soft corals such as *Sinularia* sp. Highest live coral cover found was 6% in the reef lagoon next to the jetty and in the shallow reefs highest live coral cover was 5%. However, for the rest of the areas live coral cover was 0-1%.

The reef flats are subject to expose time to time. The reefs are not very healthy and found dead corals and coral rubbles. The reef flat is smothered with sediment in most of the areas and deeper areas not exposed are mostly covered with algae dominated by *Padina* sp, *Caulerpa* sp, *Halimeda* sp and *Turbinaria* sp. Reefs are also rather low in structural complexity and diversity compared to the sub-tidal reefs elsewhere in the Island. These reefs are subject to periodic smothering by regular accreting or eroding beachlines preventing continuous colonization of hermatypic corals and thereby hampering the reef growth.

At the edge of the reef it is all sand bottom that extendtowards offshore. The sandy bottom is covered with fine sand and mud on surface layers and visibility is very poor due to fine particles. The sandy bottom is devoid of any benthic communities.

The inshore reef areas harbor commercially important fish species such as Jacks (Carangidae), Snappers (Lutjanidae), Groupers (Serranidae) and Sardines (Clupeidae). The rocky reefs of the area support a lobster population. The reef habitats also support a large population of beche-de-mer (sea cucumber) dominated by *Holothuria atra*.

Significant area of the reefs composed of exposed rock boulders, often enclosing extensive rock pools. These rock pools are mostly inter-tidal and the higher sections are prone to periodic drying and exposure to wave action.

The rocky shores in the study area are typical and support diverse colonies of intertidal communities. Some of the larger pools such as one west of the jetty, are inhabited by several species of hermatypic corals as well as soft corals. Reef associated fishes as well as juvenile stages of some Butterflyfishes (*Chaetodon* spp.) and Angelfishes (*Pomacanthus* sp) were also observed.

Plankton samples studied showed some common marine plankton found in coastal waters around Sri Lanka. Large aggregations of fish or invertebrate eggs or larval stages were not recorded among samples and therefore cannot consider the project area as a breeding ground.

Coastal population around the project site is heavily depend on fisheries for their livelihood. Existing landing are open beach landing without any infrastructure facilities for proper anchorage and handling of fish and fishing gear. Fishing in the area is small-scale fishing operations using traditional fishing gear and vessels. Vessels used are mostly traditional crafts such as *theppam*, and they are now been replaced by FRP boats with outboard engines. In order to develop the fishery of the area, proper infrastructure developments together with fisher training, education and technology transfers are imperative.

Development of a new harbours that involve dredging and construction, including breakwaters in the coastal zone, are likely to cause substantial unavoidable losses to reef communities in the surrounding area. Such projects need compensatory mitigation and safeguard mechanisms for the environment. Among the potential management options available for the mitigation of impending damage to coral reef ecosystems is the development of artificial reefs submerging some structures specifically designed for coral colonization. Scientifically selected submerged structures would provide a substrate that can be inhabited by corals either through natural processes or by transplanting living coral colonies. The development of a coastal structure such as a breakwater provides an opportunity to create a large-scale artificial reef that will mitigate for lost or impacted corals. The mitigation will only be successful, however, if healthy coral communities are able to develop on the artificial substrate. This could be achieved by either proving a artificial substrate along the breakwater that coral can colonize or carefully placing the coral bearing boulders and sandstones along the breakwaters. Example can be observe in newly constructed Hambantota port in Southern Sri Lanka, where healthy reef is developing along the breakwater.

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Ms Ruvini Weerasinghe	MPhil (Reading) BSc	Uni. of Sri Jayewardenepura	Coral and other sessile fauna	Identification of Sessile fauna
Mr J A C Prasad	MSc BSc PADI Diver	NARA	Underwater Survey	Professional Diver
Mr Saman LIyayanage	PADI Advance Diver	Freelance	Underwater Photography	Professional Diver, Underwater photographer
Manuja Promodya	BSc SP	Uni. of Sri Jayewardenepura	Field Assistant and Plankton analysis	Assist in the field and Plankton Analysis
Dinuka Jayawicrema	BSc SP	Uni. of Sri Jayewardenepura	Field Assistant and Mobile fauna identification	Assist in the field and Fish taxonomy

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Annex 06- Summary of Ground Water

ඇමුණුම 06 - භූගත ජල සාරාංශය

பின்னிணைப்பு 06 - தரை நீர் பற்றிய சுருக்கம்

Annex 5: Ground water Quality test Results from wells adjacent to the PPPDP site.

No.	Water Parameter	Unit	Standards	Well 01	Well 02	Well 03	Well 04
1	Color	Hazen	15	<5	<5	<5	<5
2	Odor	-	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
3	Taste	FTN	Unobjectionable	04	04	04	04
4	Turbidity	NTU	2	0.2	0.8	3.7	0.2
5	pH at 29^0C*	-	6.5 to 8.5	7.3	7.3	7.2	7.1
6	Free Ammonia (as $NH_{3)}$	mg/l	.2	ND	ND	ND	ND
7	Calcium (as CA)	mg/l	100	441	361	321	321
8	Chloride (as Cl^-)	mg/l	250	1267	2180	1774	2433
9	Chemical Oxygen Demand (COD)*	mg/l	10	06	06	07	05
10	Copper (as Cu)	mg/l	1.0	ND	ND	ND	ND
11	Fluoride (as F)	mg/l	1.0	1.4	1.2	0.9	1.0
12	Iron (as Fe)	mg/l	0.3	0.001	0.004	0.002	0.003
13	Manganese (as Mn)	mg/l	0.1	ND	ND	ND	ND
14	Nitrate (as NO_3)	mg/l	50	0.3	0.3	0.4	0.4
15	Nitrite (as NO_2)	mg/l	3	ND	ND	ND	ND
16	Oil and Grease*	mg/l	0.2	ND	ND	ND	ND
17	Sulphate (as SO_4^{2-})	mg/l	250	593	526	367	366
18	Total Alkalinity (as $CaCO_3$)	mg/l	200	393	441	329	411
19	Total Hardness (as $CaCO_3$)	mg/l	250	2407	1856	1505	1605
20	Total Phosphates (as PO_4^{3-})	mg/l	2.0	ND	0.2	0.2	0.1
21	Zinc (as Zn)	mg/l	3.0	0.03	0.08	0.007	0.006
22	Electrical Conductivity	µS/cm		4200	6300	5200	6400
23	Total Solid	mg/l	-	2698	4484	3430	4840
24	Arsenic (as As)	mg/l	0.01	ND	ND	ND	ND
25	Cadmium (as Cd)	mg/l	0.003	ND	ND	ND	ND
26	Chromium (as Cr)	mg/l	0.05	ND	ND	ND	ND

No.	Water Parameter	Unit	Standards	Well 01	Well 02	Well 03	Well 04
27	Lead (as Pb)	mg/l	0.01	ND	ND	ND	ND
28	Selenium (as Se)	mg/l	0.01	ND	ND	ND	ND
29	Escherichia coli *	MPN/100ml	Not detected	50	$5.5x\ 10^2$	ND	$3.5x10^2$
30	Total Coliform *	MPN/100ml	Shall not exceed 10	80	$2.5x10^2$	ND	$2.5x10^2$

Annex 07- Summary of Sea water Quality

ඇමුණුම 07 - මුහුදු ජල ගුණත්ව සාරාංශය

பின்னிணைப்பு 07 - கடல் நீரின் தரம் பற்றிய சுருக்கம்

Annex 6: Seawater Quality Test Results from 4 sample sites associated with the PPPDP.

No.	Parameters		Unit	Sample Site 01 Surface	Sample Site 01 (5 m depth)	Sample Site 02 Surface	Sample Site 03 Surface
1	Color (Spectral Absorption coefficient)	Yellow ($36 nm)	m^{-1}	ND	ND	ND	ND
		Red (525 nm)	m^{-1}	ND	ND	ND	ND
		Blue (620 nm)	m^{-1}	ND	ND	ND	ND
2	pH Value at 30^0C		-	8.4	8.3	7.8	8.0
3	Temperature		^{0}C	30.3	30.1	31.1	30.2
4	Total Kjedhal Nitrogen (as N)		mg/1	11	5.5	5.5	5.5
5	Ammonical Nitrogen (as N)		mg/1	0.2	<0.1	0.2	0.2
6	Chemical Oxygen Demand (COD)		mg/1	15	23	18	31
7	Biological Oxygen Demand (BOD) @ 20^0C		mg/1	5	5	10	15
8	Total Suspended solids (TSS)		mg/1	<1	12	ND	ND
9	Sulphide (as S)		mg/1	ND	ND	ND	ND
10	Fluoride (as F)		mg/1	1.5	1.5	1.6	1.4
11	Total residual Chlorine		mg/1	ND	ND	ND	ND
12	Oil and Grease		mg/1	ND	ND	ND	ND
13	Dissolved Phosphate (as P)		mg/1	ND	ND	ND	ND
14	Arsenic (as A)		mg/1	ND	ND	ND	ND
15	Copper (as Cu)		mg/1	200	200	275	210
16	Iron (as Fe)		mg/1	0.05	ND	0.05	ND
17	Nickel (as Ni)		mg/1	ND	ND	ND	ND
18	Cadmium (as Cd)		mg/1	ND	ND	ND	ND
19	Total Chromium (as Cr)		mg/1	ND	ND	ND	ND
20	Lead (as Pb)		mg/1	ND	ND	ND	ND
21	Mercury (as Hg)		mg/1	ND	ND	ND	ND
22	Zinc (as Zn)		mg/1	150	150	150	130
23	Selenium (as Se)		mg/1	ND	ND	ND	ND
24	Cyanide (as CN)		mg/1	ND	ND	ND	ND
25	Hexavalent Chromium (as Cr^{6+})		mg/1	ND	ND	ND	ND

No.	Parameters	Unit	Sample Site 01 Surface	Sample Site 01 (5 m depth)	Sample Site 02 Surface	Sample Site 03 Surface
26	Phenolic Compounds (as C_6H_5OH)	mg/1	ND	ND	ND	ND
27	Fecal Coliform	MPN/100ml	2.2×10^2	1.4×10^2	2.4×10^3	9.2×10^2

Annex 08-Terrestrial Ecological Assessment

ඇමුණුම 08 - මතුපිට පාරිසරික ඇගයීම

பின்னிணைப்பு 08 - நிலம் சார் சுழலியல் மதிப்பீடு

TERRESTRIAL, ECOLOGICAL AND BIOLOGICAL ASSESSMENT OF THE POINT PEDRO FISHERY HARBOR DEVELOPMENT SITE, NORTHERN PROVINCE

Acronyms

ADB – Asian Development Bank

IUCN - International Union for Conservation of Nature

NPSFDP - Northern Provincial Sustainable Fisheries Development Project

NBSAP- National Biodiversity Strategic Action Plan

PIA- Project area of influence.

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1.0. Executive Summary

Development of a fishery harbor at Point Pedro is one of the activities identified by the Northern Provincial Sustainable Fisheries Development Project (NPSFDP) to revive the fisheries sector. The harbor is to be located in the seaward margin of Jaffna Ponnalai Point Pedro road. Project area and project area of influence is highly man modified and urbanized. Typical natural vegetation formations belonging to the Coastal and Marine Belt Floristic Zones could not be observed. Beach and beach vegetation, home gardens and roadsides are the main existing terrestrial habitat types observed in and around the proposed project area. The major existing terrestrial habitat types observed in the project area of influence were Beach and beach vegetation, Home gardens, Abandoned households and Road reservations.

Since the area of project influence is dominated by homesteads the vegetation recorded are mainly confined to home gardens. In addition, several vegetation were found in the beach and road reservations. A total number of 63 floral species including 02 nationally near threatened (NT) species were recorded during the field ecological survey. Most of the species recorded are herbaceous species (26) followed by trees (20), shrubs (09) and climbers or creepers (08) Further, nearly 57 % of the recorded floral species are natives and 43 % of the species are exotic to the country.

The beach and beach vegetation were predominated by *Cocos nucifera.* Other species reported are *Ipomoea pes-caprae* (Mudu Bin Thamburu), *Phyla nodiflora* (Hiramanadetta), *Thespesia populnea* (Suriya), *Sesuvium portulacastrum* (Maha Sarana), *Trianthema decandra* (Maha Sarana), *Launaea sarmentosa*, *Calotropis gigantea* (Wara), *Catharanthus roceus* (Mini Mal), *Canavalia rosea* (Mudu Awara), *Cyperus arenarius*, *Cyperus stoloniferus*, *Antigonon leptopus*, *Lantana camara, Morinda coreia* (Ahu), *Gomphrena celosioides*, *Tridax procumbens*, *Coccinia grandis* (Kowakka), *Leucas zeylanica* (Geta Thumba), *Boerhavia diffusa* (Pita Sudu Pala), *Cynodon dactylon*, *Solanum virginianum* (Katuwel Batu), *Cassia occidentalis* (Ath Tora), *Phyllanthus* sp., *Caesalpinia bonduc* (Kalu Vavuletiya), *Azadirachta indica* (Kohomba), *Argemone Mexicana* and *Ficus benghalensis* (Maha Nuga) are the recorded floral species in the project area. The species *Sesuvium portulacastrum(*Vankiruvila*i)* and, *Trianthema decandra* (Mahasarana) recorded are nationally near threatened (NT) in conservation status.

A total number of 29 faunal species including 01 critically endangered species were recorded during the field survey. The land snail species *Trachia fallaciosa* recorded on trees in the home gardens and roadsides of the project PIA influence area during the feasibility study, is a nationally critically endangered (CR) species.

The Project includes dredging and clearing of an area with limited faunal and floral terrestrial diversity for harbor construction, in an area with a sandy shore and sandstone rocky shore.

It is recommended to conserve as much as possible the coconut trees and other vegetation located in the eastern margin of the project and minimize the interaction of this area with the construction activities

Establishment of Green belts and green areas where possible and planting of suitable tree species within the project area will contribute towards improving the terrestrial biodiversity. *Cocos nucifera* (Coconut), *Borassus flabellifer* (Palmyra) and *Thespesia populnea* (Suriya) are the tree species most acceptable to the community for replanting/green belt development. Other species for the green belt can be selected from native species recorded from project and project area of influence with the consultation of a specialist in horticulture. Near threatened species *Sesuvium portulacastrum* and *Trianthema decandra* are the other species proposed for the inclusion in establishment of vegetation within the project site. Existing patches of these NT plants can be relocated in green areas.

Adhering to green building concepts during planning and construction and addressing the pollution issues from main waste streams during the harbor operation are recommended to reduce adverse impacts on terrestrial ecosystems.

Designing and implementing a detailed Environmental Management Plan (EMP) to minimize and control adverse impacts, including monitoring of terrestrial biodiversity together with air quality and noise levels will contribute towards improving terrestrial biodiversity of the area. Awareness programs for all stakeholders on environmental protection, biodiversity and nature conservation is also suggested. These strategies will promote sustainable development goals and the targets of the current National Biodiversity Strategic Action Plan (NBSAP) of Sri Lanka while improving the terrestrial habitats.

2. 0. Introduction

The Northern Provincial Sustainable Fisheries Development Project (NPSFDP) aims to revive the fisheries sector in the four coastal Districts of Jaffna, Mannar, Mullaitivu, and Killinochchi. The purpose of the present investigation is to identify environmental safeguard requirements associated with the fisheries infrastructure development proposed in the Northern Province identified through the PPTA Output 1: Climate Resilient Infrastructure.

The project has included the development of two (2) harbors (Point Pedro and Pesalai), six (6) fishing anchorage sites and twenty-two (22) fish landing sites.

Northern Province of Sri Lanka where fishery harbors, anchorages and landing sites are identified for the development (Fig. 1) is associated with several natural ecosystems and includes evergreen forests, Palmira woodlands, seashore scrubland, sandy seashores, mangroves and mangrove associates, saltmarshes, tidal flats, sand dunes and other aquatic systems such as corrals, sea grass meadows as indicated in Fig. 2.

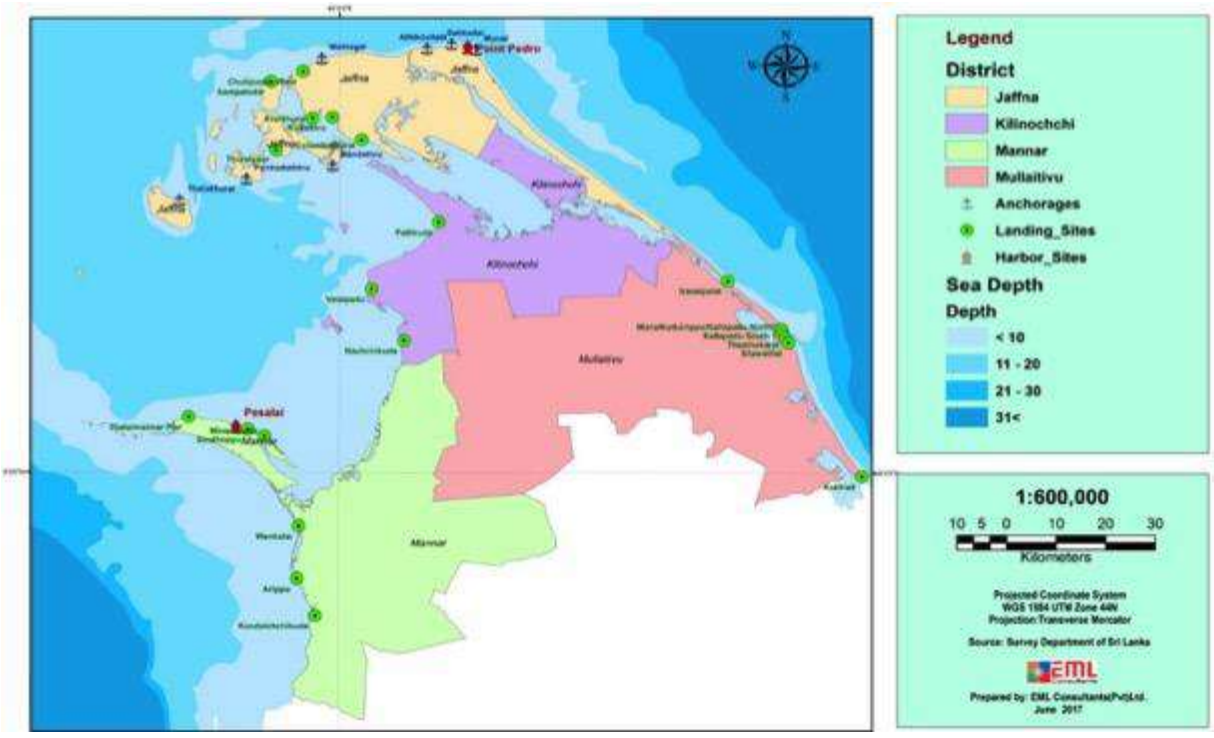

Fig. 1. A map indicating the locations of proposed Fishery harbors, Anchorages and Landing sites in the Northern Province.

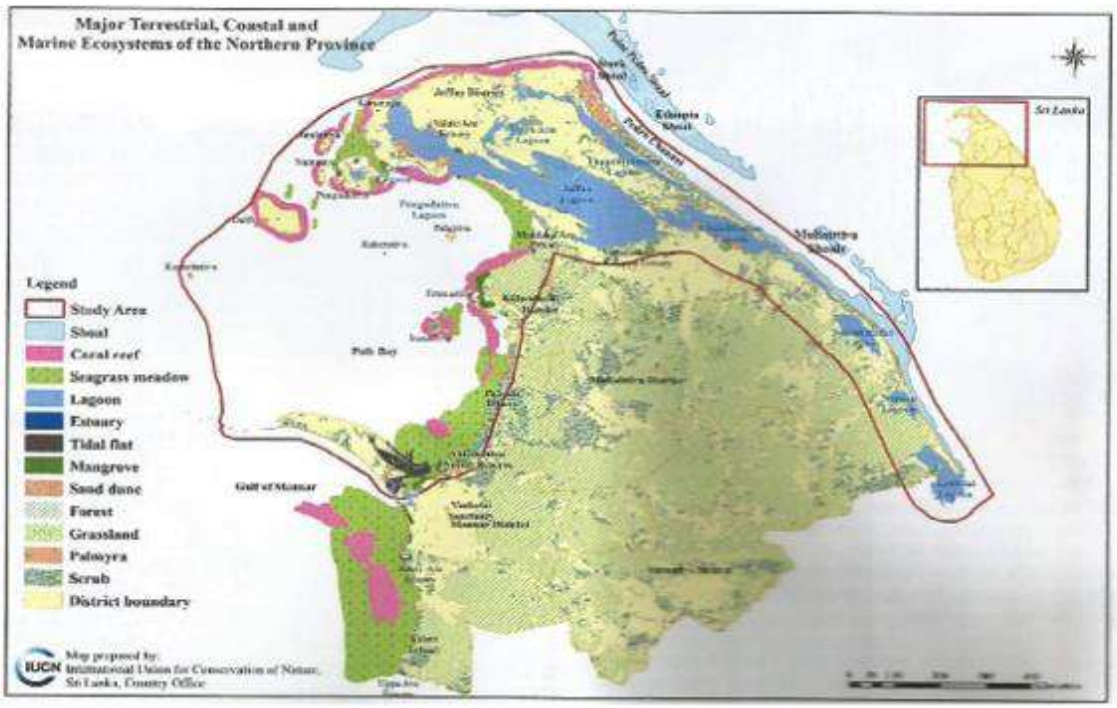

Fig. 2. Major Terrestrial, Coastal and Marine ecosystems of the Northern Province (Source: IUCN, 2017).

This report concentrates on the terrestrial ecology and biology of the fishery harbor proposed in Point Pedro.

Biogeographically, the proposed project area lies in the Low Country Dry Zone. Floristically it lies in the Coastal and Marine Belt Floristic Zone. Mangroves, Salt Marshes, Sand Dunes and Beach Vegetation are the typical natural habitats in Coastal and Marine Belt Floristic Zones. The soil and water resource of the area are both related to the lime stone geology of the land. The soils are formed on the marine deposits and sediments under the influence of sea waves and winds on lime stones. Alkaline saline soil and Regasol are the dominant soil types in the area. However, the proposed project area is highly man modified.

The climate of the region is mainly governed by the monsoonal system. Annual precipitation ranges from 696 mm to 1125 mm and more than 90 % of this annual rainfall occurs due to the north-east monsoon that takes place between October and January. The temperature ranges from 26°C to 33°C.

2.1. Methodology

An investigation was conducted to identify major habitats/vegetation and fauna in and around the proposed Fishery harbor project area of Point Pedro and adjoining 500 m area. A rapid line transect method was used to assess the existing terrestrial floristic and faunal diversity. The rapid ecological survey was carried out during the day time to assess the biological

environment, prepare a species inventory, identify existing environmental problems/issues, identify possible ecological impacts, and propose mitigation measures. In addition, indirect observations of animal sign such as pellets, foot prints, food remains were carried out to understand the different faunal species in the area. In some case reliable evidence from villages and government officers of Departments of Fisheries, Environment and Wild life and Coast conservation also has been used to understand the species occurrence. Available information through previous investigations, published literature was verified through site visits. Distribution pattern of vegetation along the coastal area; List of trees with girth size of dominant plant species and the locations of those were marked in a Google map within the project area. Digital photos were taken for key biological features and global positioning system (GPS) coordinates were recorded for important locations.

Respective Assistant Director of Fisheries for Jaffna and Fisheries Officers, and Fisheries Inspectors responsible were met and interviewed. During the field assessment key officials of the fisheries society of the Kottady fish Landing site which borders the eastern margin of the proposed development were met. Suparmadam landing site which is located near to western margin of the proposed site was also visited to consult the Chairman, secretary and key members of the fisheries society.

The findings of current study were comparatively assessed with the outcomes of the previously conducted feasibility study. The list of government officers and personnel who were interviewed during the study is annexed (Annex 1).

3.0. Site description

3.1. Project area

Point Pedro is a town, located in Jaffna District, Sri Lanka, at the northernmost point of the island. Total population is around 31,351. During pre-colonial and colonial times Point Pedro was a trading port. Now fisheries and related activities are some of the main livelihood activities in the area.

Project area and area of Influence of project area are shown in Fig.3 and Fig. 4. Biogeographically, the proposed project area lies in the Low Country Dry Zone. Floristically it lies in the Coastal and Marine Belt Floristic Zone. Mangroves, Salt Marshes, Sand Dunes and Beach Vegetation are the typical natural habitats in Coastal and Marine Belt Floristic Zones. However, the proposed project area is highly man modified and only beach vegetation was observed.

The proposed harbor is mainly in the shallow area of the sea bordering the Jaffna Ponnalai Point Pedro road and the Point Pedro east coast road in the South. The eastern margin of the project site is occupied by a number of small homesteads of Kottady fishing community with coconut tree as the dominant vegetation and *Corvus aplengens* is the main species of birds live

associated with these plants. In addition, the proposed project site includes a small jetty, High sea operating office and a damaged and abandoned building.

3.2. Project area of influence

The Google map of the project area of influence of the Point Pedro project site is given in Fig. 4. indicating main developments. It indicates that this area is a highly man modified area. The Kottady fish landing site (Fig. 5) is the boundary of the eastern margin of the proposed site. The western margin of the proposed landing site is occupied by another fishing community named as “Supermadam fish landing site” (Fig. 6). The northern margin of the proposed landing site is covered by sea and is associated with marine ecosystem. Southern margin is highly urbanized, with man modified habitats and includes key government institutions, military brigade, school, religious places, households and shops (Fig. 4).

Fig. 3. Google map indicating the proposed site for the fishery harbor and area of influence.

Fig. 4. A Google map indicating main developments in the project area of influence.

A – Supermadam landing site **B** – Proposed Point Pedro fishery harbor **C** – Existing Point Pedro jetty **D** – Residential area of Kottadi fisher community (including library and community hall) **E** – Natarajar stadium (damaged) **F** – Kottadi landing site **G, K, L, I** – Homesteads **H** – Hindu and Buddhist temple **J** – Periya pillayar temple **M** – Sithy Vinayagar School **N** – Police station **O** – Sports complex of Hartley college **P** - Abandoned Homestead **Q** – Abandoned police station **R** – District Magistrate **S** – Hartley College **T** – 551 Military Brigade **U** – Point Pedro Urban Council **V** – Methodist Girls High School

Fig. 5. Kottady fish landing site without much vegetation except *Thespesia populnea* (Suriya) (Lat - 9.82805556 and Long 80.23833333)

Fig. 6. Supermadam fish landing site without much vegetation except the grasses and a growing coconut tree (Lat - 9.83000000 and Long 80.23027778)

3.3. Climate

Point Pedro experiences the typical dry zone climate of Sri Lanka and is characterized by a relatively wet period alternating with a dry period. Wet season covers October to December / January and is associated with the northeast monsoon. The minor wet season occurs during April to May due to the southwest monsoon. The main rainfall season is from October to January. The climate of the region is mainly governed by the monsoonal system. Annual precipitation ranges from 696 mm to 1125 mm and more than 90 % of this annual rainfall occurs due to the north-east monsoon. The temperature ranges from 26°C to 33°C. There is however a considerable variation in annual rainfall during recent years.

3.4. General area usage

As the project and project area of influence is highly man modified and urbanized, any typical natural vegetation formations normally associated with these habitats within the Coastal and Marine Belt Floristic Zones could not be observed. Mangroves, and salt marshes were not recorded in the area. Beach and beach vegetation, home gardens and vegetation established along either side of the roads are the main existing terrestrial habitat types observed around the proposed project area.

The beach front is very narrow along the project site which extends from Kottady fish landing site towards Supermadam landing site. The eastern margin of the beach is seasonally subjected to sand accumulation. The western margin of the beach is subjected to soil erosion and as such greatly restricts the establishment of native and/or introduced vegetation. The beach area is relatively more established closer to the border where dwellings are located in the eastern side. Beach vegetation is restricted to this area. Beach vegetation is dominated by coconuts. The household vegetation was dominated by economically beneficial trees *(Cocos nucifera*) and ornamental plants. Details of floral and faunal composition is given under section 4.1.

4.0. Detailed findings for project area and project area of influence

4.1. Project area and the major habitat types observed

The proposed project area is highly disturbed due to human activities. The Jaffna Ponnalai Point Pedro road and the Point Pedro east coast road margins the Southern boundary and the construction is mainly in the shallow area of the sea (Fig. 7). In the eastern margin there is a concentration of small homesteads of Kottady fishing community with coconut tree as the dominant vegetation (Fig. 8). There are 21 homesteads located within the Eastern side of the project area. These families are involved in fishery related activities such as sorting fish, dried fish preparation, net mending and clearing. In addition, a library building, a fisheries society building and an abandoned and damaged Natarajar stadium (Fig. 9) are also located in the proposed project site. Relative abundance of flora and fauna is high in these areas when compared to rest of the area. There is a small jetty which can provide facilities to around 10 multiday boats (Fig. 10). Multiday boats unload their catch at this jetty and purchase provisions for their next trip and complete procedures laid down by the Department of Fisheries to

multiday boat operations. To facilitate these procedures, a permanent High sea operating officer is stationed near the facility with an office. The office and the landing facility and a damaged and abandoned building are in the project area.

Fig. 7. Southern boundary of the proposed project site with grasses and herbaceous plants

Fig. 8. Homesteads of Kottady fishing community within the Eastern margin of the proposed project site with Coconuts, *Thespesia populnea* (Suriya), *Antigonon leptopus* & *Calotropis gigantea* (Wara).

Fig. 9. Abandoned and damaged Natarajar Stadium with emerging vegetation

Fig. 10. Existing Point Pedro fisheries port without any vegetation

Although the coastal areas of the Northern region are associated with diverse natural ecosystems and includes evergreen forests, Palmyra woodlands, seashore scrubland, sandy seashores, mangroves and mangrove associates, saltmarshes, tidal flats and sand dunes. But the project area only consists of a narrow sandy and rocky seashore area and any such typical natural habitats could not be observed. The substratum is either non-stable or too hard to establish fauna or flora typical to sandy or rocky shores of Sri Lanka.

The major terrestrial habitat types observed in the proposed project area were

- Beach and beach vegetation
- Home gardens

In addition to the above-mentioned habitats, a waterway habitat has been observed during the feasibility study, however, it has been entirely dried up and was not observed during present study period which was a dry weather period.

Beach and beach vegetation

The beach and beach vegetation were predominated by *Cocos nucifera.* Other species reported are *Ipomoea pes-caprae* (Mudu Bin Thamburu), *Phyla nodiflora* (Hiramanadetta), *Thespesia populnea* (Suriya), *Sesuvium portulacastrum* (Vankiruvilai), *Trianthema decandra* (Maha Sarana), *Launaea sarmentosa*, *Calotropis gigantea* (Wara), *Catharanthus roceus* (Mini Mal), *Canavalia rosea* (Mudu Awara), *Cyperus arenarius*, *Cyperus stoloniferus*, *Antigonon leptopus*, *Lantana camara, Morinda coreia* (Ahu), *Gomphrena celosioides*, *Tridax procumbens*, *Coccinia grandis* (Kowakka), *Leucas zeylanica* (Geta Thumba), *Boerhavia diffusa* (Pita Sudu Pala), *Cynodon dactylon*, *Solanum virginianum* (Katuwel Batu), *Cassia occidentalis* (Ath Tora), *Phyllanthus* sp., *Caesalpinia bonduc* (Kalu Vavuletiya), *Azadirachta indica* (Kohomba), *Argemone Mexicana* and *Ficus benghalensis* (Maha Nuga) are the recorded floral species on the beach.

The species *Sesuvium portulacastrum* (Vankiruvilai) and, *Trianthema decandra* (Mahasarana) recorded are nationally near threatened (NT) in conservation status. No endemic floral species were recorded in the beach and beach vegetation. In addition, the two invasive species; *Antigonon leptopus* and *Lantana camara* occupied significant space within the beach and beach vegetation. Detailed information on the taxonomic status and National Conservation Status is given in table.2.

Home gardens

This habitat was observed in association with the existing 21 homesteads of Kottady fishing community. Like the beach and beach vegetation, this habitat was also predominated by *Cocos nucifera* (Coconut). In addition, *Thespesia populnea* (Suriya)*, Calotropis gigantea* (Wara), *Azadirachta indica* (Kohomba), *Carica papaya, Moringa oleifer, Morinda coreia* (Ahu), *Phyllanthus sp.*, *Punica granatum, Antigonon leptopus* and *Lantana camara* were also recorded.

No endemic floral species were recorded in the home gardens within the project area. In addition, the two-invasive species; *Antigonon leptopus* and *Lantana camara* were found in the home gardens. Detailed information on the taxonomic status and National Conservation Status is given in table.2.

4.2. Project area of influence and the major habitat types observed

The project area of influence (PIA) of the Point Pedro project site is shown in Fig 4. The project area of influence is a highly urbanized and man modified area. Jaffna Ponnalai Point Pedro road and the Point Pedro east coast road demarcate the project area from the landward margin of the PIA. There are several road connections to Jaffna Ponnalai Point Pedro main road which borders the project site, through project influence area.

Two fish landing sites Kottady and Supermadam are also located in the PIA.

Other developments in the PIA which are noteworthy of mentioning are, Homesteads, Hindu and Buddhist temple (Fig. 11), Periya pillayar temple, abandoned homesteads (Fig. 12), Sithy Vinayagar School (Fig. 13), Police station, Sports complex of Hartley college, District Magistrate court complex, Hartley College, 551 Military Brigade, Point Pedro Urban Council and Methodist Girls High School.

Methodist Girls High School which has a student population over 1800 students is situated in front of the proposed site. All of these establishments are subjected to impacts of air pollution, noise pollution during construction and operation of the harbor.

Kottady fish landing site is managed by the Kottady Fisheries Co-operative Society. The society consists of around 250 families and they are operating 200-day boats and 2 multi-day boats. There is a barrier of rock boulders which helps them to land and keep their boats safe. Typical vegetation of sandy shores was not observed. The major concern of this society is that sand accumulation in their landing site may be intensified due the construction of proposed harbor.

The westward Supermadam fish landing site is managed by the Supermadam Fisheries Co-operative Society. The society consists of around 425 members and they are operating 60-day boats and several Catamaran (Kattumaram). Like the Kottady fish landing site, there is a barrier of rock boulders which help them to land and keep their boats safe. But, the major concern of this society is that prevailing soil erosion in the landing site may be exacerbated due the construction of proposed harbor.

Soil erosion may have negative impacts on biodiversity due to loss of habitat. Strengthening the existing barrier is the suggestion proposed by the society, which may contribute towards improvements in biodiversity of the area.

Fig. 11. Hindu and Buddhist temple with *Ficus religiosa* (Bo tree)

Fig. 12. Abandoned homesteads with vegetation including *Morinda coreia*

Fig 13. Sitthy Vinayagar School with a huge *Phyllanthus sp.*

The major existing terrestrial habitat types observed in the project area of influence were

- Beach and beach vegetation
- Home gardens
- Abandoned households
- Road reservations

Beach and beach vegetation

The beach and beach vegetation are similar to the vegetation types recorded in the beach and beach vegetation habitat of the project area. Similarly, no endemic floral species were recorded in the beach and beach vegetation. The two invasive species; *Antigonon leptopus* and *Lantana camara* occupied a significant space within the beach and beach vegetation. Detailed information on the taxonomic status and National Conservation Status is given in table.2.

Home gardens

The household / home garden vegetation was predominated by economically beneficial trees; *Cocos nucifera, Borassus flabellifer, Mangifera indica, Carica papaya, Moringa oleifer, Punica granatum, Azadirachta indica and Musa x paradisiaca* and ornamental trees; *Hibiscus rosa-sinensis, Plumeria obtuse, Lantana camara, Antigonon leptopus, Bougainvillea sp. and Nerium*

oleander. No endemic floral species were recorded in the home gardens. The two invasive species; *Antigonon leptopus* and *Lantana camara* were also found in the home gardens. Detailed information on the taxonomic status and National Conservation Status is given in table.2.

Abandoned households

The major vegetation types recorded in the abandoned households were *Passiflora foetida, Morinda coreia, Azadirachta indica, Tribulus terrestris, Datura metel and Abutilon indicum.* No endemic floral species were recorded in the gardens of abandoned households. Detailed information on the taxonomic status and National Conservation Status is given in table.2.

Road reservations

Plants like *Cynodon dactylon, Phyla nudiflora, Azadirachta indica, Thespesia populnea, Solanum virginianum, Passiflora foetida, Argemone Mexicana, Abutilon indicum Antigonon leptopus* and *Lantana camara* were observed in the road reservations. No endemic floral species were recorded in the road reservations. The two invasive species; *Antigonon leptopus* and *Lantana camara* were also significantly found in the road reservations. Detailed information on the taxonomic status and National Conservation Status is given in table.2.

4.3 Vegetation.

A total number of 63 floral species including 02 nationally near threatened (NT) species were recorded during the field ecological survey as indicated in Table 1. Most of the species recorded are herbaceous species (26) followed by trees (20), shrubs (09) and climbers or creepers (08) Further, nearly 57 % of the recorded floral species are natives and 43 % of the species are exotic to the country.

The floral species encountered in this survey including the project area and project area of influence, their different habitats types, taxonomic status and National Conservation Status is given in Table.2. The detailed map of the existing vegetation within the project and project influence area is given in the Fig.11. The photographs of NT species are given separately, and their exact GPS locations are given in section 4.

Table 1. Summary of the Floral Species Recorded during the Study in both Project Area and Project Area of Influence

Type of Flora	**No of**	**Conservation Status**				**Endemic**	**Native**	**Exotic**
	Species	**CR**	**EN**	**VU**	**NT**			
Tree	20	0	0	0	0	0	8	12
Shrub	9	0	0	0	0	0	4	5
Herb	26	0	0	0	0	0	19	7
Epiphyte	0	0	0	0	0	0	0	0
Climbers or Creepers	8	0	0	0	0	0	5	3
Total	**63**	**0**	**0**	**0**	**2**	**0**	**36**	**27**
%							**57%**	**43%**

CR - Critically Endangered, **EN** - Endangered, **VU** - Vulnerable, **NT** - Near Threatened

The species *Sesuvium portulacastrum (*Vankiruvila*i)* and, *Trianthema decandra* (Mahasarana) recorded are nationally near threatened (NT) in conservation status. However, it is scattered on the beach area of the eastern margin of the project site (close to the residential area of Kottady fishing community). The species *Sesuvium portulacastrum* (Fig. 12, Fig. 13 and Fig 14) has been identified as a nearly threaten species in IUCN national conservation status.

This species is found in the eastern margin of the project site which is close to the location where Kottady fishing community is occupying at present. Two patches of this species have been identified in two locations. In one location (9^{o} 49' 43" N, 80^{o} 14' 17" E) the patch covers an area of around 5.5 m^{2}. In other place (9^{o} 49' 44" N, 80^{o} 14' 16" E) the area of the extent of this species was 4.5 m^{2}. These plants are sprawling herbs and individual plant counts cannot be taken. All those two patches are in a disturbed state. *Ipomoea pes-caprae* (Mudu Bin Thamburu) and grasses which are competing with this species in this habitat. In addition, garbage was also found disposed on the patches of *Sesuvium portulacastrum*.(Fig 12, Fig 13,Fig 14.).

Proposed infrastructure of the harbor is to be located in this area. The careful removal of this species and replanting them in the proposed green belt area is suggested as a mitigation. It also may be noted that several previous studies confirmed the significant existence of these species in Jaffna, Mannar, Vavuniya, Kilinochchi and Batticaloa Districts (Asela *et al*, 2014; Joseph, 2003, Department of Wildlife Conservation, 2017; IUCN, 2012; IUCN, 2011; CEB, 2016; GOSL, 2017).

Removal of this species during construction may not significantly affect the biodiversity in the region, districts and province.

The species *Trianthema decandra* (Fig.15), a nearly threatened species in IUCN national conservation status, was observed in two areas. One patch is located close to the existing jetty, behind the high sea fisheries office. These plants are loosely mat forming and are found interwoven. Distribution is in an area of 1.6 m^2. The GPS location is 9° 49' 41" N, 80° 14' 9" E. The other patch (9° 49' 42" N, 80° 14' 15" E) was found close to the eastern margin of the project site where Kottady fishing community is occupying at present. It may be noted that this patch is subjected to human interference and is located only on one side of a small pathway leading to the community dwelling. Several previous studies confirmed the significant existence of these species in Jaffna, Mannar, Vavuniya, Kilinochhi and Batticaloa Districts (Asela et al, 2014; Joseph, 2003, Department of Wildlife Conservation, 2017; IUCN, 2012; IUCN, 2011; CEB, 2016; GOSL, 2017). Some of this plants can be removed during construction and be replanted in the areas marked for green belt establishment under the guidance of a horticulturist.

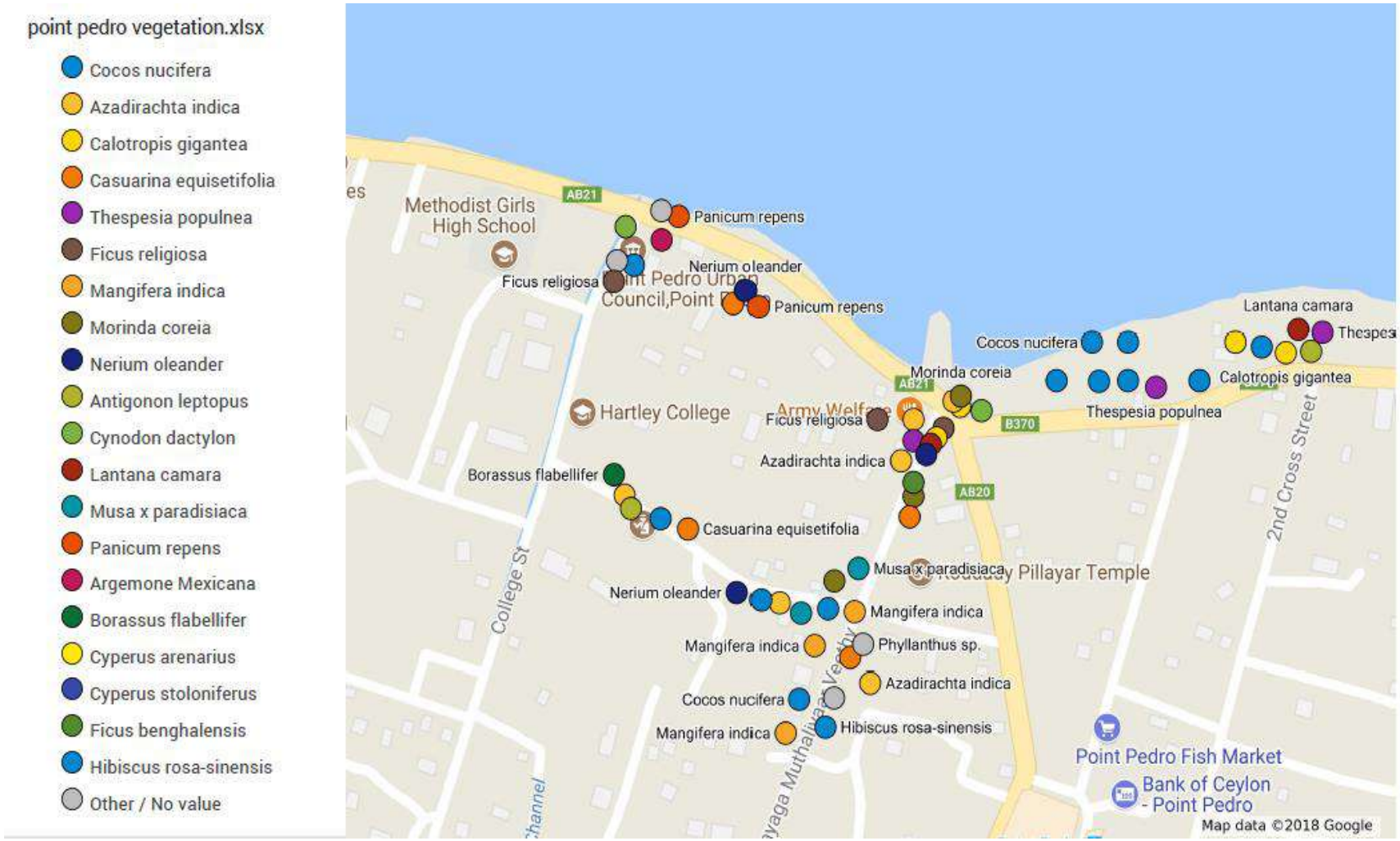

Fig. 14. The detailed map of the existing notable vegetation within the project and project influence area

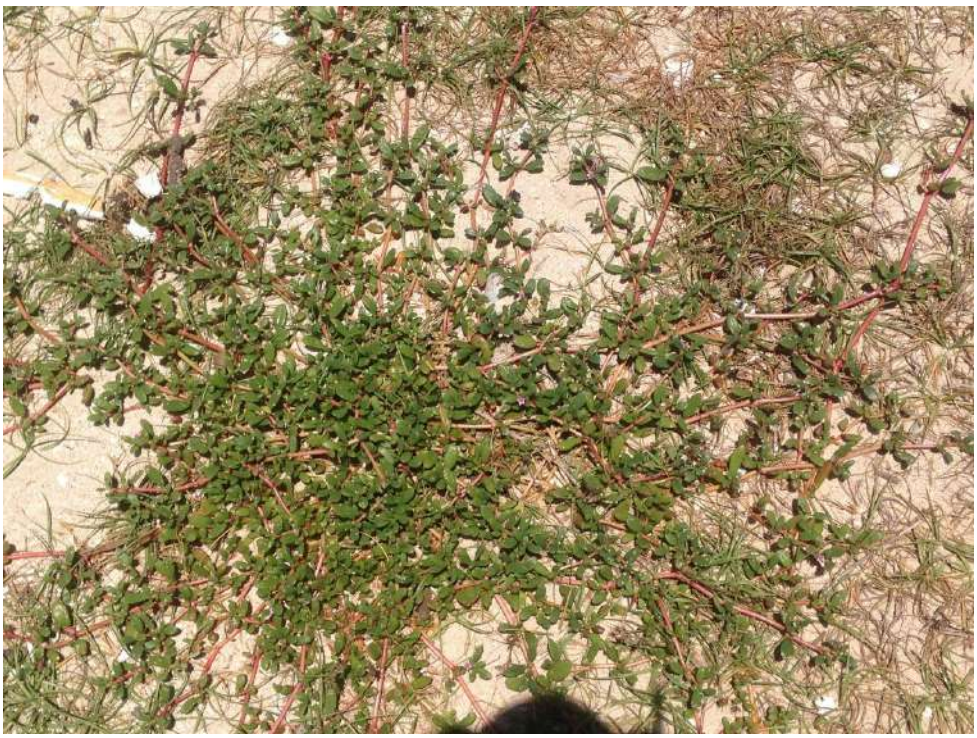

Fig. 15. *Sesuvium portulacastrum* patch. Please note competing with grasses in the project area

Fig. 16. *Sesuvium portulacastrum* competing with *Ipomoea pes-caprae* (Mudu Bin Thamburu) in the project area

Fig. 17. Garbage in association with the patches of *Sesuvium portulacastrum*.

Fig. 18. Patches of *Trianthema decandra* (Maha Sarana) in the project area

Table 2. Details of Floral Species Recorded indicating different Habitats, Taxonomic Status and National Conservation Status.

Family	Species	Local name	HA	TS	NCS	GCS	In		Out			
							BB	HG	BB	HG	AH	RR
Aizoaceae	*Sesuvium portulacastrum*	Vankiruvilai Maha Sarana	H	N	NT		+					
Aizoaceae	*Trianthema decandra*	Maha Sarana	H	N	NT		+					+
Amaranthaceae	*Aerva lanata*	Polpala	H	N	LC							+
Amaranthaceae	*Gomphrena celosioides*		H	I			+					
Amaryllidaceae	*Crinum asiaticum*	Tolabo	H	N	LC					+		
Anacardiaceae	*Mangifera indica*	Amba	T	I				+	+	+		+
Apocynaceae	*Calotropis gigantea*	Wara	S	N	LC		+		+	+		
Apocynaceae	*Catharanthus roceus*	Mini mal	H	I			+					
Apocynaceae	*Nerium oleander*	Kaneru	S	I						+		
Apocynaceae	*Plumeria obtuse*	Araliya	T	I						+		
Apocynaceae	*Tabernaemontana divaricate*	Watu Sudda	S	I						+		
Arecaceae	*Borassus flabellifer*	Tal	T	I				+	+	+		+
Arecaceae	*Cocos nucifera*	Pol	T	I			+	+		+		
Asparagaceae	*Sansevieria sp.*		H	I						+		
Asteraceae	*Eclipta prostrata*	Kikirindiya	H	N	LC							
Asteraceae	*Launaea sarmentosa*		H	N	LC		+		+			+
Asteraceae	*Tridax procumbens*		H	I			+					+
Asteraceae	*Vernonia cinereal*	Monara Kidumbiya	H	N								
Bignoniaceae	*Tecoma stans*	Kelani Tissa	T	I						+		
Cactaceae	*Cereus peruvianus*		H	I						+		+
Capparaceae	*Crateva adansonii*	Lunu Warana	T	N	LC							
Caricaceae	*Carica papaya*	Gas Labu	T	I						+		

Family	Species	Local name	HA	TS	NCS	GCS	In		Out			
							BB	HG	BB	HG	AH	RR
Casuarinaceae	*Casuarina equisetifolia*	Kasa	T	I						+		
Convolvulaceae	*Ipomoea pes-caprae*	Bin Thamburu	C	N	LC		+		+			
Cucurbitaceae	*Coccinia grandis*	Kowakka	C	N	LC		+			+		
Cyperaceae	*Cyperus arenarius*		H	N	LC	LC	+					
Cyperaceae	*Cyperus stoloniferus*		H	N	LC	LC	+					
Euphorbiaceae	*Euphorbia hirta*	Bu Dada Kiriya	H	N	LC							+
Euphorbiaceae	*Jatropha gossypiifolia*		S	I						+		
Fabaceae	*Caesalpinia bonduc*	Kalu Vavuletiya	C	N	LC		+					
Fabaceae	*Canavalia rosea*	Mudu Awara	C	N	LC		+					
Fabaceae	*Cassia occidentalis*	Ath Tora	S	N	LC		+					+
Fabaceae	*Desmodium triflorum*	Undupiyaliya	H	N	LC							+
Fabaceae	*Gliricidia sepium*	Weta Mara	T	I						+		
Fabaceae	*Leucaena leucocephala*	Ipil Ipil	T	I				+		+		
Lamiaceae	*Leucas zeylanica*	Geta Thumba	H	N	LC		+					+
Malvaceae	*Abutilon indicum*	Wal Anoda	S	N	LC					+	+	
Malvaceae	*Hibiscus rosa-sinensis*		S	I				+		+		
Malvaceae	*Thespesia populnea*	Suriya	T	N	LC		+	+	+	+		+
Meliaceae	*Azadirachta indica*	Kohomba	T	N			+	+	+	+	+	+
Moraceae	*Ficus benghalensis*	Maha Nuga	T	N	LC		+					
Moraceae	*Ficus religiose*	Bo	T	I						+		+
Moringaceae	*Moringa oleifer*	Murunga	T	I						+		
Musaceae	*Musa x paradisiaca*	Kesel	H	I						+		
Nyctaginaceae	*Boerhavia diffusa*	Pita Sudu Pala	H	N	LC		+		+			+
Nyctaginaceae	*Bougainvillea sp.*		C	I						+		
Nyctaginaceae	*Pisonia grandis*	Lechchakotta	T	N	LC			+		+		

Family	Species	Local name	HA	TS	NCS	GCS	In		Out			
							BB	HG	BB	HG	AH	RR
Papaveraceae	*Argemone mexicana*		H	I			+					+
Passifloraceae	*Passiflora foetida*		C	I				+		+	+	
Phyllanthaceae	*Phyllanthus sp.*		H	N	LC		+					+
Poaceae	*Cynodon dactylon*		H	N	LC		+		+			+
Poaceae	*Panicum repens*	Etora	H	N	LC				+			
Polygonaceae	*Antigonon leptopus*		C	I			+	+	+	+		+
Punicaceae	*Punica granatum*	Delum	T	I						+		
Rhamnaceae	*Ziziphus mauritiana*	Dambara	T	N	LC					+		
Rhamnaceae	*Ziziphus oenoplia*	Heen Eraminiya	C	N	LC				+			
Rubiaceae	*Morinda coreia*	Ahu	T	N	LC		+	+	+	+	+	+
Rutaceae	*Citrus sp.*		T	I				+		+		
Solanaceae	*Datura metel*	Attana	H	N							+	+
Solanaceae	*Solanum virginianum*	Katuwel Batu	S	N	LC		+					+
Verbenaceae	*Lantana camara*	Gandapana	S	I						+		
Verbenaceae	*Phyla nudiflora*	Hiramanadetta	H	N			+					
Zygophyllaceae	*Tribulus terrestris*	Nerinchi	H	N	LC					+	+	+

HA – Habit, **T** – Tree, **S** – Shrub, **H** – Herbaceous, **C** – Climber or Creeper, **TS** – Taxonomic Status, **N** – Native, **I** – Introduced or Exotic, N**CS** – National Conservation Status, **NT** – Near Threatened, **IN** – Proposed Project Area, **BE** – Beach and Beach Vegetation, **HG** – Home Gardens, **AH –** Abandon households **OUT** –Project Area of Influence, **RR** – Roadside Reservations

4.4. Fauna

A total number of 29 faunal species including 1 critically endangered species were recorded during the field survey as indicated in Table 3. The land snail species *Trachia fallaciosa* recorded on trees in the home gardens and roadsides of the project PIA influence area during the feasibility study is a nationally critically endangered (CR) species and restricted to dry northern parts of the country. However, in Jaffna peninsula, it is common on trees and shrubs found in home gardens, roadsides and abandoned lands. But, this species was not recorded during our study.

The land snail species *Trachia fallaciosa* is nationally critically endangered (CR) species recorded during the feasibility study. But, this was not recorded in project area during our field survey which was conducted during a severe dry weather period. The feasibility study has been conducted during wet season. Interviews with community members revealed that this species can be observed during rainy seasons. According to the available information on biology this species and expert consultations reveals that this species aestivate to overcome the unfavorable weather conditions. During the feasibility survey, the exact location has not been recorded. Snails have been observed in a decaying log during the previous survey and the team was unable to trace the site and the decaying log during the present survey. However, another verification survey was conducted recently. Although this species was not observed in the project area, species was located in a Palmyra fence of a home garden (9° 49’ 41” N, 80° 14’ 14” E) in the project area of influence (Fig. 19.). Interviews with the community reveled that this species can be observed during rainy season and is abundant in the project area of influence.

Fig. 19. Land snail species *Trachia fallaciosa* in a Palmyra fence of a home garden (GPS Location 9° 49’ 41” N, 80° 14’ 14” E) in the project area of influence.

No migratory bird species were recorded during the field ecological study. However, the Jaffna peninsula of Sri Lanka is famous for the birds classified under the Indian Avi-faunal Zone. The Jaffna area is also the entry point to the country for the migratory birds on the Middle Asian Flyway. The period from August to April each year is significant as the bird migratory period in the country. As the proposed project site is highly urbanized and man modified, the occurrence of migratory birds is rare. This was confirmed by the field interviews with fishermen and fisheries officers. Further, the available literature also revealed that proposed project site is not a hot spot for bird watching (Fig. 20).

Feral pigeon (*Columba livia domestica*) is the common pigeon that we observed everywhere. The rock pigeon *Columba livia* is the wild race of the domesticated feral pigeon. Although the populations of the wild pigeons are relatively low, they are found scattered in and out of the project area of influence and in the Jaffna District. They are not nesting and rearing juveniles in the project area. Proposed harbor will not pose a serious threat to this species.

No turtles were recorded during the field ecological study and the discussions with local coastal communities also revealed that turtles are not observed in the area. Sri Lanka's sandy beach is a nesting ground for five species of marine turtles which include the Green Turtle, the Leatherback, the Hawksbill, the Loggerhead and the Olive Ridley. All 5 species have been recorded to nest along specific areas of Sri Lanka's coast. Hawksbill (*Eretmochelys imbricata*) nesting is sparse and this species is considered uncommon in Sri Lanka. It is mainly found around eastern and southern coast (Dattatri and Samarajeewa,1982; Scott, 1989). Fishing practices of Sri Lanka threaten *E. imbricata* populations, and national conservation status for the species is "Endangered" and The World Conservation Union classifies the hawksbill globally as critically endangered. There is no evidence of nesting site in or near the project area either from literature or from the local community/ researchers. The proposed project site and its surrounding environment does not provide an appealing environment for turtles as it is an urbanized and highly modified habitat and consist of narrow sandy beaches.

Fig. 20. Birding locations in Jaffna peninsula (Source: Udita Wijesena, URL; https://udithawijesena.blogspot.com/2015/02/bird-watching-in-chundikkulam-jaffna.html)

Table 3. Summary of the Faunal Species Recorded During the Study in both Project Area and Project Area of Influence

Taxonomic Group	Total Number Of Species	No of Endemic Species	Conservation Status				No of Exotic/Feral Species
			CR	EN	VU	NT	
Birds	13	0	0	0	0	0	1
Butterflies	10	0	0	0	0	0	0
Dragonflies	3	0	0	0	0	0	0
Mammals	1	0	0	0	0	0	0
Reptiles	1	0	0	0	0	0	0
Land Snails	1	0	1	0	0	0	0
Total	**29**	**0**	**1**	**0**	**0**	**0**	**1**

CR – Critically Endangered, **EN** – Endangered, **VU** – Vulnerable, **NT** – Near Threatened

The details of faunal species recorded in the proposed project area are given in Table 4.

Table 4. Details of Faunal Species Recorded in the Proposed Project Area and Project Area of Influence

Family	Scientific Name	English Name	Sinhala Name	TS	NCS	GCS
BIRDS						
Accipitridae	*Haliastur indus*	Brahminy Kite	Bamunu Piyakussa	BrR	LC	LC
Apodidae	*Cypsiurus balasiensis*	Asian Palm Swift	Asiaa Thal-thurithaya	BrR	LC	LC
Columbidae	*Columba livia*	Rock Pigeon	Podu Paraviya	Feral	CR (considering only the wild population)	LC
Columbidae	*Streptopelia chinensis*	Spotted Dove	Alu Kobeiyya	BrR		
Corvidae	*Corvus splendens*	House Crow	Kolamba Kaputa	BrR	LC	LC
Cuculidae	*Eudynamys scolopacea*	Asian Koel	Kowula	BrR		
Dicaeidae	*Dicaeum erythrorhynchos*	Pale-billed Flowerpecker	Lathudu Pililichcha	BrR	LC	LC
Muscicapidae	*Copsychus saularis*	Oriental Magpie Robin	Polkichcha	BrR	LC	LC
Nectariniidae	*Nectarinia zeylonica*	Purple-rumped Sunbird	Nithamba Dam Sutikka	BrR	LC	LC
Psittacidae	*Psittacula krameri*	Rose-ringed Parakeet	Rana Girawa	BrR	LC	LC
Sturnidae	*Acridotheres tristis*	Common Myna	Mayna	BrR	LC	LC
Sylviidae	*Orthotomus sutorius*	Common Tailorbird	Battichcha	BrR	LC	LC
Timalidae	*Turdoides affinis*	Yellow-billed Babbler	Demalichcha	BrR	LC	LC
BUTTERFLIES						
Lycaenidae	*Chilades lajus*	Lime Blue	Podu Panu-nilaya	Indigenous	LC	
Nymphalidae	*Acraea violae*	Tawny costor	Thambily panduru-boraluwa	Indigenous	LC	
Nymphalidae	*Danaus chrysippus*	Plain tiger	Podu koti-thambiliya	Indigenous	LC	

Family	Scientific Name	English Name	Sinhala Name	TS	NCS	GCS
Nymphalidae	*Euploea core*	Common crow	Podu kaka-kotithiyaya	Indigenous	LC	
Nymphalidae	*Junonia almana*	Peacock pansy	Monera alankarikya	Indigenous	LC	
Nymphalidae	*Junonia lemonias*	Lemon pansy	Dumburuwan alankarikya	Indigenous	LC	
Papilionidae	*Pachliopta hector*	Crimson rose	Maha rosa papilia	Indigenous	LC	
Pieridae	*Catopsilia pyranthe*	Mottled emigrant	Thith-piya piyasariya	Indigenous	LC	
Pieridae	*Colotis amata*	Small salmon arab	Punchi rosa sudana	Indigenous	LC	
Pieridae	*Eurema hecabe*	Common grass yellow	Maha kahakolaya	Indigenous	LC	
DRAGONFLIES						
Libellulidae	*Diplacodes trivialis*	Blue Percher		Indigenous	LC	LC
Libellulidae	*Orthetrum sabina*	Green Skimmer		Indigenous	LC	LC
Libellulidae	*Tramea limbata*	Sociable Glider		Indigenous	LC	LC
MAMMALS						
Sciuridae	*Funambulus palmarum*	Palm squirrel	Leena	Indigenous	LC	LC
REPTILES						
Agamidae	*Calotes versicolor*	Common garden lizard	Gara katussa	Indigenous	LC	
LAND SNAILS						
Camaenidae	*Trachia fallaciosa*			Indigenous	CR	

5.0. Impacts due to project activities during construction and operational stage

5.1. Construction period.

The proposed fishery harbor is to be in a seaward site bordering the Jaffna Ponnalai Point Pedro road and the Point Pedro east coast road, in a shallow area of the sea and in sea beach. The beach is sandy, and the shore line is narrow. In some areas rocky bottom is found with a sandstone rocky reef. There is no significant vegetation establishment typical to sandy sea shore or to a rocky shore. Generally, the sea-shore vegetation is observed above the high-water mark on sandy, gently sloping beaches. Unstable beach line and lack of gentle slope together with human interaction appears to be responsible for the lack of establishment of typical fauna and flora.

There are about 60 coconut trees with girth size of 80 to 110 cm in an area close to the eastern boundary where dwellings of the Kottady fisher community are located. There is a possibility of preserving most of the trees by minimizing the interaction of this area with construction activities (Annex 3 and Annex 4) or incorporation of trees in architectural design as landscape features.. Then the number of coconut plants to be removed can be limited to 8 to 10. Permits are not needed to remove and transport *Cocos nucifer*a. If this area is to be cleared, replanting could be done in available spaces to replace the removed plants as seedlings are available. According to the construction plans (Annex 2) this area does not indicate major structural components. No endangered or endemic plant species were recorded in the proposed project site during the field survey.

The project site is not situated within or adjacent to any buffer zones, buffer zones of protected areas, or special areas for protecting biodiversity. There is very minimal impact on flora and Fauna due to the proposed construction. Since this area is not a terrestrial habitat with diverse flora or fauna, adverse impacts on the terrestrial environment including biodiversity is very minimal.

5.2. Operational period

The role of the fishing harbor is considered as the interface between the harvesting of fish and its consumption. Fishery harbor can be a focal point of pollution of the surrounding terrestrial habitats and can affect the flora and fauna of the project area in general and in project area of influence during operational period.

Within the fishery harbor complex many activities take place related to waste generation as indicated in Annex 2. Fishery harbors are found to cause several adverse impacts on the terrestrial coastal environment and biodiversity in and around harbors, related to waste generation. Disposal of dredging material during de-siltation and waste that is generated

during harbor operation, in the harbor or in the project area of influence can affect the terrestrial environment and biodiversity.

After the construction of the existing jetty to facilitate a few multiday boats, erosion of beach in Supermadam area and accumulation of sand in Kottady area have been observed by the respective fishing communities. Similar impacts can be expected after the construction of harbor and during the operational stage. Beach erosion can cause adverse impacts due to loss of habitat while accumulation of sand will have positive impacts on biodiversity. Establishment of Green Buffer Zones and planting of trees in and around harbor area will contribute to the enhancement of biodiversity and aesthetic quality during harbor operation.

6.0. Mitigation measures

Developing Green Buffer Zones, wherever possible, should be encouraged in and around the harbor and within the spaces in the harbor area, to minimize air pollution within the harbor. The proposed greenbelt development/plantation in the area will function primarily as a landscape feature. In addition, it acts as a pollution sink/noise barrier, reduces soil erosion and makes the ecosystem more diversified and functionally more stable and healthy. The proposed green belts should form an effective barrier between harbor and the surroundings. Other open spaces within the harbor should be converted to green areas in the form of lawns and shading areas. *Thespesia populnea* (Suriya) is widely accepted as a shading plant in the area. Assistance of a specialist in horticulture can be obtain to identify other suitable species. Most acceptable species for the community are *Cocos nucifera* (Coconut), *Borassus flabellifer* (Palmyra) and *Thespesia populnea* (Suriya). Other species can be selected form the native plants listed in Table. 2 with the consultation of a horticulturalist. Table 2 lists Trees, Shrub, Herbaceous, Climber or Creepers recorded during the investigations.

Preference should be given to native species and to species *Sesuvium portulacastrum*, *Trianthema decandra* which are nationally near threatened (NT) species with reference to national conservation status. Possibility of relocation of these two specie should be considered in green area development. Dumping garbage and invasive plants pose a threat to these species even at present.

Terrestrial biodiversity should be monitored. Environmental Management Plan (EMP) should include monitoring plan for biodiversity and factors that affect the terrestrial biodiversity associated with the fishery harbor to identify corrective measures. Awareness programmes to harbour staff and other stakeholders on biodiversity and environment are also suggested.

7.0. Summary

Development of a fishery harbor at Point Pedro is one of the activities identified by the Northern Provincial Sustainable Fisheries Development Project (NPSFDP) to revive the fisheries sector. The harbor is to be in the seaward margin of Jaffna Ponnalai Point Pedro road.

The Project includes dredging and clearing of an area with very limited faunal and floral diversity for harbor construction hence, the adverse impacts on terrestrial biodiversity will be very minimal. It is recommended to conserve coconut trees located in the eastern margin where there is not much interaction with the construction activities. Green Buffer Zones and green areas should be established. Open spaces within the harbor should be converted to green areas in the form of lawns and shading areas to enhance the terrestrial biodiversity.

Incorporating monitoring of terrestrial biodiversity in designing and implementing the environmental Management Plan (EMP) will control and minimize the adverse impacts on terrestrial biodiversity of the harbor and will contribute towards the sustainable development goals and the targets of the National Biodiversity Strategic Action Plan of Sri Lanka while improving the terrestrial environment.

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9.0. Appendices

Annex 1. The list of government officers and personnel were interviewed during the study

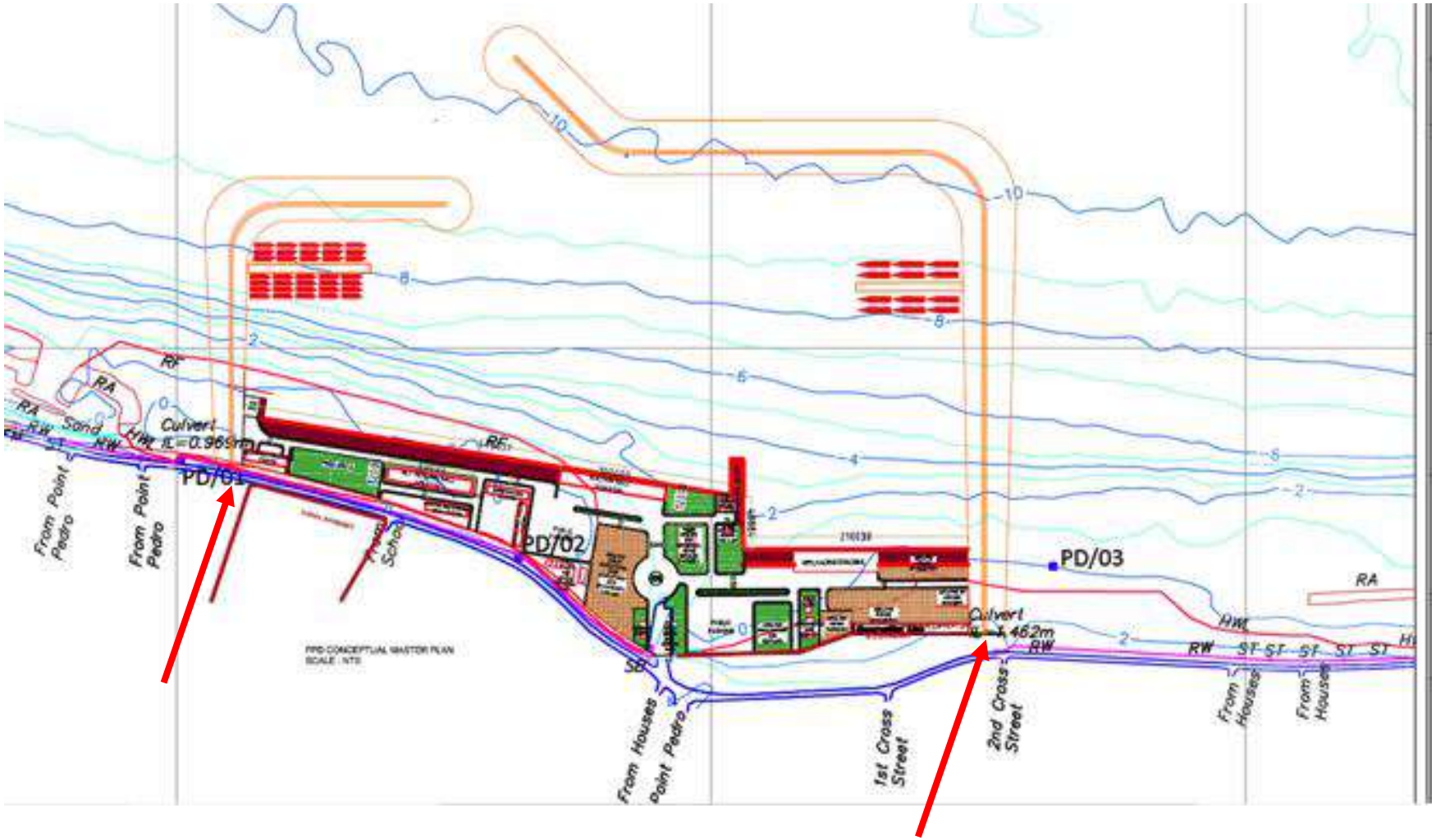
Name	Position	Contact Details
Mr. Suthakaran	Assistant Director for Fisheries, Jaffna District	+94779072967
Mr. Susanthan	High Sea Unit Operating Officer	+94772370272
Mr. Sivakumar	Fisheries Officer, Point Pedro West, Jaffna District	+94777295603
Mr. Suthakaran	Fisheries Officer, Point Pedro East, Jaffna District	+94771999639
Mr. Aanandan	President, Kottady Co-operative Fisheries Society	
Mr. Rajkumar	Secretary, Kottady Co-operative Fisheries Society	
Mr. W. Aruldhas	President, Munai Co-operative Fisheries Society	+94777295603
Mr. J. Christy	Member, Munai Co-operative Fisheries Society	+94772850167
Mr. M. Sivakumar	Vice President, Supermadam Co-operative Fisheries Society	
Mr. T. Srinanasundaram	Member, Supermadam Co-operative Fisheries Society	+94777295603
Mr. K. Sutharasan	Member, Sakkodai Co-operative Fisheries Society	+94778291305
Mr. Thinesh Kumar	Member, Sakkodai Co-operative Fisheries Society	+94779074708
Mr. CUK. Daluwatte	Skipper, Multi-day fishing	+94775905223

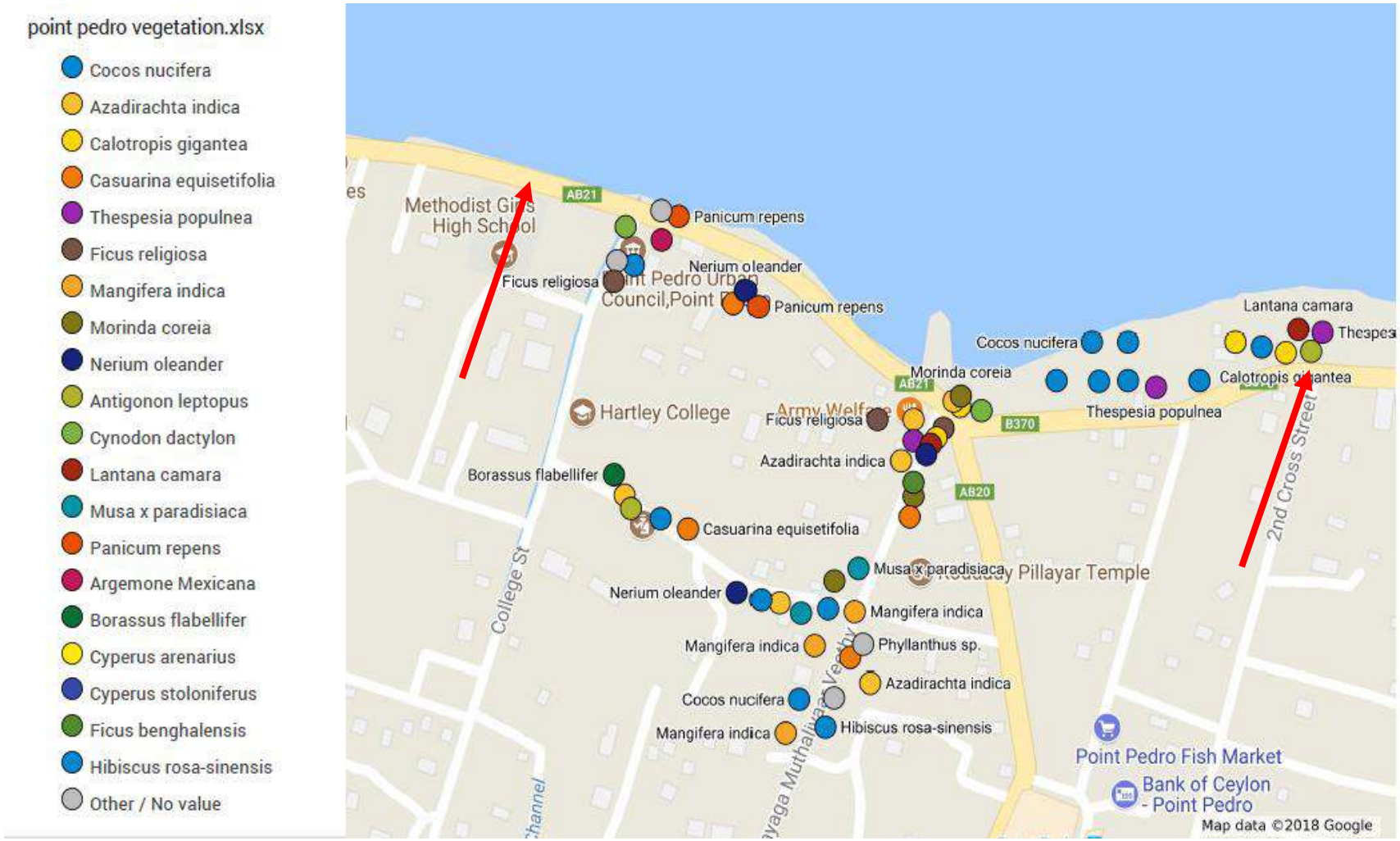
Annex 2. Typical potential waste streams identified in fishery harbors that can affect the terrestrial habitat and biodiversity in surrounding areas

Harbour Area	Source Area	Type of Waste Generated
Main Building Complex	Harbour office	Toilets and garbage
	Toilets	Sewage
		Waste water from bathing & washing areas
	Canteen	Kitchen waste
		Packaging materials
		Waste from wash area
		Litter and food scraps
	Boat repairs	Oil and grease
		Paint cans, paint
		Anti-fouling paint cans
		Used batteries
		Fiberglass coating
		Wood shavings, steel scrap
	Net mending shed	Torn nets and rope
	Ice plant	Waste ice
Landing Jetty and adjacent areas	Auction hall	Fish waste
		Blood water
		Trash fish
		Hose down water
	Gutting area	Fish offal
		Hose down water
	Fuel dispensing facility	Oil spills
		Accidental oil leaks
	Breakwater structures and dunes, beaches	Human defecation
		Lubrication oil
		Sewage

Harbour Basin	Fishing vessels	Toilet waste
		Packaging materials (plastics)
		Un used provisions
		Kitchen waste
		Deck washing waste water
		Fish hold cleaning waste water
Harbour		Floating garbage
		Bilge water
		Lubrication oil
		Sewage
		Toilet waste

Annex 3. Main structures and the adjoining area of the proposed harbour where community is occupying at present.





Annex 4 –Notable vegetation that will interfere with the project infrastructure

Annex 09- Archeological Impacts Assessment

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பின்னிணைப்பு 09 - தொல்பொருளியல் தாக்க மதிப்பீடு

Archaeological Impact Assessment

Fisheries Harbour Development Project - Point Pedro

2018

Underwater Archaeology Unit
Exploration and Documentation Branch
Department of Archaeology
Colombo 7.

Background

The authorized body of the archaeological evidences not only in the land but also under the territorial sea of the country is the Department of Archaeology. In order to comply with the orders set out in terms of provisions in the Antiquities (Amendment) Act, No. 24 of 1998 [Annex 01] and Antiquity Ordinance 2000 (Annex 02) whenever any development, industrial scheme or project is proposed by the Government, any other institution or person, such scheme or project shall not be approved or permitted until a report is submitted by the Director General of Archaeology, as to the effects the implementation of such scheme, or project may have upon such land or any antiquities within it. Finally, every development project in this country should be subjected to Archaeological Impact Assessment [AIA].

01. Introduction

The archaeological impact assessment study is initiated in response to the development proposals of the 'Point Pedro Fisheries Harbour Project' [PPFHP] which would potentially disturb or alter the archaeological localities and cultural landscape in and around the project area. The proposed development area is sited in Point Pedro Grama Niladari division of Point Pedro Divisional Secretariat in the Jaffna District in Northern Province of Sri Lanka. The project is funded by Asian Development Bank [ADB] and the Ministry of Fisheries and Aquatic Resources Development and Rural Development [MFARD] is employing as the project proponent.

Survey Area.

The area chosen to the survey was a 0.56 km^2 of the sea and land around the Point Pedro Jetty. The beach of this area is aligned east-west in the northern cost. The north-western most point (9^0 50' 0.60'' N/ 80^0 13' 50.01'' E) of the survey was located on the sea parallel to the current Tsunami Alert Tower, while the north-eastern most point (9^0 50' 0.60'' N/ 80^0 14' 19.01'' E) was located on the sea parallel to the collapsed Beach Pavilion. South-western point (9^0 49' 39.81'' N/ 80^0 13'' 50.01'' E) located on the land adjoining to the current Tsunami Alert Tower and south-eastern point (9^0 49' 39.81'' N/ 80^0 14' 19.01'' E) located on the ground near the collapsed Beach Pavilion (Fig. 02).

02. Geography and Environment of the Survey Area

Sri Lanka has a coastline over 1700 kilometers long. Point Pedro, where Northern most point of Sri Lanka located in the Northern coastline in the Jaffna Peninsula (Lat. 9.8280808 N, Lon. 80.2354791 E).

Geological History of Point Pedro

According to the major events of the geological history of Sri Lanka; beginning of the geology of Pont Pedro and around is going back to the 22.5 -5 million years ago of Miocene period of Tertiary period, Cainozoic of Geological Era (Swan, 1983). Tertiary sediments are Miocene and occur in the North and North west of the Island, known as the Jaffna limestone (Swan, 1983) (Fig. 2 & 3)

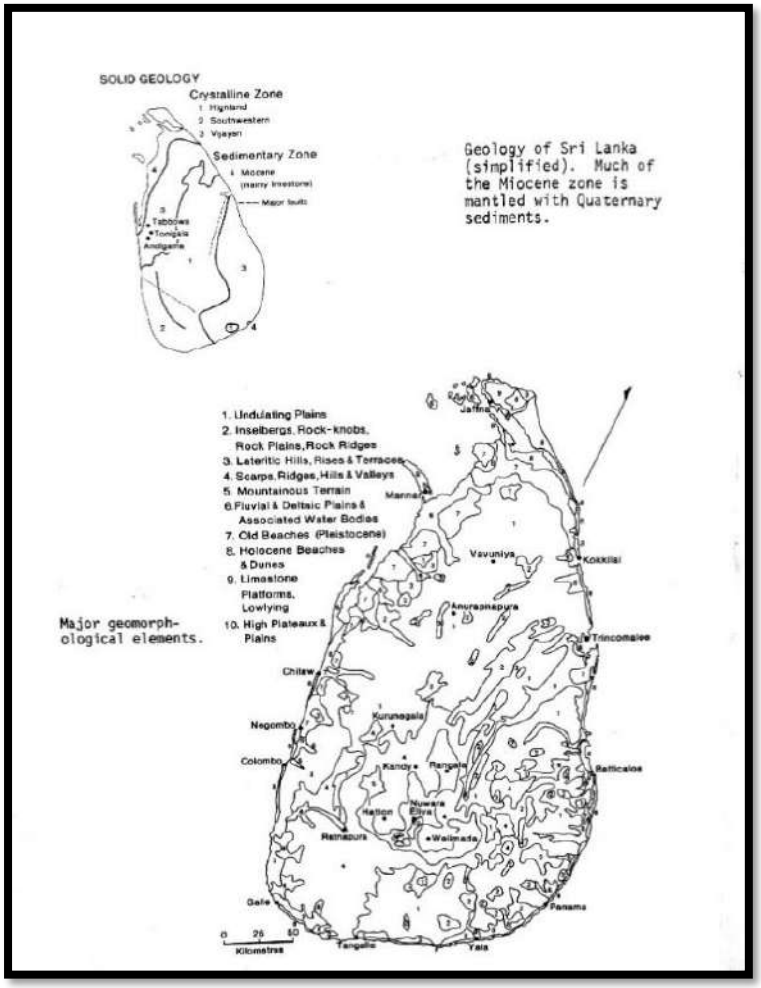
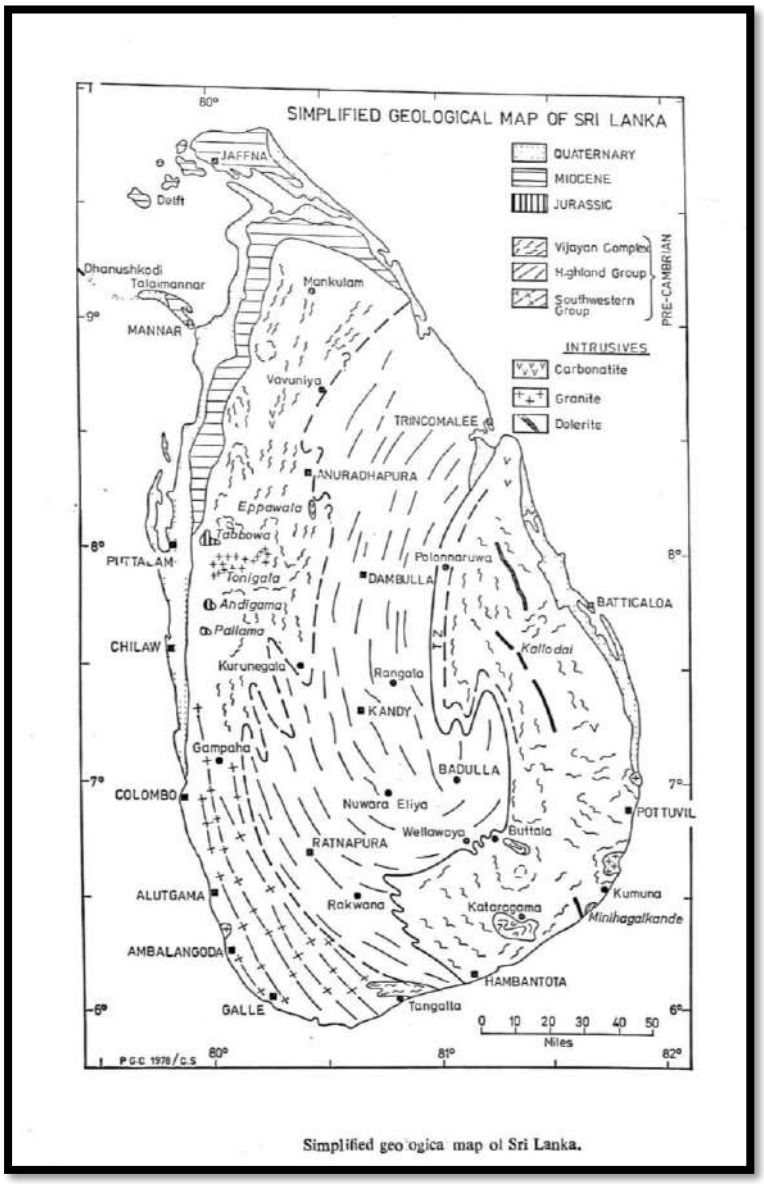


Fig. Miocene Zone (Swan, 1983)



Map 3 - Miocene and other Geological Regions (Cooray, 1984, p. 79)

Physical Features of Point Pedro

The coast of Point Pedro occupies the Northern flank of Jaffna peninsula. It faces seas that are less than 13 meters deep and for this reason is not affected by medium and period ocean swell (Swan, 1983). Continental Shelf of point Pedro is less than 60 meters, shelf edge is 119 meters and shelf width is 60 kilometers (Fig. ….).

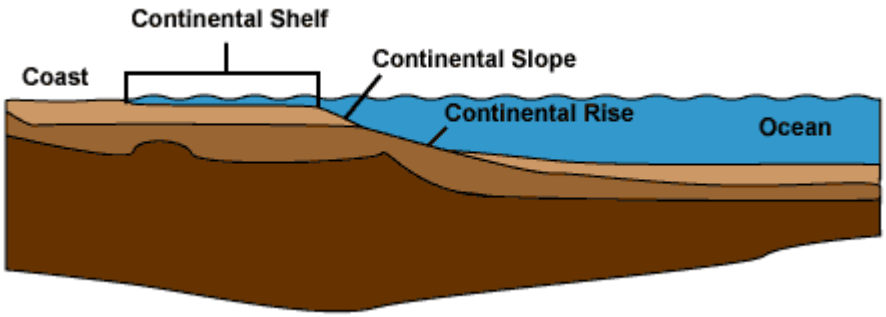


Fig. … - Continental Shelf

Rock and Soil

Tertiary sedimentary consists of thick, nearly horizontal beds of coralline limestone, calcareous sands and muds (Swan, 1983, p. 11). Jaffna limestone total extend is about 800 square miles, and the limestone is several hundreds of feet thick, as shown by borings (Cooray, 1984, p. 126; Cooray, 1984, p. 127).

The coast is low-lying and composed of corallian limestone, capped with red calcic latosoils which are weathered beach and aeolian deposits. Raised Holocene beach deposits lay within 3m of the high water mark (Swan, 1983).

A varied assemblage of fossils is found in the Jaffna limestone and it includes foraminifera, lamellibranches, gastropods, echinoids, corals, calcareous algae etc.(Cooray, 1984, p. 127).

Marine processes of Point Pedro and around

Waves - According to the coastal wave climate of Sri Lanka; Point Pedro located in the Low Energy Zone (Silva, Ranasinghe; & etal, 2007, p. 48) (See map 4 & Table 3).

Currents - General Circulation of surface currents of point Pedro; in December - North to South, in March - South to North, in June - North to Northeast, in September - Northeast to South (See Diagram 2)

Duration	Zone					
	High		Moderate		Low	
	Wave Length (M)	Wave Period (S)	Wave Length (M)	Wave Period (S)	Wave Length (M)	Wave Period (S)
South-West Monsoon	1.3-3.5	6-8	1.2-3.3	7-11	0.4-2.0	9-12
North-East Monsoon	1.1-3.0	7-10	0.5-2.2	9-13	1.5-2.7	7-10
Intermonsoonal	0.6-2.5	8-18	0.3-1.8	10-16	0.4-1.5	12-20

Table 3- Coastal Wave Climate around the Year (Silva, Ranasinghe; & etal, 2007, p. 48)

Tides

The magnitude of tides varies from place to place and attributable to relationships to ocean basins, sea floors, and the plan shapes of coastal margins. The seas around Sri Lanka are micro-tidal by world standards. The tidal range is within 75 cm at spring tides and 25 cm at neaps (See Table 4).

Location	High Water		Low water	
	Mean springs	Mean neaps	Mean springs	Mean neaps
Point Pedro	67	49	6	24
Colombo	73	49	6	27
Hambantota	58	40	-	-
Trincomalee	55	43	6	18

Table 4 - Tidal level in Point Pedro and some selected places in Sri Lanka (centimeters)

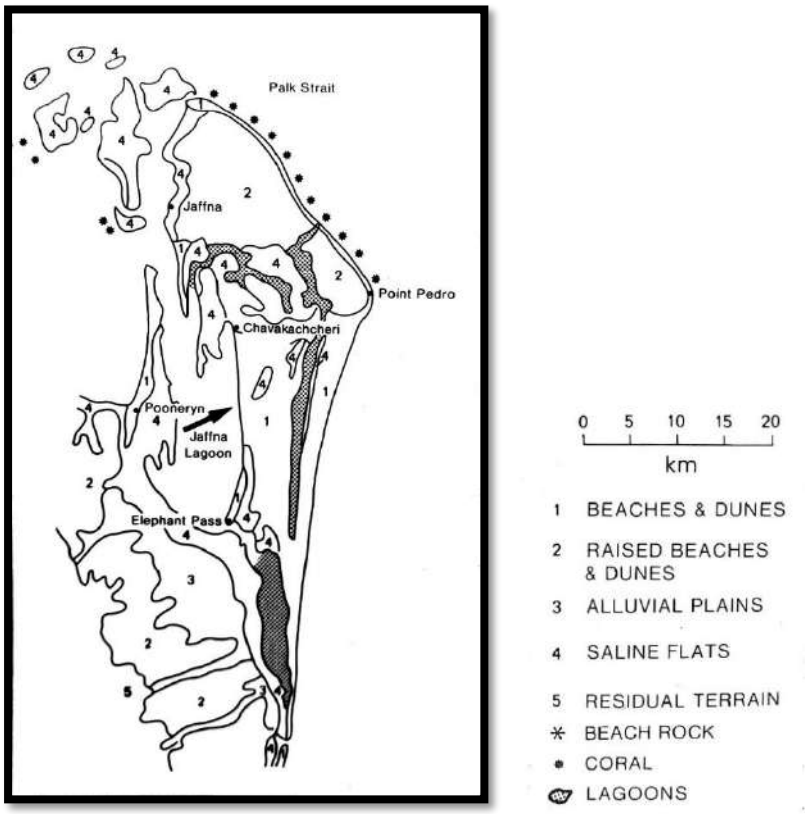
After (Swan, 1983, p. 36)(Monthly variations in tidal levels occur, Spring tide maxima are highest in March and April and lowest around July and August).

Climate - Point Pedro and around area falls under the Dry Zone of Sri Lanka.

Rainfall - Mean Annual Rainfall fall in Point Pedro and around area is 1500-2000 ml. Peak rainfall is during the months of October to December during North East Monsoon and the Scattered during April to May (See map 5).

Temperature - Mean annual Temperature in Point Pedro is over 27.5 ºC. The average temperature during the year fluctuated between 25.14 and 31.22 centigrade.

Vegetation - The species of *Cocos nucifera*^fmd,a&*Thespesiapopulnea* (.kaiQßh&, *Tamarindusindica*^ishU,d&" *Plymeriarubra*^wr,sh&" *Borassusflabellifer*^;,a&" *Calotropisgigantea*^jrd&" *Mangiferaindica*^wU&; can be seen in the area of Point Pedro.



Map 6 - Coral Reef of Point Pedro(Swan, 1983, p. 122)

Fauna - The fish species of Clown fish (*Amphipriom ocellaris*), Parrot fish (*Searusfrenatus*), some species of Butterfly fish and other unidentified species can be seen in the sea of Point Pedro.

Some Coral species can be seen in the reef of Point Pedro (See Map 6)(Swan, 1983, p. 122). The coral species of Brain coral, Elkhorn coral, and unidentified coral species can be seen in the area of Point Pedro.

Aims of the Archaeological Impact Assessment:

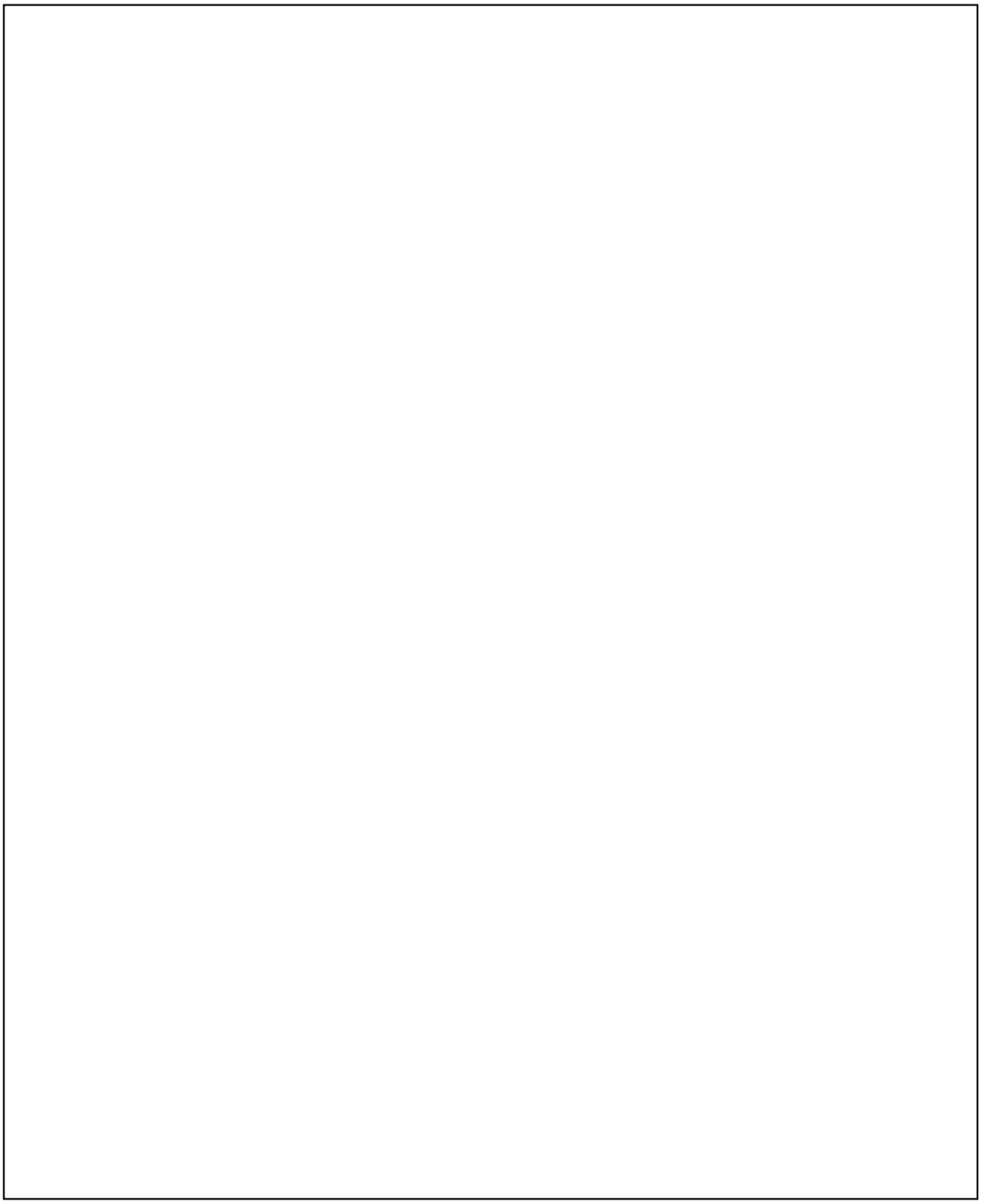
The basic aim of the assessment survey is to get a rough idea on the archaeological potentiality of the proposed area as quickly and efficiently as possible. Then it leads to identify potential conflicts between the archaeological resources and the proposed development project.

Furthermore, survey the sea area using diver search methods and survey the terrestrial area using field walking methods,

- To identify and record both endangered terrestrial and underwater archaeological sites that may be affected by the Point Pedro Fisheries Harbour Development Project [PPFHDP].
- To identify and evaluate the sites within the proposed development area.
- To identify and assess all the impacts on archaeological sites which might affects from the project

Accordingly, this survey is aimed to submit some conditions and alterations to the Director General of Department of Archaeology for recommend, for object or for recommend subjecting such conditions and alterations to the proposed PPFHDP.

03. History



04. Methods

Literary survey.

Almost all accessible literature was referred prior to the field work of the proposed area to obtain a basic picture of the history of the Point Pedro in relevant to the seafaring. Especially, previous research and public works which were done in different aspects within and in the suburbs of the current survey area were studied. We observed ancient maps, photographs and paintings of the Point Pedro Harbour. Further topographic maps and nautical charts of the area were also studied (Annex 04 & 05).

Local fishermen and recreational divers were interviewed to obtain information on submerged shipwrecks and other remains around the survey area, since they are well aware of their catchments area. Fisheries officers, fishermen and Navy diving officers were also interviewed to verify the underwater conditions of the area prior to the field survey. Weather Reports of the particular area were obtained from the Department of Meteorology. Accordingly, we could plan how much time likely to be spent working underwater and how much time might be lost due to poor weather or adverse tidal conditions. Websites such as, www.divesrilanka.com, www.weather-forecast.com and www.meteo.slt.lk/cityfc.html were also searched to verify the best time period for diving in Northern sea under good visibility (Annex 06).

Survey Design.

Total area of the proposed project is divided in to two main categories.

a. Direct Impact Area
b. Indirect Impact Area

The site surveying is mainly focused into the areas where there would directly be impacted. Besides this, the areas of indirect impact also been surveyed.

The entire area supposed to be developed [direct impact area] was divided into sub squares of 100 m x 100 m by laying out a virtual grid using the ArcGIS Pro software (Fig. 10) which made it easy to gently handle the field survey

without misleading and also to ensure proper recording with efficiency after observing the data in the field.

All the sub squares placed in the sea were observed by using diver search method along transects while the other squares placed on the land were followed by the pedestrian survey methods.

Basic visual record obtained through photographic survey and sketches with a minimum amount of information about the structure generally only noting the building's location, origin, age, type and function of the building or structure. Structural components of the building are examined in detail and plans of the interior and exterior of the building are produced in addition to a detailed photographic record.

During the survey we encountered many localities outside of the proposed area. Those localities were recorded as off-transect of indirect impact area.

Underwater survey.

Diver search methods.

Transect surveys were conducted by diving in straight lines across the sea bed of the survey area, and scanning for artifacts. As each diver was effectively able to scan just over three meters (4m) under general visibility conditions the area on either side of them, the transects covered by the divers was around 11 m wide. The distance between each transect was about 30m (Fig. 11). The transects were guided from the boat on the surface using a Global Positioning System (GPS) handheld unit. The divers used the 'Towed Diver Search Method' to search the seabed. In this method the diver holds on to a weight which has a direct connection with the boat through a rope. The speed of the moving boat was kept below 5 km/h to enhance the effectiveness of the towed diver search. Divers used rope signals to control the speed and even to stop the forward movement to inspect potentially interesting sightings. Besides this, divers used the underwater compass to follow the transects.

The 'Circular search method' was occasionally used to determine the extension of a site and to understand the context of a site. Dive reports were

completed by divers, recording all information of potential interest for subsequent conclusions (Annex 07).

Based on the depositional and environmental context, we tried to predict the potential areas for finding archaeological localities and dive over it.

Land survey.

The land survey was carried out using the pedestrian walk method. The total land area was covered by just two grids and we could scan all of them.

Sampling and recording.

The random sampling method was followed during the course of diver search. For each archaeological locality, we assigned a unique locality code consisting of a three letter abbreviation for the name of Colombo Port City followed by a number which was incremental (e.g. PPFH 005). We noted the latitude and longitude in the approximate centre of the locality using the GPS. Each locality was photographed, sketched and drawn. For structures, we measured the dimensions, noted its raw materials and made an assessment of their possible functions. Measurements were taken with 5.5m, 30m and 50m tapes. Detailed architectural plans were drawn to scale on graph paper to understand whether there was any relationship among architectural elements located throughout the total survey area. All observed data was recorded with an underwater slate and pencil.

Equipment overview.

Diving equipment - Appropriate SCUBA diving gears were chosen to enable the divers to carry out the work safely and comfortably. A small fiberglass boat with a 15hp and 75hp engine enabled the survey team to get to the site quickly.

Camera - A Digital camera (Canon Power Shot G11 10MP Digital Camera with 5x Wide Angle Optical Stabilized Zoom and 2.8-inch articulating LCD) with underwater housing was used to produce high quality underwater pictures and a digital camera (Nikon D90 SLR with 18-200m VR II lens) was used to produce land pictures of a publication standard.

GPS (Global Positioning System) – A Garmin (Colorado 300) GPS with the following specifications was used to mark potential sites, to guide transects and to record the tracks of the side scan sonar. [*GPS specifications*: Temp Range – from -4^{0}F to 158^0 F (from -20^{0}C to 70^{0}C), Acquisition time – 36 seconds (auto locate), Accuracy – 33 feet (10 meters].

Work Plan.

With regard to the requesting letter of the MFARDRE for the AIA (Annex 01), the UAU team verified the suitable weather condition for diving in the west coast after referring weather reports for the past three years. Accordingly, the suitable time period for the underwater survey is between the end of May to the beginning of September. As it is mentioned in the Antiquities Ordinance 2000, a total estimated timeframe for the AIA survey spans a time frame of six weeks. But considering the fluctuating sea conditions, the survey team had to postpone the survey program. The first field season took place between 06th August and 14th August 2018.

Limitations.

The transects could not be placed to cover the entire facet of the sea bed. It resulted in missing some areas that should have been explored. Though the extensive diver search (visual search) may have covered every square meter of the sea bed in the transect, it may have failed to spot an object which was a few millimeters in length, or a large object camouflaged by a temporary dusting of light silt or as a result of low visibility.

Since the proposed project is locally controversial and unpopular, unexpected objections of local fishermen badly affected the team to proceed with the pre-scheduled timeframe in the field.

05.Description of archaeological remains

Land survey.

Total of six structural remains which have archaeological value were found from the land survey of the proposed area. All of them are colonial structures belonging to the Portuguese, Dutch and British periods. Those are situated in the vicinity of Point Pedro jetty. The presence of concrete in some of these structures indicates that they have been used and have been renovated till recent past.

Old Customs Building – [PPFH 001]

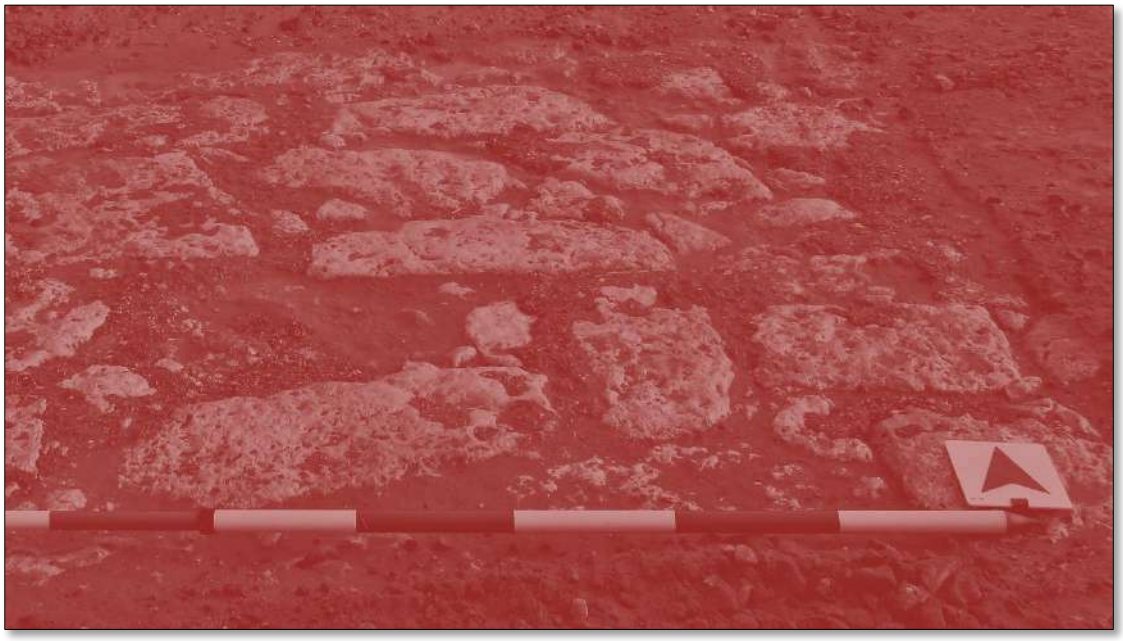
This is an ancient structure with old Dutch architectural features which belongs to 17th century owning now by Sri Lanka Customs. This building was used as a goods clearance center in Point Pedro port which had been used until second half of 20th century as a commercial port.

The Building is faced to the North and oriented to the East-West direction. It has remains of front verandah with pillars and built with stones made of coral. It has eight divided parts of inside rooms and small size (/////) halls. Front section has three arch shaped doors and a window. It shows the renovations of later periods. Cement mix plaster in the walls and on the inner floor also can be seen at present. Coral stone slabs are placed in a proper order on the floor of the outside verandah and no finishing with cement plaster. Old roof cannot be seen at present and there are wooden roof bars and there are few recently fixed asbestos sheets.

Old Entrance to the Jetty – [PPFH 002]

The entrance from the main road to the jetty was paved with limestone slabs. This has been used since about 18th century. But now covered with gravel and thin tar layer.

This entrance was built towards the North from main road with a slight slop. It can be observed that the two rows of limestone pavement were destroyed as a result of the main road widening. We could expose small area and recorded.



Retaining Wall - [PPFH 003]

The Retaining wall is oriented towards to the East – West parallel to the Point Pedro – Jaffna road. It was built by the Portuguese when they were controlling the coastal regions of the Island. Both cuboid shaped coral stone slabs and limestone slabs alone with natural coral stones and natural limestone rubbles have been used for the construction of the wall. Sand and clay was used as mortar of the wall in the early stages of construction. Cement and sand mixed mortar and concrete also has been used for the later maintenance. The wall has been renovated in several times in the history and broken parts of the wall scattered in the beach.

There are two drains (tunnels) open to the sea through the wall. One of these is well preserved and its arch shaped tunnel mouth build by using the corral stones. This tunnel located near the Methodist Girls' High School, Point Pedro. Second tunnel mouth located in front of the Hindu temple of Point Pedro. The drain and the tunnel at the Hindu Temple have been renovated using concrete cylinders.

Remains of the Ancient Fort – [PPFH 004]

Old Dispensary [PPFH 005]

This is a building with old Dutch architectural style in 17th century. Old port had used as a store. This building was situated on North- South direction facing to the West. Front room of this had been used as a medical Centre.

This medical center has been used in the 80 century which this port was activated as a health checking center of immigration such as blood checking, spread diseases vaccinations center.

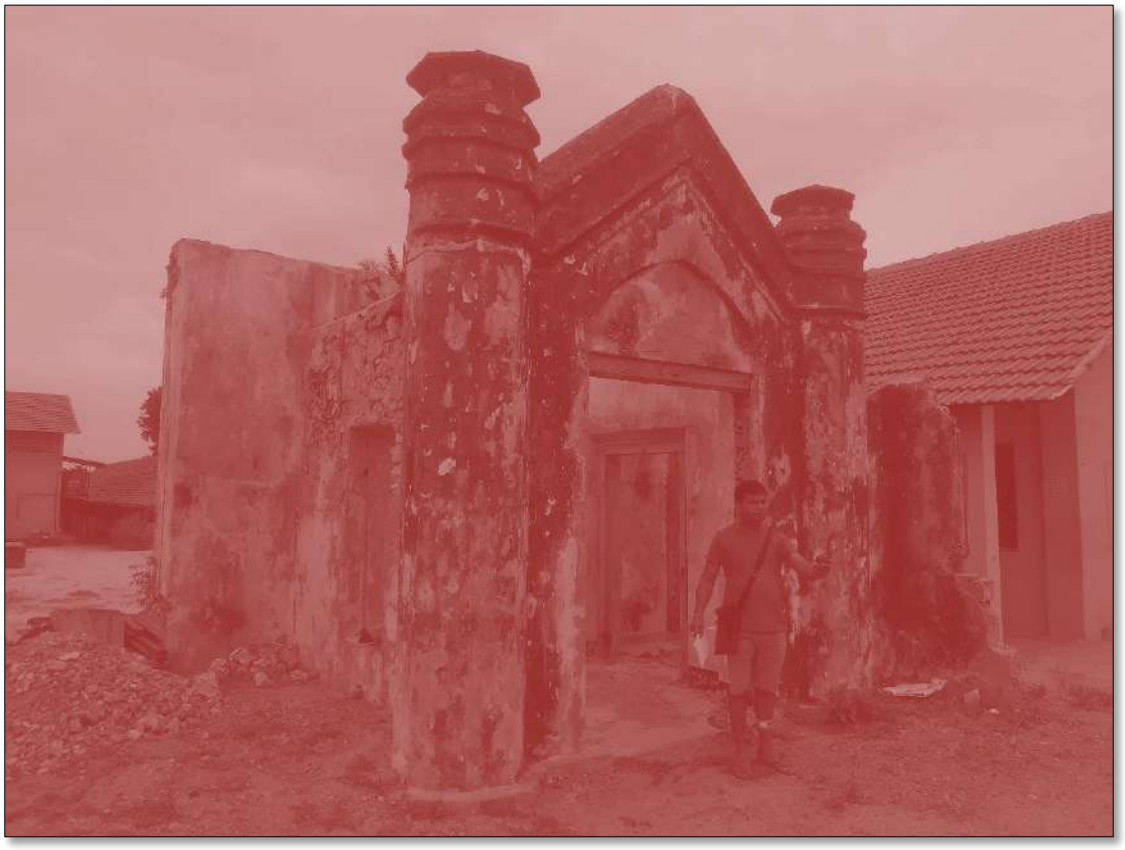
Foundation of the building made out the mixture of corral and limestone and clay had been used to the foundation when this building was built. It can be seen the corral mixture had used after the period of lime mixture. This shown about a renovation of the building. Also there was a recent renovation with cement blocks and mixture.

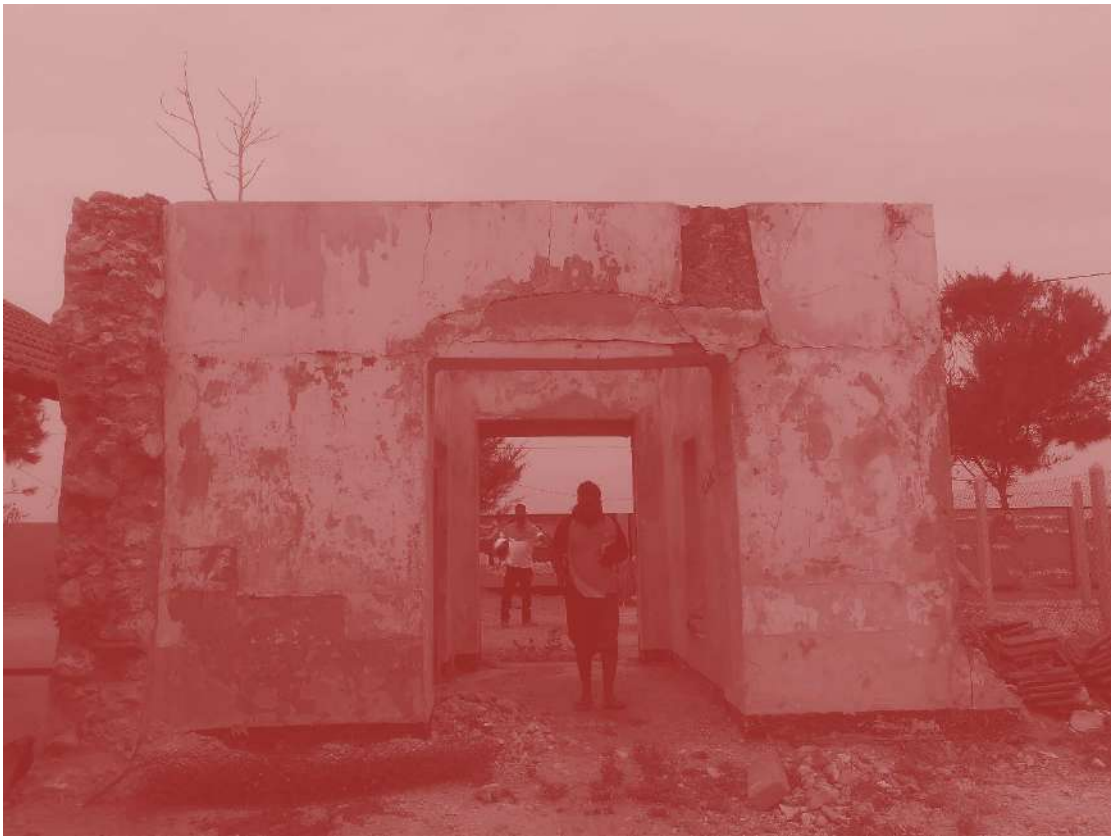
Doors and windows were made to the arch shapes in style. But the wood used were destroyed. A small part of the right side of the roof was fixed with roof tile (takaran). Front side of the building has been demolished for the constructing of port junction.

Old Entrance of Methodist Girls' College – [PPFH 006]

This is a ruined structure located in side the Methodist Girls' High School premises at Point Pedro. There are remains of a main entrance and some other parts attached to a building which had built in 1823. Coral blocks, limestones and cement had used to build this structure.

This entrance is faced to the North. There is a small room on right side just after the entrance. It can be predicted that there was a wooden structure with rafters for the roof and it has been totally taken off. Floor plaster and the wall plasters were removed. Upper wooden bar of the square shaped doorframe of the main entrance and the wooden doorframe of the room are still existing. Wall above the main door frame prominently finished with arched shape. There are hexagonal shaped two pillars on both side of the main entrance which are half prominent from the wall with gable shaped top.





Ancient Harbour Jetty - [PPFH 007]

Ancient jetty of the ancient Point Pedro harbor is still existing. But, the jetty has been totally renovated at present and therefore, it is unable to recognize the early forms and the early features of constructions. This is projected to the Northern side towards the sea from the 30 m western side of the east end of the retaining wall. The width of the jetty gradually decreasing from the entrance (land side) to the sea side.

Underwater Survey.

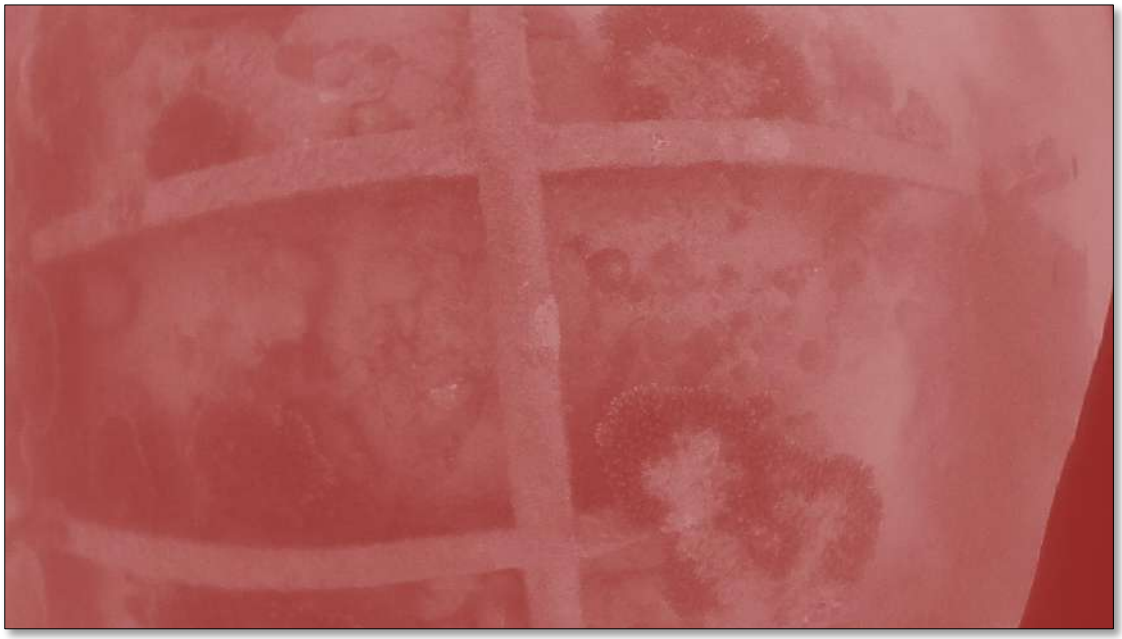
The sea bed has been searched by the underwater archaeologists seeking of archaeological records of an ancient port site such as shipwrecks, cannons, anchors and diagnostic artifacts like ceramics. Even though we covered around 90% of the proposed development area in the sea bed no much evidences could be uncovered. Underwater archaeological recording also could not be practiced properly due to poor visibility. UAU team of the Department of Archaeology unearthed three (03) barges along the diver search transects in and around the area. Two of them are located outside of the proposed development area or indirectly impacted area.

A barge is a flat bottomed, slow moving floating boat which is mainly used for transporting heavy freight. Barges were first used on the Nile in ancient Egypt. The most famous Egyptian barge was used by Cleopatra. In the 14th century, a Thai king included a royal barge bearing Buddhist relics in his war party against Burma. Until the middle of the 19th century barges were common sights on the River Thames in London. There are several types of barges such as the Admiral's barge, Dutch barge, Pleasure barge, Royal barge etc. These were mainly used to carry cargo in ancient ports in Sri Lanka. Big seagoing ships used barges to carry goods from the deep sea to the shore. These kind of barges might have been used for the same purpose when the Point Pedro port was small and when big ships were unable to reach the Jetty. Also they were used for defense, supply and repair of ships. There are remains of ancient iron and wooden barges in the Galle Harbour. Dutch barges were basically made of iron or steel and powered by diesel engines. Some barges are not self propelled and need to be towed by tugboats or pushed by towboats.

Barge 01 [PPFH 008]

Parts of a barge was recorded within the survey area (Fig. 26 & 27). This is broken and wrecked within the coral reef located at the left side of the jetty. Several parts of the barge are scattered in the sea bed. Planks of the barge is made of cast iron. Maximum Depth of the site is 3 m and visibility was medium. Various species of corals could be seen in the barge and surrounds.

This is identified as parts of a recently build iron barge which is having no archaeological value. According to the information of the local fishermen this is been used during the war period. After measuring and observing the construction features of the remains it can be predicted that the barge was about10 m wide.



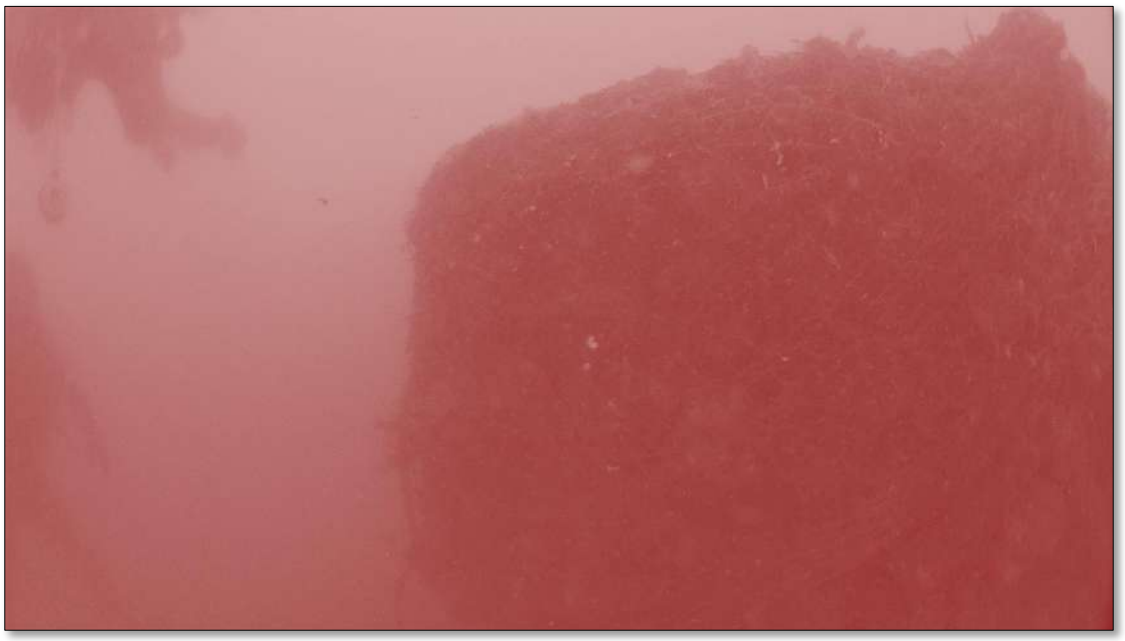
Barge 02 [PPFH 009]

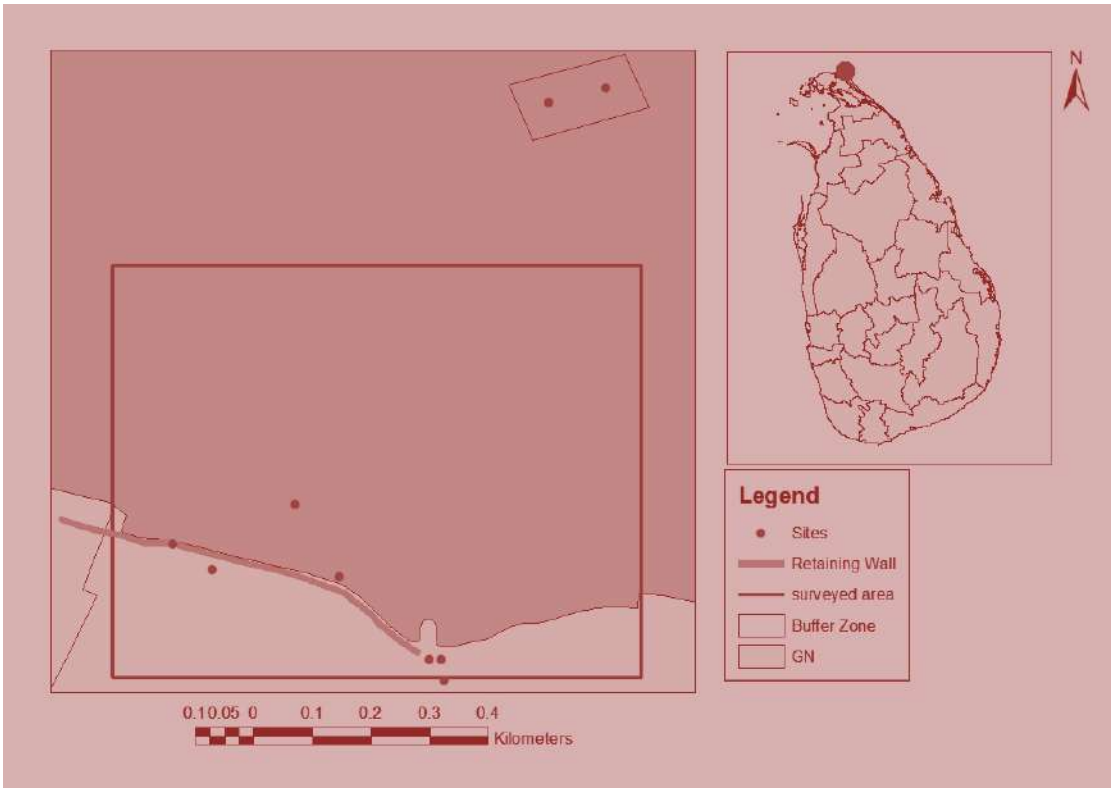
The Barge 02 is located outside of the proposed development area. This is made of cast iron covered with patina. Most of the surfaces are concord by the corals increasing the marine biological value. Trapped fishnets shows the fisheries activities in the barge area since its rich with marine life. Maximum Depth of the site is 13.5 m and visibility was very low.

Barge 03 [PPFH 010]

This is located outside of the proposed developed area. Various species of corals could be seen in the barge and around. Planks of the barge have made by the cast iron and the frame of the barge has laid in the sea bed. Maximum Depth of the site is 14 m and visibility was very low.

According to the information grabbed from the local fishermen, this barge has used for transporting civilians and freight during the war season in 1990s. it has been abandoned for long due to technical problems and eventually it sank with her mechanical stuffs. Since the Point Pedro was the second most important harbour after the Kankesanthurai the jetty of Point Pedro was played a major role not only in the ancient times but also during the last war period.




N
Legend
Sites
Retaining Wall
surveyed area
Buffer Zone
GN
0.10.05 0 0.1 0.2 0.3 0.4
Kilometers

06. Evaluation of the Survey.

With a rigorous assessment of the area we were able to make some assertions about the traces of the past of the surveyed area. Cultural values of those archaeological localities were estimated and localities were divided accordingly into four categories (Fig. 51).

A - Extremely important archaeological site, cannot be destroyed, removed, replaced or even touched.

B - Important archaeological site, cannot be destroyed, but can be replaced in a secondary context after recording/documenting the primary context.

C - Has meager archaeological value, and can be removed or disregarded after a detailed recording/documenting by archaeologists.

D - No archaeological value.

A total of five (05) localities were found during the Archaeological Impact Assessment Survey of PPFHDP. They are often unique in their nature and available nowhere else and some sites are quite well preserved (Old Customs Building – PPFH 001). It is important to be aware that these sites provide a great diversity and range of cultural clues of the past human and environments in and around the studied area.

A total of three underwater sites (barges) of interests were identified through inspection dives by underwater archaeologists. Besides three barges, some rock outcrops and corals were visible and inspection dives did not find any archaeological evidence along the seabed. It needs to be also noted that the dive search method may not be entirely successful in identifying all potential targets, particularly those that might be buried in sediments at the time of the survey.

These sites provide unique evidence in order to interpret the past activities of Point Pedro ancient harbour and its surroundings. Rapid industrialization of this area is likely to destroy such valuable data forever. Once lost they can never be recovered. Therefore, conservation and documentation of important sites is paramount.

07. Recommendations.

» If any archaeological evidence or past human remains were to appear, be exposed or discovered, during the construction process of the proposed site in the future, the development process should be stopped and the Department of Archaeology should be informed immediately within two days.

» It is also important to realize that though no archaeological evidence was detected in some areas during the survey, it does not necessarily mean that nothing is there and since there are already a number of archaeological sites and potential of archaeology around the surveyed area, if the development area is enhanced for further constructions of PPFHDP by the project proponent, it is recommended to evaluate it with an Archaeological Impact Assessment in order to undertake mitigation procedures.

» It is also recommended to include the officials of the Department of Archaeology (Archaeologists) in the monitoring committee of the project.

» As it is mentioned in figure 51, the Old Customs Building [PPFH 001] is placed in the 'B' category. Therefore, it cannot be destroyed. It is recommended to restore, following the archaeological conservation procedures with the consultation of the Architectural Conservation Branch of the Department of Archaeology, Sri Lanka. The draft estimated cost for the conservation process is attached (Annex 09).

Since this has been used as a custom clearance center in its primary context, it is recommended to establish the Old Custom Building as a living heritage by using this as an office of the project proponent in its secondary context. Further, necessary actions would be taken by Department of Archaeology, Sri Lanka to declare this monument as a protected monument under the Antiquity Ordinance.

» According to figure 51, the 'Old Entrance to the Jetty' [PPFH 002] is placed in the 'C' category. Therefore, it can be removed or disregarded after a detailed documentation by archaeologists. But here, it is specially suggested either to use as it is present with architectural combination of new constructions or to fill and cover it without demolishing.

» As it is mentioned in the Figure 51, Retaining Wall [PPFH 003] is placed in the 'B' category. Therefore, it cannot be destroyed. Furthermore, it is recommended to conserve some parts of the wall to display with the consultation of the Department of Archaeology.

» As it is mentioned in the Figure 51, the Remains of the Fort [PPFH 004] is placed in the 'B' category. Therefore, it cannot be destroyed and needs to be salvaged and replaced in a secondary context after documenting the primary context. Hence, it is recommended to place the 'Remains of the Fort' in a museum after conducting necessary conservation procedures under the consultation of Architectural and Chemical Conservation Branches of the Department of Archaeology.

It can be predicted archaeologically, there might be hidden remnants of a fort within or below the coral reef. Hence, it is further recommended to allocate archaeologists as a monitoring officers during the dredging of such areas.

» As it is mentioned in figure 51, the Old Dispensary [PPFH 005] is placed in the 'B' category. Therefore, it cannot be destroyed. It is recommended to conserve, following the archaeological conservation procedures with the consultation of the Architectural Conservation Branch of the Department of Archaeology, Sri Lanka. The draft estimated cost for the conservation process is attached (Annex 09).

» As it is mentioned in the Figure 51, the Old Entrance of Methodist Ladies' College [PPFH 006] is placed in the 'B' category. Therefore, it cannot be destroyed.

But if the space need to be allocated for constructions of the proposed project, it can be replaced in a secondary context after documenting the primary context.

» As it is mentioned in figure 51, Barge 01 [PPFH 007] is placed in the 'D' category. Therefore, it has no archaeological value and it can be disregarded in the context of archaeology.

» Although the Barge 02 [PPFH 008] is placed in the 'D' category as a site which has no archaeological value, considering its biodiversity value and the scenic tourism value, it is suggested to promote it as an underwater tourist site for recreational SCUBA (Self Contained Underwater Breathing Apparatus) divers. Besides this, under the decisions which were taken by the Inter-Ministerial Committee on Wrecks, salvaging of wrecks has been suspended. Hence, it is recommended not to conduct any development activities in and around the Barge 02 [PPFH 008] site. GPS locations of the four corners (A,B,C,D) of the square shaped buffer zone of the ship wreck are given below to demarcate the non activity area (Fig. 50).

A. N 06^0 56' 22.44'' E 79^0 49' 5.17''
B. N 06^0 56' 20.44'' E 79^0 49' 7.72''
C. N 06^0 56' 16.68'' E 79^0 49' 4.68''
D. N 06^0 56' 18.62'' E 79^0 49' 2.16''

» Although the Barge 03 [PPFH 009] is placed in the 'D' category as a site which has no archaeological value, considering its biodiversity value and the scenic tourism value, it is suggested to promote it as an underwater tourist site for recreational SCUBA (Self Contained Underwater Breathing Apparatus) divers. Besides this, under the decisions which were taken by the Inter-Ministerial Committee on wrecks, salvaging of wrecks has been suspended. Hence, it is recommended not to conduct any development activities in and around the Barge 03 [PPFH 009] site. GPS locations of the four corners (A,B,C,D) of the square shaped buffer zone of the ship wreck are given below to demarcate the non activity area (Fig. 50).

E. N 06^0 56' 22.44'' E 79^0 49' 5.17''

F. N 06^0 56’ 20.44’’ E 79^0 49’ 7.72’’

G. N 06^0 56’ 16.68’’ E 79^0 49’ 4.68’’

H. N 06^0 56’ 18.62’’ E 79^0 49’ 2.16’’

» The places where sand is pumped (sucked) also need to be observed by underwater archaeologists before the commencement of dredging.

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Annex 10- Community Consultations

ඇමුණුම 10 - ප්‍රජා අදහස් විමසීම

பின்னிணைப்பு 10 - சனசமுக ஆலோசனைகள்

INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

Consultation process

Continuous consultations with relevant stakeholder were conducted during the PPTA (time frame) and the detailed design (time frame) stages. Consultations will continue during implementation as well. The details are as follows:

PPTA

Consultation activities conducted during the PPTA are: meetings with relevant government authorities for specific issues, concerns, and information collection; public meetings with a wide range of participants for the proposed project

Public meetings were conducted for Point Pedro fishery harbor; Summary of the meetings and minutes are in **Appendix 1.**

Meetings with government authorities

Table 1: provides a summary of the main meetings and consultations with relevant government authorities.

Table 1: Meetings with government authorities

Government Authority	Consultation date
Northern Provincial Council Chief Secretary's Secretariat, Jaffna	01 August 2016
District Secretariat, Jaffna District	01 August 2016
District Secretariat, Kilinochchi District	02 August 2016
CCD and MMDE, Colombo	02 August 2016
Climate Change Secretariat, Colombo	02 August 2016
Central Environmental Authority, Colombo	02 August 2016
Disaster Management Centre, Colombo	02 August 2016
District Secretariat, Mullaitivu District	03 August 2016
District Secretariat, Mannar District	04 August 2016
Ceylon Fisheries Harbor Corporation, Colombo	08 August 2016
CCD, Jaffna	31 October 2016
Divisional Secretariat and District Secretariat, Mannar	30 November 2016
NARA, Colombo	14 December 2016
DWC, Colombo	14 December 2016
Climate Change Secretariat, Colombo	14 December 2016
MFARD, Colombo	16 December 2016

Source: PPTA Consultants

A public consultations at Point Pedro was held, chaired by the District Secretary of the vadamarachchi North DS. as well as several consultations with the land owners and fishers.

Table 2: Consultations for Proposed Fishery Harbors

Subproject	Consultation location	Consultation date
Point Pedro Fishery Harbor	Suppaamadam Community Hall	29 November 2016
Point Pedro Fishery Harbor	Kottady Beach	28 December 2016
Point Pedro Fishery Harbor	Divisional Secretariat, Point Pedro	30 March 2017

Source: PPTA Consultants

Prior to the meetings, the PPTA consultants distributed a leaflet, in Tamil, containing brief description of the proposed investment. At the beginning of each consultative meeting, an overall brief of the project was provided to the participants. The PPTA consultants described technical aspects of the proposed investment and highlighted social, environmental, and resettlement aspects.

Impacts, both negative and positive, that are common with any infrastructure development project, were discussed with the stakeholders. People interacted with interest to learn about the project and shared their views and potential concerns. Discussions were conducted in Tamil language and translations from English to Tamil language were made whenever necessary. After the meetings, the participants were invited to a site visit.

Key concerns raised or suggestions made, and proposed solutions are presented in the Table 3 below.

Table 3: Concerns and Responses - Fishery Harbors Consultations

Key concerns or suggestions	Response
(Point Pedro) Participants indicated that the site is vulnerable to erosion as the coastline doesn't have any reef for wave protection	The PPTA consultants confirmed that the proposed design considered all aspects and further studies will be done during the detailed design stage. The representative of DCC also confirmed that adequate measures will be proposed to prevent erosion when the project comes to approval stage.
The fishers who engage in fishing with small boats raised concern that they may not be able to anchor small boats in the proposed harbors, and hence they fear of potential livelihood loss.	The PPTA consultants informed that the proposed investment includes anchorages and landing sites to cater the requirement of small boat owners to continue fishing.
Concerns were raised over the usage and sharing of the harbor with fishers from other parts of the island that could lead in conflicts with local people.	CFHC will act as the regulatory body in place to control the activities of the fishers and avoid conflicts. It was emphasized that fishery harbors are national assets and the license

	holder has rights to use services of any fishery harbors of the Island.
The fishers of Koddadi village requested to allocate a separate strip within the proposed Point Pedro Fishery Harbor to anchor their one-day boats.	Adequate space is available in the Kottady
The fishers raised concern about livelihood loss if the fishing activities will be limited during construction of the harbors.	No impacts to the livelihood as the fishers can continue the activities in the Kottady area
Many participants expressed desire to observe operation of modern harbors.	It was discussed to potentially arrange an exposure visit to modern fishery harbors in the country during the detailed design stage as the suggestion of GM, CFHC. Dickowitha Harbor was identified as the best example. Operation procedures could be explained during the visit.
Fishers appreciated the livelihood development proposals and also requested loan facilities to purchase multi-day boats.	This should be further discussed during the detailed design stage.

Source: PPTA Consultants

Detail Design period

The meetings were conducted using different tools. At the initial stage of the designing period, most of the meetings were conducted using the draft layout plan to explain the location of each activity in the proposed site. Secondly, meetings were conducted using 3D conceptual model to understand the clear picture of the proposed project and then stakeholder meetings were conducted with power point presentation with details of the project activities. One consultation meeting was held with the Chief Minister Northern province where detailed power point presentation was done with the major anticipating impacts and the proposed mitigation measures. All the meetings were either conducted in Tamil language or provided with the translation. As the domestic Environmental Specialist and the Social and Resettlement Specialists are Tamil speaking consultants, which added positive value to the consultation process. Generally, in the consultation the consultants described technical aspects of the proposed investment and highlighted social, environmental, and resettlement aspects as much as possible.

Table 4- Stakeholder consultation

No.	Subject	Venue	Date
1	ADB- Divisional Level Meeting	Progress Briefing	02.11.2018
2.	Discussion on Methodist Girls High School concerns	Methodist Girls High School	11.12.2017

3.	Stokeholder meeting with Ministry of Education including Principal of Methodist School	Northern Province Education Ministry	24.11.2018
4.	Jaffna Government Agent and Planning officials updated on district Progress and issues	Government Agent Office-Jaffna	6.03.2018
5.	Chief Mininister and key stockholders including Methodist Girls High School-Awareness	Chief Ministers office-Northern Province	7.03.2018

In addition to the above, the consultants had several field visit and one is to one discussion with the community in the area.

Key concerns raised or suggestions made, and proposed solutions are presented in the Table xx below.

Table 5: Responses to the community consultation

Key concerns or suggestions	Response
The fisherman society of Kottady and the fishing community in Kottadi requested consider to limit the harbor boundary up to Nadarajar Stage during the design	The design was shift towards western side
J/Methodist Girls High School has indicated that noise, dust and vibration during the construction period and the odour and the misbehaviour of the fishers will disturb their day today school activities.	Most of the project activities are located away from the school premises towards eastern boundary. Proper mitigation measures are proposed to reduce the nuisance due to the construction activities and operational activities
Shift the present quarters location to the east	The Batcheler quarter is relocated to the western site
Ensuring the promise given that no future development will take place in the future - through MOU and to allow them to participate from time to time in the Harbor Management committee meeting.	There is no legal provision to have the MOU, with School management
The principal expecting assistance to construct a school building by purchasing a private land adjoin to the school	There is no prevision to purchase private property.
Principal requested a Copy of the EIA Report	A copy of the report will be provided to the principal once it is open for the public comments

Kottady and suppermadam fishers indicated their concern over the beach erosion and accretion	The sand movement modelling study conducted for the proposed fisheries harbour, indicates no major erosion or accretion in both sides of the harbour. Therefore, no impacts could be expected.

Two Consultation meetings were conducted with the fisher community and the government official separately on the findings of the EnA on 21.11.2019 at the Divisional Secretariat Office, Vadamarachchi North. The concerns raised by the fisher community and the Government officers are given in the Table 6 and 7.

Table 6: Responses to the concerns raised by the fisher community

Key concerns or suggestions	Response
Increased wave action will cause higher erosion along the western coastline (suppermadan area), as a result fishing activity will become a challenge to the fishermen and safe docking of one day OFRP boats will not be possible.	The sediment transportation study shows the impact is not significant.
Koddadi women help to arrange the hooks for long line fishing in boxes and earn around Rs1,500 per day. Because of the proposed intervention, women will permanently lose their livelihood and become vulnerable.	There are no impacts to the present livelihood activities as the construction activities are limited only to the project site.
Koddadi Fishermen Society requested a navigation access through the eastern edge of the breakwater.	Provision of navigation channel through the break water is technically not feasible, but a separate access with gate will be provided at the inception of the eastern breakwater to easy access to the OFPR boat owners.
The participant requested a meeting with the Governor Northern Province or higher officers.	The project will arrange such meetings.

Table 7: Responses to the concerns raised by the Government Officials

Key concerns or suggestions	Response
The roads may get damaged due to transportation of construction materials and PS has no funds for rehabilitation. This will create community issues against the intervention. Further, the width of the road is also not adequate for heavy vehicle movement and may cause accidents. Mainly schoolchildren use these roads to access schools and church.	Transportation of construction materials will be carried out only through the RDA and PRDA roads. Therefore, no impacts to the rural roads are expected. Further, the construction contractor should identity suitable quarry sites, borrow areas and disposal sites and conduct Transport Impact Assessment prior to the commencement of the construction in order to ensure the safety of the community and the properties.
Allocating adequate space for storage of boulders is not available within the PS area because the volume is massive. Therefore,	The armors will be temporarily stored in the reclaimed area for the shore facilities.

measures should be taken for offshore storage.	
At present the PS manages the solid waste disposal with lot of difficulties with minimal machineries. During the construction period and the operation period of the harbor, solid waste generation would be higher and PS will find it difficult to manage the situation in addition to household collection. Therefore, the project should provide assistance to the PS to continue the service without interruption and without management issues.	The pradeshiya sabha has already given the concerns to collect waste during the operation phase. The Harbor management will make payment as requested by the PS for the disposal of their wastes.
Since shallow water fishing is a common phenomenon in the region as a result wastewater disposal is crucial during the construction period and the operation period of the harbor. Therefore, wastewater treatment plant should be in place for treatment prior to discharge into the sea to avoid public protest among fishing community and the environmentalists.	There is no discharge of wastewater during the construction period to the sea as the wastewater from the labor camps will be either discharged into properly constructed septic tank/soakage pit or sealed septic tanks. However, during the operational stage the wastewater will be treated to the CEA standards and discharged into the sea about 100m away from the beach.
Upgrade Munai offshore facilities prior to Point Pedro harbor to cater the operation of about 22 OFRP boats. Obtaining concurrence from Munai fishermen to accommodate Koddadi boats until the completion of proposed harbor. This official arrangement will minimize the issues between the two societies.	A temporary break water will be constructed to facilitate the berthing of 22 Koddadi OFRP boats. Therefore, no need of using Munai facilities by the Koddadi fishers
The Chairman and the GND of Koddadi expressed that fishermen in Koddadi have traditionally been engaging long line fishing. Therefore, they will have space for continuing this without disturbing their livelihood including women.	No disturbances to the Koddadi people as the construction activities are limited to the foot print of the project area.

The minutes of the consultations are given in Appendix 2.

Appendix 1 : PPTA Meeting Minutes

Project Title	Northern Province Sustainable Fisheries Development Project Project Preparatory Technical Assistance
Client	Ministry of Fisheries
Funding Agency	Asian Development Bank (ADB)
Contract Number	TA 9049
Sub Project	Fishery Harbor – Point Pedro, Jaffna District
Purpose of Meeting	Group consultative meeting with fishing community on proposed Fishery Habour – Point Pedro
Date	29. 11. 2018
Venue	Suppaamadam Community Hall
Participants	(List of Participant is attached)

Description of the meeting

1. The Divisional Secretary of Point Pedro welcomed the gathering and briefed the purpose of the meeting. He requested the PPTA team to briefly explain the proposed harbour project to the participants.
2. The Resettlement Specialist and the Environmental Specialist of the PPTA team explained about the proposed fishery harbour project in Point Pedro. The team initially explained the technical features of the proposed intervention and distributed the leaflet for further understanding.
3. The Resettlement Specialist explained about the ADB Social Safeguard Policy to protect the people from negative impacts due to the implementation of the proposed interventions. At the same time the Environmental Specialist described the environmental safeguard measures during the construction and post construction stages.
4. The following social and economic benefits of the proposed intervention also highlighted to the participants. (i) Expansion of deep sea fishing; (ii) Modern fishing technologies; (iii) Protection for fishing vessels; (iv) Availability and expansion of available services; (v) Income growth; (vi) Livelihood development; (vii) Land value; (viii) Area development; (ix) Easy access to market the harvest; and (x) Direct and indirect employment opportunities
5. The Resettlement Specialist pointed out that the intervention of the development needs land and the design included many offshore facilities to minimize land requirement. However all the facilities cannot be located on offshore such as fuel, ice plant storage, auction hall etc. Under this circumstance approximately 4.5 hectare of onshore land is required. As per the design, state and few private land have been identified for location these facilities. The Resettlement Specialist assured that the private land acquired for this project will be compensated as per ADB Safeguard Policy and Government regulations.
6. The Divisional Secretary suggested for site visit after the meeting and agreed to provide the list of affected people due to land acquisition. The Divisional Secretary asked the fishermen to express their views about the proposed fishery harbour in Point Pedro.
7. The participants of the meeting appreciated the initiative of ADB. The chairman of the fishermen society raised concerns over the usage and sharing the harbour with other fishermen from other parts of the island and thus will lead conflicts with local people. He pointed out that a regulatory body should be in place to control the activities of the fishermen to avoid conflicts. In response to this issue, the Deputy General Manager of the Ceylon Fishery Harbour Corporation (CFHC) explained that the CFHC will be a regulatory body for the fishing harbours operating all over the island. The Harbour Development Committee of the harbour includes all the stakeholders of the harbours to resolve any issues regarding the operation of the harbour.
8. The Deputy General Manager of CFHC pointed out that the fuel facilities will be provided by the CFHC and other facilities should be taken care of the fishermen society. They can use the allocated space for providing services at nominal government rent. Harbour berthing charges will collect by CFHC. Vessel licencing is the responsibility of the Department of Fisheries. Harbour accommodates only registered vessels with the Department of Fisheries. He further added that at the moment there is no any such regulating body available in Point Pedro harbour to resolve issues among fishermen. Harbour development committee is to help Harbour management to resolve the problems & issues and play the role of mediator between management & the

stakeholders.

9. The Resettlement Specialist said that the Fisheries Harbours are the national assets and the license holder has have rights to get the services of any fisheries harbours in the Island.
10. The participants expressed their views over soil erosion and siltation due to the proposed offshore structure. They pointed out the adjoining places to the harbours are vulnerable to erosion. The participants of Supparmadam area expressed their concern that they have been living next to the proposed harbour site. According to the direction of the water current Supparmadam is more vulnerable for erosion because the costal line does not have any reef for wave protection. The Resettlement Specialist said that the proposed design considered all the aspects and further care shall be taken during the detailed design to manage the situation. The concerns raised by the communities will be addressed during the detailed design in an appropriate manner. The Environmental Specialist explained that the geographical location is more conducive for the establishment of fishery harbour and adequate measures will be taken during the post construction stage of the harbour to safeguard the surrounding environment. The representative of the Department of Costal Conversation also confirmed that adequate measures will be proposed to prevent erosion when the project comes to approval stage. The Deputy General Manager of CFHC said periodical dredging is in practice to remove the silt for easy vessel movement.
11. The participants requested to arrange an exposure visit to other modern fishery harbours in the Island to study the situation. The Deputy General Manager of CFHC suggested that Beruwella and Dickowitha are the best example to see the function. The Resettlement Specialist said the exposure visit could be arranged during the detailed design phase.
12. The Resettlement Specialist explained that the project will look into the livelihood aspect of the vulnerable families in the prioritized GNDs. Special attention will be given to women headed families to strengthen their income earning capacity. The fishermen participated in the meeting appreciated the livelihood development proposals and the fishermen also requested for loan facilities to purchase multiday boats.
13. The fishermen engage fishing with small boats informed they may not able to anchor the small scale boats in the proposed harbour. As a result they have a fear of livelihood loss. The Resettlement Specialist informed this project also identified anchorages and landing sites to develop to cater the requirement of small boat owners to continue fishing without any disturbances. The participants said if the anchorages or landing sites are far from their houses they encounter security issues for their fishing properties without proper storage facilities.
14. Finally the DS thanked all the participants, with this the meeting adjourned.

ADB TA – 9049 NORTHERN PROVINCE SUSTAINABLE FISHERIES DEVELOPMENT PROJE

PUBLIC CONSULTATION – PROPOSED FISHERY HARBOUR AT POINTPEDRO, JAFFNA

Venue : Suppermadam Community hall, Pointpedro Time : 8.00

Date : 29/11/2014

S.no	Name	Designation	Contact number	Signature
01	S. CHANDRASEGARAM		7505936)	S.Ch
02	V. SIVAKUMAR		0774809203	V. Sivakumar
03	[illegible]		0777295603	[illegible]
04	N. Rathnaja		0773043244	N.Rathna
05	[illegible]		0777205538	[illegible]
06	[illegible]		0773317025	[illegible]
10	V. Vasantharay		0773283896	V. Vy
11	S. Kanagamuthy		0779587744	[illegible]
12	[illegible]			
13	[illegible]			
14	[illegible]		0773285863	[illegible]
15	[illegible]			
16	[illegible]		021226 2876	[illegible]
17	[illegible]			
18	[illegible]		0778253921	[illegible]
19	M. Kanagaraja	[illegible]	0770279011	[illegible]

Appendix- 2

Minutes of the Northern Province sustainable Fisheries Development project- Divisional Secretary level meeting

Subject	NPSFDP project PPT harbor progress briefing
Place	Vadamarachi North D.S Office Auditorium
Date	02.11.2017
Time	9.30 pm
Attendance	annexed

Divisional Secretary welcomes invitees in his office. Ms. Manjula brief about the proposed PPT harbor progress. Mr. Channa did the power point presentation design of PPT harbor. He explained the design detailed based on new design up to Tunami tower and positive impact to the suppermadam community due to natural wave cover.

The adjusted plan is presented by Channa Detail Design Engineer and then discussed

S.No	Matters Discussed	Decision Taken	Responsibility
1	Harbour length of Koddady side should be limited to Nadarasa Auditorium	The original plan was shift about 350 meter from koddady towards west up to Suppermadam Tsunami tower	Project unit Ministry of Fisheries Divisional Secretary
2	Congestion due to multiday boat movement to entry toward Suppermadam landing site. Sand accumulation in to the supermadam landing site.	Entry point of harbour will be design for the middle of the harbour. Design showed no sand movement in to suppermadam landing site due to natural wave cover.	PIMU Ministry of Fisheries Divisional Secretary
3	The change of wave pattern in the supermadam landing site due to monsoons	There is no affect by North east monsoon and the waves are mainly blocked by the harbor structure	PIMU
4	Erosion due to waves in the super madam coast	Engineering study will give more information regarding this	PIMU
5	Community concerns in to design and implementation through Grievances committee.	Form participatory grievances committee at DS level. Representations to the forum from Kottadi and suppermadam fishery communities. Form the GRC from December	DS and PIMU
6	Resettlement of families from the koddady area which comes under the harbor development	Three families already located there is no need for further displacement of families from that area. 11 to 12 private permit holders in affected area. The grievance committee including	Divisional Secretary PIMU ADB

		Divisional secretary, Asst. Director-Fisheries, Representative of fishermen and Representative of ADB. Any issues related to this project can complaint to this grievances committee.	
7	Anchorage points design were discussed	Principally the design were agreed by relevant Divisional secretaries	Project unit Divisional secretaries

Finally Divisional Secretary thanked all the participants for coming and given valuable sharing on harbor and landing site success of the Point Pedro division. He promised to share all information with District Secretary before evening meeting.

Bandula Weerasinghe
Sociologist

Northern Province Sustainable Fisheries Development Project
ADB Review Mission – Meeting with key Stakeholders
Attendance Sheet

Date: 2nd November 2017
Venue: Jaffna District Secretariat Auditorium
Time: 2.00 pm

No	Name	institution	Position	Contact no	Signature
1	Mangalika Adhikari	M/FARD.	Sec.	021-2425822	
2	R. Umakanthan.	NPC	D.C.S (P)	0773868573	
3					
4	Ravath Ranaweera	MFARD	PD	0760297287	
5	Percy Samarasinghe	CFHC	GM	0714927805	
6	Maylee Jayasinghe.	ADB	PS		
7	S. M. Croos	ADB	Consultant	0777227361	
8	K. Thushimathan	MFARD	PE		
9	Channa Fernando	EML	Team Leader	0773861578	
10	T. Gnanasuntharam	MDG, NP	DDE	0718214896	
11	S. Jeyakanth	Delft	DS	0770760523	
12	A. Sothinathan	Velanai	DS	0773618499	
13	U. Yasotha	Sandilipay	DS	0776404374	
14	K. Shrimolavarman	Karaveddy	DS		
15	P. Premini	Chunnakam	DS	0776660608	
16	V. Risi Langan	Jaffna CHC		0774813408	
17	V. Dhanushkodi	FRO Delft		0777216028	
18	T. Thavarajah			0773612052	
19	A. Regi			0778027348	
20					
21	E. Thayaruban	DS Jaffna	DS	0776530397	
22	B. Ramesh Kanna	Deputy Director Fisheries	DFI	0774047930	

No	Name	institution	Position	Contact no.	Signature
23	J. Suthagaran	Dept. of Fisheries	A.D	0779072967	J. Suthagaran
24	A Siri	point pedro	DS	0718172949	
25	V. Prameechthiran	Mulai	Divisional	0214437000	
26	K.K.Sivachandran	Kachchai	ADP	0777606870	
27	N. Visnuvarthanan	CCD	DO	0775155331	
28	P. Sivanantharasa	LED DEV Officer	member	0774991096	
29	V. Rajkumar	"	"	0772529835	
30	A. Rajanadar	"	"	0774018886	
31	A. Mathivanni	"	"	0774402341	
32	[illegible]	[illegible]		0773243103	
33	V. THAVASHSELVAM	F.C.O.P	PRESIDENT	0779229842	
34	H. A. VERVOORN	CDR INTERNATIONAL	HARBOUR DESIGN REVIEW ENG.	0775509530	
35	Y.S.M. Asmi	ADB	Infrastructure	0773481180	
36	Sudarshana Anga	ADB	SDO	0774581286	
37	K. Jegatheesan	Point Pe	Supervisor	0775565184	K. Jegatheesan
38	B. RAMACHANDRAN	Dis/Sec	D/A	0771378823	
39	P. A. S. Ayesha	PIMU-MEARD	R/S	0713058052 0778865	
40	B. Weerasekara	Sociologist	Sociologist	0773181121	
41					
42					
43					
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Northern Province Sustainable Fisheries Development Project – Stakeholders meeting with Ministry of Education including Principal of Methodist School PPD

Meeting Minutes

Date: 24th November 2017

Venue: Northern Province Education Ministry Auditorium, Nallur, Jaffna

Time: 2.00 pm

Representative attendance annexed

Secretary to Education, Cultural Affairs, Sports and Youth Affairs in the Northern Provincial Council welcomed the invitees and thanked for arranging special meeting with Ministry of Northern Provincial Education.

After the welcome address, he invited Project Director to conduct meeting. Project Director explained the objectives of the Stakeholders meeting and fisheries sector development in Jaffna District under NPSFDP including Point Pedro fishery harbour.

Objective of the stakeholders meeting was to inform the progress of Northern Province Sustainable Fisheries Development project and discuss the concerns of education sector stakeholders about Point Pedro Fishery Harbour detail design.

Project Director explained with power point presentation about PPD harbour draft layout and showed them boundaries of fishery harbour. He explained the reason for the adjustment up to Tsunami tower area near Methodist Girl high school due to Kottadi boat landing issues. View of the sea from school and frontages of Girl high school and proposed harbour development would evolve a child friendly environment.

Discussions

S.No	Matters Discussed	Agreed decisions	Responsibility
1	Methodist Girl school land acquisition	No any land acquisition from school side. Explained that the land in front of the school on beach side will be reclaimed for shore facilities.	PIMU
2	Safety of children and disturbances to girls' school due to fishery harbor activities and harbor operations after the construction.	Most of the parents of the school children are fishermen in the area. Construct 8 feet high retaining wall along the road edge on the beach side. There will be no gate to the harbor at the school frontage and the only entrance to the harbor is located at the jetty area.	PIMU Ministry of Fisheries

		No major harbor infrastructures in the harbor premises in front of school other than the parking area. Parking outside the harbor premises will not be allowed. Sign board for "no honing" will be displayed within and outside the harbor.	
3	Sea view from school and view of the school frontage.	Design shown to them and agreed to only sea view from 1st floor of the school building. Sea view can be expanded by reduction of height of harbor wall but Principal did not want to reduce height of the harbor wall as visibility of harbor activities was not recommended by her.	PIMU
4	Traffic condition in front of the school during and after harbor construction	Harbour wall will be constructed on road reservation on the opposite of Sea side. Traffic control at school area with sign board, road block and police/ guards. Rock armor transport on the road minimized during the harbor construction period. Harbor and commercial vehicles parking outside the wall in front of the school will be banded. Provision of parking space for children's bicycles adjoining the school boundary wall agreed. Sitting arrangements for school children by the harbor wall under the shade of trees.	PIMU with Grievances committee.
5	Noise and smell of harbour	Fish auction center constructed north side of jetty area (Not at school side) Treat all harbor waste water by treatment plant. No school side construction during the school term test and major exam	PIMU

		periods.	
6	School infrastructure requirements	Construct foot cycle parking hut outside the school premises. Design harbor wall in front the school in child friendly manner Construct school wall on road side	PIMU

Stakeholders including school principal and School Development Society (SDS) leaders participated and agreed to support Point Pedro proposed harbour construction. They requested for further awareness among their parents.

Finally Secretary of Northern Province Ministry of Education thanked all the participants for coming and giving valuable contribution for the success of the meeting.




Prepared by,

Bandula Weerasinghe
Sociologist

Northern Province Sustainable Fisheries Development Project
Stakeholders meeting proposed Point Pedro Fishery Harbour

Attendance Sheet

Date: 24th November 2017
Venue: Northern Province Education Ministry Auditorium
Time: 2.00 pm

No	Name	institution	Position	Contact no	Signature
1					
2	S. M. CRAVEN	ADR	Consultant	0272227341	
3	A. Siri	D.S.	DS	0718772494	
4	Mr K. Sivachandran	District Secretariat	ADO	0777760080	
5	M. Nawanithamani	DEO Point Pedro	DEO	0776152326	
6	R. Thamilmaran	ZEO, Vadamarachchi	DDE	0774656973	
7	A. Parthipan	-do-	DDE	0779911752	
8	K. Nimalan	"	DDE	0771830153	
9	V. Mythily	J/ Methodist Girls' High	Treasurer	0776612695	
10	S. SRIRAMACHANDRAN	" "	S.D.C_Se	0773607163	
11	G.D Thevarajah	" "	Principal	0779449760	
12	K. Premabarthan	PDE Office NP	Addl. PDE (Ad)	0774138976	K. Premabarthan
13	S. Muthayakumar	PDE Jaffna.	PDE	0776759625	S. Muthayakumar
14	F. JOHNSON	D/PL	PPS, N P	0773960571	
15	[illegible]	N/R	"	"	
16	Prabath Ranaweera	PIMU	PD	0766497287	
17	Bandula Weerasinghe	PIMU	Sociologist	0773118111	
18					
19					
20					
21					
22					

Northern Province Sustainable Fisheries Development Project
Stakeholders meeting proposed Point Pedro Fishery Harbour

Attendance Sheet

Date: 24th November 2017
Venue: Northern Province Education Ministry Auditorium
Time: 2.00 pm

No	Name	institution	Position	Contact no	Signature
1					
2	S. M. C[illegible]	ADB	[illegible]	0772227341	
3	A. Siri	D.S.	DS	0718772496	
4	K. Sivachandran	District Secretariat	ADD	0777760680	
5	M. Nawanithamani	DEO Point Pedro	DEO	0776152326	
6	R. Thamilmaran	ZEO, Vadamarachchi	DDE	0774656973	
7	A. Parthipan	-do-	DDE	0779911752	
8	R. Nirmalan	"	DDE	0721830153	
9	V. Mythily	J/ Methodist Girls' High	Treasurer	0776612696	
10	S. SRIRAMACHANDRAN	" "	S.D.C_Se	0773607163	
11	G. D. Thevarajah	" "	Principal	0778649760	
12	K. Premabarthan	PDE Office NP	Addl. PDE (Ad)	0774138976	K. Premabarthan
13	S. Uthayakumar	PDE office	RDE	0776759625	S. Uthayakumar
14	F. JOHNSON	D/ PL	PRS, NP	0772868571	
15	[illegible]	[illegible]	[illegible]	[illegible]	
16	Prabath Ranaweera	PIMU	PD	0766497287	
17					
18					
19					
20					
21					
22					

Minutes of meeting on construction of Fishery harbor at Point Pedro

Date: - 11.12.2017

Time: - 12.15pm

Venue: - Methodist Girls High School . Point Pedro

Attendence:

1. Mr.Alvapillai Siri, DS , Point Pedro
2. Principal . MGHS Miss Grace Thevathayalini Thevaraya
3. Mr. Sri Ramachandran – SDS Secretary
4. Prof.Nadarajasundaram – Welwisher
5. Mrs. Nicholaspillai, Director planning,DPS
6. Mr. suthakaran, AD/Fisheries
7. Mr. channa Fernando, Team Leader EML
8. MR.S.M.croos ADB Consultant

The meeting was held to discuss the location of proposed fishery harbor in point Pedro. Since the western part of the proposed harbor is extended up to school front, the meeting was arranged to explain the design of the harbor to the Principal and the school Development Society with the design engineerd of EML.

Mr.Channa Fernando. Team Leader of EML explained the proposed detailed design of the harbour at the beginning of the meeting . He also showed Pesalai harbour animation to provide correct picture of a modern fishery harbour.

Thereafter, the Principal raised the following concerns of the school society.

a. More noise which may disturb the learning activities
b. Bad smell from the harbour may disturb the learning activites
c. The beautiful sea view will be lost
d. Security of the students will be at risk due to heavy traffic in front of the school

Mr.Channa explained that the actual harbour wii be located far away from the main road. The main road in front of the school will be widened 30 feet and the 10 parapat wall of the harbour will be constructed beyond the main road. And there will be only vehicle parking and some buildings such as administration building will be located inside the harbour on western side. The quay wall will be beyond the inside vehicle park and other non harbour buildings. Since the Auction hall and

other fish handiling related activities are going to located eastern side of the jetty which is more than 300 meters away from the school, the problems of smell or noise will not affect the learning activities.

For the matter related to security, arrangement will be made with traffic police to direct the vehicles towards the routes which do noy affeat the children coming to the school. As far as the sea view is concerned, the sea view from the floor from the school building will not be disturbed.

The principal also wanted to see ELA report for making her comments. it was agreed.

Prof. Nadarajasundaram suggested for arranging a visit to Dickowita fishery harbour to see the actual fishery activities in modern fishery harbour. It was agreed to take the members of the SDS to Dickowita fishery harbour . The deta of the visit will be decided by the principal.

The meeting ended by 1.30 pm.

Divisional Secretary
Point Pedro

Alaapillai Siri
Divisional Secretary
Vadamaradchchi North
Point Pedro

Northern Province Sustainable Fisheries Development Project – Chief Minister and key stakeholders including Methodist Girl school principal Awareness Meeting

Chief Ministers Office

Meeting Minutes

Date: 7th March 2018

Venue: CM Auditorium Jaffna

Time: 10.00 am

Representative attendance annexed.

Northern Province Chief Secretary welcomes invitees. Mention that Northern Province Sustainable Fisheries Development Project is important to the all 4 districts. He said that due to 30 years of war unable to develop the infrastructures of the fisheries sector in Northern. He request support from all the stake holders to make this project success. He hands over the discussion to Project Director PIMU to introduce project.

Project Director explained the objectives of the Stakeholders meeting specially introduce NPSFDP and issues of the PPD harbour. Point Pedro and Pesalei 2 fishery harbours, 6 Anchorages and 21 Landing sites under NPSFDP project will contribute to increase local income and contribution to the GDP. Channa and his environment expert of EML Consultant explained the detailed design of Point Pedro fishery harbours. School principal awarded on PPD harbour environment mitigation measures on her issues related to dust, noise, smell and traffic. Draft copy of the report handover to CM and school principal.

Discussions Taken

S.No	Matters Discussed	Decision Taken	Responsibility
1	Design of PPD harbor and Kottadi community issue	Kottadi community now accepted develop the harbour no any land accusation from community Existing harbor basing area remain OFRP boats shift in to Kottadi landing site	
2	Suppermadam Landing site	No issues from Suppermadam landing site area	
3	Point Pedro Fishery harbor environment study and mitigation measures	Explain by EML Consultant's environment expert about the environment condition and PPD harbour proposed mitigation measures.	
4	Methodist Girl issue	Explain the design to the stakeholders and environment impact mitigation measures to dust,	

		noise, smell and traffic. The school principal agreed to support harbor development.	
5	Community issues address platforms for grievances	Grievance committee include school representation School representative will participate next grievance committee meeting at DS Office.	DS PPD and Principal
5	Road reservation of the harbour area in front of school	Road reservation boundary line from harbour side as legally cover-up Sri Lankan regulation.	PIMU
6	Provincial council officers awareness on fisheries development	Chief Minister requested to continues aware provincial council	




Prepared by,

Bandula Weerasinghe
Sociologist

REVIEW MISSION

21 Feb – 13 Mar 2018

Attendance Sheet

Venue : CM office - Jaffna

Date: 7 March 2018

#	Name	Designation	Institution	Contact No	Signature
	C.V. Wigneswaran	CM			
	Mrs. S. Ananthy	Minister	NP	0777447288	
	A. Palthuruthy	CS	NP		
	Vaiyapuri Kethees	Senior Asst Secretary	Chief Minister's Ministry	0763282443	
	R. Kiruthalingam	Secretary	Chief Minister	0718744298	
	Mrs. T. Jeyarajah	Director planning	Ministry of Education	0771163703	
	Miss G.D. Thevarajah	Principal	[illegible] High School	0779841764	
	A. Siri	D.S.	Point Pedro	0718172401	
	S. Nanthakumar	ZDE	ZEO, Vadamarachchi	0776648434	
	Prabhas Ranawaka	PD	MFARD	0766249227	
	Manjula Amarasinghe	R. Project Director	ADB		
	S. M. Croos	ADB - consultant	ADB	0777227341	
	Y. L. M. Nasmi	Project Assistant	ADB	0713491120	
	M. J. Prasanna	DGM (Op)	CEHC	0777187995	
	Sarathamani Thayaparan	PO	ADB	0774581286	
	P. Vageesan	Commissioner	Dept of Coop Dev.	0778564567	
	J. Subhanujan	PO	Dept. of Fisheries	0779072967	
	S. Sathiyaseelan	Secretary	Fisheries/Inland Fisheries Ministry	0774533934	
	K. Thushanthan	PE	MFAR-D	0765611108	

PDA6011: Northern Province Sustainable Fisheries Development Project - Detailed Engineering Design of Fishery Harbours, Anchorages and Landing Sites

REVIEW MISSION

21 Feb – 13 Mar 2018

Attendance Sheet

Date: 7 Mar 2018 **Venue :** CM office.

#	Name	Designation	Institution	Contact No	Signature
	C. Samarasinghe	MD	MFARD	077 9704424	
	B. Weerasinghe	Sociologist	MFARD	071 3118111	
	A. Amutharaj	Resettlement Specialist	Detailed Design Team	0773470335	
	P. A. Suresh Ayesha	Resettlement Specialist	MFARD.	0713058052	
	S. Uthayakumar	PDE	PDE's office, NP	0778759625	

Northern Province Sustainable Fisheries Development Project – Jaffna Government Agent and planning officials updated on district progress and issues.

Government Agent Office - Jaffna

Meeting Minutes

Date: 6th March 2018

Venue: Jaffna Government Agent Office

Time: 11.30 am

Representative attendance annexed.

Additional District secretary welcomes the invitees. Ms. Manjula ADB Project Management Specialist explained the NPSFDP Jaffna district progress and issues.

Discussions Taken

S.No	Matters Discussed	Decision Taken	Responsibility
1	Design of PPD harbor and Kottadi community issue	Kottadi community now accepted develop the harbour no any land accusation from community Strengthen and deepening existing channels and suitable dredging of Kottady landing site to relocate the affected OFARPs in Kottadi.	PIMU
2	PPD dredge material dumping location	Suitable dredged materials use as reclamation materials. Suitable land for the store dredge materials from area	DS - PPD agreed to find the suitable land with local authority
3	Mandathivu Anchorage	Conduct special discussion with CCD Jaffna officials. (7th March 2018)	PIMU with CCD
4	Sakkodei Anchorage	Only marina development No shore facilities development due to un availability of land.	AD Fisheries Awareness on the situation for community
5	Munei Anchorage	Only marina development No shore facilities development due to un availability of land.	AD Fisheries Awareness on the situation for community
6	Adikoviladi Anchorage	Site visit arranged Road reservation boundaries identify with local authority Existing abandon common toilets renovate for use of man and women	AD Fisheries Awareness on the situation for community Aware community on developments.

7	Colombothural Landing site	Visit arranged Suitable shore facilities development remaining land in-between road and no build zone.	
5	Grievances committee at PPD	Address all grievances in the committee at DS level include school issues.	Next GC 21st March 2018

Prepared by,

Bandula Weerasinghe
Sociologist

PDA6011: Northern Province Sustainable Fisheries Development Project - Detailed Engineering Design of Fishery Harbours, Anchorages and Landing Sites

REVIEW MISSION

21 Feb – 13 Mar 2018

Attendance Sheet

Date: 06-02-2018 Venue : Kachcheri, Jaffna.

#	Name	Designation	Institution	Contact No	Signature
1	S. Thevendram	Add/GA	District Secretariat		
2	Prabath Ranaweera	PD	MFARD		
3	Mayuri Amerasinghe	Sr. Project Spr	ADB		
4	S.M. CROOS	ADB consultant	ADB.		
5	Y. S M. Asumi	Asst Architect	ADB		
6	M.T. Prasanna	DGM(Op)	CFHC		
7	Sudarshana Angan	Gender specialist	ADB	0774581286	
8	A. Rajaravinam	Environ Sp.	EML	0714905101	
9	A. Amutharaj	Resettlement Sp	EML		
10	P.A.S. Ayesha	R/S.	PIMU-MFARD.		
11	B. Weerasinghe	Sociologist	PIMU MFARD	0773118111	
12	K Thushanthan	PE	MFARD	0765611108	
13	K. Akilan	FO	DFAR	0777112186	
14	J. Suthajaran	AD	DFAR	0779072967	
15	A. Siri	DS	Point Pedro	0718172	
16	K.K. Sivachandran	ADP	District Secretariat	0777760680	

Northern Province Sustainable Fisheries Development Project

Community Consultation on the Findings of the Environmental Impact Assessment for the Proposed Fisheries Harbor Development in Point Pedro

Venue **:** Divisional Secretariat Auditorium, Point Pedro
Date **:** 21. 11. 2019
Participants :
Invited; **:** Fisheries society (14) at least two from each society and boat owners (affected 23 boat owners)
: Boat Owners were absent
: The list of participants is attached

1. At the inception of the meeting Mr A Siri, Divisional Secretary, Divisional Secretariat, Point Pedro welcomed the participants and briefed the objective of the meeting. Mr Siri, briefed that the meeting is purely to discuss the finding of the Environmental Impact Assessment (EIA) conducted by the EML (Pvt) Ltd, for the proposed fisheries harbor development project.

2. A Rajaratnam, Environmental Specialist and Mr A Amurtharaj, Social Specialist have presented the findings of the EIA to the participants. Once the presentation was completed, the participants were asked to present their view on the EIA findings.

3. The participants expressed their concerns over the proposed development of the Point Pedro harbor indicating that the outsiders will dominate the local fishing community.

4. Fishermen who represented Suppermadam and Inpersiddy societies highlighted that construction of the proposed breakwater will have serious impacts along the western shoreline of proposed site where Suppermadam landing site is located. They said increased wave action will cause higher erosion along the said coastline, as a result fishing activity will become a challenge to the fishermen and safe docking of one day OFRP boats will not be possible.

5. Fishermen represented Koddadi Fishermen Society highlighted that most of them are engaged in long line fishing technique with OFRP boats. Women contribution to long line fishing is significant. Women help to arrange the hooks in boxes and earn around Rs1,500 per day. Because of the proposed intervention, women will permanently lose their livelihood and become vulnerable.

6. Koddadi Fishermen Society said they already requested navigation access through the eastern edge of the breakwater. They said their request had been considered at the meeting with Governor.

7. The participants said they already had a meeting with the Governor of Northern Province and expressed their concerns and issues. Governor promised to meet them again in Point Pedro with proper action. So far, such meeting had not been taken place. They indicated that they need a meeting with the Governor to discuss their issues.

8. The consultants highlighted that these concerns will be included in the EIA report for the reference of ADB and the meeting was concluded.

9. It is recommended to have a discussion with the community as they requested to fulfill their request.

Northern Province Sustainable Fisheries Developmet Project – Community Consultation Meeting – 21.11.2019 @ 10.00 AM

Attendance Sheet

S/No	Name	Designation	Telephone No	Signature
31	K. Kirushnamanthy	DO I/395	0776684549	K. Kirushnamanthy
32	[illegible]	[illegible]	[illegible]	[illegible]
33	T. Suresh	DOI/407	0776220581	T. Suresh
34	S. Vanathy	D.O I/383	0774374206	S. Vanathy
35	N. Selvayathini	DOI/386, I/387	0778413530	N. Selvayathini
36	N. Thiruchchelvy	DOI/405	0779935623	N. Thiruchchelvy
37	A. Kumuthiny	DO I/408	0779193535	A. Kumuthiny
38	A. Rajavarnan	Asst. Dir/FMC	0714905101	A. Rajavarnan
39	A. Amutharaj	R.S/EMC	0773470335	A. Amutharaj
40	[illegible]	[illegible]	[illegible]	[illegible]
41	Y. Prashanthini	Eng, RDA	-	Y. Prashanthini
42	[illegible]	D/O	0774496648	[illegible]
13				
14				
15				

CERTIFIED TRUE COPY

Northern Province Sustainable Fisheries Developmet Project – Community Consultation Meeting – 21.11.2019 @ 10.00 AM

Attendance Sheet

S/No	Name	Designation	Telephone No	Signature
1	A. Siri	DS		
2	J. Suthaagaran	DD	0212222532	J. Suthaagaran
3	D.A.S. Ayesha	R/S.	0713058052	D.A.S. Ayesha
4	A. Amutharaj	Resettlement Specialist	0773470335	
5	A. Rajanghm	Ent. Sp.	0714981794	
6	A.S. Sivakumar	DO	0779888861	
7	T. Sutharsan	FF	0771999639	T. Sutharsan
8	R. Mathiyalakan	Secretary Aathi Sakthi F/S	0772695486	
9	S.D. Devakumar	C.S 7/388	0766043130	S.D. Devakumar
10	V. Santhirakumar	[illegible]	0776213775	V. Santhirakumar
11	[illegible]	[illegible]	0773313173	
12	[illegible]	[illegible]	0778870474	
13	V. Sivaparan	G.N. J/403	0773438250	
14	K. Sri Shankar	GN J/401	0779392621	
15	S. Sivaha[illegible]	DC J/401	[illegible]	

Northern Province Sustainable Fisheries Development Project

Community Consultation on the Findings of the Environmental Impact Assessment for the Proposed Fisheries Harbor Development in Point Pedro

Date: 21. 11. 2019
Venue: Divisional Secretariat Auditorium, Point Pedro
Participants:
Invitees: Relevant Government officers
List of Participant is attached

1. At the inception of the meeting Mr A Siri, Divisional Secretary, Divisional Secretariat, Point Pedro welcomed the participants and briefed the objective of the meeting. Mr Siri, briefed that the meeting is purely to discuss the findings of the Environmental Impact Assessment (EIA) conducted by the EML (Pvt) Ltd, for the proposed fisheries harbor development project.

2. A Rajaratnam, Environmental Specialist and Mr A Amurtharaj, Social Specialist of EML have presented the findings of the EIA to the participants. Once the presentation was completed, the participants were asked to present their views on the EIA Findings.

3. The chairman Point Pedro Urban Council raised his concerns for the following matters and requested to resolve through proper mitigation measures to avoid further conflict and misunderstanding with the community.

    - Primarily the Chairman highlighted that the PS roads, which will use for material transport have not been designed with proper load bearing capacity to cater frequent movement of heavy vehicles. As a result, the roads will get damaged and PS has no funds for rehabilitation. This will create community issues against the intervention. He further said that the width of the road is also not adequate for heavy vehicle movement and may cause accidents. Mainly schoolchildren use these roads to access schools and church. The Chairman insisted that the project should have taken care these aspects and to have provision to rehabilitate road damages.

    - The Chairman also highlighted that allocating adequate space for storage of boulders is not available within the PS area because the volume is massive. Therefore, measures should be taken for offshore storage.

    - At present the PS manages the solid waste disposal with lot of difficulties with minimal machineries. During the construction period and the operation period of the harbor, solid waste generation would be higher and PS will find it difficult to manage the situation in addition to household collection. Therefore, the project should provide assistance to the PS to continue the service without interruption and without management issues.

    - Chairman said since shallow water fishing is a common phenomenon in the region as a result wastewater disposal is crucial during the construction period and the operation period of the harbor. Therefore, wastewater treatment plant should be in place for treatment prior to discharge into the sea to avoid public protest among fishing community and the environmentalists.

4. The Chairman also insisted to upgrade Munai offshore facilities prior to Point Pedro harbor to cater the operation of about 23 OFRP boats. He also suggested of obtaining concurrence from Munai fishermen to accommodate Koddadi boats until the completion of proposed harbor. This official arrangement will minimize the issues between the two societies.
5. The Chairman and the GND of Kottadi expressed that fishermen in Kottadi have traditionally been engaging long line fishing. Therefore, they will have space for continuing this without disturbing their livelihood including women.

6. The representative of the CCD said that the EIA will be reviewed once it is submitted.

The consultants indicated that these highlighted issues are already included in the report and more attention on these issues will be paid during the finalization of EIA reports

Northern Province Sustainable Fisheries Developmet Project – Community Consultation Meeting – 21.11.2019 @ 02.00 PM

Attendance Sheet

S/No	Name	Designation	Telephone No	Signature
1	V. IRUTHAYARAJAH	CHAIRMAN	0772631018	
2	A. SIRI	DS	0718172494	
3	P.A.S. Ayesha	Resettlement Spec.	0813058052	
4	A. Amutharaj	Resettlement Specialist	0773470335	
5	Y. Ravindran	ZDB/Vm	0777222	
6	N. Vismuthavarasa	DO/CSB Chairman	0775155331	
7	J. Sutharsan	AD. DFAR	0779612961	
8	M. ROSANATHAN	DO 5/899	0774652 489	
9	T. Pratheepan	DaJ 409	0773146530	
10	M. Sanjeevan	D-/3400	0774082758	
11	S. Vinothan	PDJ/391	0771929334	
12	S. [illegible]	[illegible]	[illegible]	
13	S. D. Devakumar	G.S J/388	0766043130	
14	S. VIJENDRA	RDO	077 5985062	
15	V. Sivaparan	GN.J/403	0773438250	

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16	K Sindhuja	US J/ [illegible]	0779390[illegible]	K Sindhuja
17	K.J. Gowthamanan	Gm J/397 & J/400	0777-916056	
18	S. Rajeepan	DS Office	0772717936	
19	K. Tharthumathi	DS office	0779[illegible]8600	K. Tharthumathi
20	K. Theeba	DS Office	0773270523	
21	R. Pirabalini	"	0776162016	
22	V. Neeraja	"	0773434095	
23	B. Bavani	DS office	0775355165	
24	P. Abirami	"	0770452313	
25	S. Sujanthini	"	0779405889	
26	S. Subagini	"	0776739715	
27	K. Pushpalatha	"	0766403581	
28	A. Meera	"	0773031801	
29	K. Nimalathi	"	0765478400	
30	E. Jeyathasan	"	0775010617	

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Annex 11 Terms of Reference Environmental Safety Officer (ESO) for Fisheries Harbors

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பின்னிணைப்பு 11- சூழலியல் பாதுகாப்பு அலுவலகருக்கான ஆய்வு வரையறைகள்

Terms of Reference Environmental Safety Officer (ESO) for Fisheries Harbors

- The Environmental Safety Officer (ESO) will have a master degree in environmental science/ management/ engineering and have 5 years experiences in environmental management associated with donor partner projects which 2 years experience associated with marine infrastructure work including coastal protection, breakwater construction and dredging activities, harbor works and building construction.

- Prior experience working with ADB and/or World Bank funded projects is considered an advantage.

- The ESO will report to the Resident Engineer of the construction contractor

- ESO will be responsible for interpreting the Environmental Management Plan (EMP) in preparing a Construction Environmental Management Plan (CEMP) in consultation with the construction engineers and any changes or additional engineering information available shall be taken into account in the CEMP.

- Obtaining approval for the CEMP from the SC (as the Supervising Engineer) upon advice from the Environmental Officer within the PMU and ADB, before any physical works are undertaken.

- Ensuring the proper implementation of the CEMP.

- Coordinate with relevant laboratories to get periodic test reports for monitoring purposes.

- Conduct necessary training and capacity development to all employees on all environmental health and safety requirements and monitoring for compliance..

- ESO will coordinate all environmental and safety matters with PMU and PIU, the EO and/or SC.

- Ensuring that the contractor engages a suitable organization to undertake STI/HIV/AIDS briefings and awareness raising amongst the Contractor‟s employees.

- Ensuring that the Contractor complies with the clauses in the contract and bidding documents in respect of the environment and OH&S issues;

- Coordinating with PMU and/or PIU in respect of continued community consultations

- Participating in monitoring and coordinating with PMU and PIU and the SC to ensure that environmental management activities are reported as required;

- Maintaining a log of all grievances received and action taken to address these issues.

Annex 12 List of EIA preparers

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பின்னிணைப்பு 12-சூ.தா.ம தயாரிப்பாளர்களின் பட்டியல்

Team Composition & Task Assignment				
Name of Staff	**Firm**	**Areas of Expertise**	**Position Assigned**	**Tasks Assigned**
Eng. P C Fernando	EML	Assessing impacts of interventions on coastal processes, Identification of areas of accretion, erosion etc. and recommending/ implementing suitable costal protection measures, Numerical Modelling, Harbour Engineering, Hydraulic Engineering, Environmental Hydraulics, Modelling and Fluid Mechanics**,** Coastal Zone Management and Coastal & Estuary Engineering, Designing, Marine Environmental Engineering, Hydrology	Team Leader/ Coastal Engineer	○ Lead the study team ○ Ensure the quality of the report ○ Review report and improve report where necessary ○ Coordinate with the environmental specialist for identifying and analyzing environmental issues. ○ Data collection and analysis of coastal processes and relevant studies of the project area. ○ Providing necessary project details and construction methodologies ○ Recommend preferred equipment and construction methods ○ Coordinate with the other team members. ○ Identification of the environmental impacts and suggesting mitigation methods to incorporate for the designs. ○ Work in close consultation with the Coast Conservation Department in finalizing the alternative options for coastal impact mitigation
Mr. Stephen Lindsay	MFARDREA/ ADB	Marine Ecology, Environmental Assessment,	International Environmental Specialist	○ Review of Marine and Terrestrial Ecological reports prepared by the Domestic Consultants and suggest for improvement. ○ Provide input for the ecological part of the report ○ Identify potential impacts and propose suitable mitigation measures for the ecological section of the report.

Team Composition & Task Assignment				
Name of Staff	**Firm**	**Areas of Expertise**	**Position Assigned**	**Tasks Assigned**
				○ In association with the Domestic Environmental Consultant the International Environmental Specialist perform the compilation of reports, editing and finalize the report.
A Rajaratnam	EML	Conducting IEE, EIA, EA, SEA Assessments, Natural Resource Management, Solid Waste Management, Project Coordination, Pollution Control, Environmental Safeguard, Monitoring & Evaluation	Environmental Specialist	○ Assess potential impacts including project site, borrow sites, quarry sites and disposal sites considering the short and long term impact on the environment. ○ Liaise with the coastal engineer to understand the impact of the coastal structures on the near show region. ○ Assess the pollution that may occur due to increase of the facilities to the fisher community and propose preventing measures. ○ Coordinate with the team members. ○ In association with the International Environmental Specialist compile and finalize the report.
Dr R R M K P Ranatunge	EML	Marine Biology, Marine debris survey, underwater survey, Side-Scan sonar survey, IEEs, EIAs, Biodiversity survey using underwater visual census, Fisheries survey, terrestrial and aquatic Fauna and flora, Oceanography, Coral Reef	Marine ecologist	○ Conduct marine ecological survey ○ Identify marine habitats such as coral reef, sand stone reef/lime stone rocks, sea grass beds, fishing grounds, breeding grounds, fishing activities and interaction with coastal protection structures. ○ Classification and mapping of all habitats

Team Composition & Task Assignment				
Name of Staff	**Firm**	**Areas of Expertise**	**Position Assigned**	**Tasks Assigned**
		Ecology and Mgt ,		○ Identify potential impacts due to project activities. ○ Propose mitigation methods for the identified negative impacts
Prof. J.M.P.K Jayasinghe	EML	Aquaculture, Marine biology, , coastal environment management, Fisheries post-harvest management, shrimp farming, , fish quality management, development of fishery products, post-harvest losses , sanitation,	Terrestrial Ecologist	○ Document review, ○ Design and conducting the Ecological survey on flora. ○ Identify the floral species and preparation of Preparation flora check list or inventory to the project area. ○ Identify the anticipated impact on flora by the implementation of the project and suggesting the migratory measures to reduce the impacts. ○ Participating to the meetings and presentations and submit the ecological report to the team leader.
A. Amurtharaj	EML	Social Impact Assessment, Resettlement, Implementation supervision, Institutional Development, Sociology, Socio economics, Monitoring & Evaluation, Social Surveys, Data Collection & Analysis, Report writing on social aspects related to irrigation rehabilitation, Research, Livelihood Development, social aspects related to irrigation	Sociologist	○ Document review, ○ Design and conducting the sociological survey and conducting the study. ○ Organize the consultation and community meetings and conducting the meeting. ○ Identify the anticipated sociological impacts of the project and suggesting the migratory ○ Liaise with the surrounding community, societies, community leaders and hold discussion with them. ○ Identify the social issued that may arise from the community due to the

Team Composition & Task Assignment				
Name of Staff	**Firm**	**Areas of Expertise**	**Position Assigned**	**Tasks Assigned**
		rehabilitation, water management, livelihood improvement.		implementation of the proposed project activities o Identify the mitigation measures to overcome these social issues.