TERMS OF REFERENCE (TOR) FOR THE RECRUITMENT OF A FIRM TO DESIGN AND DEVELOPMENT OF AN END-TO-END SMART SOLID WASTE MANAGEMENT SYSTEM, IN THE MALDIVES UNDER THE WORLD BANK-FUNDED PLASTIC FREE RIVERS AND SEAS PROJECT(PLEASE) IMPLEMENTATION PARTNER: SOUTH ASIA COOPERATIVE ENVIRONMENT PROGRAM (SACEP)

I. BACKGROUND

1. Introduction.

The demographics and geography of the Maldives are characterized by its unique, fragmented, and vastly dispersed land masses and respective population over a longitudinal stretch of nearly 900 kilometers. In order to bring a solution to the waste generated on the distinctively disconnected islands of the Maldives, the government has adopted a zonal approach to waste management. The current waste management strategy is the division of the country into 7 zones and grouping of zones to create 3 main Regional Waste Management Systems.

The Ministry of Environment, Climate Change and Technology of Maldives (MECTM) has requested the PLEASE project financed by the World Bank and implemented by the SACEP to support the Ministry of Environment, Climate Change and Technology's efforts to implement the project of *Design and Development of an End-to-End Smart Solid Waste Management system, in the Maldives***.** Considering the above, the World Bank/SACEP agreed to support the implementation of the proposed project to support the Design and Development of an End-to-End Smart Solid Waste Management system, in the Maldives under the World Bank-funded Plastic-Free Rivers and Seas Project(PLEASE). The executing agency of the PLEASE project is SACEP.

2. Description of grant funds available for the proposed project under the World Bank Financed PLEASE project.

The regional "**Plastics Free Rivers and Seas for South Asia" project (PLEASE)** is a world bank-funded regional initiative that is executed by the South Asia Cooperative Environment Program (SACEP). The Project aims to strengthen innovation and coordination of circular economy solutions to plastic pollution flowing into South Asian seas.

The Project Development Objectives are based on the combination of two medium-term outcomes such as, strengthening innovation of circular plastic economy approaches across South Asia and strengthening coordination of circular plastic economy approaches amongst the public, private sector, and non-government stakeholders in SACEP member countries. These align with the objectives of project components which are;

(1) To improve the identification and testing of plastic pollution mitigation solutions.

(2) To increase leveraging of policy solutions and public-private sector engagement in plastic pollution, waste, and leakage mitigation across the value chain

(3) To strengthen regional integration institutions.

The term 'innovation' in the project development objectives refers to better policies, strategies, plans, standards, technologies, and investments at both national and regional levels that will reduce the amount of plastic pollution flowing into rivers and seas across South Asia. This will also focus on leveraging the engagement of the public and private sectors to build a more integrated regional oversight, management, and policy framework for plastic pollution control. This in turn will enable an increased circular plastic economy model in the South Asia Region (Afghanistan, Bangladesh, Bhutan, India, the Maldives, Maldives, Nepal, and Sri Lanka).
In line with the above project development objectives, three main project components have been defined to achieve project outcomes in a timely manner.

Component 1. Supporting Competitive Block Grant Investments to Reduce Plastic Waste
Component 2. Leveraging Public and Private Sector Engagement and Solutions
Component 3: Strengthening Regional Integration Institutions

The proposed consultancy assignment will provide the necessary expertise to identify project initiatives under the above-mentioned component 2 in collaboration with member countries and the Project Implementation Unit, which is located in Sri Lanka.

Leveraging Public and Private Sector Engagement and Solutions:

The objective of this component is to improve regional and national strategies, policies, action plans, and standards based on better analysis, and to facilitate the transition of the region to a more circular plastic economy through public-private sector intervention, dialogue, and cooperation.
To this end, the component will provide support to develop and/or improve national and regional plastic pollution mitigation strategies and action plans, policies, and industry standards and, provide technical and other support to relevant institutions to identify, prioritize, collect and analyze lifecycle data and identify data issues and gaps. The development of national action plans, while led by national ministries authorized to do so will get support from SACEP and will complement, and be coordinated with, other country dialogues and advisory work financed by other sources.
The component would also support the convening of public and private sector decision-makers to discuss and agree on mainstreaming circular plastic economy, solutions and approaches. This component will be undertaken through two proposed subcomponents:

Subcomponent 2.1: Enabling Policies, Standards, and Analytics: This subcomponent supports the development of strategies, action plans, policies, and standards to harmonize plastic pollution mitigation measures through:
(a) Developing and implementing a multi-year plastic policy support program, working with leading universities and organizations.
(b) Developing a database for lifecycle analysis, data collection, and modeling related to plastic across, selected industry value chains; and
(c) Supporting communication activities. Such policy will be incorporated into policy revision, planning and investment processes across the region, including modification of existing standards and regulations governing private sector organizations.
The project builds on strong working relationships with units in government Ministries of each of the SACEP member states responsible for plastics and marine litter policy and their associated government standards bodies. One of its functions will be to help maintain an up-to-date understanding of plastic relevant standards at any given time across countries, analyze the extent of their harmonization and key areas of divergence, and help respond to the research and technology-focused agenda needed to work on the update and introduction of new standards. In the project's first year, SACEP will work closely with national ministries toward the development of improved country-level/national marine litter strategies and action plans in addition to the development of an approach, including methodology and measurement to track and report on existing plastic pollution levels (national and regional) and plastic reduction impact of solutions (investment and policy), by MTR.

Subcomponent 2.2: Enabling Regional Public and Private Engagement:
This subcomponent supports the circular use of plastic in the economy through regional public-private collaboration and engagement in South Asia, including designing and organizing annual or more frequent meetings of representatives from the public and private sectors.

Activities supported will bring public and private sector representatives together to review and discuss strategies, policies, and standards (developed under subcomponent 2.1) that can accelerate South Asian countries toward a more circular and reduced use of plastics in the economy. More specifically, it will support the design of regional convenings as a part of SACEP's regular convening of stakeholders; support costs associated with such annual or more frequent meetings of public sector policy and decision-makers with private sector representatives, including the sharing of best practice public-private partnership (PPP) solutions from within the region and beyond; And proactively disseminate The World Bank Plastic free Rivers and Seas for South Asia (P171269) information on a regular basis to a broad range of stakeholders on the goals and progress on shared priorities defined for an action-focused agenda for regional conversion as reported by both public and private entities from across the region. These convenings could be branded to further accelerate awareness and exemplify regional cooperation in support of plastic-free rivers and seas and could adopt a fee for private sector participation (a successful model used in trade shows, convening on other topics, and so on) to ensure continued convening's over time that SACEP will continue to oversee beyond the life of the project.

3. INTRODUCTION

3.1. INTRODUCTION TO WASTE MANAGEMENT IN THE MALDIVES

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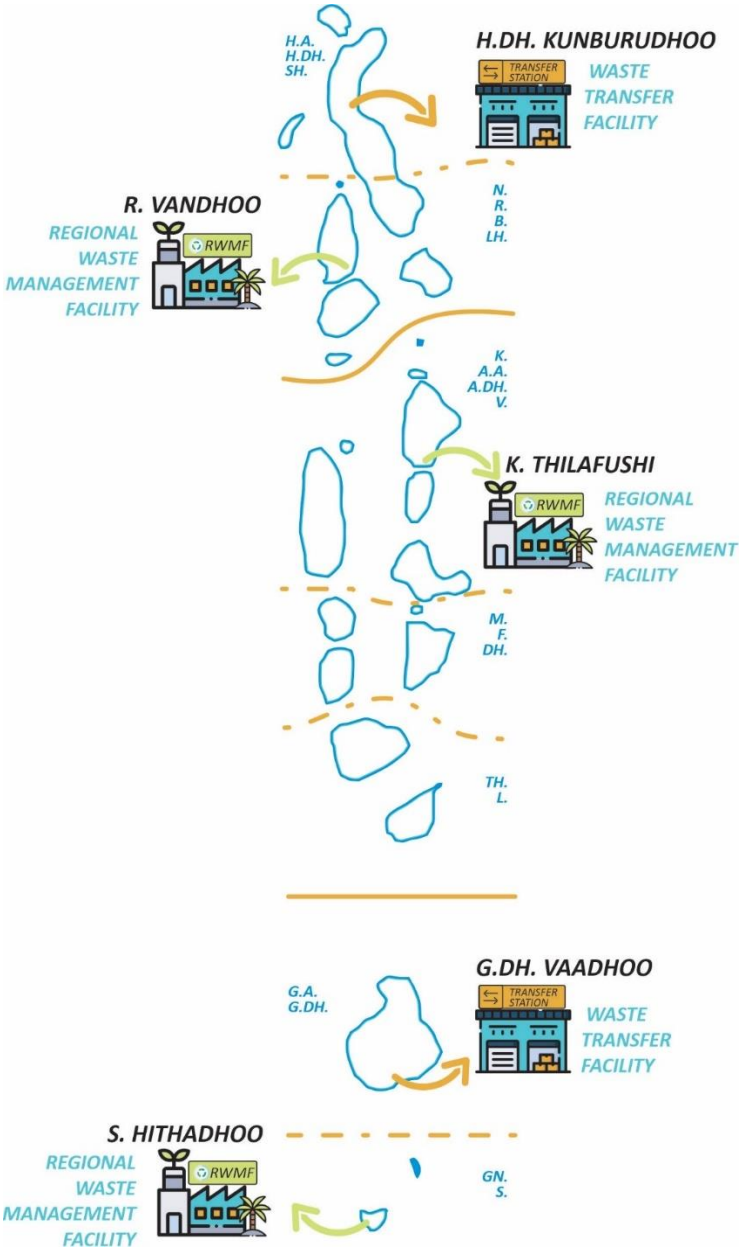
Sustainable solid waste management is amongst the most visible and challenging issues threatening the environment of the Maldives. Based on projections, it is suggested that the Maldives would produce 22.1 KT of Plastic Waste in 2020, representing 7.5% of the total municipal solid waste generated in the country (Royle, et al., 2022). Furthermore, the study by Royle et al. (2022) estimates that 1.6 kits of plastic waste, which is 7% of the total plastic waste generated from the Maldives to have entered the marine environment in 2022. As per the study, the contributing factors to the leakage of solid waste into the delicate natural environment of the Maldives is due to the poor management of waste management sites, marine waste transfers, and through illegal waste dumping. However, due to the vast marine spatial environment, and limitations in resources for monitoring at the disposal of enforcement authorities, implementing a holistic-overarching management process remains a challenge.

3.2. PROJECT BACKGROUND

As a nation that largely relies on the health of its natural systems for its economic sustainability and its mere existence; For achieving sound management of solid wastes, it is imperative that the mechanisms in place and the planning processes are backed by informed decisions. Furthermore, as an adequate means of solid waste tracking and monitoring is yet to be established at the national level, enforcement of set solid waste management policies, laws and regulations is limited. Therefore, the project aims to create a solid waste data management system and its complementing standards through the establishment of a national, overarching, harmonized solid waste tracking and monitoring system. The current waste management strategy is the division of the country into 7 zones and grouping of zones to create 3 main Regional Waste Management Systems, as shown in Figure below;



3.3. SECTORAL GAPS AND NEED FOR THE PROJECT

The island nation encompasses 188 administrative inhabited islands (National Bureau of Statistics , 2021), while 169 are registered islands for tourist resort operations (Ministry of Tourism , 2023). In addition to this, it is important to consider the waste generated by liveaboards and industrial islands in planning for sound management of solid waste on a national scale. The recently ratified Waste Management Act recognizes the need for proper management of solid waste management data. According to the act, it is a requirement to monitor solid waste management utility service centers at the island, zonal and regional levels, which includes the respective solid waste process flow of the centers and its data management.

Additionally, as the nation's land masses are vastly dispersed, and acknowledging the importance of monitoring the movement of solid waste through marine means; the Waste Management Act

requires to establish measures to ensure the safeguards of natural and socioeconomic associated. Furthermore, through the Act, the Ministry of Environment, Climate Change, and Technology are mandated to establish a solid waste management database that caters to proper planning, management, and monitoring of the dynamics involving solid waste, up until now this has not been properly initiated.

Furthermore, under the 'Single-Use Plastic Phase-Out Plan 2020-2023' policy 2 states that the main challenge in the development of the plan was the lack of data throughout the lifecycle stages of plastic materials, which often end up as litter. The plan also identifies the importance of improving the national waste management data mechanisms as a key policy goal under the 'guiding principles and cross-cutting strategies' (Ministry of Environment, 2020). Concurrently, under the Strategic Action Plan 2019-2023 of the Government of the Maldives; developing and establishing a solid waste management national database is a key policy to achieve the strategic goal of fostering evidence-based policy making (President's Office , 2019). Moreover, the 'Review on Water and Waste Accounts' published by the National Bureau of Statistics (2018) stresses the importance of establishing a structured, centralized national data collection system that facilitates regular updating within different user levels.

Even though multiple policies and strategies are in place within the sector, the diverse variables at play in the whole spectrum of solid waste management in the Maldives make the process of monitoring and evaluating a complex and dynamic one. The limitation of vital statistics has made it challenging to understand and tackle waste generation trends from key sources, making the creation of effective policies, laws, and regulations even more challenging. This also hinders the improvement of work done within the sector in order to achieve sustainable waste management and resource allocation.

Currently, waste management data is stored in fragmented silos, dispersed among the many entities involved, creating wide discrepancies with one another. Without a centralized, adequate, and accessible waste data collection and management system, it is expected that key stakeholders will utilize different means of data storage and management protocols, further complicating the issue. Therefore, at present it will be vexing to upkeep continuous data management without a proper centralized, harmonized, and accessible data management system that accounts for all the dynamics from waste generated at the island level including the intermediary to the final endpoint.

Policy directives that support the proposed *Design and Development of an End-to-End Smart Solid Waste Management system, in the Maldives are given below.*

Relevant Government Policy	**Description**
Waste Management Act	The Waste Management Act requires establishing of measures to ensure the safeguards of natural and socioeconomic associated. Furthermore, through the Act, the Ministry of Environment, Climate Change, and Technology (MECT) is mandated to establish a solid waste management database that caters to proper planning, management, and monitoring of the dynamics involved of solid waste.
Strategic Action Plan 2019-2023	Relevant strategies: Action 1.3b: Develop a framework to conduct a waste audit at the island level. Action 1.5a: Conduct comprehensive waste audits across all islands to identify the volume of different waste streams and to formulate reduction targets

	Action 1.5b: Develop a national database and establish methods for information collection, collation, access, and dissemination to ensure its comprehensiveness and public availability.
Single-use Plastic Phase-Out Plan 2020-2023	Policy 2 stresses the issue of data management stating that the main challenge in the development of the plan was the lack of data throughout the lifecycle stages of plastic materials, which often end up as litter

II Project

4. PROJECT OBJECTIVES

The primary objective of the proposed project is to develop a comprehensive, end-to-end, user-friendly, and smart, solid waste monitoring and tracking system with the ability to configure, monitor, and plan waste management activities at various levels of Solid Waste Management. A smart waste management system makes use of advanced technologies to streamline waste collection, transportation, and disposal, providing numerous advantages in various sustainable development areas such as environmental, social, and economic aspects.

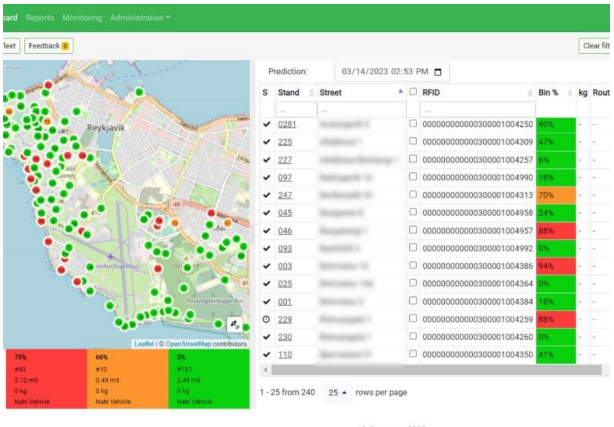
In this regard, the objectives, of the project can be listed as follows:

#	Activity / Component	Objectives of each activity
1	Development of IT based Waste Tracking System	a. Track the movement of waste within the national boundary b. Ensure regulatory compliance c. Improve accountability d. Safeguard the environment and public health by reducing the gaps which facilitate ocean dumping and/or waste spillage to marine bodies
2	Carry out an inbuilt Smart Analytics	a. Demand forecasting and customer analytics b. Route optimization and improvement of logistical arrangements c. Vessel tracking with efficiency d. Cost reduction in waste collection and operations leading to reduced subsidy requirements e. Provide a real-time platform to service providers to optimize operations f. Enable adequate monitoring and evaluation for implementing and regulatory bodies g. Low carbon emissions through reduced amount of entailed GHGs h. Cities are able to achieve ecological sustainability solving urban waste issues i. Increased recycling rates through establishment of the concept of a recycling economy which lead to greener and cleaner cities
3	IT based database development	a. Improved and accessible data b. Informed decision-making c. Creation of effective, environmentally sustainable and cost-effective plans and strategies d. Enable sound implementation of waste management strategies e. Monitoring and evaluation

		f. Implementation of location-specific target activities to minimize and manage solid waste g. Report generation h. Smart urban development through the implementation of correct decisions and policies
4	Cross-platform application for defined levels of end users	a. Common platform for waste management service providers b. Improved resource management
5	Introduction of Citizen App	a. Aids the concept of smart city b. Clean and safe public spaces c. Reduced littering d. Improved engagement and dialogue with the citizens
6	Overall IT-based interventions on waste management	a. Increased awareness about smart technologies b. Facilitate continuous monitoring of local authorities to ensure quality service delivery c. Cleaner and healthier life for citizens through an improved quality of life d. Integration of smart technologies and sustainable development e. Increased participation of citizens contributing to effective implementation and sustainable and development of cities f. Transparency of sectoral work

5. KEY FEATURES OF THE PROPOSED SYSTEM)

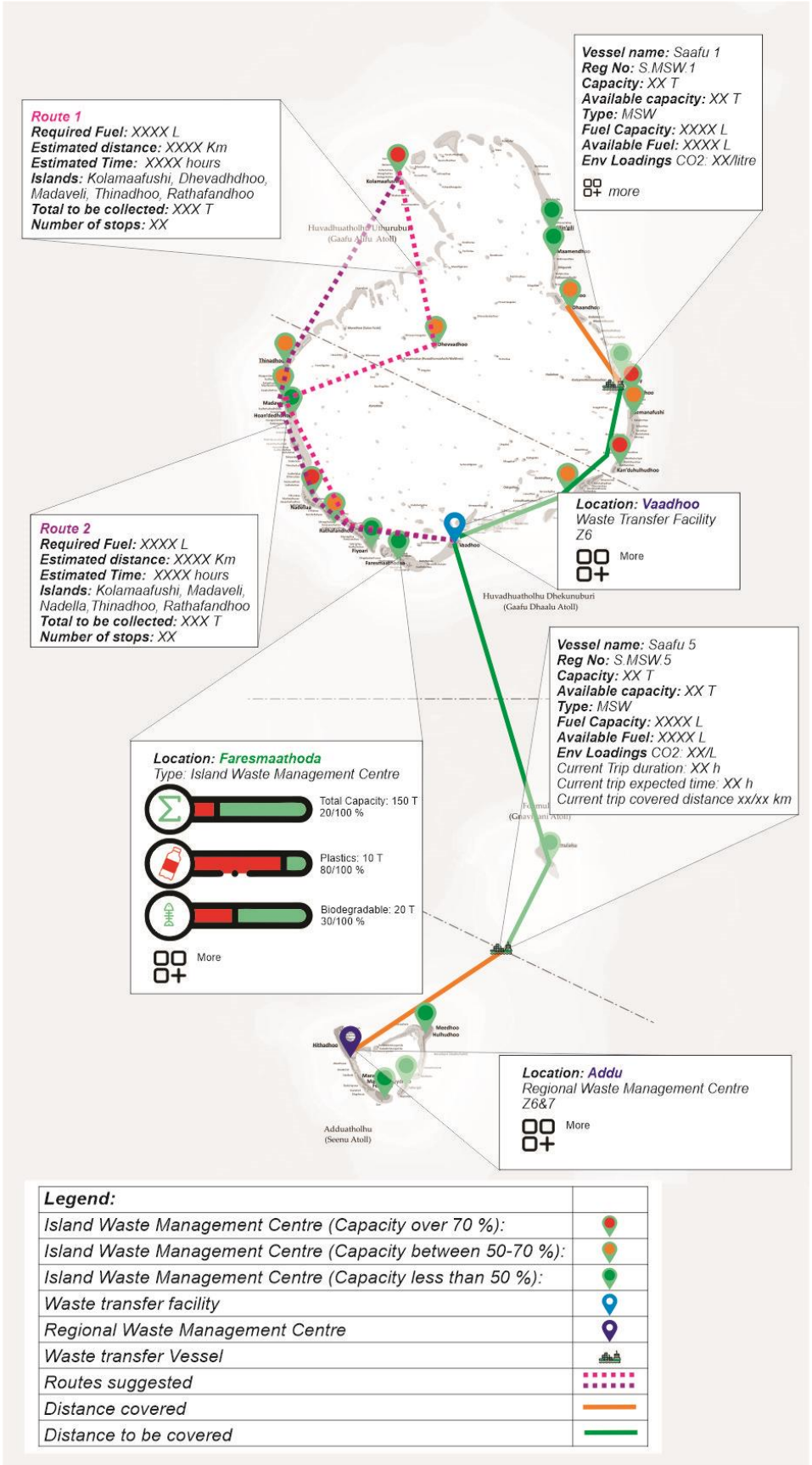
Key features of the system to be developed by the consulting firm are as follows;

Feature	Description
Waste Identification/Input	a. Should have the ability to create classes (waste categories) based on the standards set by the central administrator (MoECCT/EPA) b. Ability to input georeferenced solid waste based on its respective categories
Database design	a. The database must be designed by the consultant to capture, store, and retrieve data in an efficient and organized manner. This involves defining the data schema, selecting appropriate data types, and establishing relationships between data tables.  Above is an example of SW management system (Sensoneo, 2023) for the consultant for guidance purposes only

	b. Based on the need, the system should facilitate the creation of user profiles for island level waste management systems (municipalities, resorts, industrial or otherwise), which can include, but not limited to the following data parameters: i. Location (island name) ii. Username (Island Council/Owner/Waste management service provider) iii. Total population in the parameter of interest iv. Total customers/households v. Type of facility (Waste yard, Waste and resource management center, etc.)
Create User levels	Based on the legal character and needs, the consultants need to create different classes of user levels in the prop the system with the relevant controls. For example: Central Administrator, User levels for waste management center administrators, regional waste management facility administrators, waste transfer vessel user level, etc.
Waste transportation tracking	a. Under this component the consultant is required to consider in the proposed system the variables and dynamics involved in the movement of solid waste from one point of interest to the other – for example: from Island Waste Management Centre to Regional Waste Management Centre. b. This includes but is not limited to the vessel details, timestamp details, locations, route taken c. The system should be able to register the vessels by accounting for each vessel with a unique identification, and its respective environmental loading (for example: the amount of carbon dioxide released per liter)
Vessel Navigation App	Based on the instructions of the system administrator or the set user level, the system by the consultant should be able to produce an itinerary for the waste collection route for the vessel operator.  Example of a vessel navigation system (navionics, 2023)
Route identification	a. The developed system by the consultant should be able to suggest the collection routes in the Maldivian context that are based on improving efficiency and cost reduction. The parameters of interest in the smart analytics which need to be incorporated into the system but are not limited to the storage capacity status of the waste management centers, type of waste to be collected, location, distance to cover, vessel type and capacity, etc. b. In this regard the system should facilitate (through utilization of gathered data overtime and smart analytics) in reducing the

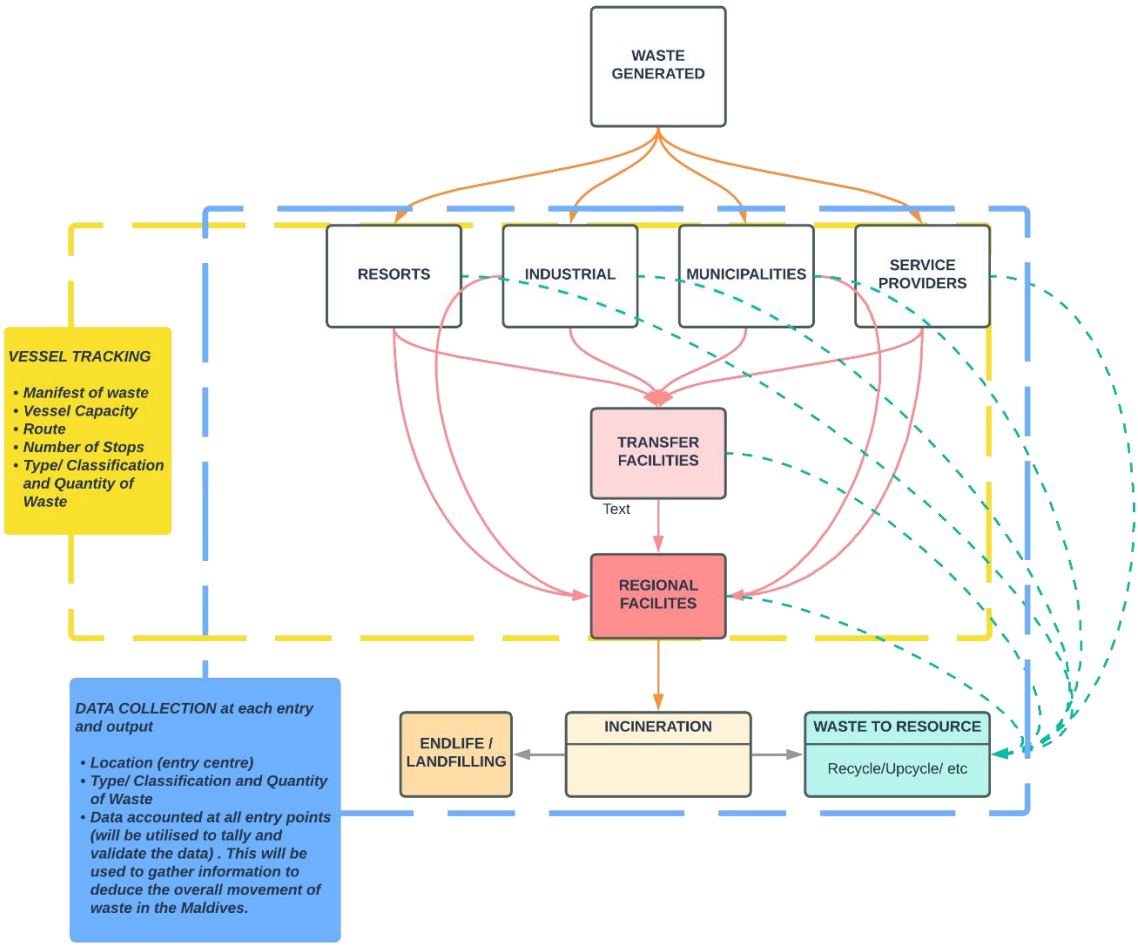
	number of unnecessary trips and travel distance and the consequent fuel used – leading to cost savings and a reduction in greenhouse gas and air pollutant emissions.  Route planning example (Nord Sense , n.d.)
Monitoring and reporting	This component involves monitoring the overall performance of the solid waste tracking system, island waste management system, waste transfer process, etc while generating reports on but not limited to the following: a. Waste diversion b. Waste movement c. Waste generation
User interface	The system should have an intuitive and user-friendly interface that allows users to easily input and access data, generate reports, and conduct analysis.
Integration	For future development the system should be designed in a way to cater/integrate other waste management systems and processes.

An overview of the Proposed system is depicted below;



Legend:	
Island Waste Management Centre (Capacity over 70 %):	
Island Waste Management Centre (Capacity between 50-70 %):	
Island Waste Management Centre (Capacity less than 50 %):	
Waste transfer facility	
Regional Waste Management Centre	
Waste transfer Vessel	
Routes suggested	
Distance covered	
Distance to be covered	

Proposed waste flow dynamics in the Maldivian context, is indicated below



6. PROJECT KEY ACTIVITIES AND TIMELINE

Accordingly the project activities and the timeline with responsivities are indicated below.

#	Activity	Details	Timeline	Responsibility
1	The hiring of a Consulting Firm by the PIU of the PLEASE project and the Establishment of a project office in Maldives	Hiring process through the PIU in Colombo	3 months	PIU/MECT
3	Enhancement and formulation of detailed project concept	Literature review: a. Explore similar smart waste monitoring systems established in the relevant context b. Analyze the types of technology and online mechanism commonly used for waste monitoring, tracking, and data collection.	1 month	Consultant
4	Stakeholder Consultations	Undertake stakeholder consultations with relevant authorities and organizations dealing with waste, including but not limited to: a. Waste Management and Pollution Control Department (WMPCD) and Environment Management and Conservation Department of the Ministry of Environment, Climate Change and Technology b. Environmental Protection Agency of the Maldives (EPA) c. Utility Regulatory Authority (URA) d. Health Protection Agency (HPA) e. Waste Management Corporation Ltd. (WAMCO), f. Maldives National Defense Force (MNDF), g. Ministry of Tourism h. Maldives Association of Tourism Industry (MATI), i. National Centre for Information Technology (NCIT) j. Local Government Authority (LGA)	1 month	Consultant/MECT/PMU

5	Conceptual design finalization	Development and presentation of the conceptual design	2 months	Consultant
6	Development of the system based on the approved concept	As per the general proposal the following needs to be included the system, but subject to change based on the final concept analysis: a. User application: A cross-platform mobile application with the ability to create different usage levels depending on the user (Island/City Councils, Waste transporter, resorts, Waste producers, Regional Waste Management Centers, Waste Transfer facilities, etc). This app should be able to log in time-stamped waste data such as waste quantities, type of waste, location, etc. b. Live central waste management database which feeds in data of waste movement through the transferring mechanisms. The database should be able to create waste categorization groups depending on the demand of the central administrator (the Ministry). c. Waste Tracking system: The system should be able to track the types and quantities of waste received at the IWMCs and resort waste management centres, those loaded to collection vessels from each island and resort, real-time location of the transfer vessels, waste received at the RWMFs from each island and resort, and how the received waste at RWMFs were processed and disposed. d. Use of smart analytics for making better informed decisions. For example: waste collection route planning, collection frequency suggestions etc.… e. Dashboard: Development of a central dashboard with viewing levels (public view, user view, central administrator view, etc.)	6 months	Consultant

		f. Citizen App: this should be a cross-platform mobile (IOS and Android) application designed as a gateway for the public to report issues in waste management to the Central Control Centre (the Ministry). The reports should have the ability to log GPS location, upload photos etc.		
7	Pilot Testing and Trouble Shooting of the System	Trial testing of the system	3 months	Consultant
8	Final Version of the System	Based on the pilot phase assessments from the System enhancement of the system where necessary and submit a final version for the approval of the client	1 months	Consultant
9	User Manual	Preparation of User Manual	1 month	Consultant
10	Training	Continuously	3 months	consultant/MECT
11	Monitoring and Technical Support		3 months	Consultant/MECT

The proposed program of implementation of the Consulting tasks is indicated below;

Deliverable Task Group	**#**	**Activity**	**Est. Duration**	**Year 1**				**Year 2**			
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	1	The hiring of a Consultant and Establishment of Office Space	3 months	X							
A	2	Enhancement and formulation of detailed project concept	1 month		X						
	3	Stakeholder Consultations	1 month		X						
	4	Conceptual design finalization	2 months		X						
B	5	Development of the system based on the approved concept	6 months			X	X				
C	6	Pilot Testing and Trouble Shooting of the System	3 months					X			
	7	Final Version of the System testing and rollover	1 month						X		
D	8	User Manual	1 month					X			
	9	Training (within 6 months)	3 months					X	X		
E	10	Monitoring and Technical Support (intermittent)	3 months					X	X		

The proposed development will be completed by the Consultant within 18 calendar months beginning from September 2023. For easy identification and monitoring purposes, the PIU has segregated deliverables into 5 categories, as indicated above and explained below.

7. Project Deliverables

In general, the scope of consultancy services will include, but not be limited to the following:

The overall plan for the principal activities and how they map to the deliverables have been set out and listed below; A summary is then prepared on approaching each deliverable, including an indicative implementation approach which will be subject to further comments from the MECTM and relevant contracting consulting parties. MECTM expects the consultant to accomplish all tasks indicated above within a time span of 18 months with the aim of accomplishing the above activities using the following indicative brief methodology and approach ;

Task A: Enhancement and formulation of detailed project concept and Stakeholder Consultations Conceptual design finalization.
Task B: Development of the system based on the approved concept, as approved by the MECTM.
Task C: Pilot Testing and Trouble Shooting of the System Final Version of the System Testing and Rollover to ensure the final requirements of the MECTM are complied with.
Task D: User Manual and Training, as required by the user division
Task D: Monitoring and Technical Support as required by the user division

Accordingly, on the basis of the indicative methodologies in brief the activities are expected to be carried out by the consultants within the first 3 months;

a. Desk review of existing literature, studies, and data sources on plastic pollution across the Maldives will be carried out. The literature and policies review will be focused on the existing status of and data available on plastic pollution in the zones and grouping of zones level to identify gaps in the data and characterization of plastic wastes based on available data.
b. Based on the research and individual stakeholder consultations, identify the data gap which is to be filled.
c. Develop a project plan and inception report for conducting primary data collection methods at different proposed sites and share it for approval and feedback with the Contracting Party and key informants; the study sites should cover the main sources and sinks in the zones and grouping of zones.
d. Analysis of collected data to produce diagnostic and quantification reports, detailing sources, and detailed breakdown of types of plastic pollution. Integration of desk research and comparative analysis of diagnostic results with global standards.
e. Road map for the Development of an End-to-End Smart Solid Waste Management system, in the Maldives, as per the scope and integration of primary data and other identified databases into the proposed End-to-End Smart Solid Waste Management system, in the Maldives.
f. Use the integrated database to Design and Development of an End-to-End Smart Solid Waste Management system, in the Maldives, including projections for future levels along three different pathways (business-as-usual, low-level intervention, and high-level intervention).

Deliverable Plan

The consultant shall furnish the following deliverables within the time span indicated below;

Tasks	**Deliverable**	**Final submitted**
Task A	Deliverable 1: Inception report on the scope of the methodology of primary data collection and other databases Enhancement and formulation of detailed project concept and Stakeholder consultations	After 4 weeks of the commencement of the Contract

	Conceptual design finalization	
Task B	Deliverable 2: Development of the draft and final system based on the approved concept	After 30 weeks of the commencement of the Contract
Task C	Deliverable 3: Pilot Testing and Trouble Shooting of the System Final Version of the System testing and Rollover	After 32 weeks of the commencement of the Contract
Task D	Deliverable 4: User Manual and Training	After 30 weeks of the commencement of the Contract
Task E	Deliverable 5: Monitoring and Technical Support	After 33 weeks of the commencement of the Contract up until the 54th week

8. PROJECT TEAM AND STRUCTURE AND ROLES

The project is to be implemented by a Project Implementation Unit (PIU) of the PLEASE project through a firm of consultants hired in coordination with MECTM with the PLEASE project financing support. MECTM and PIU opined that the following staff categories are required to carry out assignments:

1. Project Team Leader, who will ensure that;
    i. The project progresses according to the timeline;
    ii. Ensure the activities are in line with the requirements of the World Bank and PIU/SACEP and the laws and regulations of the Republic of Maldives;
    iii. Coordinate the procurement and financial aspect of the project;
    iv. Provide expertise on the environmental and social aspects of the project;
    v. Ensure the environmental and social needs of the project beneficiaries are met; and
    vi. Ensure compliance of the project with environmental and social safeguards of the funding agency and the laws and regulations of the Republic of Maldives
2. ICT Specialists will provide ;
    i. Expertise on the technical side of the project related to ICT to *Design and Development of an End-to-End Smart Solid Waste Management system, in the Maldives;*
    ii. expert feedback on the development of the system;
    iii. Ensure the system complies with the requirements specified; and
    iv. Ensure the system functions according to the requirements.

The Consulting Firm will be appointed by PIU of the PLEASE project and will function in coordination with the MECTM, with the activities overseen and closely monitored by the Research

and Development Section of the Waste Management and Pollution Control Department of MECTM. The staff of the PIU will be working closely with the dedicated officers of the MECTM and the Waste Management and Pollution Control Department of the Ministry of Environment, Climate Change and Technology(MECTM). Ensure proper monitoring of the implementation of the project, the out-of-pocket expenses and cost of transportation together with their per diem incurred by the staff assigned for the purpose of supervision and monitoring of the Consultant's work and their peridium will be will be reimbursed through the project funds.

9. STAKEHOLDERS, AND STAKEHOLDER ENGAGEMENT

The success of the proposed project depends on the participation and support of key stakeholders throughout the development and implementation processes. Accordingly, the Consultant needs to have a closer dialog with the following key stakeholders;

a. Waste Management and Pollution Control Department (WMPCD), MoECCT
b. Environment Management and Conservation Department, MoECCT
c. Environmental Protection Agency (EPA)
d. Utility Regulatory Authority (URA)
e. Health Protection Agency (HPA)
f. Waste Management Cooperation ltd. (WAMCO)
g. Maldives National Defense Force (MNDF)
h. Maldives Association of Tourism Industry (MATI), MoT
i. National Center for Information Technology (NCIT)
j. Local Government Authority (LGA)
k. Island Councils
l. Atoll Councils
m. Regional Waste Management Centers (RWMF)
n. Transfer facilities (TF)
o. Island Waste Management Centers (IWMCs)

Stakeholders will be involved with the project team during the stakeholder engagement process, which will include consultations, meetings, and workshops. All stakeholders will be provided with the benefits of stakeholder engagement as well as a detailed plan for how stakeholder engagement will be carried out, including timelines, responsibilities, and expected outcomes.

10. **Estimated total person-months.** The consultants will be comprised of a team of 91 man-months including non-key and key staff as follows;

Key task	Key staff	Non-Key staff
The development of a Dashboard for the IT Solution	33	35

The Consultant will be paid according to the **time spent** and other out-of-pocket expenditures with evidence throughout the duration of the consulting assignment. The team will be headed by the Team Leader. The detailed breakdown of the person-months for each required expert is given in Section III (Team Composition and Qualification Requirements for Key Experts).

III. TASKS

11. COMPOSITION OF THE TEAM

The team will leverage expertise from local consultants of Maldives. An indicative list of the positions of key staff for the firm of consultants who will be evaluated during the technical evaluation process is given below (note that the list does not include support staff for fieldwork and other activities such as data collection, documentation, etc.). The consultant may enhance the utility of expertise by proposing their own estimate of the required number of positions/person months to carry out the assignment.

The teams

Two teams will be deployed to this work, including (i) a project management team, (ii) a technical experts and analysis team, combining a blend of in-depth country insight, and global expertise, drawing on experience with governments around the world.

A. Project management /Leadership team

The project management/ leadership team will oversee the project. The project leadership team will provide quality assurance on final deliverables, ensuring that the work draws on all collaborating forms' collective regional and global experience.

A dedicated Project Leadership team will oversee the development of the project, including managing relationships with key leaders and stakeholders in the government and private sphere, facilitating individual consultations and project planning documents and selecting critical meetings, and leading the development of the final deliverables. The Project Leadership team will serve as overall project managers, acting as a lead point of contact for the PIU.

B. Technical experts and analysis team

The Team Leader will lead experts, drawing on the wider expert pool as required, and work to bring subject-level expertise to the project, particularly as related to the design, implementation, and monitoring of the proposed IT-based data collection and monitoring system to the MECTM;

Team composition for the development of a IT Solution of Design and Development of an End-to-End Smart Solid Waste Management system, in the Maldives

Description	**Total Man months**
Key staff	
Team Lead/Database management expert	12
Backend Developer 1	8
Frontend Developer 1	8
User Interface (UI) and User Experience (UX) (UI/UX)	5
Non key staff	
Frontend Developer 2	12
Backend Developer 2	12
Backend Developer 2	12
Mobile Developer 2	10
DevOps (development (Dev) and IT operations (Ops)1	6

Quality Assurance1	6
Total	**91**

In addition to the above-listed positions of professionals, the consultant should decide and submit CVs at the proposal submission stage for other experts and support professionals with adequate experience in relevant fields match to approximately **91 Man-months**. During the technical evaluation process, non-key staff will not be evaluated individually. However, they will be considered collectively along with other support staff, if any, under the "Work Schedule and Staffing" criteria of evaluation.

IV. TERMS OF REFERENCE OF CONSULTANTS

12. Generally, each individual consultant will work under the direct guidance/supervision of the designated team leader of the firm of consultants in close consultation with the Ministry of Environment, Climate Change and Technology of Maldives (MECTM). The outline terms of reference of the individual consultants are briefly described below.

13. Composition of Key Staff

a. Project Team Leader /Database management Expert

The expert should have an Advanced University Degree (Master's or equivalent) preferably in Information Technology and Business Administration/ or a related field is required. An expert should have a minimum of 10 years of experience in the relevant field as a Team leader/project manager together with database management, or development of similar system experience, of a minimum of 5 years. A first-level university degree (Bachelor's or equivalent) with (2) two additional years of experience may be accepted in lieu of the Advanced University Degree. The Team Leader should have work experience in the plastic waste management field.

b. Backend Developer 1

A master's degree, preferably Computer Science, or another relevant discipline with a minimum of experience of 5 years is required. A Bachelor's degree in combination with additional two years of experience may be accepted in lieu of a master's degree. Secondary education in combination with additional six years of experience may be accepted in lieu of a master's degree.

c. Frontend Developer 1

A master's degree, preferably in computer science, information systems, information technology, or other relevant disciplines with a minimum of 5 years of experience is required. A Bachelor's degree in combination with additional two years of experience may be accepted in lieu of a master's degree. Secondary education in combination with an additional six years of experience may be accepted in lieu of a master's degree.

d. UI/UX

A Bachelor's degree in computer science, computer engineering or a related field with a minimum of 5 years of experience in the relevant field is required. Secondary education in combination with additional five years of experience may be accepted in lieu of a Bachelor's degree.

14. Composition of Non-Key Staff

a. Backend Developer 2 Positions

A Bachelor's degree in Computer Science or another relevant discipline with a minimum of 2 years of experience is required. Secondary education in combination with additional five years of experience may be accepted in lieu of a Bachelor's degree is required.

b. Frontend Developer 2 Positions

A Bachelor's degree, preferably in computer science, information systems, information technology, or other relevant disciplines, with a minimum of 2 years of experience is required. Secondary education in combination with additional five years of experience may be accepted in lieu of a Bachelor's degree.

c. Mobile Developer-1

A Bachelor's degree, in computer science, information systems, mathematics, statistics, or a related field with a minimum of 3 years of experience in the relevant field is required. Secondary education in combination with additional five years of experience may be accepted in lieu of a Bachelor's degree.

d. Mobile Developer 2

A Bachelor's degree, in computer science, information systems, mathematics, statistics or a related field with a minimum of 2 years of experience in the relevant field is required. Secondary education in combination with additional five years of experience may be accepted in lieu of a Bachelor's degree.

e. DevOps

A Bachelor's degree in computer science, computer engineering or a related field with minimum 10 years of experience in the relevant field is required. Secondary education in combination with additional five years of experience may be accepted in lieu of a Bachelor's degree.

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f. QA

A Bachelor's degree in computer science, information technology or a related field with minimum 5 years of experience in the relevant fields required. Secondary education in combination with additional five years of experience may be accepted in lieu of a Bachelor's degree

V. REPORTING REQUIREMENTS AND TIME SCHEDULE FOR DELIVERABLES

15. The total duration of the assignment is expected to be 91 man-months for the Selected consultants, and the consultant team will focus its efforts to facilitate the activities identified in the TOR. The selection of the consultancy firm will be based on the Consultant Qualification Selection basis (QCBS) method with a quality-cost ratio of 80:20. Additionally calling for a Full Technical proposal will be used at the time of calling for proposals. All consultants, including the firm and individuals, will be recruited in accordance with World Bank 's 'Procurement Regulations for IPF Borrowers'(Procurement in Investment Project Financing- Goods, Works, Non-Consulting and Consulting Services, July 2016 Revised November 2017 and August 2018), setting forth the World Bank's policy on conflict of interest.

16. The consultant will develop the quarterly progress report format in consultation with the Ministry of Environment, Climate Change, and Technology, which will meet the requirements of the World Bank/SACEP requirements. An inception report and interim reports will be prepared. A draft final report will be submitted to the World Bank/SACEP as stated below. World Bank's /SACEP comments, and the comments of the Ministry of Environment, Climate Change, and Technology will be provided before the commencement of the dissemination stage. In addition, the Consultant will prepare any reports required in relation to the project as requested by the SACEP/ Ministry of Climate Change Maldives. The deliverables expected in this consulting service are explained in section 7 of TOR.

VI. CLIENTS' INPUT AND COUNTERPART PERSONNEL

The following condition will be applicable to this requirement:

a) The Consulting Firm shall use its own office and other resources to provide the services under TOR.
b) The MECTM of Maldives /SACEP will have strict reporting requirements which will be agreed upon with the contracting party at the outset of the project. The Consultant will report progress on all deliverables and milestones in an agreed timeline and will report any deviations or issues at regular intervals. Different teams within the consulting team will also have to strictly report to the overall project leadership team with regular updates.
c) The Consultant will also report to the MECTM and regular periodic updates will be given on the status of implementation. The Ministry will provide nominated officials who will receive these updates and look over the assignment.
d) The project will contain a strong monitoring and evaluation process to ensure overall deliverable quality and accuracy, including regular checks of the data collection team, regular check-ups of the report-writing process, and stakeholder engagement process.
e) The Inception Report will also include a detailed success factor analysis, laying out the processes, tools, plans, skills, communication methods, and management techniques that will be used to ensure the success of the project. The project will be evaluated against this metric at regular intervals to ensure adherence to overall project success and quality.

17. Services, facilities, and property to be made available to the consultant.

The Ministry of Climate Change of Maldives will provide available reports, data, and information relevant to Consulting assignments and the office space. A provisional sum of US$ 10000 has been allocated for office furniture for team leaders, managerial officers, and other office staff. The equipment and furniture purchased under this item are considered the property of the Project. However, the consultants must make the arrangements for obtaining the required utilities such as computers, stationery, telephone, and internet facility, etc.

18. Professional support counterpart personnel to be assigned.

They will provide adequate counterpart support to the consultant's team for this assignment and their cost incurred will be reimbursed under the project.

VII INFORMATION TO FACILITATE PROPOSAL

19. Upon written request from the consultants, the Ministry of Climate Change will provide the consultants with all available data.