INTEGRATION OF TECHNOLOGIES (DRONE, SATELLITE IMAGERY AND GIS) INTO EXISTING LAND USE PLANNING PROCESSES

TECHNICAL DESCRIPTION

Maldives being formed of Small low-lying geographically diapered islands, the communities are living in very close proximity to the shoreline and highly exposed to risks associated with coastal hazards such as sea swells, sea level rise. Climate change impacts have increased many folds over the past few decades. Over 80% of the total land area of the Maldives is less than 1 m above mean sea level (MSL). Approximately 44% of the settlement footprints of all islands are within 100 m of the coastline and more than 50% of the housing structures in islands are within 100 m of the coastline.

One of the main challenges to implement impactful adaptation in Maldives is lack of contextualized and quantifiable historical and monitoring data and information on island to atoll level disaster risks, coastal erosion, flood prone areas, land uses biodiversity etc, as data acquisition is challenging for various parameters such as coastal, terrain, infrastructure, geology, weather history and hydro meteorological events etc to use for the decision-making purpose. To build resilience of natural environment and cope with climate adaptation Integration of technologies (drone, satellite imagery and GIS) into existing land use planning processes will facilitate identification of areas at risk of land loss, flooding etc., and help to identify and prioritise mitigation and response efforts to coastal risks and strengthens other adaptation options, such as coastal erosion, island dynamics flood mitigation measures, emergency planning, provision and evacuation planning.

Integrated Land Use Planning (ILUP) using drone mapping, high resolution satellite imagery and GIS are vital technologies for appropriate land use planning and to address climate change related vulnerabilities of islands. It creates easily-read, rapidly-accessible visual maps which facilitate the identification of areas at risk of erosion flooding etc., and also helps prioritise mitigation and response efforts. Such maps contribute to increase awareness of the likelihood of climate risks among the public, local authorities and other organizations and serve as an indispensable resource for integrated planning. Hence the Integration of technologies (drone, satellite imagery and GIS) into existing land use planning processes is important for CCDRM and coastal adaptation.

CURRENT TECHNOLOGY READINESS LEVEL OR COMMERCIAL READINESS INDEX

Technology Readiness Levels (TRL)

TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)

Commercial Readiness Index

Level 4 - Multiple commercial applications

CLIMATE RATIONALE OF THE TECHNOLOGY

- Integration of technologies in the LUP process can strengthen other adaptation options, such as coastal erosion, island dynamics flood mitigation measures, emergency planning, provision and evacuation planning..
- The technology is appropriate for present and future climatic conditions

- implementation of the technology could contribute and help for the protection against coastal flooding, storm surges and erosion, greatly contribute to protection of critical infrastructures particularly in the vicinity of coastline
- can also be implemented as part of a wider coastal zone management plan which employs other technologies.
- Understand measure required to stabilizes shorelines and reduces erosion
- Plan could be used to identify and minimize risks from storm surge and storm driven waves

Economic and Social

- Minimize the economic loss from disasters and extreme hydro-meteorological extreme weather events due to proper planning and preparedness
- People will feel more secure and safer and protected with better designs and protection measures.
- Livelihood and properties of people will be better protected from extreme weather-related disasters.

Environmental

- Strengthen disaster risk reduction and reduce the country's vulnerability to climate risk and extreme weather events
- Strengthen climate data and subsequent modelling capacity while promoting collaboration among relevant agencies
- Enhance the adaptive capacity of the country

AMBITION OF THE TECHNOLOGY

The overall ambition of Integration of technologies (drone, satellite imagery and GIS) into existing land use planning processes will be used for flood mapping, coastal ecosystems mapping, bathymetry and current mapping to better understand waves dynamics in order to allow for better planning of coastal restoration and protection measures. This is important to make evidence-based informed decision with the understanding of the carrying capacity of islands and adaptation to CCDRM. Establish, database, modeling and GIS platform for data analysis and integrated land use planning for decision support system and decision making to ensure that climate change is integrated into development planning and decision-making process.

SCALE FOR IMPLEMENTATION AND TIME-LINE

The technology is widely used in the private sector and some Government offices. High resolution mapping is required because the islands are small and the beach widths, length and area are small and the magnitude of change is also small. Therefore, centimeter level accuracy is required to determine the changes. Use High-resolution satellite images to assess island dynamics, LULC changes, shoreline shifts, vegetation cover, and urban development, Drones data, Use photogrammetry techniques to create 3D models and orthomosaics. Integration of satellite and drone date with GIS to create spatial databases to store and manage data and develop ILUP.

This project can be planned within a 2-3 year timeframe but the implimentation can go up to 10 years.

AMBITION FOR TECHNOLOGY READINESS LEVEL OR COMMERCIAL READINESS INDEX

Technology Readiness Level
TRL 9 – actual system proven in operational environment
Commercial Readiness Index
Level 6 - "Bankable" grade asset class

EXPECTED IMPACTS OF THE TECHNOLOGY

- Promote use of evidence-based decision making on coastal adaptation planning and management of coastal zones.

- Reduce exposure of communities to coastal hazards.
- Mainstream climate change risks into coastal development policies.
- Continue to facilitate investments in coastal protection of inhabited islands, industrial islands and resorts
- Strengthen the early warning systems and disaster risk management.

POLICY ACTIONS FOR TECHNOLOGY IMPLEMENTATION

EXISTING POLICIES IN RELATION TO THE TECHNOLOGY

Existing laws and policies integration of technologies for LUP planning process includes the following:

- Climate Emergency Act (9/2021)
- Guidance Manual for Climate Risk Resilient Coastal Protection in the Maldives
- Regulation for Protection and Preservation of Island Vegetation and Flora in the Maldives
- Ground Water Conservation Regulation (2021/R-22)
- Guidelines for building climate resilient safer islands in the Maldives
- National Strategic Framework to Mobilize International Climate Finance to Address Climate Change in the Maldives 2020- 2024
- National Communication (NC) to the United Nations Framework Convention on Climate Change (UNFCCC)
- Maldives First Biennial Update Report (BUR) to the UNFCCC
- National Community-Based Disaster Risk Reduction (DRR) Framework
- Disaster Management Act (DMA) (2015)
- Scaling up early warning systems implementation roadmap 2023-2027
- Maldives Integrated National Financing Framework (INFF) Gender-Responsive Climate Financing Strategy 2023

PROPOSED POLICIES TO ENHANCE TECHNOLOGY IMPLEMENTATION

- Policy to reduce the high capital cost of survey equipment
- Establishing data sharing protocols within the government agencies and private sector
- Amendment of existing regulation on engagement of locals and expatriates in mapping monitoring and surveying projects
- Overall policy for building capacity, raising awareness, and developing long and short-term courses in mapping GIS and surveying data science related disciplines
- Awareness raising on climate change integration of surveying, mapping, monitoring and modeling technologies into LUP.
- Use IKLK in LUP development

COSTS RELATED TO THE IMPLEMENTATION OF POLICIES

The TAP is estimated at ~USD 8,835,000.00, 88% funded through donor, 8% combined donor and GOM funds and 3 % from the Government budget.

Estimated budget for the PI 1 (Obtaining multiple satellite images set and drones to assess island dynamics, LULC change and erosion monitoring) is USD 10,700,000.00 over 10 years timeframe.

Estimated budget for the PI 2 (Habitable multi-purpose shore protection structures for Climate proofing through Ecosystem Based Adaptation (EbA)) is 1,200,000.00 USD over 5 years timeframe

USEFUL INFORMATION

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LINKS TO TNA REPORTS

MEE (2012). Formulation of Guidelines for Climate Resilient Coastal Protection in Maldives - Report 8 – Final Guidelines. Ministry of Environment and Energy and United Nations Development Programme

MEE (2015). Survey of Climate Change Adaptation Measures in Maldives. Malé, Maldives: Ministry of Housing and Environment.

National Strategic Action Plan (NSAP 2019 -2023), Presidents office, Government of Maldives

https://unfccc.int/ttclear/tna/guidance.html