THE ADOPTION & DIFFUSION OF ROCKS REVETMENT IN LIBERIA

TECHNOLOGY DESCRIPTION

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A revetment is a sloped seaward structure of hard engineering option which protects against erosion caused by wave actions, storm surge and tidal effects. It is often built with boulders (rocks), concrete or other durable materials to protect a scarp, shoreline, embankment or sand dune against erosion. As climate change induced coastal erosion vulnerabilities and risks have become a national concern in Liberia, the application and adoption of rocks revetment option is necessary and could easily be widely adopted nationally due to the availability of ideal rocks quarries. The construction of revetments provides jobs opportunities; they protects vulnerable coastal communities from the impacts of coastal erosion; they promote the creation of coastal habitats and many more. Considering the future projections of increasing sea level rise and the level of vulnerability across Liberia's coastal communities, it is highly important to adopt coastal adaptation measures.

CURRENT TECHNOLOGY READINESS LEVEL OR COMMERCIAL READINESS INDEX

The current Technology Readiness Level (TRL) for the adoption of rocks revetments technology in Liberia meets the *TRL 8 (TRL 8: system complete and qualified)*; this means that the technology's national readiness level has met TRL 1 to 7 as indicated below. This TRL status of revetments in Liberia covers the *EU-HLG Technological Research (pillar 1)* and the *KET Pilot line and demonstration projects (Pillar 2).* As such, the *TRL 1 to 7* that have been met are specified below.

- TRL 1 – basic principles observed;
- TRL 2 – technology concept formulated;
- TRL 3 – experimental proof of concept;
- TRL 4 – technology validated in laboratory;
- TRL 5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies);
- TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies);
- TRL 7 – system prototype demonstration in operational environment;

CLIMATE RATIONALE OF THE TECHNOLOGY

The direct impacts of climate change induced coastal erosion and flooding have become some of the alarming climate change risks currently affecting coastal cities and communities along the majority of Liberia's coastline. The impacts of coastal erosion and flooding are currently disrupting livelihoods, destroying properties and coastal ecosystems while

leaving many residents in coastal communities homeless due to the lack of sustainable approach to adapt to or mitigate the direct threats presented to the communities. Hence, if immediate and sustainable actions are not taken to mitigate or adapt to climate change, the situation will worsen.

It is therefore for the above reasons that rocks revetment is being prioritized for adoption and diffusion across vulnerable coastal communities in Liberia. The revetment will protect the beach, shoreline, embankment or sand dune against erosion. It minimizes the destructive and hazardous risks to coastal ecosystem, vegetation, sand dunes and important infrastructures. The revetment will build the resilience of affected and vulnerable coastal residents. It is in this regard that the technology is targeted for the most high risk and vulnerable cities/ communities with alarming and destructive impacts of coastal erosions that require a quick fix alternative/ solution in Liberia. Revetments that are in continuous contact with the water promote the formation of coral reefs and attract many coastal species. This option of coastal defense helps to stabilize the beach environment and its related ecosystems. In general, it reduces coastal vulnerability to climate change impacts and in so doing; it also protects lives, properties and the shoreline from coastal erosion and flooding impacts.

AMBITION OF THE TECHNOLOGY

SCALE FOR IMPLEMENTATION AND TIME-LINE

The action plan for the rocks revetment Technology is expected to be implemented for a period of ten years (2021-2031). After said duration, it is highly recommended to be reviewed and updated as per the current/ prevailing future situation following a needs assessment and gap analysis. The revetment is to be adopted, transferred and diffused at the national level across all coastal areas with focus on the most vulnerable and at risk communities.

AMBITION FOR TECHNOLOGY READINESS LEVEL OR COMMERCIAL READINESS INDEX

The TRL ambition for the rocks revetment technology is at least *TRL 8 as of the year 2023. The TRL 8 = system complete and qualified.* The ambition for the technology action plan as it relates to the revetment aims to have the technology adopted, transferred and diffused as a climate change adaptation technology across all highly vulnerable coastal erosion and flood areas in the coastal zone of Liberia.

EXPECTED IMPACTS OF THE TECHNOLOGY

The adoption and deployment of the rocks revetment across highly vulnerable and affected coastal communities will indeed improve the resilience of the community to the impact of climate change induced coastal erosion and its associated impacts. With this, the coastal defense will have a positive impact on the lives of vulnerable residents. In so doing, socio-economic activities, properties and the coastal environment including its ecosystems and habitats will be protected and conserved. As such, these positive results will encourage coastal residents to improve their livelihood activities and socio-economic development and will promote sustainable environmental management.

POLICY ACTIONS FOR TECHNOLOGY IMPLEMENTATION

EXISTING POLICIES IN RELATION TO THE TECHNOLOGY

Nationally Determined Contribution of Liberia (NDC), 2021: Liberia's revised NDC is the nation's 5 years commitment submitted to the UNFCCC. The NDC indicates Liberia's commitment to climate change adaptation targets for eight sectors: Agriculture, Forests, Coastal zones, Fisheries, Health, Transport, Energy and Waste; as well as cross-cutting

targets for urban green corridors. The coastal sector's adaptation targets include the construction or implementation of coastal protection systems such as hard engineering methods and also green/ gray environmentally sustainable measures. "***NDC (2021),*** *Nationally Determined Contribution of Liberia; submitted to the UNFCCC on August 4, 2021".*

National Policy and Response Strategy on Climate Change (NPRSCC) of 2018: The climate change policy and strategy document is prepared in order to ensure that climate change adaptation and mitigation issues are mainstreamed at policy level and in key sectorial and cross-sectorial development efforts. The NPRSCC includes concrete policy and measures in specific areas on climate change adaption and mitigation, action and resource mobilization plans and monitoring and evaluation framework. "***NPRSCC (2018),*** *National Policy and Response strategy on Climate change Liberia, NUDRR Prevention Web, viewed 8 October 2021".*

National Disaster Management Policy of Liberia (NDMP), 2012: The NDMP provides an overall framework for disaster management in Liberia. It particularly aims at integrating risk reduction as appropriate into development policies and planning at all levels of government; including the environment, land, agriculture & forestry sectors, coastal areas and etc.

PROPOSED POLICIES TO ENHANCE TECHNOLOGY IMPLEMENTATION

The TNA TAP report proposed the strengthening and enforcement of existing zoning laws and building codes in coastal areas (along the beaches) in terms of the adoption, implementation and diffusion of the rocks revetment across vulnerable coastal communities in Liberia in order to protect lives, properties and the environment.

With respect to the above policy action, below are the associated activities intended to make the proposed policy action work.

- MPW & LLA to conduct a desk review of the existing zoning laws and building codes; if applicable, strengthen to avoid the construction of private / residential building along and very close to the beach.
- MPW & LLA to give a specific demarcation / limit in length from the shore (beach sand) where all residential construction must stop.

COSTS RELATED TO THE IMPLEMENTATION OF POLICIES

The cost for the implementation of the above mentioned policy action and its related activities for the implementation and diffusion of the rocks revetment is estimated to be about US $75,000.00 (Seventy-five thousand United States dollars). The detailed costs for this policy action and that of each related activity are available in the TNA TAP report at https://tech-action.unepdtu.org/country/liberia/

USEFUL INFORMATION

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LINKS TO TNA REPORTS

1) Liberia's sub-page on the TNA website *https://tech-action.unepdtu.org/country/liberia/*
2) Environmental Protection Agency of Liberia's website https://www.epa.gov.lr/
3) Liberia's Environmental Knowledge Management System website https://ekmsliberia.info/
4) Diversified information for the country https://www.emansion.gov.lr/