

Re-use of dredged sediments for sustainable mangrove forests development

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Introduction: Jan De Nul Group has a long-standing presence in Ecuador, particularly since 2018, when a 25-year concession contract began for performing maintenance dredging for the Access Channel to the ports of Guayaquil. This area is part of the Guayas river delta and is covered by mangrove forests. Mangroves are among the most productive ecosystems and provide a long list of important ecosystem services. For example, they: i) protect coastal communities from flooding, erosion and extreme weather events; ii) have a strong ability to capture and store carbon with their “carbon sequestration rate” being even higher than that of the terrestrial tropical forests [1], iii) are biodiversity ecosystems with high biodiversity rates and limited to tropical regions, iv) perform water purification; and v) contribute to the subsistence of local forest-dependent communities and their livelihoods. However, in the last few decades there has been significant loss of mangrove habitats in the Guayas delta [2], mainly due to land use change driven by intensive shrimp aquaculture activities, agriculture, and urban and rural settlements. At the same time, mangrove loss intensifies coastal safety problems, making the land around the Guayas river delta more exposed to floods and erosion [3].

Based on the above, the new innovation project AquaForest was introduced in January 2023. Within AquaForest, dredged material from the Access Channel of Guayaquil will be reused in a circular and sustainable way for the reclamation of an island for the creation of a mangrove habitat, within the area where modelling results have shown that sediment starts to be deposited naturally. The AquaForest project consortium is coordinated by Jan De Nul Group and is composed of two large international companies (Jan De Nul Group and South Pole), two Flanders-based consultants (Mantis Consulting and Haedes), three universities (ESPOL, University of Antwerp and VUB), and one NGO (Fundación Calisur).

Methods: The AquaForest project concept is based on the development of “green-grey infrastructure”. This approach combines conventional engineering techniques for land reclamation with the circular reuse

of dredged material to create a mangrove forest through assisted afforestation, in first instance. At the same time, the methodology focuses on establishing the initial conditions (mainly referring to sediment characteristics and hydraulic conditions) that are ideal for the growth of mangrove propagules, the proliferation of new accompanying tree seeds and the colonization process of associated biodiversity (micro and macro fauna). The new mangrove habitat will be developed on a new intertidal flat created in the Guayas river delta, located 15km NE of Posorja.

Results: Even though mangrove restoration is widely applied worldwide, AquaForest is an unprecedented project in the region due to the innovative reuse of dredged sediments for the creation of a new habitat. As such, AquaForest will become a Nature-based-Solutions (NbS) ‘Living lab’ where important mangrove ecosystem services will be demonstrated i.e. protection against floods, biodiversity gain and socio-economic benefits (the latter, with a special focus on local communities and gender inclusiveness). Importantly, technical and economic feasibility of such NbS will be demonstrated through the ‘AquaForest Living Lab’. Moreover, international collaboration between key stakeholders will be the basis of AquaForest, i.e. co-creation between private companies, public institutions (state and local governments, and municipalities), international organisations, local communities and citizens, NGOs, universities and researchers.

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