

Nature-based solutions for restoring and developing new mangrove habitats through eco-engineering

Drouet Cruz Huran Tonalli¹ and Stratigaki Vicky^{2,3}

¹ Vrije Universiteit Brussel (VUB), Pleinlaan 2, 1050 Brussel, Belgium

E-mail: huran.drouet.cruz@vub.be

² Jan De Nul Group, Tragel 60, 9308 Aalst, Belgium

³ Faculty of Engineering and Architecture, Ghent University, Jozef Plateastraat 22, 9000 Gent, Belgium

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 port of Guayaquil. This area is part of the Guayas river delta and is covered by mangrove forests that provide important ecosystem services. However, in the last few decades there has been significant loss of mangroves in the area, which intensifies coastal safety problems, as the land around the Guayas river delta becomes more exposed to floods and coastal erosion. In response to this, the AquaForest innovation project was introduced in 2023. Dredged material from the Access Channel of Guayaquil will be reused for the first time in a circular and sustainable way to create a new mangrove habitat on a new intertidal flat created in the Guayas river delta, located 15km NE of Posorja. AquaForest will become a 'Nature-based-Solutions' (NbS) Living lab where important mangrove ecosystem services will be demonstrated and monitored such as protection against floods, biodiversity gain, carbon sequestration and socio-economic benefits for the local communities. 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 mangroves through assisted afforestation. At the same time, the initial conditions will be created (e.g. sediment characteristics, hydraulic and hydrodynamic 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), though suitable eco-engineering of the project site. Part of the project also focuses on the study of upscaling of this type of Nature-based-Solutions. As such, knowledge obtained from this pilot project regarding the implementation and monitoring of mangrove NbS will be employed in the upscaling of the AquaForest concept in future projects across the region and around the world, particularly in areas where mangrove forests serve as vital components of local ecosystems. AquaForest demonstrates co-creation between private companies, public institutions, international organisations, local communities and citizens, NGOs, universities and researchers. The project is a collaboration between Jan De Nul Group, Mantis Consulting, HAEDS, Escuela Superior Politécnica del Litoral, Free University of Brussels, University of Antwerp, South Pole, and the Calisur Foundation. The project furthermore has the full support of the Ecuadorian Ministry of Environment, Water and Ecological Transition (MAATE) and all other important local stakeholders. Acknowledgements: AquaForest is supported by the Government of Flanders (NL: "Departement Omgeving") through the G-STIC Climate Action Programme 2022, and The International Union for Conservation of Nature (IUCN) through the 'Blue Natural Capital Financing Facility'.

Keywords

NbS; Mangrove; Restoration; Ecuador; Eco-engineering