



Airport Name: Aéroport International Martinique Aimé Césaire

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Project's Name: EcoSlope: Vegetated stabilisation of a stormwater channel bank in the general aviation area

Executive Summary

Located in the Caribbean region, Martinique Aimé Césaire International Airport supports regional connectivity through general aviation and small-aircraft services between islands. Along the southern edge of the general aviation apron, an embankment borders one of the airport's main stormwater drainage channels. This channel is a natural habitat for many different species. Repeated exposure to tropical rainfall has progressively eroded the bank, posing a long-term risk to this strategic infrastructure.

In Martinique, such erosion typically prompts the use of heavy structural protection, including sheet pile walls and concrete structures. These established solutions offer durability but often require substantial quantities of imported materials, carry embodied carbon emissions and permanently alter the soil/water interface. Nearby sensitive utilities also increase the risk of pile driving disrupting services and the power supply to navigation aids.

The airport's study reassessed this conventional approach. The estimated shear stress from water flowing along the bank reached 30.2 N/m^2 , compared with an allowable shear stress of approximately 120 N/m^2 for a well-established vegetated slope.

EcoSlope grew from this assessment. The project proposes stabilizing $3,880 \text{ m}^2$ of slope and 260 meters of bank through hydroseeding. The process sprays a mixture of selected seeds, mulch fibers and binding agents onto the slope. The mulch and binding agents provide initial surface protection. As vegetation establishes, root development progressively reinforces the soil.

The airport will monitor this pilot site through a georeferenced campaign combining fixed photographic stations, erosion pins, a gully inventory, rainfall data and automated analysis of vegetation cover. At this stage, EcoSlope presents assessment findings and design calculations. The innovation lies in proportionate, measurable and repeatable engineering designed to strengthen the resilience of island airport infrastructure while reducing reliance on hard engineering solutions.

Projects results and benefits

At this stage, EcoSlope draws on engineering findings and an initial site assessment to measure the solution's performance objectively over time.

The hydraulic study establishes a design shear stress of 30.2 N/m² in the channel, well below the allowable value of approximately 120 N/m² adopted for dense, mature and well-established grass cover. The vegetated solution is therefore designed to withstand the expected hydraulic loads while protecting soils exposed to runoff.

EcoSlope has an estimated cost of €50,000, compared with €1.8 million for sheet pile reinforcement. The sheet pile option would have required nearly 580 tons of imported steel and associated freight. Under the assumptions adopted for the environmental comparison, avoiding this option saves approximately 920 tCO₂e in embodied emissions. Choosing vegetation also avoids pile driving near sensitive utilities, reducing the risk of damage affecting service continuity and certain navigation aids.

The team has established a baseline before works across the 3,880 m² of slope and 260 m of bank. The initial assessment records approximately 30% vegetation cover and shrinkage cracks indicating soil desiccation. Eleven erosion pins will track slope and bank retreat alongside rainfall totals, rainfall intensity and antecedent dry periods.

The evaluation will focus on three objectives: establishing continuous vegetation cover, reducing erosion and sediment inputs to the channel, and maintaining a vegetated soil–water interface rather than an impermeable vertical wall.

EcoSlope therefore contributes to targets 13.1, 15.3 and 9.1 of the United Nations Sustainable Development Goals, addressing climate resilience, restoration of degraded land, and sustainable and resilient infrastructure respectively.

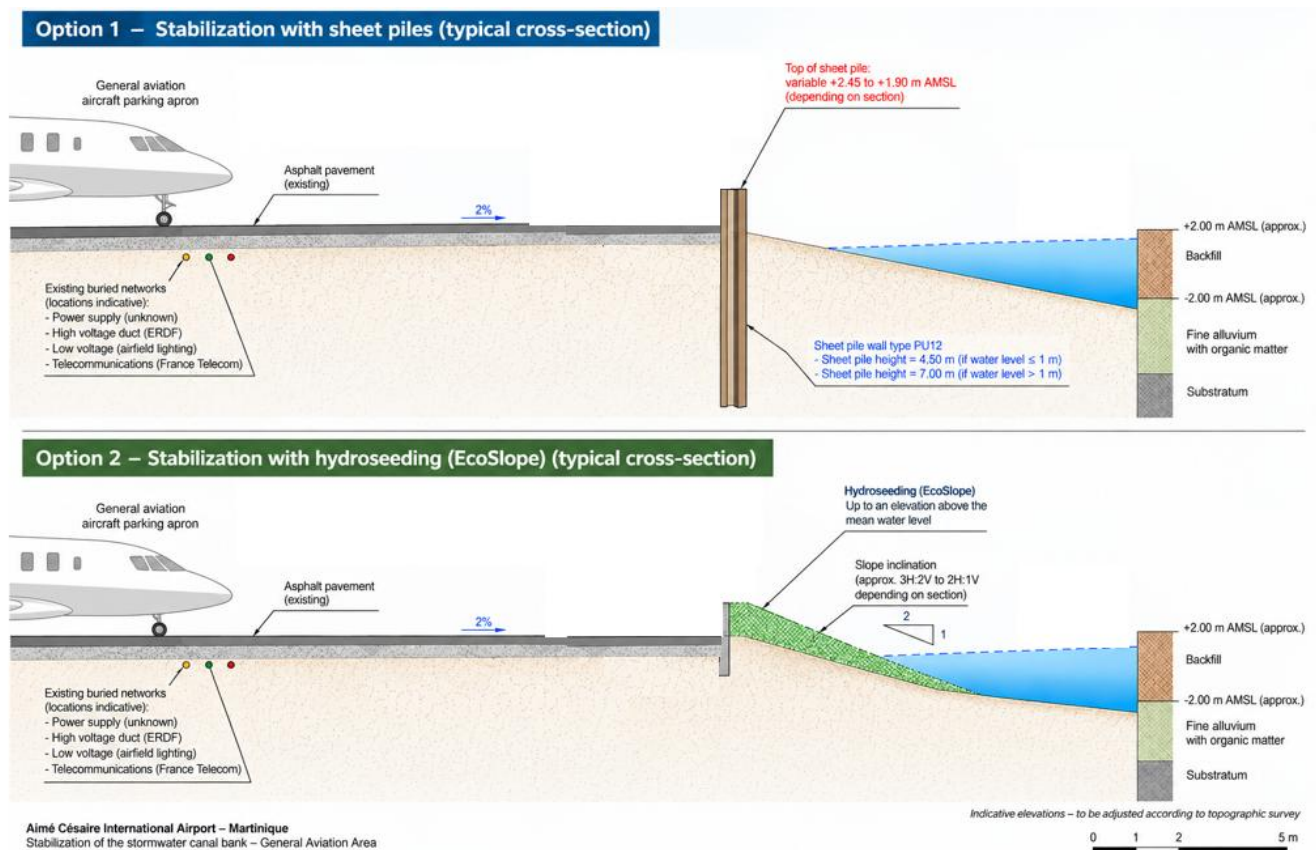


Figure 1. Cross-section showing the solutions considered

Option	Allowable shear stress	Investment cost	Imported materials	Estimated embodied carbon	Comments
Bare bank (existing condition)	4,5 N/m ²	—	—	—	Applied shear stress of 30.2 N/m ² , nearly seven times the resistance of the exposed cohesive soil.
Open-top concrete box culvert 2 × 3 m	Rigid, non-erodible lining	≈ 1 460 000 € excl. VAT (contractor's quotation)	≈ 190 m ³ of cast-in-place concrete + 200 meters of precast units	≈ 170 tCO ₂ e	Diversion of the channel by a 200 meters cofferdam, 950 m ³ of excavated material, night-time installation of the L-shaped retaining walls. Soil–water interface eliminated.
Sheet pile wall	Rigid, non-erodible wall	≈ 1 800 000 € excl. VAT	≈ 580 t of steel + maritime freight	≈ 920 tCO ₂ e	Permanent soil sealing. Pile driving in the immediate vicinity of the networks supplying the navigation aids.
EcoSlope hydroseeding	≈ 120 N/m ² (established cover)	≈ 50 000 € excl. VAT	Seed, fibers and binder	No steel, no concrete	Safety margin of a factor of 4 on the applied stress. Cost 29 to 36 times lower. No earthworks, no channel diversion.

Figure 2. Quantitative comparison of options: allowable shear stress, cost, imported materials and estimated embodied carbon.