Opportunities for participatory data collection	Yes, through citizen science
Additional information	
References	Gonzalez-Ollauri, A. and Mickovski, S.B., 2017. Hydrological effect of vegetation against rainfall-induced landslides. Journal of Hydrology, 549 (374–387) Gonzalez-Ollauri, A. and Mickovski, S.B., 2017. Plant-Best: A novel plant selection tool for slope protection. Ecological Engineering 106 (2017) 154–173.

4.41 Soil water retention capacity

Project Name: OPERANDUM (Grant Agreement no. 776848)

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Soil water retention capacity	**Water Management**
Description and justification	Soils can store water in their matrix and skeleton depending on their structure, texture and mineral composition. There is an intrinsic relationship between the amount of water stored in the soil and the matric suction, which is established through the soil water retention function. This function defines field capacity and wilting point, which difference establishes the water available to plants in the soil. Soil water retention is also related to soil strength and bridges soil hydrology with mechanics. Soils that can hold a lot of water support more plant growth and are less susceptible to leaching losses of nutrients and pesticides. All of the water held by soil is not available for plant growth. Soil water retention capacity is mainly determined by the soil texture (sand, silt, clay contents), structure (bulk density and porosity), and organic matter content. It can influence the choice of NBS as well as the stability/effectiveness of the NBS put in place to mitigate against natural hazards. In general, the higher the percentage of silt and clay sized particles, the higher the water holding capacity. The small particles (clay and silt) have a much larger surface area than the

	larger sand particles. This large surface area allows the soil to hold a greater quantity of water.
Definition	It is the ability of the soil to store water under changing hydrological regimes -i.e., residual, transition and saturation. Soil water retention (or holding) capacity is the amount of water that a given soil can hold for an intended use.
Strengths and weaknesses	+ Standardised procedure for determination exists; it can be estimated based on soil type; bridges soil hydrology and mechanics; established the boundaries for the water available to plants in the soil. - Direct measurement requires significant time and effort from suitably qualified personnel; difficult to measure on site; requires measurement of matric suction; requires numerical modelling; limited availability of sensors measuring high soil suctions; difficult to establish under vegetated soil
Measurement procedure and tool	Determine water content at field capacity Determine water content at wilting point Plant available water = field capacity – wilting point moisture content Create a soil water retention curve
Scale of measurement	Micro, point but the results can be extrapolated to meso (field) scale
Data source	
Required data	Moisture contents at different air pressures
Data input type	Quantitative: Numerical
Data collection frequency	Periodic
Level of expertise required	Intermediate to high
Synergies with other indicators	Soil type, degree of saturation, moisture content, soil stability (FoS), organic matter content; soil field capacity, wilting point
Connection with SDGs	11,13,15,17
Opportunities for participatory data collection	Yes, especially for sampling
Additional information	
References	Gonzalez-Ollauri, A. and Mickovski, S. B., 2017. Plant-soil reinforcement response under different soil hydrological regimes. *Geoderma*, *285*, 141-150.

	Gonzalez-Ollauri, A. and Mickovski, S.B., 2017. Hydrological effect of vegetation against rainfall-induced landslides. *Journal of Hydrology, 549*, 374–387.

4.42 Stemflow rate

Project Name: OPERANDUM (Grant Agreement no. 776848)

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Stemflow rate	**Water Management**
Description and justification	Aboveground vegetation parts funnel rainfall around the plant stem and promote its infiltration preferentially into the soil. The volume of water funnelled around the stem is substantial and its infiltration into the soil may promote changes in the stress state of the soil. Also, when rainfall interacts with the canopy it becomes richer with nutrients and organic matter that will then be transported into the soil.
Definition	Proportion of rainfall that is funnelled around the plant stem and then into the soil. Funnelling ratio > 1 implies substantial concentration of rainfall around the plant stem.
Strengths and weaknesses	+: well established procedures exist for NBS that include trees; it can be related to tree architectural traits; easy-to-establish empirical models with incident rainfall; related to soil biogeochemical processes; opportunities to use soil temperature as an indicator of stemflow funnelling belowground -: requires significant effort and suitably qualified workforce for measurement/monitoring; difficult to measure effect in the soil
Measurement procedure and tool	Installation of small diameter gutters spiralling along the tree stem and collection of the volume of water flowing through the gutters. Measurement of rainfall volume beyond the canopy's influence. Linear regression between stemflow and gross rainfall. Data collection of tree architectural traits and implementation of multivariate statistics to relate both tree architecture and stemflow
Scale of measurement	Point (micro, individual) to field (meso)