Data collection frequency	Once as a baseline and then periodically or sporadically during the growth/life of the NBS
Level of expertise required	Low to intermediate
Synergies with other indicators	Soil type, degree of saturation, moisture content, soil stability (FoS), organic matter content; soil water retention capacity, wilting point
Connection with SDGs	11,13,15,17
Opportunities for participatory data collection	yes
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. Plant-Best: A novel plant selection tool for slope protection. Ecological Engineering 106 (2017) 154–173.

8.19 Plant-available water

8.19.1 Plant available soil water

Project Name: OPERANDUM (Grant Agreement no. 776848)

Author/s and affiliations: Slobodan B. Mickovski[1], Alejandro Gonzalez-Ollauri[1], Karen Munro[1]

[1] *Built Environment Asset Management Centre, Glasgow Caledonian University, Glasgow, Scotland, UK*

Soil water retention capacity	**Water Management** **Green Space 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	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)

8.19.2 Soil water available for plant uptake (SAW metric)

Project Name: Nature4Cities

Author/s and affiliations: Ryad Bouzouidja[1], Patrice Cannavo[1], Stéphanie Decker[2]

[1] *Institut Agro – Ecole interne AGROCAMPUS OUEST, 2 rue André Le Nôtre, 49045 Angers Cedex 01, France; e-mail: patrice.cannavo@agrocampus-ouest.fr*

[2] *NOBATEK/INEF4, 67 Rue de Mirambeau, 64600 Anglet, France*

Soil Available Water - SAW	**Green Space Management**
Description and justification	**The SAW** represents the capacity of the soil to provide water for plant uptake (Yilmaz et al. 2016; Bouzouidja et al. 2018).
Definition	The use of this indicator aims to : ● Provide water for plants growth ● Favor plant transpiration and cooling effect
Strengths and weaknesses	This indicator can be capable to describe initial planning problems, like soil compaction. It is an important indicator to assess plant water uptake. This indicator is available to everyone and easy to implement. It is possible to apply the indicator in numerous cases (different locations). The indicator has been used in different circumstances (different soil uses) and delivered reasonable results (Nature4Cities D2.1).
Measurement procedure and tool	SWR = (Hfc-Hwp)*Bd*z*F with Hfc is the massic water content at field capacity (in kg water/kg dry soil), Hwp the volumetric water content at the wilting point (m^3/m^3), Bd is the bulk density in (kg/m^3), z is the depth of soil in (m), F is the stone fraction content (in m^3 of small soil per m^3 of total soil)