Connection with SDGs	13
Opportunities for participatory data collection	
Additional information	
References	

6.23 Height of flood peak and time to flood peak

Project Name: UNaLab (Grant Agreement no. 730052)

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Height of flood peak **Time to flood peak**	**Water Management** **Natural and Climate Hazards**
Description and justification	Rapid urbanisation and industrialisation have led to reduced vegetative cover and decreased water storage in the subsurface, as well as the concentration and accumulation of surface runoff in sewage systems due to reduced infiltration into the soil. As a result, the volume of surface runoff as well as the velocity and time to peak storm runoff and baseflow are all increased. Urbanisation also reduces the land coverage of forests and vegetation that help to dissipate the flow energy (Devi, Ganasri & Dwarakish, 2015; Liu, Gebremeskel, De Smedt, Hoffman & Pfister, 2004). The detrimental effects of urbanisation on hydrologic systems are expected to increase in the future due to both increasing urbanisation as well as changes to the global climate, including rising sea levels, glacial retreat, changing precipitation patterns and an increasing frequency of extreme events (Kiehl, 2011).
Definition	Flood peak height is the highest point of the rising limb of a flood hydrograph (describing discharge over time) (m^3/s, cfs, L/s or similar units) Time to flood peak (h)

Strengths and weaknesses	+ Straightforward assessment of degree to which the changes in the local land-use (i.e., change in imperviousness) had an effect on reducing/promoting runoff - Requires *in situ* measurements
Measurement procedure and tool	Assessment of the effectiveness of flood management methods can be performed by different methods. For example, the assessment of runoff can be performed by in situ measurements before and after construction of a flood management structure. In the studies reviewed by Iacob et al. (2014), the assessment of natural management methods was performed either by hydrologic and hydraulic modelling or by direct monitoring. Parameters used for the assessment of the performance of natural flood management measures were: (a) flood peak reduction for different flood event return periods (e.g., 1, 2, 25, 50, or 100 years); (b) increase in time to flood peak; (c) decrease in annual probability of flood risk for the selected area.
Scale of measurement	Site to catchment scale
Data source	
Required data	*In situ* runoff measurements
Data input type	Quantitative
Data collection frequency	At the time of precipitation events and/or daily, monthly and yearly continuous monitoring before and after construction of the area and/or installation of NBS
Level of expertise required	Low
Synergies with other indicators	Direct relationship to *Surface runoff in relation to precipitation quantity* indicator, and partial relationship to *Measured infiltration rate and capacity* and *Evapotranspiration rate* indicators
Connection with SDGs	SDG 6 Clean water and sanitation, SDG 11 Sustainable cities and communities
Opportunities for participatory data collection	No opportunities identified
Additional information	
References	Iacob, O., Rowan, J.S., Brown, I.M., & Ellis, C. (2014). Evaluating wider benefits of natural flood management strategies: An

	ecosystem-based adaptation perspective. *Hydrology Research*, *45*(6), 774-787.

6.24 Peak flow rate

Project Name: PHUSICOS (Grant Agreement no. 776681)

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Peak Flow Rate	**Natural and Climate Hazards**
Description and justification	Indicators of Flooding Risk Resilience sub-criterion will assess the site response to Flooding phenomena based on susceptibility indicators: land use cover, run-off coefficient, rainfall intensity and duration.
Definition	Maximum rate of discharge during the period of runoff caused by a rainfall event. For a time period of T years, the T years-recurrence peak flow Q_T is defined as a value of discharge, which occurs statistically each T years. More precisely, Q_T is defined by the fact that probability to have a maximal annual discharge greater than Q_T is equal to $1/T$. It is influenced by both the basin (size, shape, geographical location, topography, geology, type of vegetal cover, extent of surface detention) and the rainfall event characteristics (intensity, duration, spatial and temporal distribution pattern, storm direction).
Strengths and weaknesses	
Measurement procedure and tool	The peak flow can be estimated by applying two main approaches: probabilistic and deterministic models. Probabilistic models are based on statistical inference which essentially estimates the design variables by fitting the observed data. Deterministic models are based upon the peak flow estimation through analytical relationships and provide a point estimate without uncertainty assessment. Rainfall-Runoff models are applicable to estimate the peak flow. These are usually applied when flow observations are not available and, thus, they require the use of rainfall data (more easily available) to quantify the required data.