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OPERANDUM
OPEn-air laboRAtories for Nature baseD solUtions to Manage hydro-meteo risks

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Deployment of Green roof top as a Nature Based Solution in Dublin, Ireland

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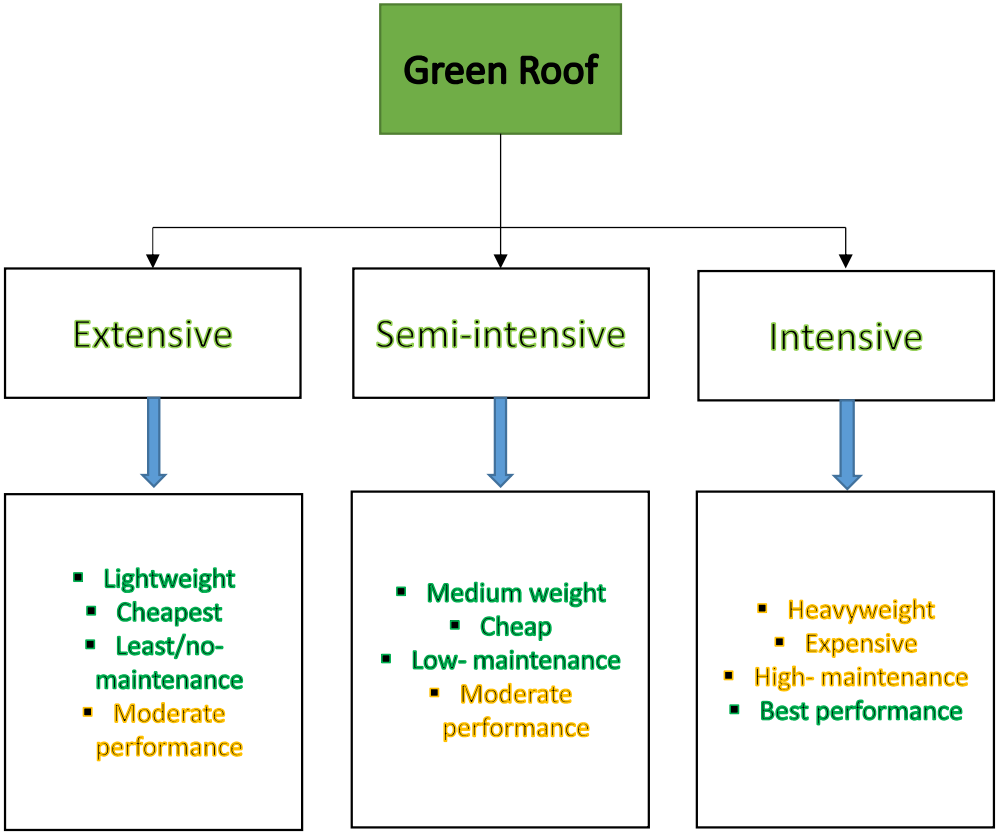
Significance of the work

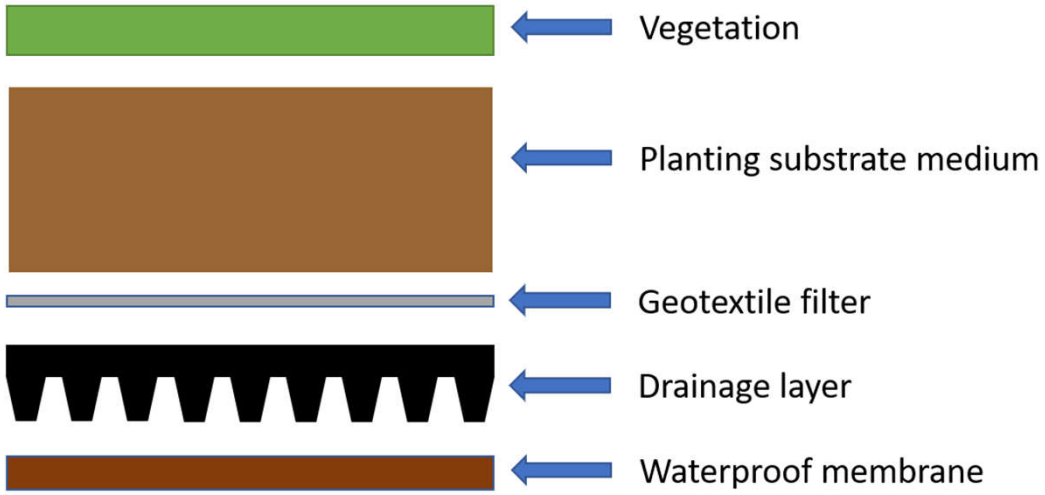
- **Increase** in **Hydro-meteorological** events such as **hurricanes, floods** results in exposure to population each year.
- 1998-2018, Europe experienced **2,796** **hydro-meteorological** related hazards whose overall damage including overall losses and insured losses cost reached about **$720 billion**.
- Massive deforestation, over-building of rural and coastal areas, modification of natural watersheds have made territories more **prone** to hazards.
- Research is needed to investigate the application of sustainable solutions such as **Nature-Based Solutions** in mitigating the effect of natural hazards.
- This study investigate an application of **green roof** in flood reduction using a simulation study.

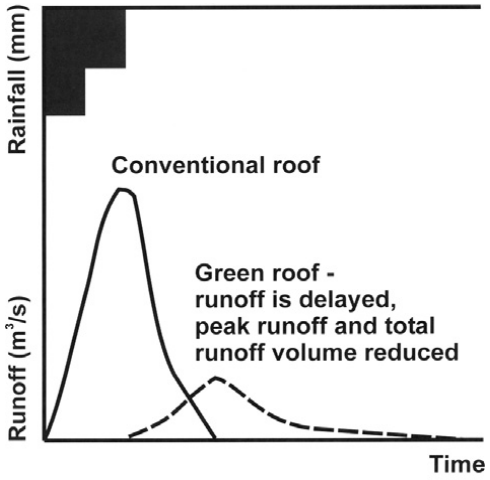
Types of Nature-Based Solutions

Sl.	Nature-Based Solutions	Co-benefits
1	Bioswales receive runoff and has vegetation and organic matter holds water, reduce infiltration and filter out pollutants.	Green infrastructure could significantly reduce heat leading to greater thermal comfort.
2	Rainwater harvesting involves collection of rainwater from roofs and hard pavement surfaces on a much larger scale.	Collected water can be used for irrigation and other household activities.
3	Tree pit systems are porous surfaces that are laid around the base of trees in urban areas. These porous systems allow water, air and nutrients to reach tree roots and thereby use evapotranspiration process to reduce stormwater runoff.	Increate amenity value of the surrounding area.
4	Attenuation tanks are used to temporarily store stormwater for a period, normally until the peak storm has passed. The water is then released to the sewer network at a controlled rate using a flow control device.	Space above the tank can be used for other purposes.
5	Infiltration trenches are excavations that are filled wit void-forming materials, typically rubble or stone, that allow temporary storage of water before it soaks into ground.	Can be constructed along pavement or parks to increase aesthetic value.
6	Green roofs are used to increase evapotranspiration and store water at the roof, leading to reduced flow from the roof to the ground via stormwater drainage system.	Has potential to reduce noise, heat, air pollution and increase aesthetic values.

Green Roofs
Types, Structure and Importance







(Ref: Stovin et al., 2012)

Results and Discussion

Soil type	Percentage reduction in runoff
Shallow soil (80mm)	32.77
Medium soil (150mm)	60.48

- **120** storm events at daily timescale was considered in Dublin for the simulation study
- Each event had **at least 20 mm** rainfall amount
- **Two types of soil** depths were considered in the simulation study, while sedum was selected as the vegetation
- Shallow extensive green roof can reduce the runoff by **32%**
- Increase in soil depth can increase the efficiency of runoff reduction up to **60%**. However, caution needs to be taken as deeper soil increases weight of the green roof considerably.