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Modelling the effect of Nature based solutions on urban heat island using the Local Climate Zone scheme in Weather Research Forecast model

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Urbanization causes modifications in the urban climate of a city due to increase in impervious fraction and lack of evapotranspiration. The rise of extreme heatwave events due to climate change is causing concern for the cities effected by the urban heat island. Europe Union has recommended using Nature based solutions as a solution for multiple urban issues including the mitigation of urban heat. The UPSURGE project aims to use nature-based solutions for regenerative development in five demonstration cities. The five cities are based in different climate zones, consists of single to multiple demonstration sites, and are deploying various Nature based solutions based on the key city challenges. The cities include Belfast, Breda, Budapest, Maribor, and Katowice. The demonstration sites are being Co-designed with multiple stakeholders to address the local concerns, diversity of voices to encompass perspectives and include citizens to address the longevity of Nature based solutions. The static and mobile sensors are being deployed to build a baseline and measure the effect of Nature based solutions. The cities have selected Nature based solutions varying from green roof, green wall, raingardens, Miyawaki forest, agroecology community gardens, rewilded zones, climate arboretum, meadows, water gardens. The work aims to model the effect of different Nature based solutions on the canopy urban heat island. The urban parameterization of the cities is done using local climate zone classification scheme. The advanced research Weather Research Forecast model is used to model the canopy urban heat island during the heatwave of July 2022. The WRF model is run for 7 days on three domains, 10 km, 5 km and 1 km horizontal resolution using six hourly data from ECMWF. The performance of the model has been assessed by analysing temperature, wind speed, relative humidity and surface level pressure considering their effect on local urban heat stress. The results showcase the importance of using actual urban morphology values in Weather Research Forecast to accurately simulate near-surface variables. The Weather Research Forecast simulations shows the presence of urban heat island and depicts the effect of deploying the various Nature based solutions across cities.