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CLARITY's climate services: Using EURO-CORDEX simulations and including dynamical-statistical downscaling to allocate current and future climate-related hazard patterns at different spatial scales

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The CLARITY project, funded by Horizon 2020 (http://www.clarity-h2020.eu), aims to derive actionable information about climate change and climate change impacts and to make this information usable for local decision-makers through an integrated Climate Services Information System (CSIS) that is specifically designed for transferring knowledge on climate-related risks to urban and transport infrastructure sectors.

The CSIS development follows a standardized methodology that incorporates the characterisation of extreme events and related hazards, evaluation of exposure, analysis of vulnerability, risk and impact assessment as well as the identification and appraisal of adaptation options. This requires a profound analysis and harmonisation of available climate data.

An ensemble of 16 different global climate model (GCM) and regional climate model (RCM) combinations from the EURO-CORDEX initiative is used to extract information on climate-related extreme events (e.g. severe heat, cold, heavy precipitation, storms, droughts) at European level. To account for potential systematic errors in the model simulations, the data are bias-corrected against the gridded observational dataset E-OBS using a quantile mapping technique. Following this procedure, the current climate conditions (baseline) as well as future changes, considering three different representative greenhouse gas concentration pathways (RCP2.6, RCP4.5, RCP8.5), are provided at a spatial resolution of 0.11°.

Based on this, detailed climate information can be obtained at finer scales that are suitable for urban planning and climate adaptation applications within the framework of high-resolution, 'add-on' expert studies. The dynamical urban climate model MUKLIMO_3, developed by the Deutscher Wetterdienst (DWD), that takes into account urban land use and elevation data is used to investigate urban heat load at a spatial resolution of 20 – 250 m. A dynamical-statistical downscaling approach that combines urban climate simulations with long-term monitoring data and regional climate projections from EURO-CORDEX, is used to derive high-resolution climate indices for past and future climate periods on urban scale.

Results will be shown for entire Europe as well as for two urban study areas (Linz and Naples) that are part of demonstration cases used for showcasing and testing the CSIS methodology. Especially focussing on heat-related hazards, different climate indices (e.g. mean annual number of summer days, tropical nights etc.) will be analysed and their representation on European and urban scale will be assessed. Additionally, urban climate simulations will be used to evaluate the efficiency of several climate adaptation options (e.g. rooftop greening, unsealing of surfaces, increasing the albedo) on local scale.