

GREEN ROOFS

More than half of the world's population lives in cities, making them the primary source of climate impact. The highest concentrations of gases in the atmosphere from human activities correspond to the emissions of CO₂, which to date has increased three times its level compared to the beginning of the industrial revolution and is considered responsible for about 64% of global warming.

The problems due to intense and suffocating urbanization, are everywhere in the world: the city is tremendously hot, its air is unbreathable and noxious, its waterproof cement profiles make it a reservoir for rainwater. These phenomena not only affect the quality of life of citizens, but their very existence. UN agenda SDGs objective 11 (Sustainable cities and communities) aims at making cities and human settlements inclusive, safe, long-lasting and sustainable. The growth of the urban population and the expansion of the city are phenomena that are not destined to end or slow down, and the city, with its concentration of economic activities, services, productive, residential, and working settlements, can represent the ideal scale from which to start to collect and resolve all the challenges and contradictions of sustainable development.

The European Union supports the integration of Green Infrastructures (GI) into EU policies so that they can be established as a standard component of territorial development throughout Europe. Green infrastructures are defined by the EU 2019 strategy as "a strategically planned network of natural and semi-natural areas with other environmental elements, designed and managed in such a way as to provide a broad spectrum of ecosystem services. green (or blue, in the case of aquatic ecosystems) and other physical elements in land (including coastal areas) and marine areas. On land, green infrastructure is present in a rural and urban context".

Incorporating these infrastructures into territorial planning and development is the European community's challenge.

Green infrastructure construction also includes *green roof* technologies. Studies on urban green vertex garden / vegetable roofs show that, when constructed properly, they can reduce noise and air pollution, the "urban heat island (UHI)" effect by 1° - 2° C, improve the quality of rainwater runoff and ease the management loads of water regulation systems, increase the longevity of roofing membranes and reduce the energy consumption of the building.

UpToEarth uses Earth Observation (EO) data to cost-effectively support scalable assessments of the potential benefits of retrofitting buildings with green roofs and the likely effect on stormwater runoff. The simulation scenarios use a mix of sensors including optical, synthetic aperture radar (SAR) and thermal infrared, compensating for the spatial resolution limitation of the raw datasets through various machine and deep learning techniques.