

Design and Planning Tool for Circular Urban Food Systems

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Abstract

Urban food systems must be integrated into the concept of circular economy as their inputs and outputs are currently rarely assessed from circular perspective. The transition to circularity requires redesign of urban food systems by reusing nutrients and water generated in the city to produce food, which is in line with one of the key principles of circular economy, i.e., “keep resources in use”. In H2020 EdiCitNet project, innovative Edible City Solutions (ECS) are demonstrated. The ECS includes the whole chain of urban food production, distribution and utilization for inclusive urban regeneration and addressing societal challenges such as mass urbanization, social inequality, climate change and resources protection in cities. One of the EdiCitNet project outputs is also a design and planning tool, which was developed to facilitate implementation and monitoring of resilient and circular ECS, supported by underlying databases which are fundamental collections of input data for further modelling of urban food systems. The design and planning tool can be used either by the individual users, to estimate the potential amount of food they can produce on their plots, and how much resources are needed, i.e.: water, nutrients and energy, or by city planners, to investigate the impact of ECS implementation on city's food production, resources management and sustainability. The database structure supports storing all data coming from the EdiCitNet project partners and beyond by creating online profiles of ECS (through survey). To structure the information stored in the database, different classifications were applied. The database includes: (1) Products data: expected yields, nutrient (i.e., nitrogen, phosphorus and potassium) demand, growth period, and energy and nutritional values of 48 products (vegetables). (2) Fertilizer data: nitrogen, phosphorous and potassium contents from different sources, i.e., compost from store, kitchen and garden waste, and three types of manure (cow, horse and chicken). Wastewater data: typical production of mixed wastewater, urine, feces, grey and black water per inhabitant and nutrient production per inhabitant. (3) Meteorological data: long-term mean monthly precipitation and reference evapotranspiration. (4) Land use data: based on the Urban Atlas for selected

cities. (5) Information on ECS Profiles following the web-based survey structure. The structure of the design and planning tool will be presented along with its application for two case studies, namely one at the individual scale (used for planning a single ECS) and the other at the city scale (to plan city's food production and resources management). The results will show (1) estimated yield, (2) Resources demand (water, nutrient and energy needs), (3) irrigation possibilities and demand and (4) needed fertilization amount and fertilization scenario.

Keywords: Edible City Solutions, urban food systems, design and planning tool

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