8.31.1 ESTIMAP nature-based recreation model

Project Name: MAvES (Mapping, Assessment and Valuation of Ecosystems and their Services) (JRC-D3- Institutional project)

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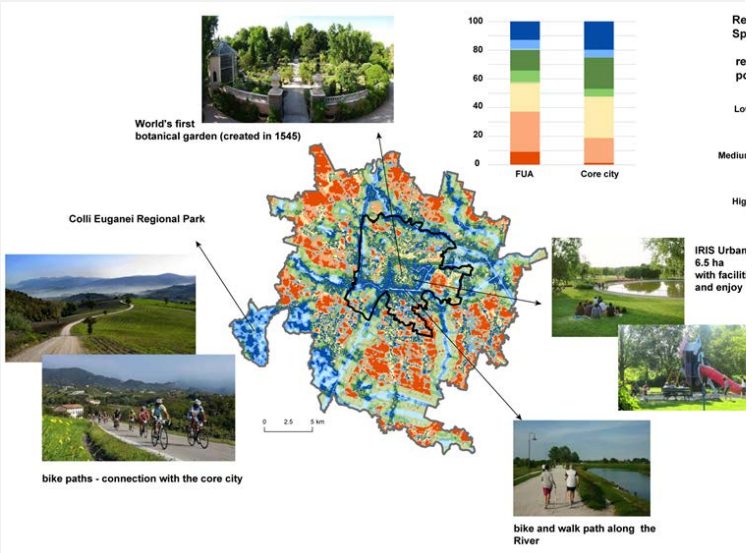
ESTIMAP nature-based recreation model	**Green Space Management**
Description and justification	Capacity of ecosystems to provide opportunities for nature-based recreation activities
Definition	Nature based recreation or "Physical and experiential interactions with natural environment" (CICES, https://cices.eu/) include a wide list of possible experience and activities such as Biking; boating; climbing; hiking; horseback riding, Walk the dog in a nice area; enjoy a local play ground; find an urban park nearby. ESTIMAP (Ecosystem Services Mapping Tool) nature-based recreation model was developed to map recreation opportunities at European scale. It is an 'Advanced multiple layer LookUp Tables" model which measures the capacity of ecosystems to provide nature-based recreational and leisure opportunities. It is a "context based indicator", to create hot spot maps for recreation activities and, simultaneously represent their territorial context. The original model (Zulian et al. 2013b; Paracchini et al. 2014; Liquete et al. 2016; Vallecillo et al. 2019), up to now applied at European scale was adapted to fit the urban setting. In previous applications the approach was used in urban context (Zulian et al. 2017), but only with reference to specific local applications, such as in Barcelona (Baró et al. 2016) or Trento (Cortinovis et al. 2018). Urban ESTIMAP-recreation consists of four basic sections: (1) The Recreation Potential (RP), which estimates the potential capacity of ecosystems to support nature-based recreational activities based on land suitability for recreation and the natural, infrastructure and water features influence recreational opportunity provision;

	(2) The Opportunity map (OS), which expresses the presence of facilities to enjoy and reach areas with potential opportunities. (3) The Recreation Opportunity Spectrum map (ROS), which combines the Opportunity map (OS) and the Recreation Potential (RP). Figure 1 (4) A potential accessibility map which represent the cumulative potential visitors based on a fuction of the distance and the total opportunities available within a defined distance.
Strengths and weaknesses	-spatially explicit -> provides maps of potential areas where opportunities for nature-based recreation are available -relatively complex
Measurement procedure and tool	The concept of the recreation opportunity spectrum is presented in Figure 1. Areas in dark blue are top areas for nature-based recreation within the boundaries of the city offering a high recreation potential and with a high availability of facilities that support recreation.  Figure 1: The Recreation Opportunity Spectrum.

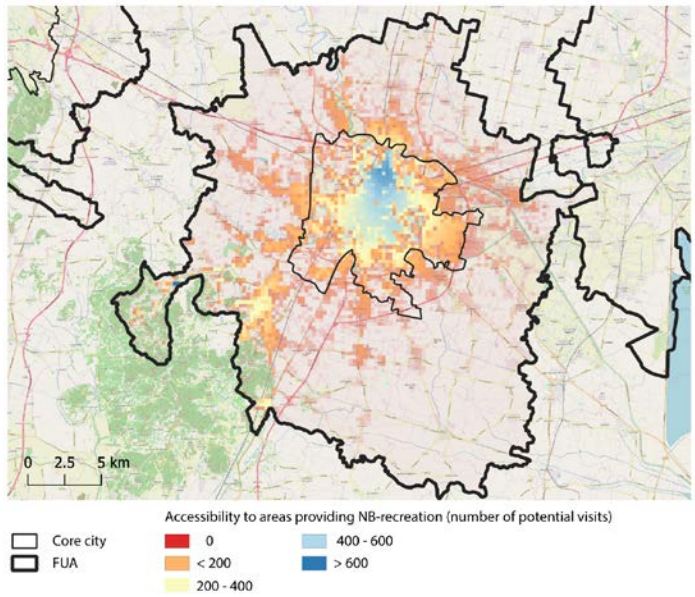


Figure 2: Potential accessibility map

Scale of measurement	Functional Urban Areas

Required data

Data (version)	Data holder	Spatial resolution	website
Corine Land Cover	EEA	100 m	https://land.copernicus.eu/pan-european/corine-land-cover
CDDA[6]	EEA	vector	https://www.eea.europa.eu/data-and-maps/data/nationally-designated-areas-national-cdda-12/gis-data/cdda-shape-file
Natura 2000			https://www.eea.europa.eu/data-and-maps/data/natura-5
Bathing water quality[7]	EEA	vector	https://www.eea.europa.eu/data-and-maps/data/bathing-water-directive-status-of-bathing-water-11
Coast geomorphology	EEA	1:100 000	http://www.eea.europa.eu/ data-and-maps http://www.eurosion.org/

[6] The European inventory of nationally designated areas holds information about protected areas and the national legislative instruments, which directly or indirectly create protected areas.
[7] The European Topic Centre on Water (Database May 2019), national submissions to the Bathing Water Directive

Urban greenness	Earth Engine's public data catalog	30 m	https://developers.google.com/earth-engine/datasets/catalog/ LANDSAT_LE07_C01_T1 _ANNUAL_GREENEST_TOA
Open Street Map	OpenStreet Map contributors. (2015)	vector	" Planet dump [Data file from: 25/06/2019$]. Retrieved from https://planet.openstreetmap.org."
Population data	GHSL	250 m	https://data.jrc.ec.europa.eu/dataset/42e8be89-54ff-464e-be7b-bf9e64da5218

Data input type	-raster and vector data - the model can be applied with any type of data suitable to represent opportunities for nature based recreation activities
Precision	100 m
Data collection frequency	Year or time-series range (for available data at EU scale): 2000 2012 2018
Level of expertise required	-GIS programmer (advanced)
Synergies with other indicators	Cultural ecosystem services
Connection with SDGs	//
Opportunities for participatory data collection	no
Additional information	
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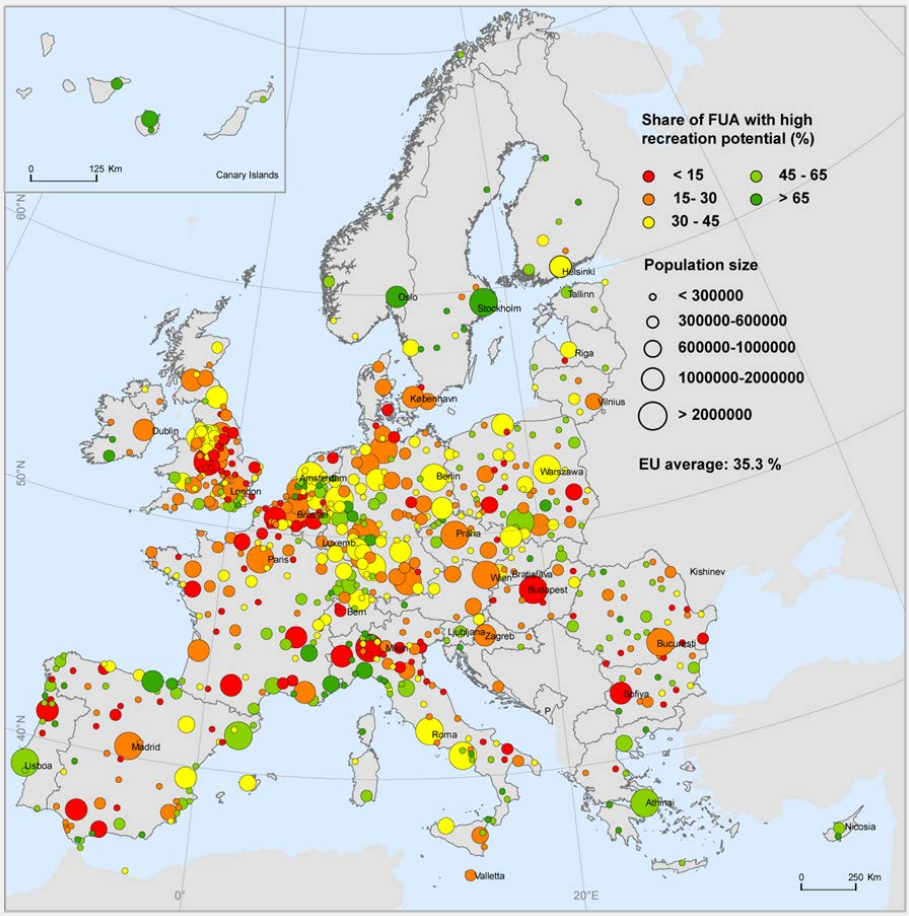

Figure 3: Areas with an high potential to provide recreation opportunities (% with the FUA)- figure extracted from the Final Report of the EnRoute Project (Maes et al. 2019)