The IMECOGIP Toolbox

IMECOGIP

Make cities …

- healthier
- more resilient
- livable

- *Ecosystem Services*
- *Green Infrastructure*
- *Shanghai & Qingdao, China & Ruhr Metropolis, Germany*
- *Planning*

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IMECOGIP = Implementation of the ecosystem services concept in green infrastructure planning to strengthen the resilience of the Ruhr Metropolis and Chinese megacities

Ministerium für Umwelt, Landwirtschaft, Natur- und Verbraucherschutz des Landes Nordrhein-Westfalen

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Prof. Dr. Harald Zepp

Some key challenges for sustainable urban development

&

The benefits of ecosystem services

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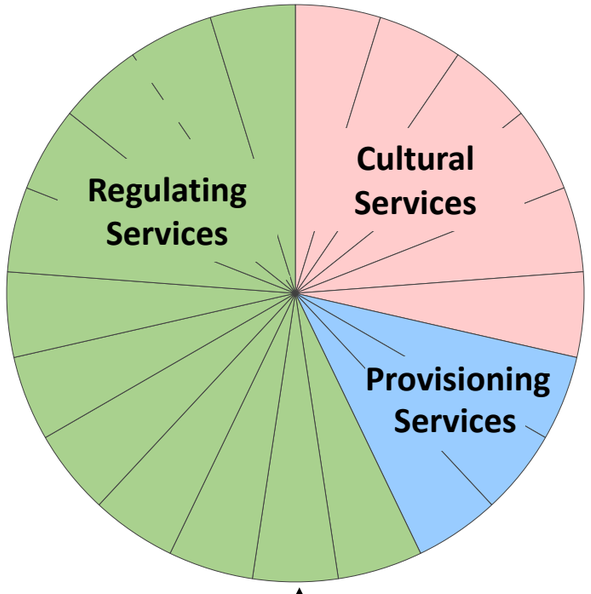
- Healthy environment
- Air Pollution
- Water Quality & Supply
- Urban Heat Island
- Urban Flash Flood
- Loss of Biodiversity
- Loss of Agricultural Land

Smart Planning of Green Infrastructure considers Ecosystem Services



- Urban Renewal
- Climate adaptation
- Ecological restoration

Ecosystem services = The benefits people obtain from nature.

Cultural ecosystem services

Regulating ecosystem services

Provisioning ecosystem services

Planners and decision makers need ecosystem services

IMECOGIP

… to find nature based solutions
for key challenges of sustainable urban development.

How can we inform planners and decision makers in a meaningful way ?

- to assess spatial inequalities and inequities in ecosystem services supply.
- to justify action plans to enhance green Infrastructure.
- to develop one's own ecosystem services standards, specific for your city or region.
- to monitor temporal changes.
- to compare planning variants.
- to decide on measures to enhance ecosystem services in your plan

IMECOGIP developed the GIS-based and open source toolbox

EnhancES
The IMECOGIP Toolbox

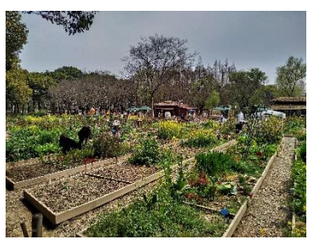


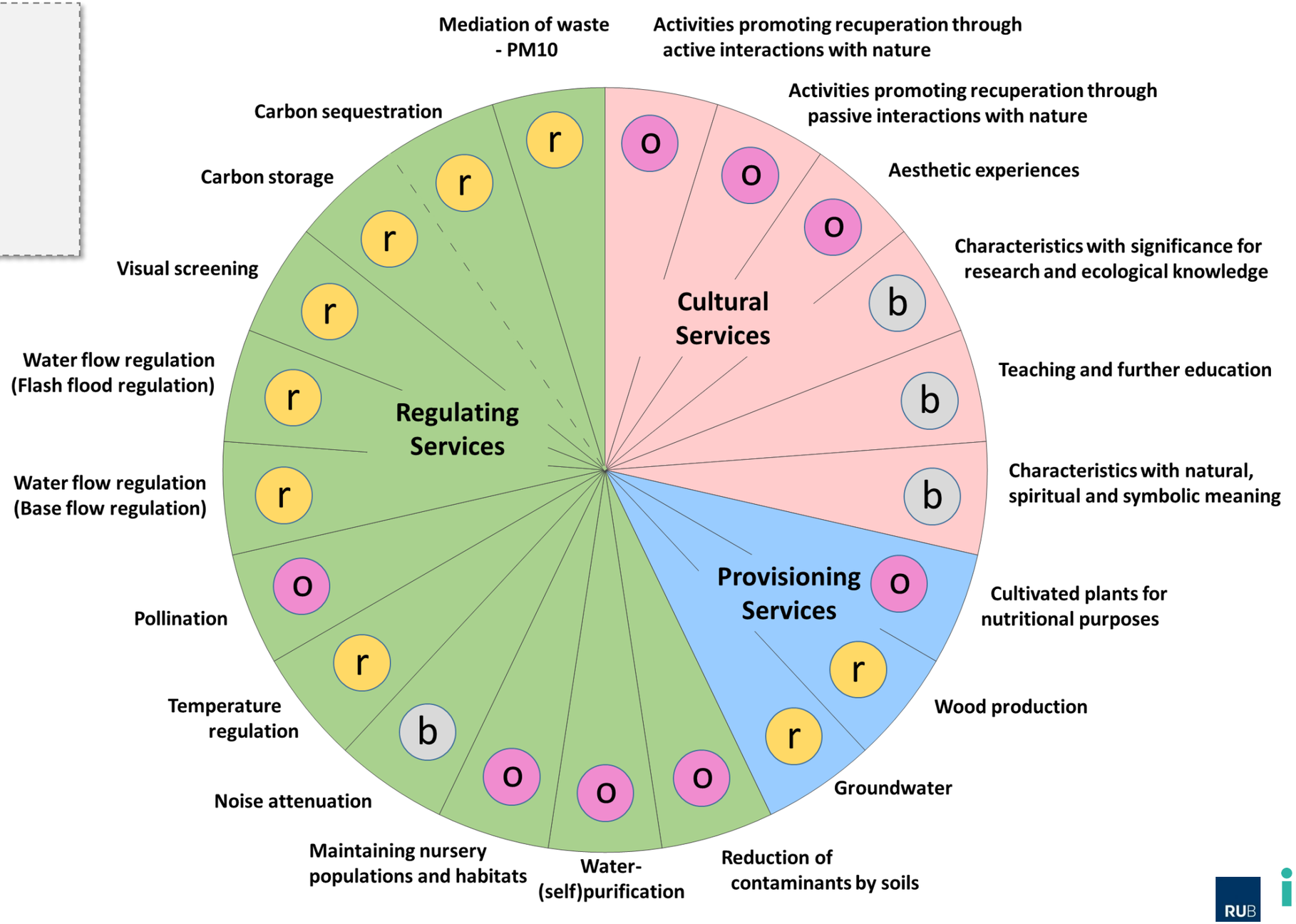
Photo: V. Mayer

Ecosystem services covered by EnhancES

- to systematically assess the ecosystem services of any area,
- be it a building block, a neighborhood, district, or region.

EnhancES uses different scale levels for the ecosystem services

- r — ratio scale
- o — ordinal scale
- b — binary



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How does EnhancES work?

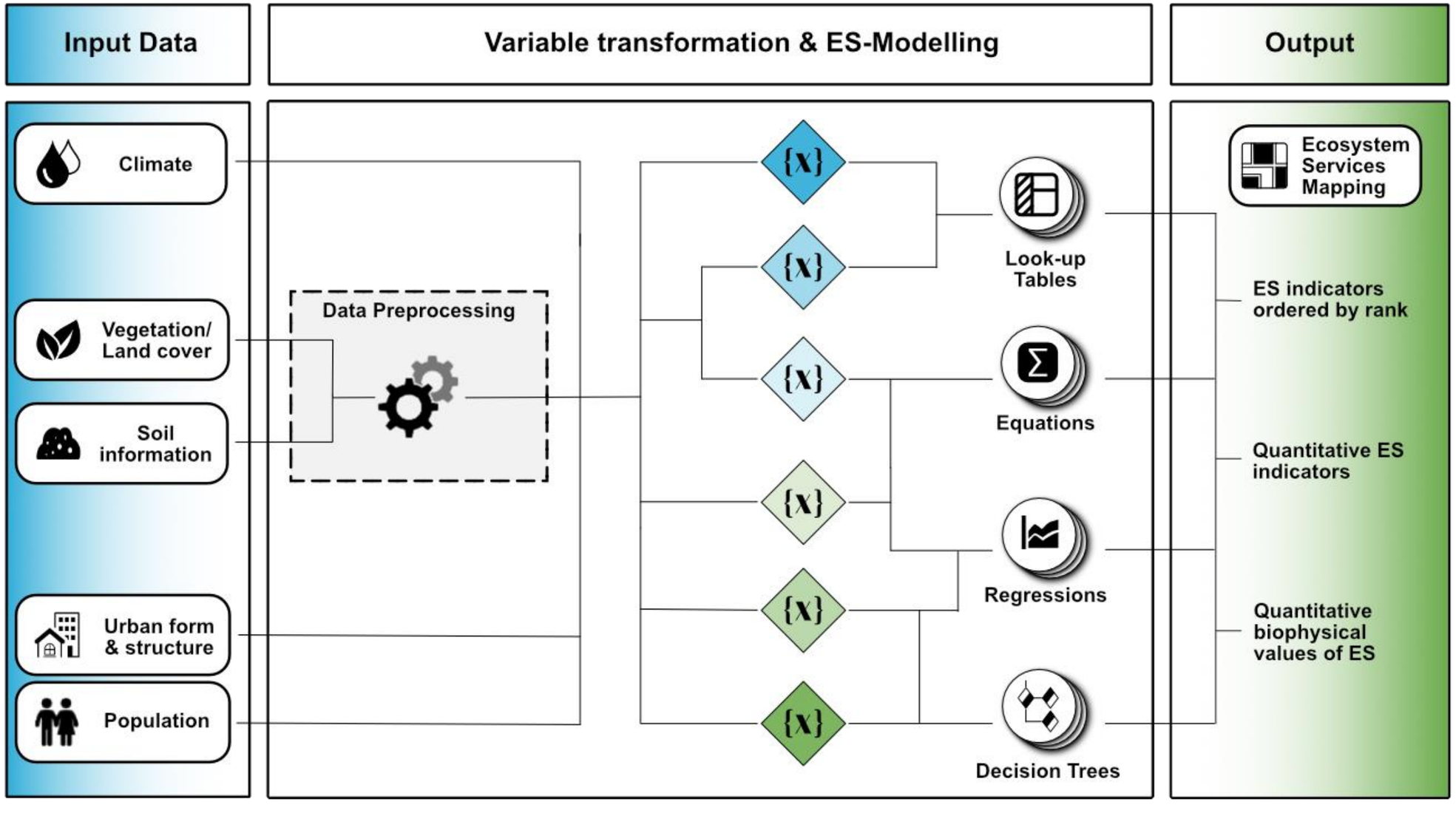
EnhancES The IMECOGIP Toolbox

EnhancES depends on existing geospatial data, e.g. WorldCover, EU Urban Atlas, or your own data.

EnhancES internally assigns model parameters to the classes of the geospatial data.

EnhancES runs the models for various ecosystem services selected by the users.

EnhancES produces maps and tables



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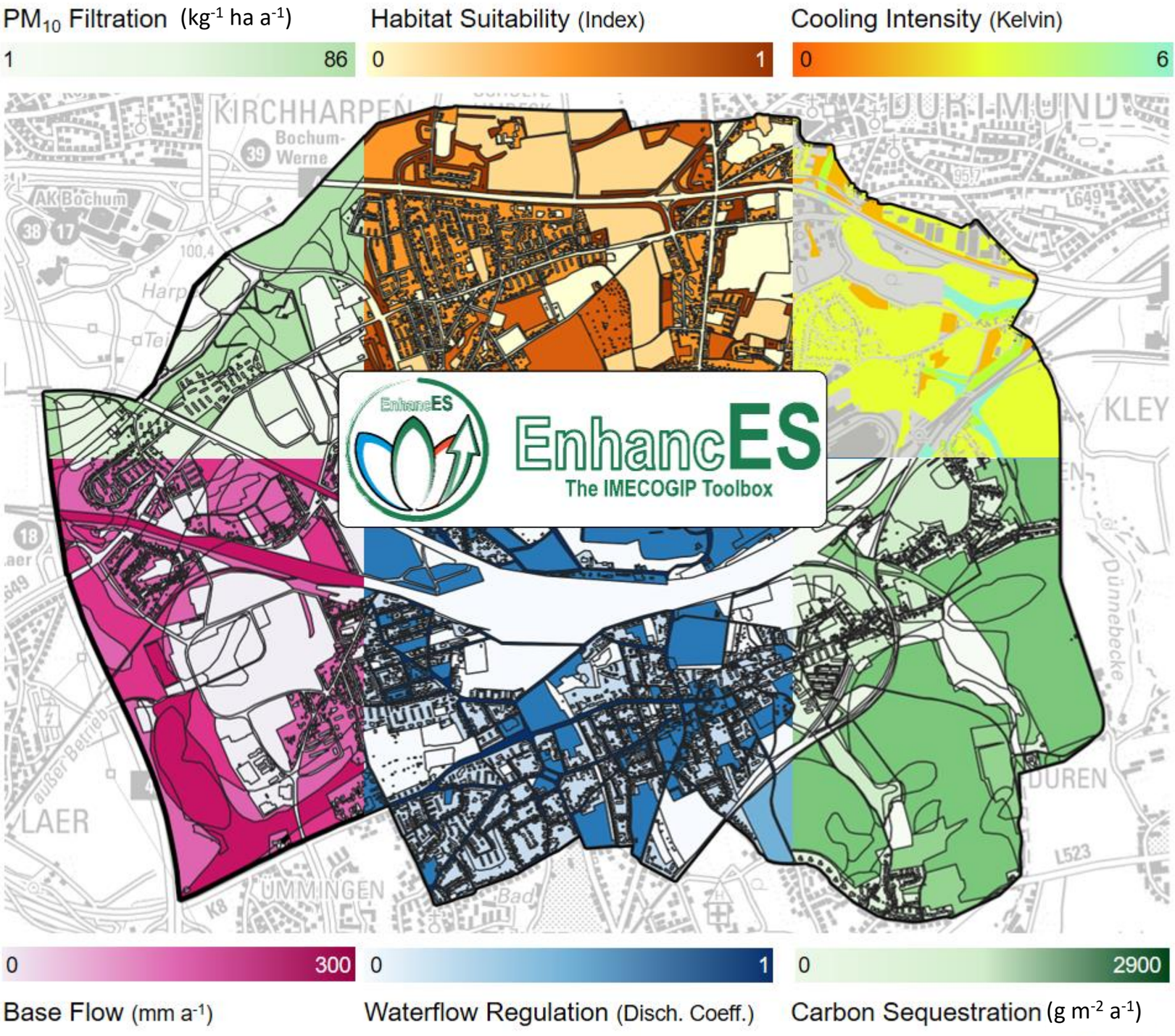
EnhancES' outputs come in maps

EnhancES
The IMECOGIP Toolbox



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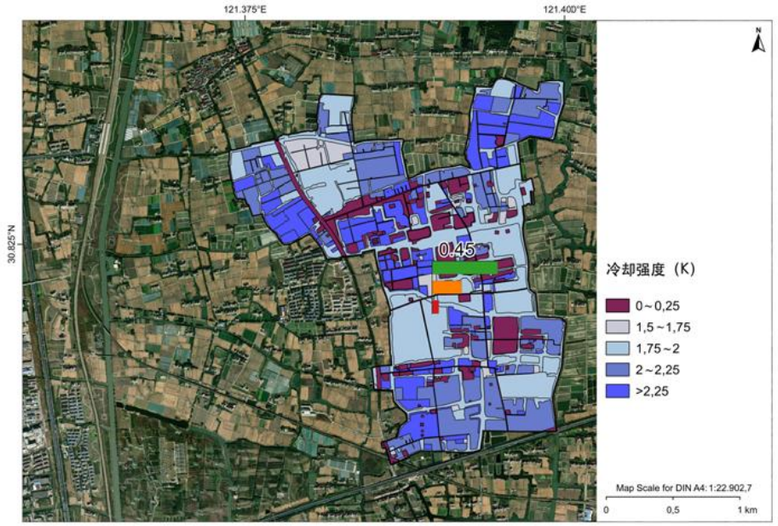
... and many more

EnhancES' applications on different scales

*in cooperation with CAUP Tongji University
+in cooperation with Bochum city administration

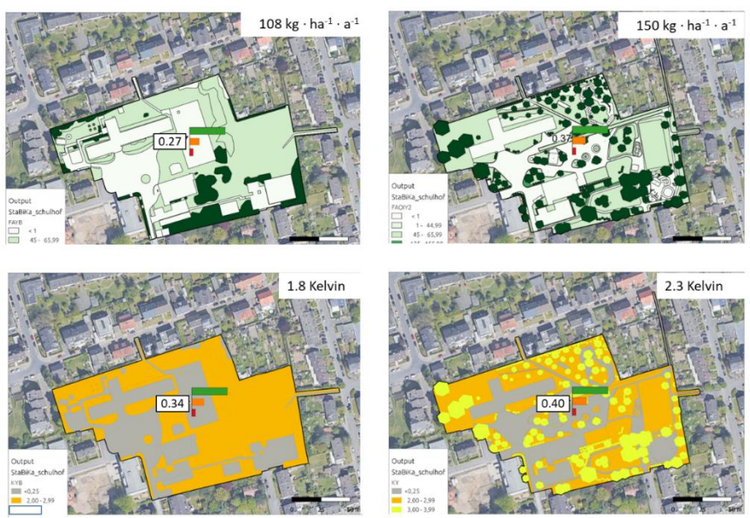
EnhancES supports rural ecological restoration in Shanghai

Present cooling intensity in Caojing Town *

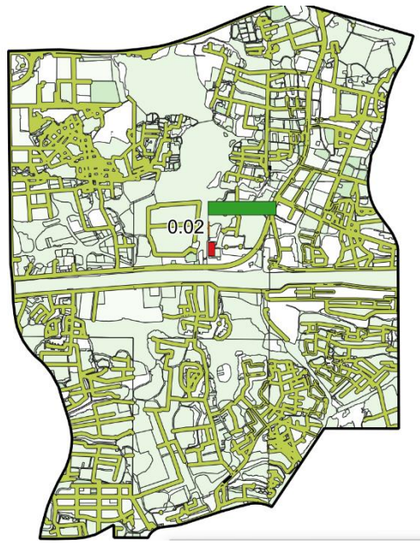


EnhancES justifies greening a schoolyard in Bochum +

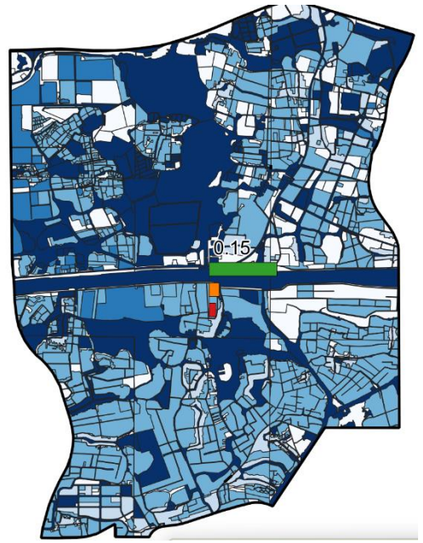
Present and future PM_{10}-filtration and cooling intensity



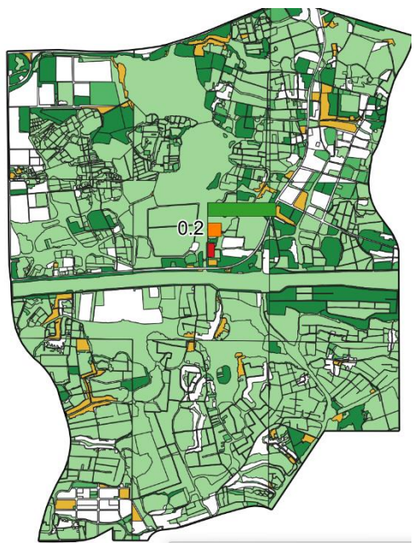
Inventory of ecosystem services in one of the small scale (35 km²) Yangtze River Delta Region Demonstration Zone Zoom areas *



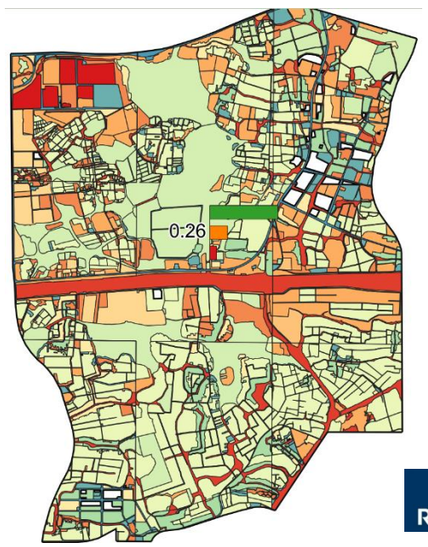
PM_{10}-filtration (kg^{-1} ha^{-1} a^{-1})



Water Flow Regulation (-)



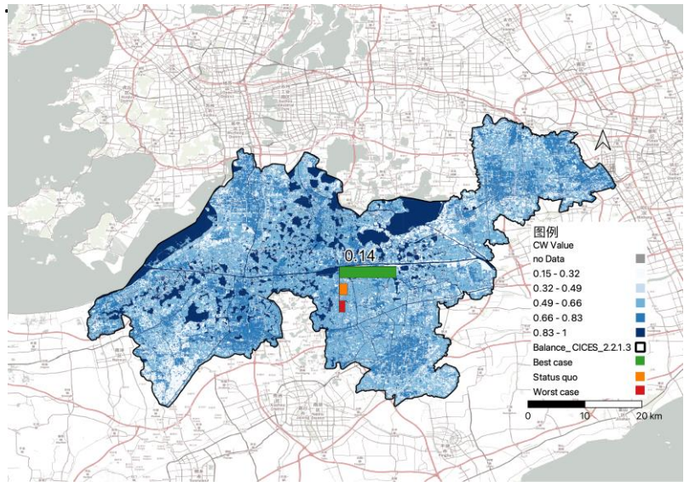
Carbon sequestration (g m^2 a^{-1})



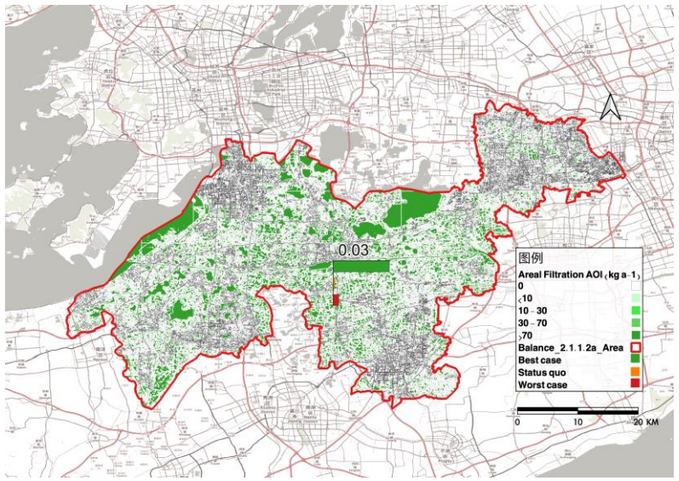
Cooling intensity (K)

EnhancES' applications on different scales

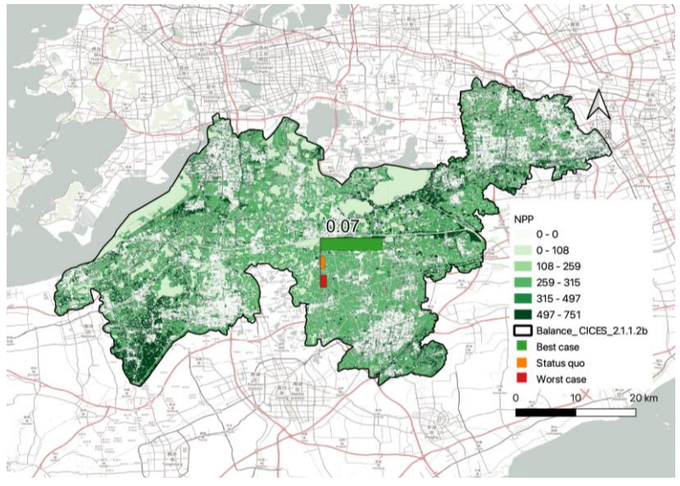
Evaluation of the Suitability of Territorial Spatial Development in the Yangtze River Delta Region (in cooperation with CAUP Tongji University)



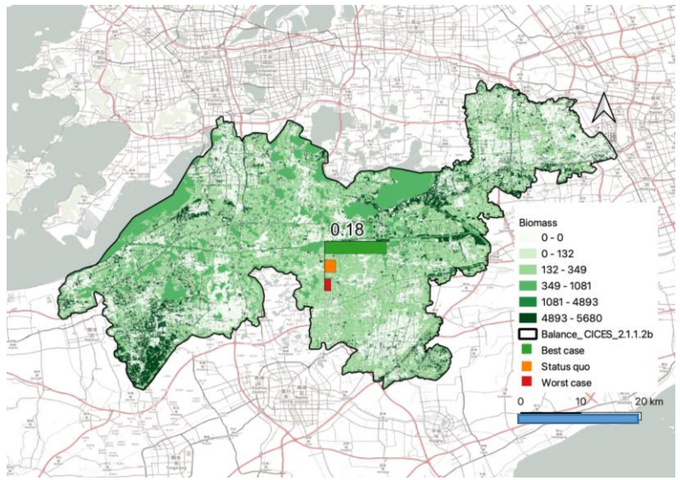
Waterflow Regulation - Discharge Coefficient (-)



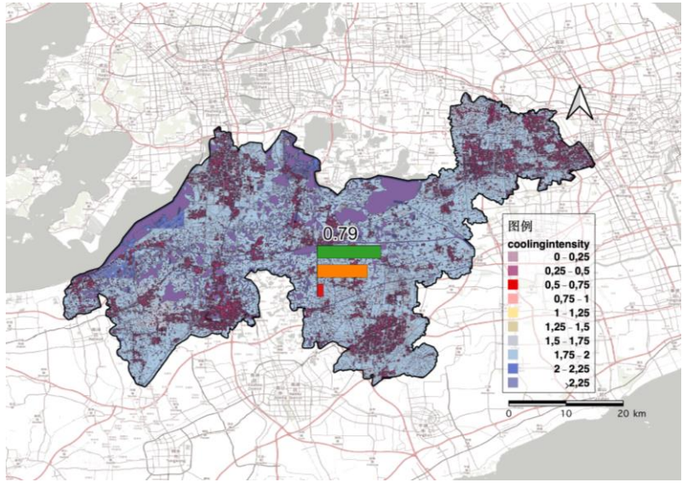
PM_{10}-filtration (areal; kg^{-1} ha^{-1} a^{-1})



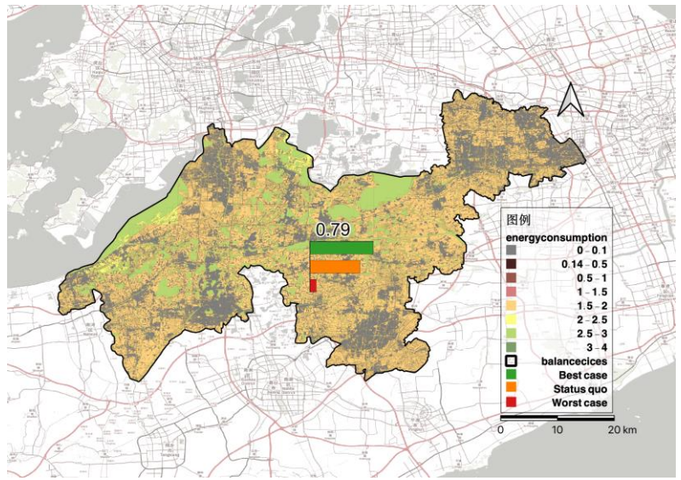
Net primary productivity (g C m^{-2} a^{-1})



Biomass (g C m^{-2})



Cooling Intensity (K)



Energy consumption (kWh)

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Regional scale: ca. 50 km

EnhancES' applications on different scales

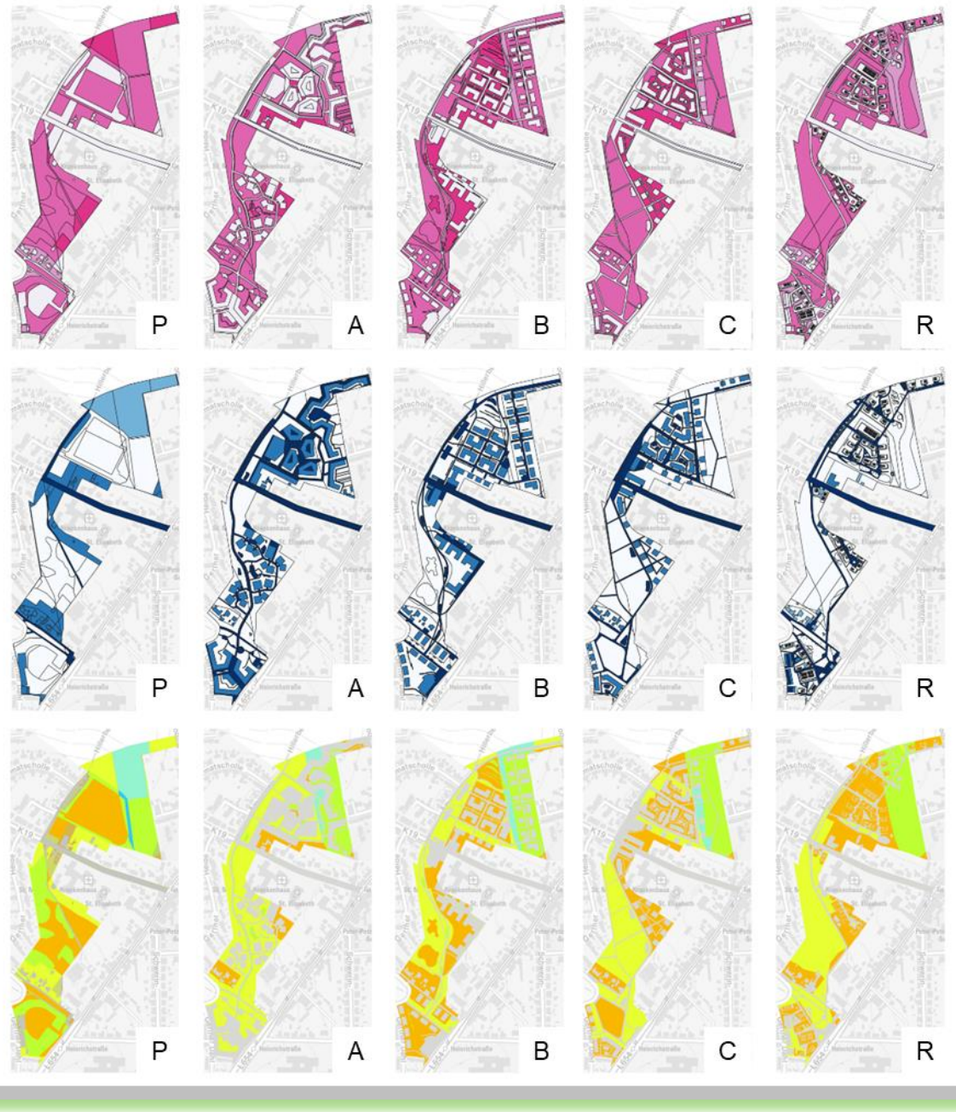
Planning scenarios for a residential area Example 1/2

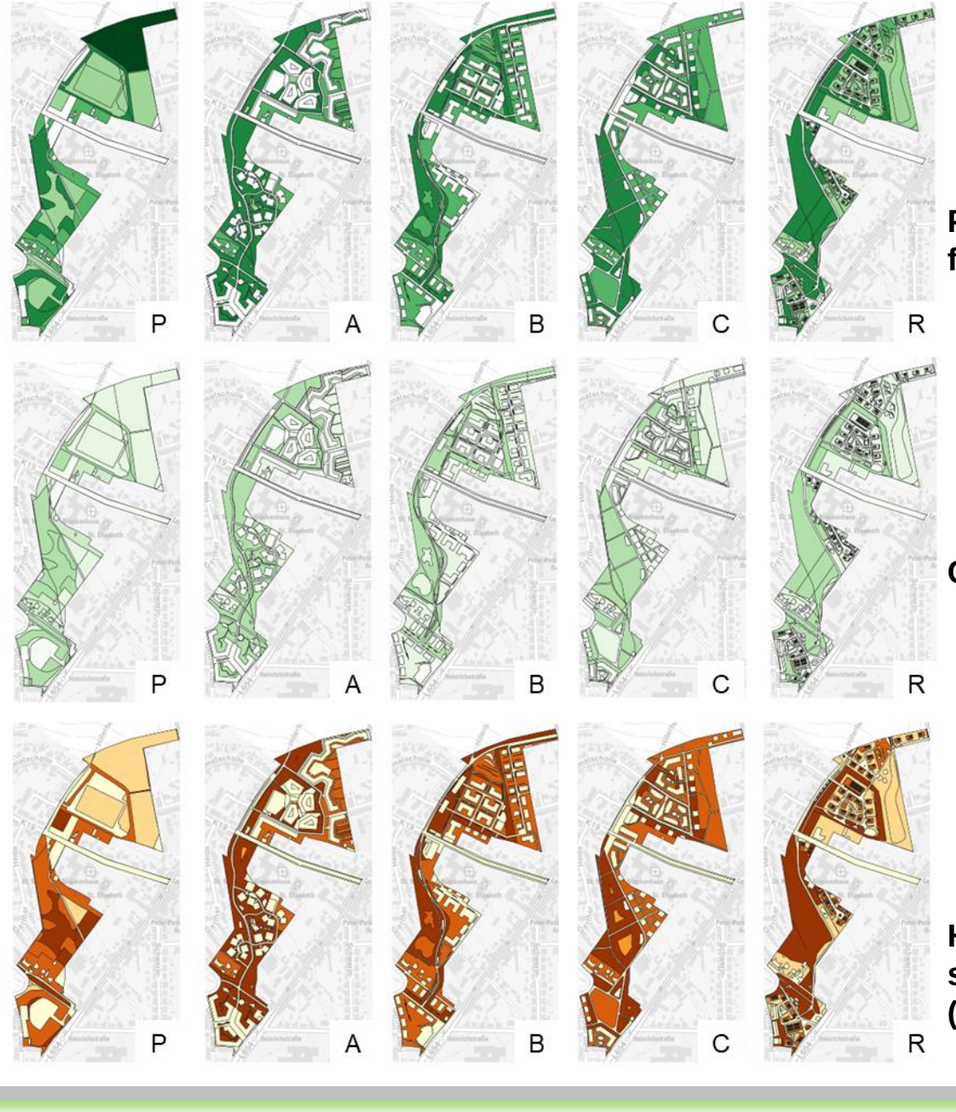
1. Competing Urban Design Plans (P, A, B, C & R)

2. Evaluating six Ecosystem Services

3. Results

in cooperation with the Bochum city administration





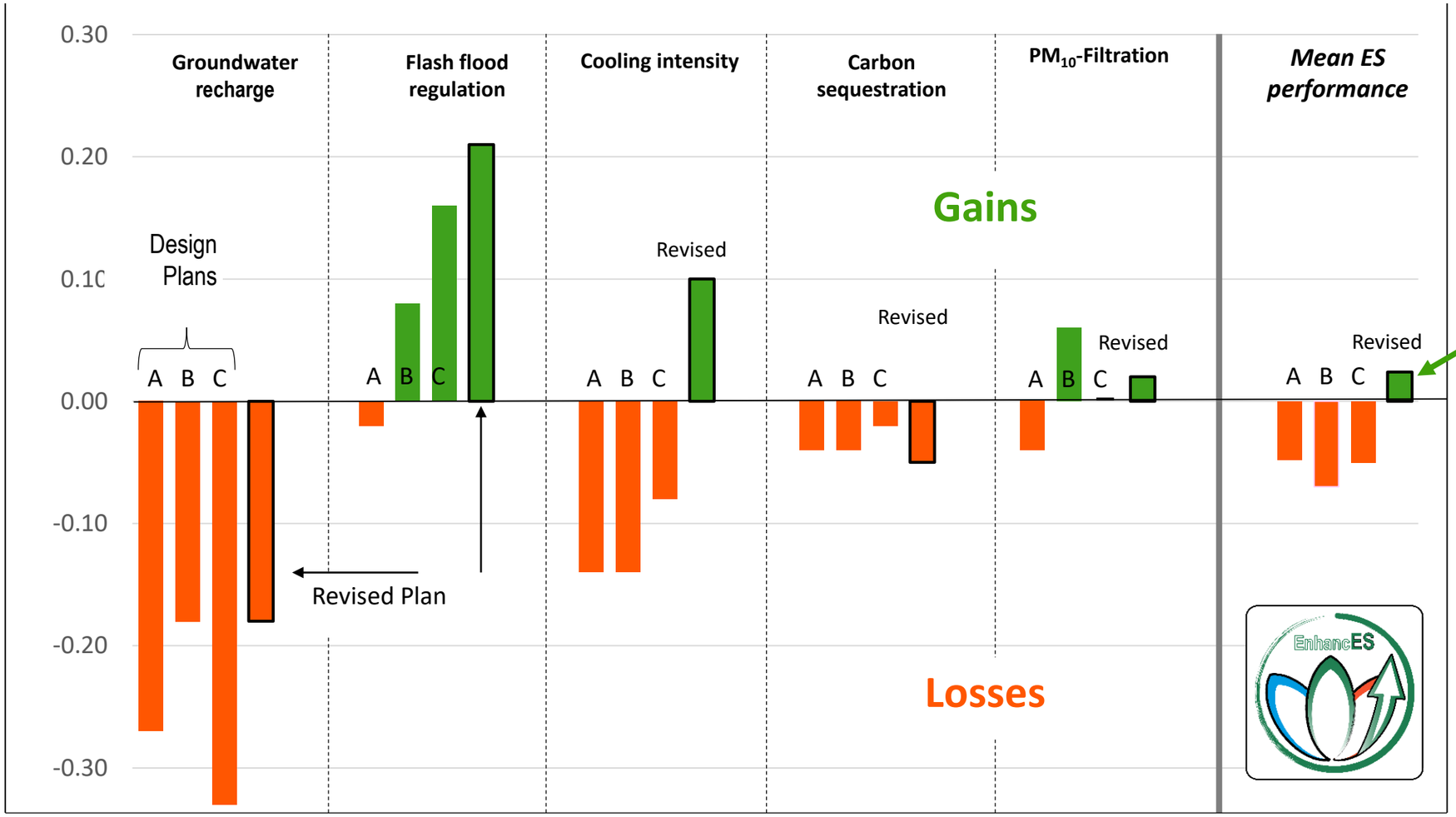
EnhancES' applications on different scales

EnhancES
The IMECOGIP Toolbox

Planning scenarios for a residential area
Example 2/2

Gains and **losses** of ecosystem service performances of design plans in relation to the present situation.

(in cooperation with the Bochum city administration)



By systematically checking planning variants with EnhancES you can optimize ecosystem services to enhance the wellbeing of people.

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