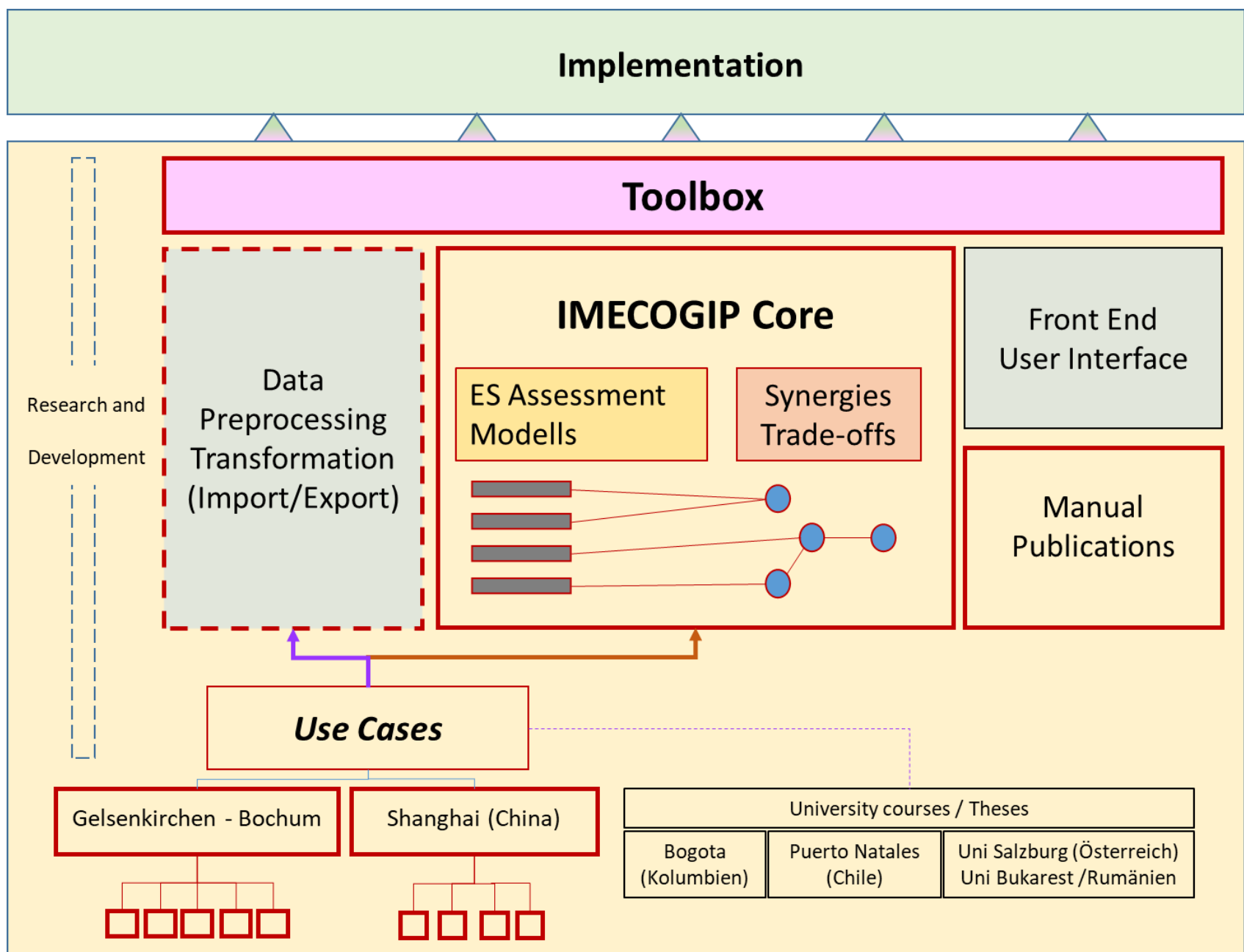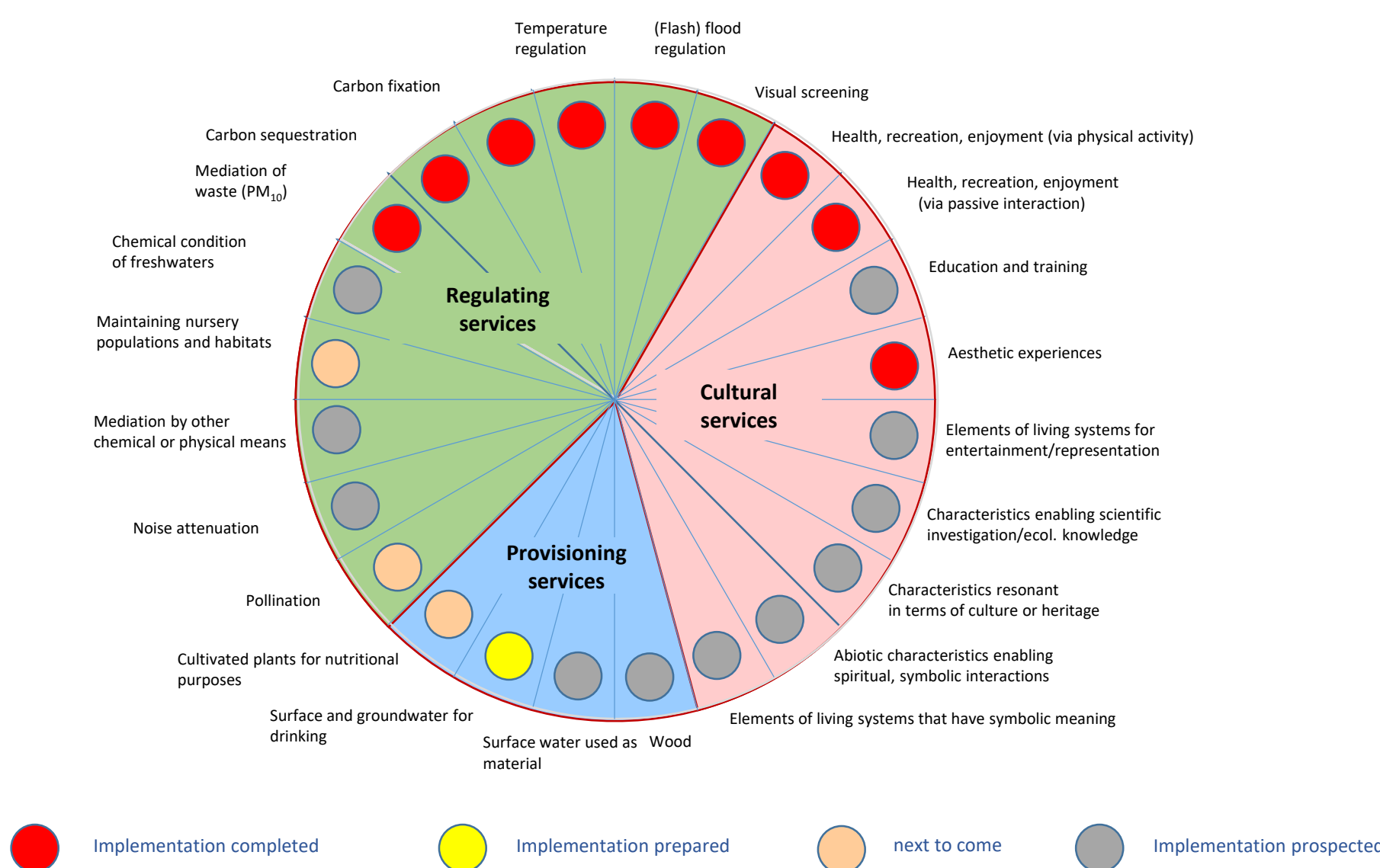# IMECOGIP
Implementation of the Ecosystem Services concept into the Green Infrastructure Planning for resilient urban development

IMECOGIP = Local Citizens' Demand + Scientific knowledge + Local Planning Culture

Implementation

Toolbox

IMECOGIP Core

Data Preprocessing Transformation (Import/Export)

ES Assessment Modells · Synergies Trade-offs

Front End User Interface · Manual Publications

Research and Development

Use Cases

Gelsenkirchen - Bochum · Shanghai (China)

University courses / Theses: Bogota (Kolumbien) · Puerto Natales (Chile) · Uni Salzburg (Österreich) · Uni Bukarest /Rumänien

IMECOGIP toolbox (β-version)

Regulating services: Temperature regulation · (Flash) flood regulation · Carbon fixation · Carbon sequestration · Mediation of waste (PM_{10}) · Chemical condition of freshwaters · Maintaining nursery populations and habitats · Mediation by other chemical or physical means · Noise attenuation · Pollination

Cultural services: Visual screening · Health, recreation, enjoyment (via physical activity) · Health, recreation, enjoyment (via passive interaction) · Education and training · Aesthetic experiences · Elements of living systems for entertainment/representation · Characteristics enabling scientific investigation/ecol. knowledge · Characteristics resonant in terms of culture or heritage · Abiotic characteristics enabling spiritual, symbolic interactions · Elements of living systems that have symbolic meaning

Provisioning services: Cultivated plants for nutritional purposes · Surface and groundwater for drinking · Surface water used as material · Wood

● Implementation completed   ● Implementation prepared   ● next to come   ● Implementation prospected

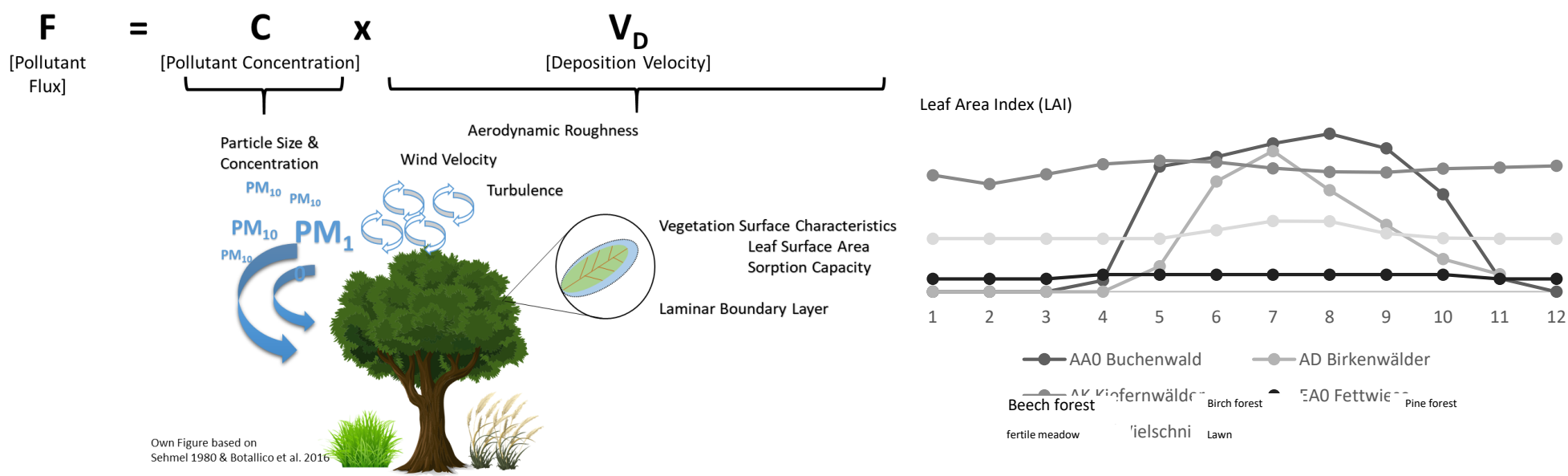BOCHUM · Stadt Gelsenkirchen · energydesign Shanghai · OBERMEYER · Ministerium für Umwelt, Landwirtschaft, Natur- und Verbraucherschutz des Landes Nordrhein-Westfalen
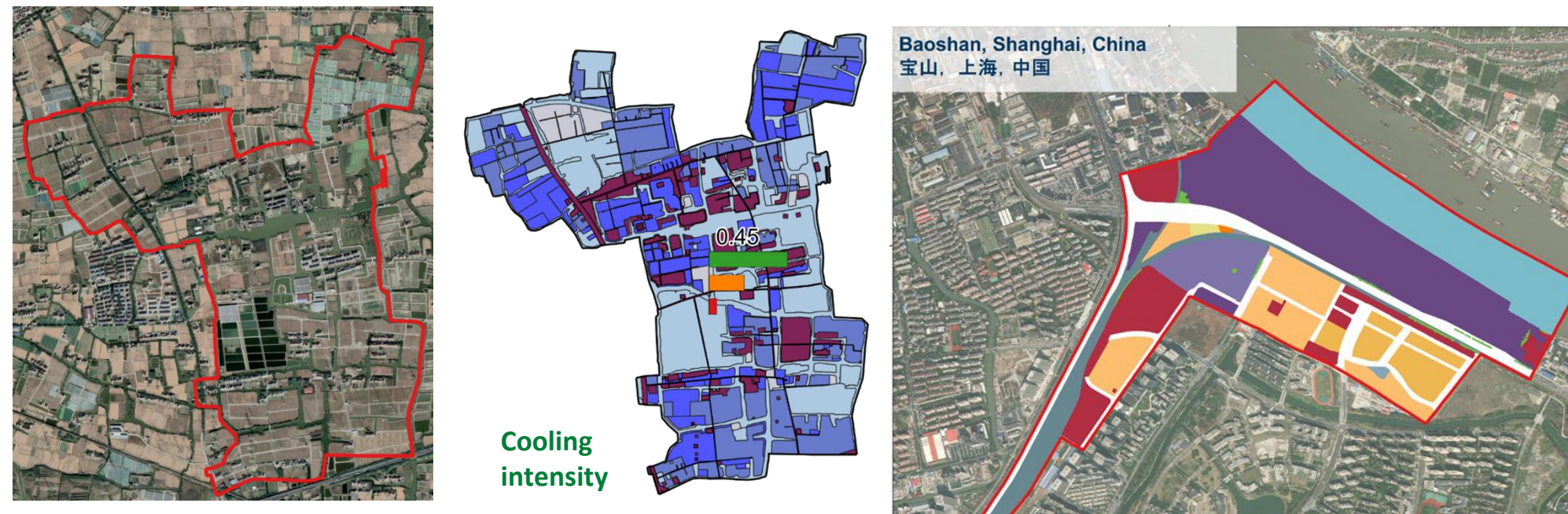

Development of Assessment Tools for China and the Ruhr Metropolis

Testing and Applications in China and in the Ruhr Metropolis

Example: Mediation of traffic-caused pollution (PM_{10}, dry deposition)

$$F = C \times V_D$$

[Pollutant Flux] = [Pollutant Concentration] x [Deposition Velocity]

Particle Size & Concentration PM_{10} PM_1 · Aerodynamic Roughness · Wind Velocity · Turbulence · Vegetation Surface Characteristics Leaf Surface Area Sorption Capacity · Laminar Boundary Layer

Leaf Area Index (LAI)

1 2 3 4 5 6 7 8 9 10 11 12

AAO Buchenwald — Beech forest · AD Birkenwälder — Birch forest · AV Kiefernwälder — Pine forest · SAO Fettwiese · fertile meadow · Vielschni · Lawn

Own Figure based on Sehmel 1980 & Botallico et al. 2016

Shanghai: Peri-urban renewal and and harbor development zone

Baoshan, Shanghai, China 宝山，上海，中国

Cooling intensity

Excerpt: Parameter data base for peri-urban agriculture in Shanghai

Leaf Area Index (LAI)													
Code	Crops	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
GF1	Peach	0.88	0.88	0.88	0.93	2.52	3.70	3.47	3.37	3.69	3.46	2.45	0.73
GF2	Pear	0.60	0.60	0.60	0.98	2.37	2.81	2.79	2.63	2.45	2.25	1.45	0.60
GA3	Watermelon	0.00	0.00	0.48	1.82	2.04	2.52	0.48	1.82	2.04	2.52	0.00	0.00
GA4	Chinese Cabbage	3.37	3.37	3.37	3.37	3.37	3.37	3.37	3.37	3.37	3.37	3.37	3.37
GA5	Lettuce	1.33	1.33	1.93	1.93	2.64	1.33	1.33	1.93	1.93	2.64	3.37	1.33
GA6	Chinese Chives	0.00	0.00	0.00	0.00	0.14	0.43	0.43	0.68	0.75	0.75	0.00	0.00
GA7	Pakchoi	3.37	1.33	1.93	2.64	2.64	3.37	0.00	0.00	1.33	1.33	1.93	2.64
GA8	Asparagus Lettuce	2.64	2.64	2.64	1.33	2.64	2.64	2.64	2.64	2.64	1.33	1.93	1.93
GA9	Eggplant	0.00	0.60	1.37	1.37	2.56	2.67	0.00	0.60	1.37	2.56	2.67	2.67
GA10	Tomato	0.00	0.60	0.60	1.37	2.56	2.67	0.00	0.60	1.37	2.56	2.67	2.67
GA11	Green Pepper	0.00	0.00	0.60	1.37	2.56	2.67	0.00	0.00	0.60	1.37	2.67	2.67
GA12	Mixed vegetables	1.41	1.23	1.55	1.67	2.39	2.65	0.97	1.15	1.67	1.99	2.33	2.16
GC	Greenhouse	1.70	1.48	1.87	2.01	2.87	3.18	1.16	1.38	2.00	2.39	2.79	2.59

Crop Coefficient (Kc)													
Code	Crops	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
GF1	Peach	0.65	0.65	0.80	1.00	1.00	1.15	1.15	1.15	1.15	1.15	0.85	0.65
GF2	Pear	0.65	0.65	0.80	1.00	1.00	1.20	1.20	1.20	1.20	1.20	0.85	0.65
GA3	Watermelon	0.20	0.20	0.40	0.70	0.70	1.00	0.40	0.70	0.70	1.00	0.20	0.20
GA4	Chinese Cabbage	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
GA5	Lettuce	0.70	0.70	0.85	0.85	1.00	0.70	0.70	0.70	0.85	1.00	1.00	0.70
GA6	Chinese Chives	0.70	0.70	0.70	0.70	0.85	0.85	0.85	0.85	1.00	1.00	0.70	0.70
GA7	Pakchoi	1.00	0.70	0.70	0.70	1.00	1.05	0.20	0.20	0.70	0.70	0.70	0.70
GA8	Asparagus Lettuce	0.88	0.88	0.88	0.70	1.05	1.05	1.05	1.05	1.05	0.70	0.88	0.88
GA9	Eggplant	0.20	0.60	0.85	0.85	1.05	1.05	0.20	0.60	0.85	1.05	1.05	1.05
GA10	Tomato	0.60	0.60	0.60	0.90	1.20	1.20	0.20	0.60	0.90	0.90	1.20	1.20
GA11	Green Pepper	0.20	0.20	0.60	0.88	1.15	1.15	0.20	0.20	0.60	0.88	1.15	1.15
GA12	Mixed vegetables	0.67	0.68	0.78	0.83	1.04	1.04	0.56	0.66	0.86	0.87	0.97	0.93
GC	Greenhouse	0.67	0.68	0.78	0.83	1.04	1.04	0.56	0.66	0.86	0.87	0.97	0.93

Bochum: Urban renewal district and schoolyard

PM_{10}: Air filtration
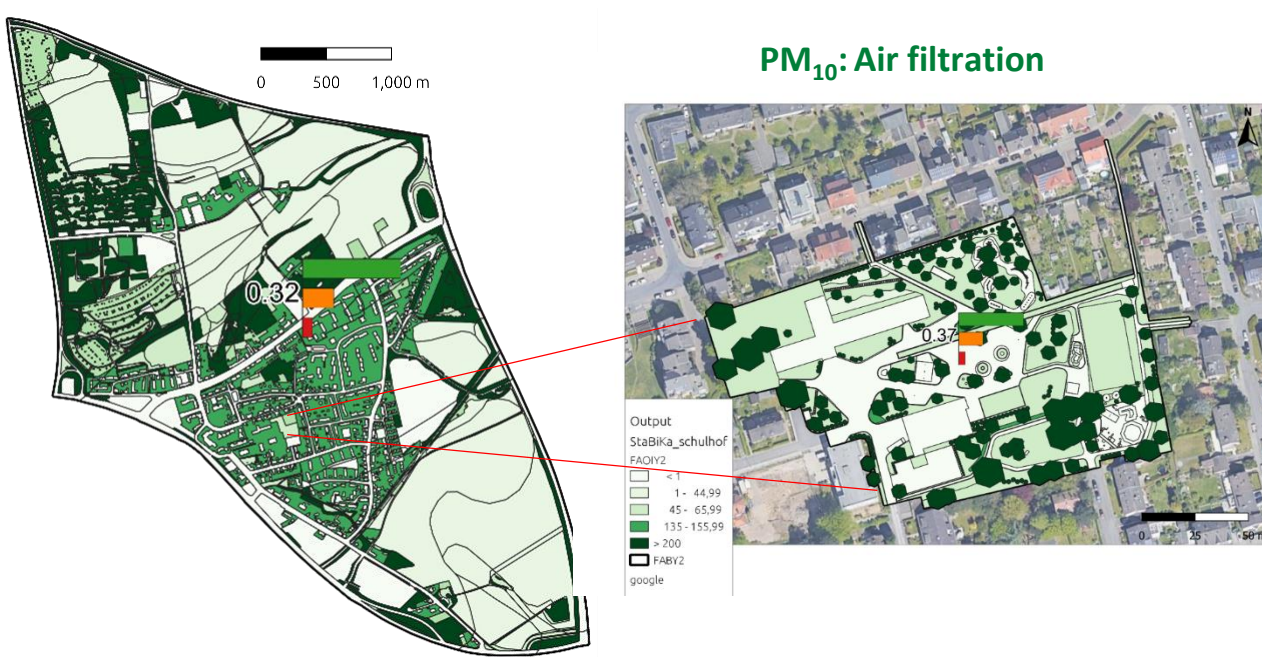
Cultural ecosystem services of urban parks
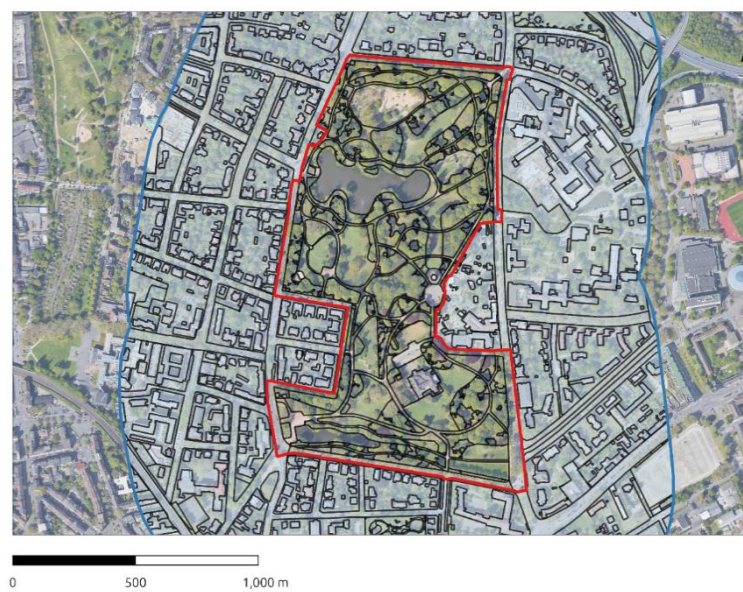
"IMECOGIP": Open source GIS-Toolbox– Knowledge-based -Transferable – Scalable
Ecosystem services from region to neighbourhood

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