The Ecosystem Services of Urban Rivers
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Ecosystem services of Urban rivers

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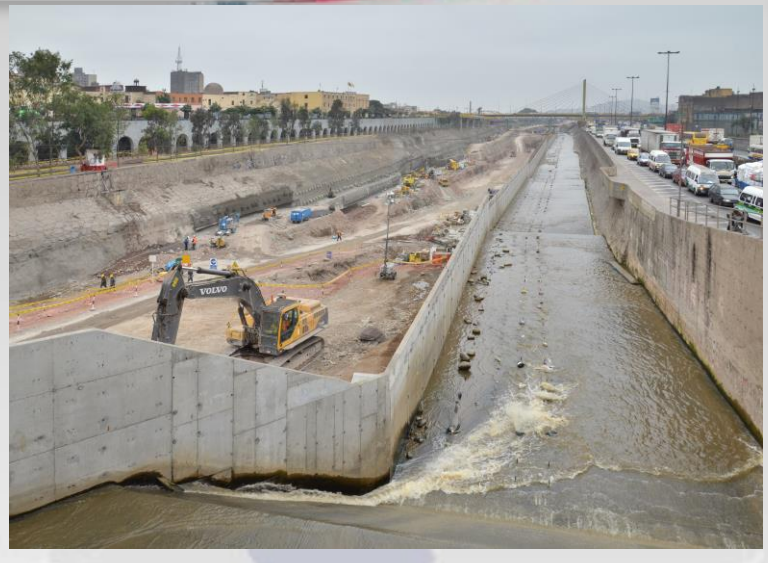
Importance of urban water spaces and rivers

More than 50% of the world's population live in cities and urban areas

All citizens of a cities depend on the same natural capital like fresh air, drinking water, soil and ecosystems

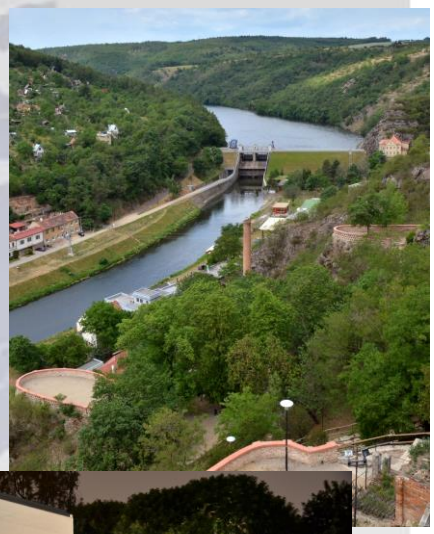
Availability of water is crucial for human health, the well-being of people but also for the economy in cities.

Source: Haase,2015



Urban BLUE ecosystem services

BLUE URBAN ECOSYSTEM SERVICES - ECOSYSTEM SERVICES IN CITIES PROVIDED BY WATERS



Urban blue ecosystem services

Source: Haase,2015

Component	Description and services provided (benefits and co-benefits)
Coast	Outline of a coast, nexus between ocean/sea and urban land → Services provided: air cooling, physical and mental recreation, aesthetic values, tourism
Rivers, creeks	Water courses within a city/urban land including riparian areas/ stripes and water front areas, riverbanks → Services provided: water supply, air cooling, physical and mental recreation, aesthetic values, tourism
Lakes	Water body within a city/urban land → Services provided: water supply, water purification, air cooling, physical and mental recreation, aesthetic values, tourism, biodiversity
Wetlands	Areas of high ground water level and natural vegetation in a city →Services provided: water purification, climate regulation, physical and mental recreation, aesthetic values, tourism, biodiversity
Peat bog	Areas of high ground water level, organic soils and natural vegetation in a city → Services provided: water purification, pollutant retention, climate regulation, physical and mental recreation, aesthetic values, tourism, biodiversity

Urban blue ecosystem services

Source: Haase,2015

Component	Description and services provided (benefits and co-benefits)
River embankment	Nexus between river and urban land, constructed and surfaced → Services provided: moderation of flood hazards, risk mitigation
Bioswale	Landscape elements designed to remove silt and pollution from surface runoff water consisting of a swaled drainage course with gently sloped and filled with vegetation, compost and/or riprap → Services provided: water retention, moderation of heavy rainfalls, habitat provision
Pond	Body of standing water, either natural or man-made, that is usually smaller than a lake. They may arise naturally in floodplains as part of a river system, or as an isolated depression. → Services provided: air cooling, storm water retention, waste water treatment
Fountain	Artificial water supply within a city or urban land, constructed and designed → Services provided: local air cooling, aesthetic values, tourism
Channel	Artificial water course within a city or urban land, mostly linked to a river network, built/constructed and partially embanked → Services provided: transport, food supply (market function), air cooling

Urban blue ecosystem services

Source: Haase,2015

Component	Description and services provided (benefits and co-benefits)
Retention basin	Artificial water body within a city or urban land with groundwater linkage and mostly open lakeshores → Services provided: air cooling, storm water retention, (physical and mental recreation)
Postmining lake	Artificial water body within a city or urban land following an opencast mining activity with groundwater linkage and mostly open lakeshores → Services provided: air cooling, storm water retention, physical and mental recreation
Pipe system	Land drainage form principally used to alleviate waterlogging in streets, open spaces and gardens → Services provided: storm water runoff and retention, water supply

Urban Blue/Green Infrastructure	Ecosystem Services	Prominent Design Elements	Effects	Benefits to People
Urban Rivers	Aesthetic	Wildlife Habitat	Provide Attractive Landscape/Views	Improve Health and Well Being
Water bodies / Waterside Areas	Health and Well being	Riparian Vegetation	Provide Learning Opportunities	Recreation
Wetlands	Spiritual/Religious	Riverfront Programme	Provide Exercise/Sports Spaces	Improve the Quality of Social Activities
Urban Parks	Recreation (Active/Passive)	Access to the Waterfront	Improve the Quality of Urban Landscape	Social Cohesion
Amenity Green Spaces	Sense of Place	Foot/Cycle Paths		Security (Reduce Crime/Vandalism)
	Social/Community Gathering	Signs and Links		
	Security	Access from Local Streets		
	Education and Research	Legible Entrance Points		
	Heritage and History Conservation	Balanced Exposed/Secluded Spaces		
	Art and Inspiration			

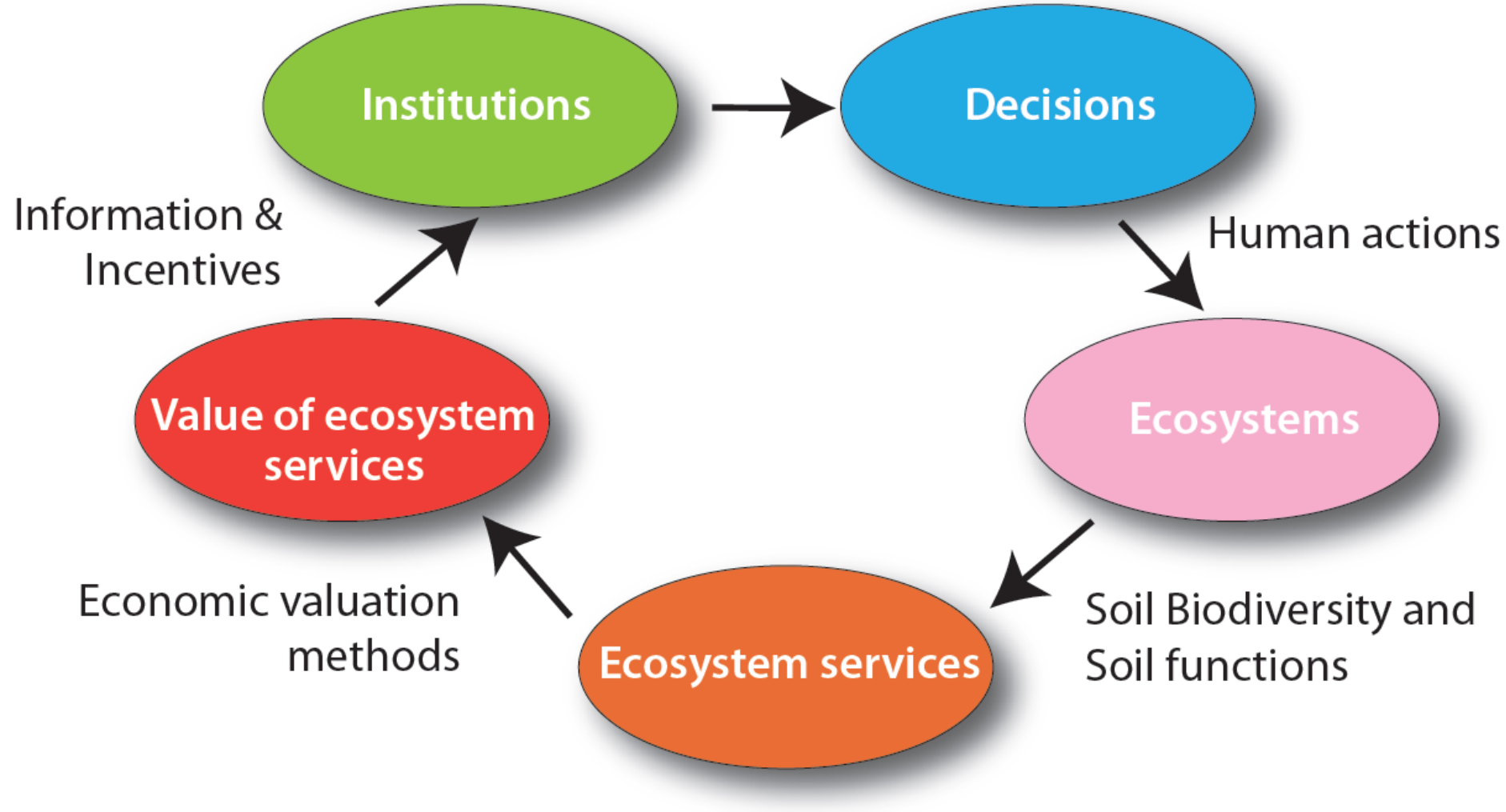
Source: Farimah, Saruhan, 2014

Approaches to urban rivers management and utilisation

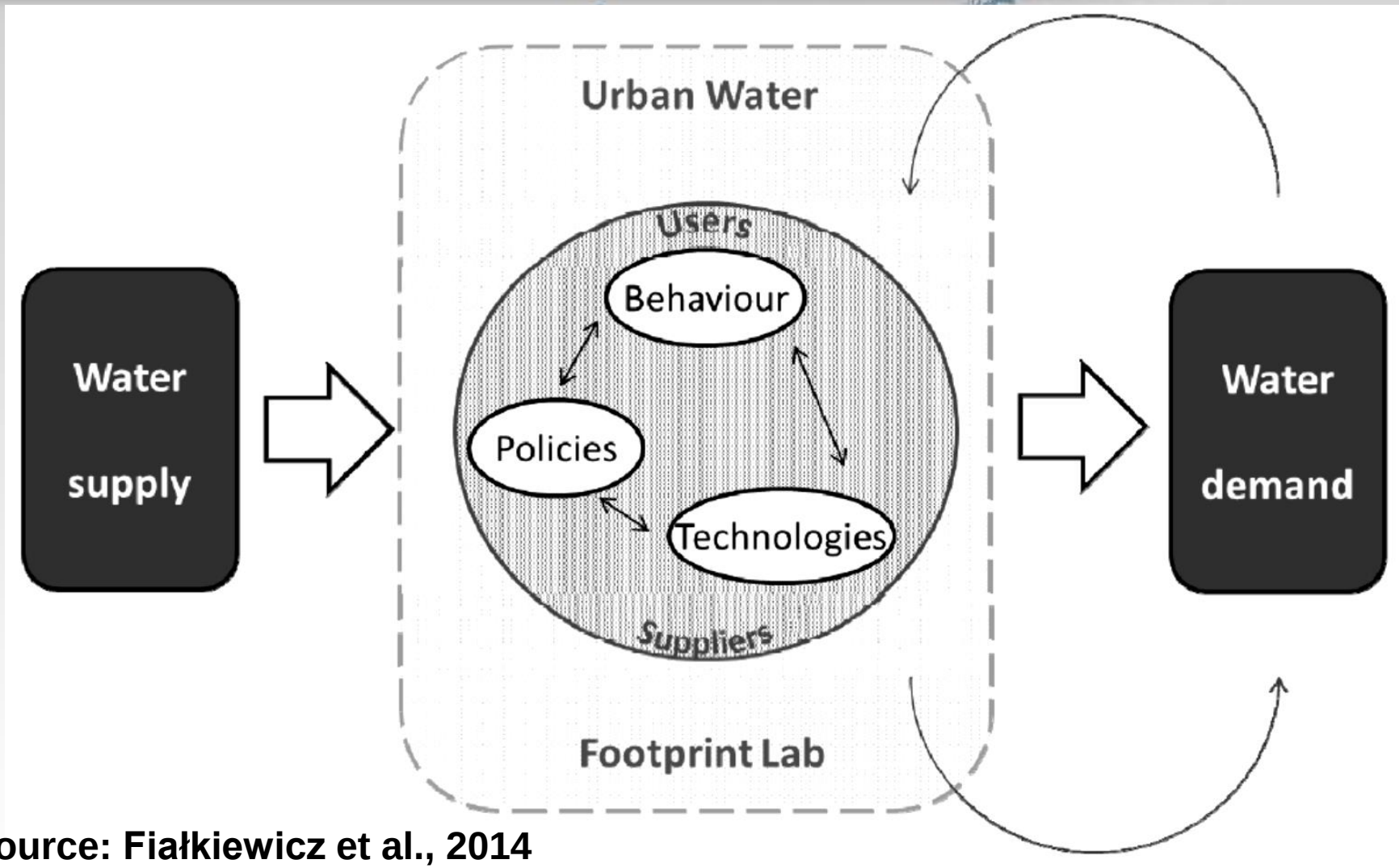
- Urbanism
- Traffic system (in general)
- Water transport
- Economy
- Biodiversity and ecology
- Flood protection
- Recreation
- Waste water treatment
- Drinking water
- Energy
- Medicine
- Fishery
- Corridors
- … … …

CLOSE RELATION

Decision loop to facilitate decision making regarding natural resources



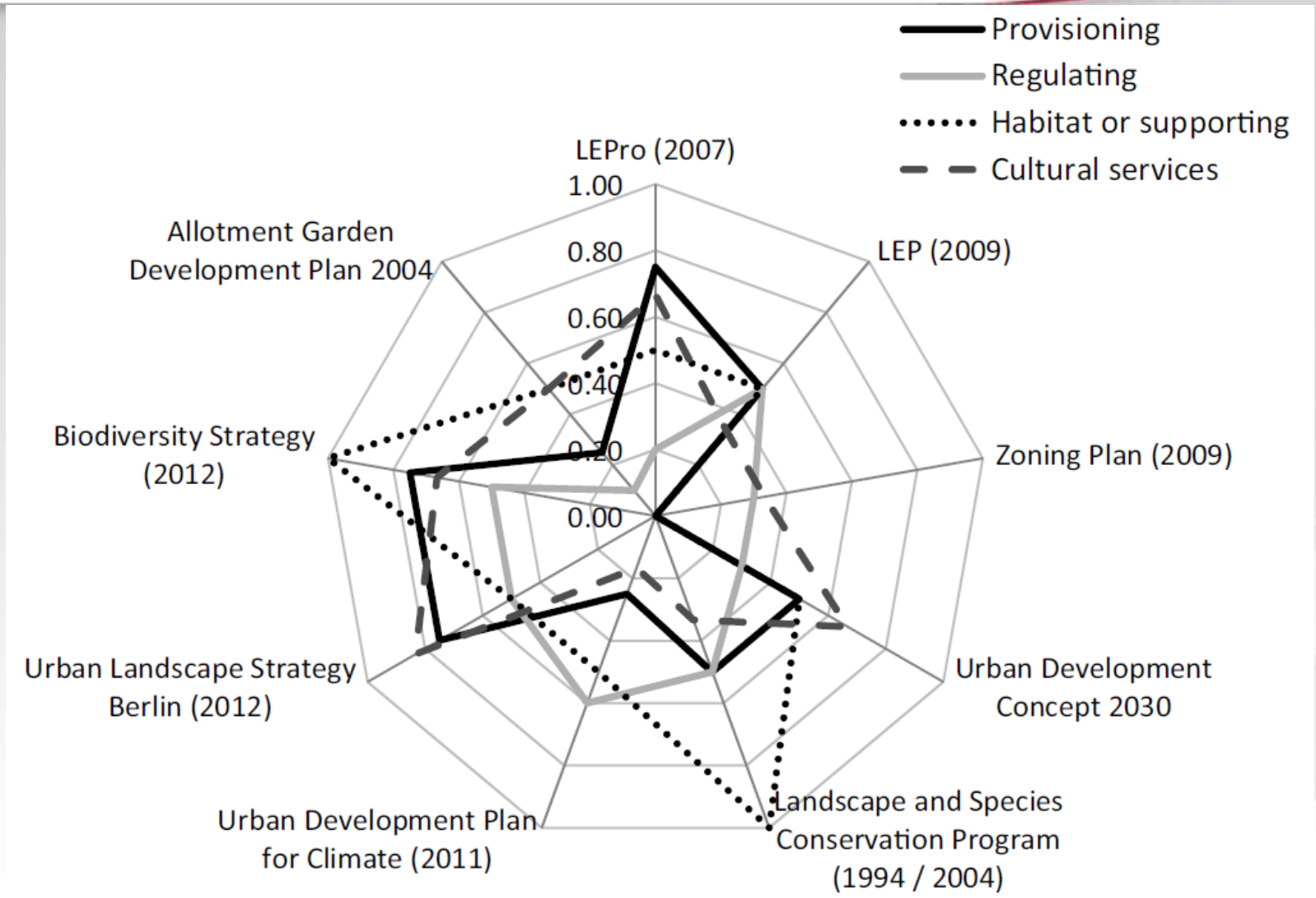
Schematic set-up of an Urban Water Footprint Lab



Source: Fiałkiewicz et al., 2014

Relative representation of the four main ecosystem service groups according to the related services mentioned in the planning documents

Source: Kabisch, 2015



Mapping of ecosystem services that are explicitly addressed in green space related planning and strategy documents

Source: Kabisch, 2015

Ecosystem Service Types (TEEB 2009)	LEPro (2007)	LEP (2009)	Zoning Plan (2009)	Landscape Program/Species Conservation Program (1994/2004)	Urban Development Concept 2030	Urban Development Plan for Climate (2011)	Urban Landscape Strategy Berlin (2012)	Biodiversity Strategy (2012)	Allotment Garden Development Plan (2004)
Provisioning									
Food supply	●	●		●	●		●	●	●
Raw materials supply	●	●		●		●	●	●	
Water supply	●				●		●	●	
Medicinal resources									
Regulating									
Local climate regulation		●	●	●	●	●	●	●	●
Air quality regulation		●	●	●		●	●	●	
Carbon sequestration and storage		●			●	●	●	●	
Noise reduction			●	●		●			
Run-off mitigation				●		●	●		
Moderation of extreme events	●	●			●	●	●		
Waste-water treatment									
Erosion prevent. & maintenance soil fertility	●	●		●				●	
Pollination									
Biological control								●	
Habitat or supporting									
Habitats for species	●	●		●	●	●	●	●	●
Maintenance of genetic diversity				●				●	
Cultural services									
Recreation, mental & physical health	●	●	●	●	●	●	●	●	●
Tourism	●	●	●		●		●	●	
Esthetic appreciation and inspiration	●			●	●		●		●
Spiritual experience and sense of place	●						●	●	
Education and learning					●		●	●	●
Recognition of term "Ecosystem services"	No	No	No	No	No	Yes	Yes	Yes	No

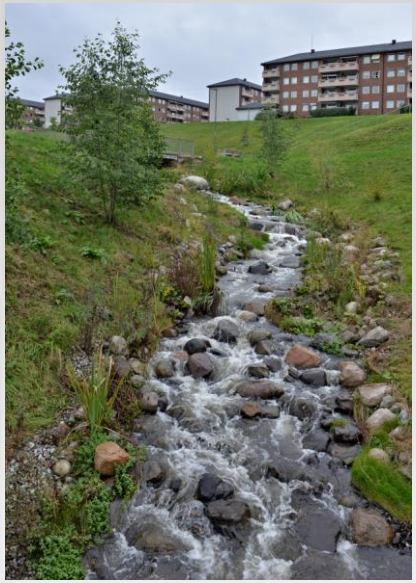
Urban ecosystem services of blue-green infrastructure

Source: Traaholt et al.,2015

			PERI-URBAN blue-green infrastructure								BUILT AREA blue-green infrastructure					
			Island	Fjord	Coast-line	Forest area	Agri-culture	Lakes	Parks and sports	Other open space	Forest	Rivers and Streams	Com-munal gardens	Private gardens	City Trees	Green roofs, facade
Category	Ecosystem															
Cultural services	Recreation, physical and		1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5		1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5			
	Aesthetics		1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5		1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	3,4	3,4	3
	Education, cognitive		3,4	3,4	3,4	3,4		3,4	3,4	3,4	3,4	3,4	3,4	3,4	3,4	
	Sense of place, heritage		1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5		1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5		1,2,3,4,5	
	Tourism		2	2	2	2		2	2	2	2	2	2		2	
	Art/toys								4				4			
Regulating services	Storm water mangement			7		2,3,4,5		2,3,4,5,7	2,3,4,5	2,3,4,5	2,3,4,5	2,3,4,5,7	2,3,4,7	3,7	3	3,7
	Erosion control					3					3	3	3	3	3	
	Local climate regulation					2					3	2,3	3	3	3	3
	cleaning soil, water or air					2,3	3		3	3	2,3	2,3	2,3	3	2,3	3
	CO2 sequestration															
	Noise reduction					6			6			2,4,6	6			6
	Pollination and seed dispersal															
Provisioning services	Food & fiber production			4	4	4		4				4				
	Water provision					4		2,4								
Supporting services	Habitat for biodiversity		1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5		1,2,3,4,5	1,2,3,4	1,3,4	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	3	2,3,4	

Valuation of urban ecosystem services in Oslo

Bjerke Valley neighborhood park and local house prices



OpenNESS
Operationalisation of Natural Capital and Ecosystem Services

Valuation of urban ecosystem services in Oslo

The Akerselva river

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THANK YOU
FOR YOUR ATTENTION