University of Salford MANCHESTER

Linking Sustainable urban Drainage Systems (SuDS) and ecosystem services: new connections in urban ecology

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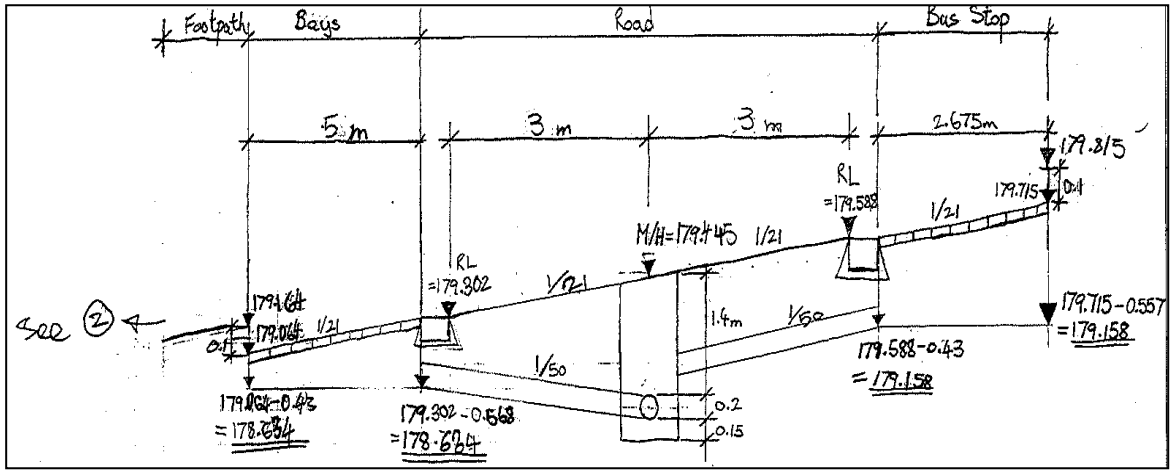
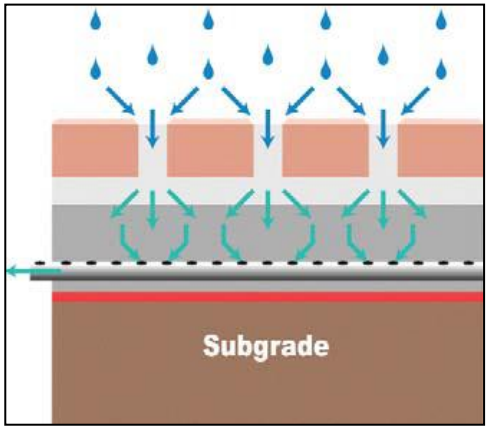
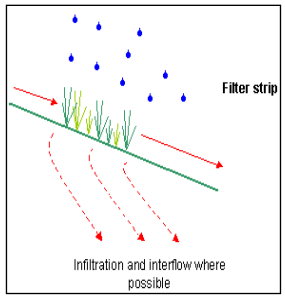
Current Situation

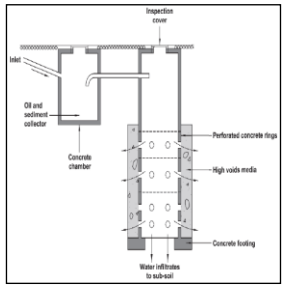
My experience - A2B Blackridge Station Car park

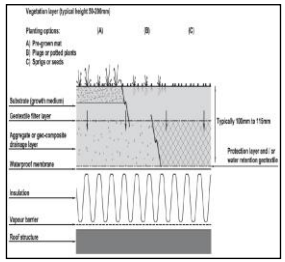




Gap in current research







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Research Approach

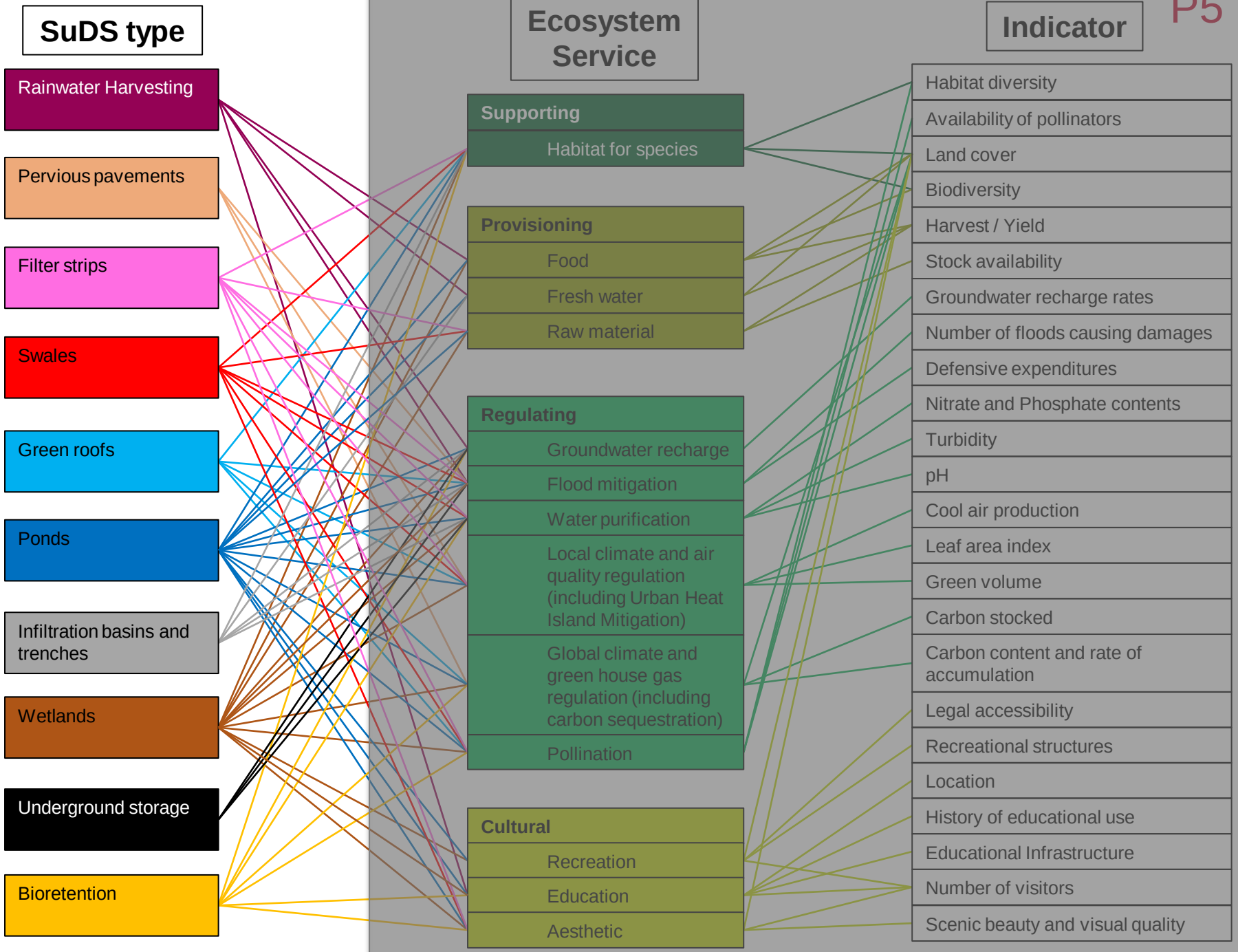
To critically evaluate Sustainable urban Drainage Systems in terms of the emerging ecosystem services paradigm.

A new way to link SuDS and ecosystem services.

Collect data to verify the links between SuDS and ecosystem services.

Data analysis to quantify the SuDS techniques and sites examined.

Extrapolate the findings for the analysis of land use changes in a city scale.


SuDS type
Rainwater Harvesting
Pervious pavements
Filter strips
Swales
Green roofs
Ponds
Infiltration basins and trenches
Wetlands
Underground storage
Bioretention
Ecosystem Service
Supporting
Habitat for species
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Land cover
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Recreational structures
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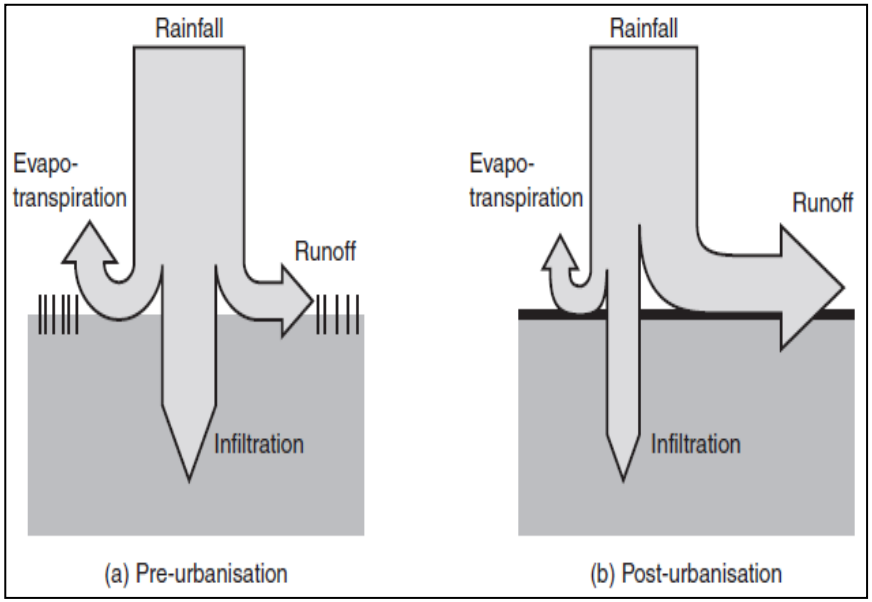
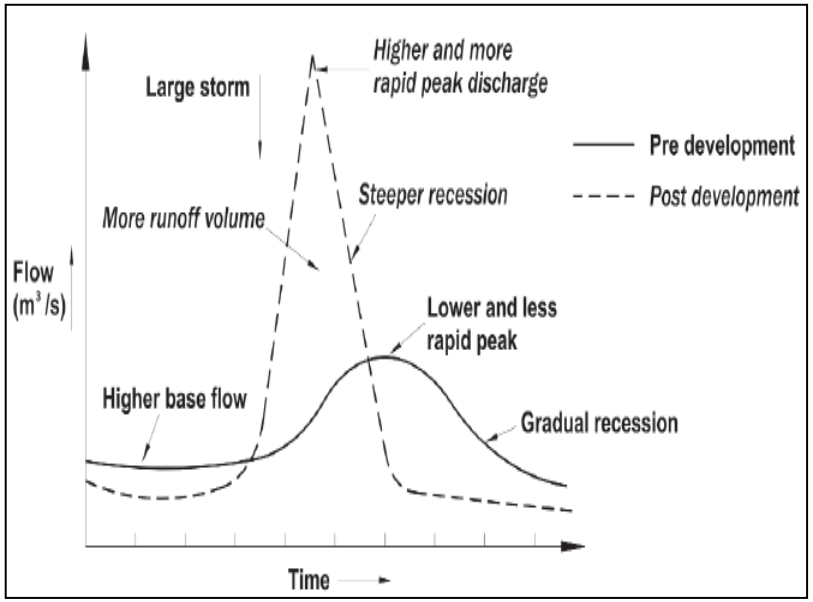
Educational Infrastructure
Number of visitors
Scenic beauty and visual quality

Key drivers for sustainability in urban drainage 1

- The impacts of urbanisation on hydrological processes.
  - Impermeable surfaces result in increased runoff and earlier arrival of stormwater to river.
  - Rapid rise and fall of peak discharge – sudden flooding of river.



(Butler and Davies, 2011)



(CIRIA, 2011)

Key drivers for sustainability in urban drainage 2

- Water quality deterioration due to urban diffuse pollution.

- Climate change increases risk of flooding.

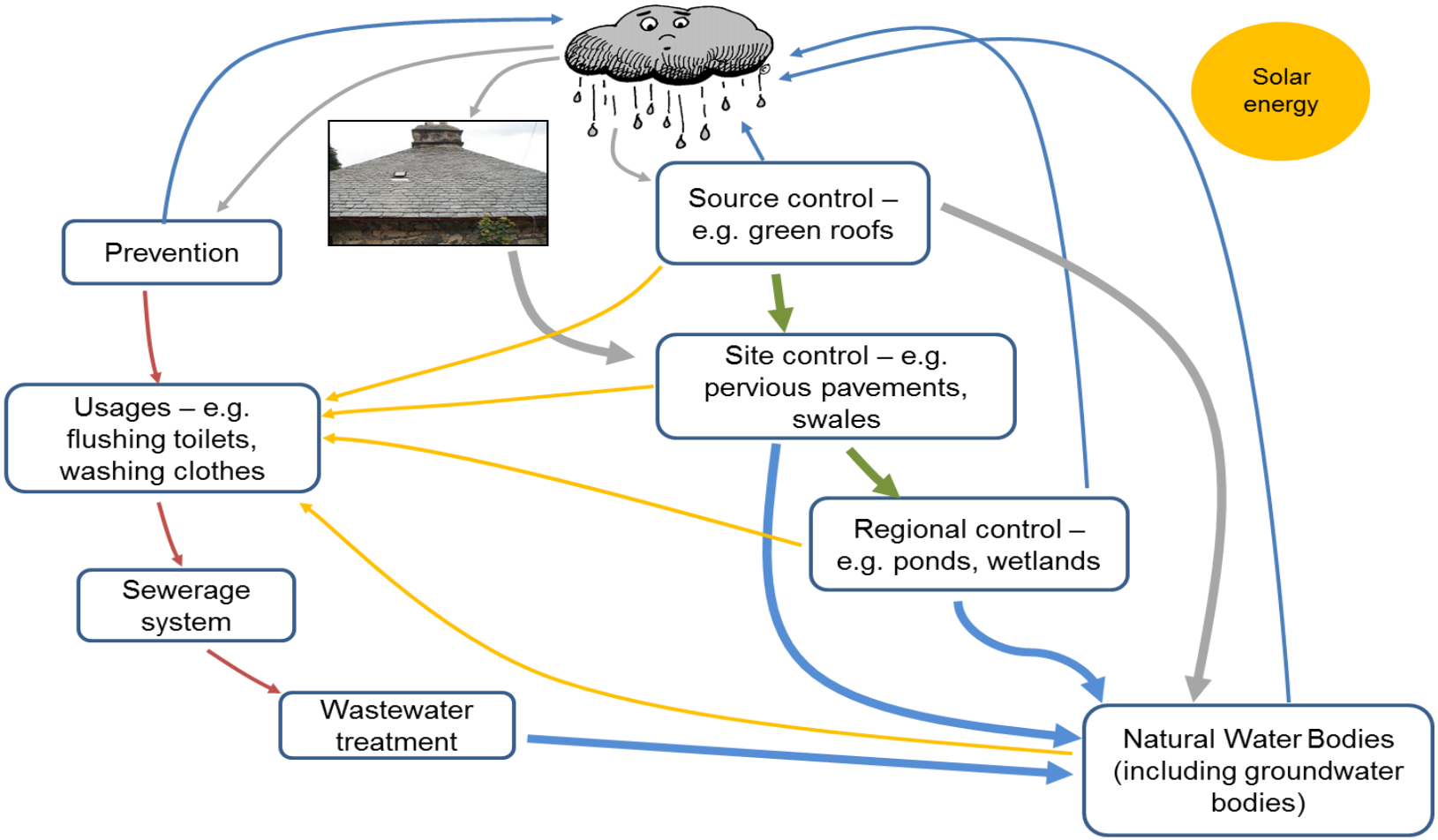
Key legislations for sustainability in urban drainage

- 2000 – Water Framework Directive
  - All urban surface runoffs has to be controlled so that their impact to the receiving environment is mitigated.
  - Transposed into UK National legislation in Dec 2003.

- 2004 – Making space for water (England)
  - Government consultation on future flood risk management.

- 2006 – National policy in England - Planning Policy Statement 25: Development and Flood Risk
  - Flood risk management hierarchy: assess, avoid, substitute, control (SuDS), mitigate.

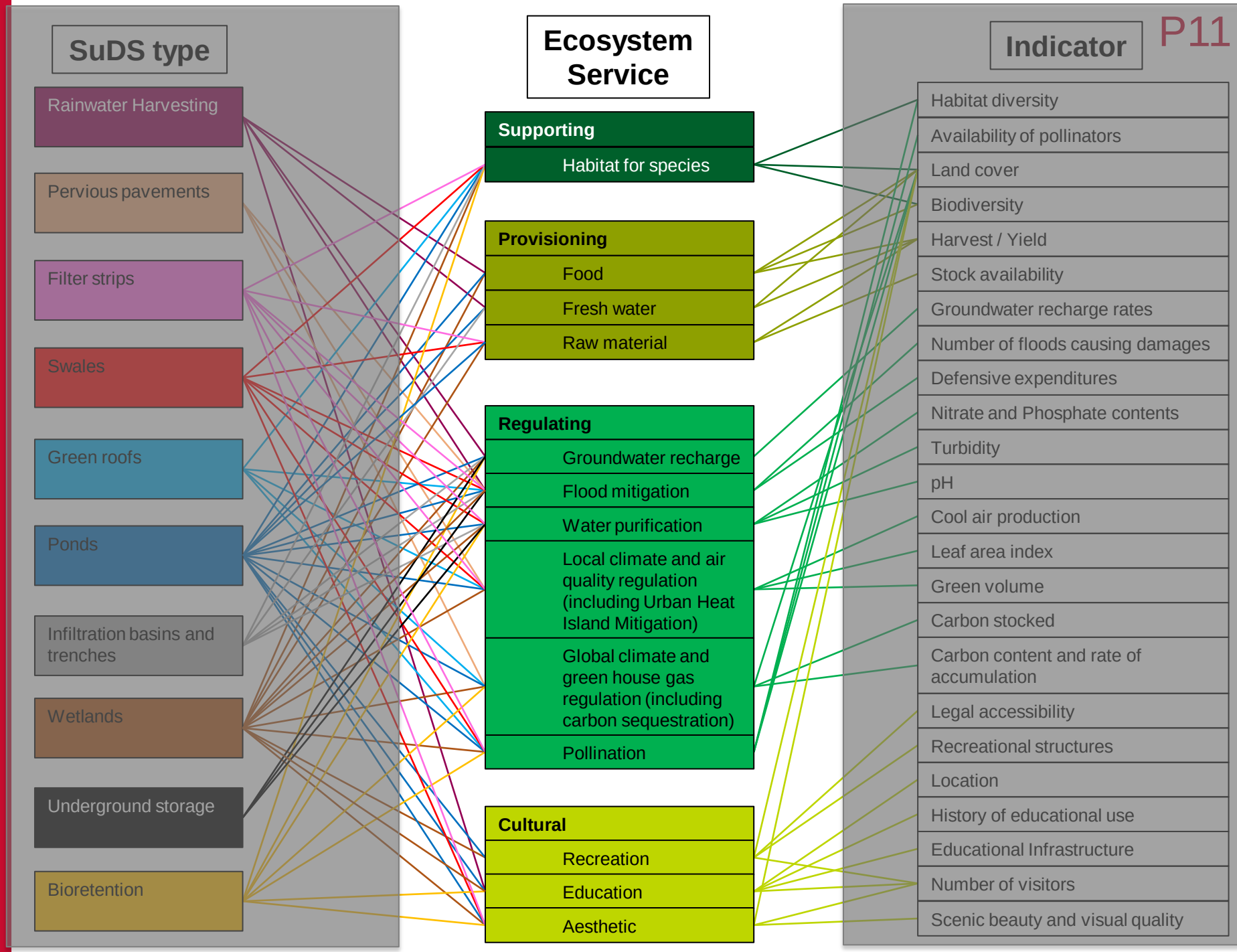
SuDS



Symbol	→	→	→	→	→	→	→
Explanation	Evaporation	Precipitation	Runoffs from roofs and impermeable surfaces	SuDS Conveyance – e.g. filter strips, swales	Conveyance to Wastewater treatment	Conveyance to Usages	Connections to Natural Water Bodies

SuDS types

Rainwater Harvesting
Pervious pavements
Filter strips
Swales
Green roofs
Ponds
Infiltration basins and trenches
Wetlands
Underground storage
Bioretention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Ecosystem Services 1

Provisions from the natural environment that are beneficial to human beings.

- 1997 – Gretchen C. Daily et. al.
  - Introduction to ecosystem services

- 1997 – Robert Costanza et. al.
  - A table listing 17 major categories of ecosystem services and functions.

- 2002 – Rudolf S. de Groot et. al.
  - A framework diagram and a table distinguishing between ecosystem functions, processes, goods and services.

- **2005 – Millennium Ecosystem Assessment (MEA)**
  - Four categories: supporting, provisioning, regulating, and cultural.

Ecosystem Services 2

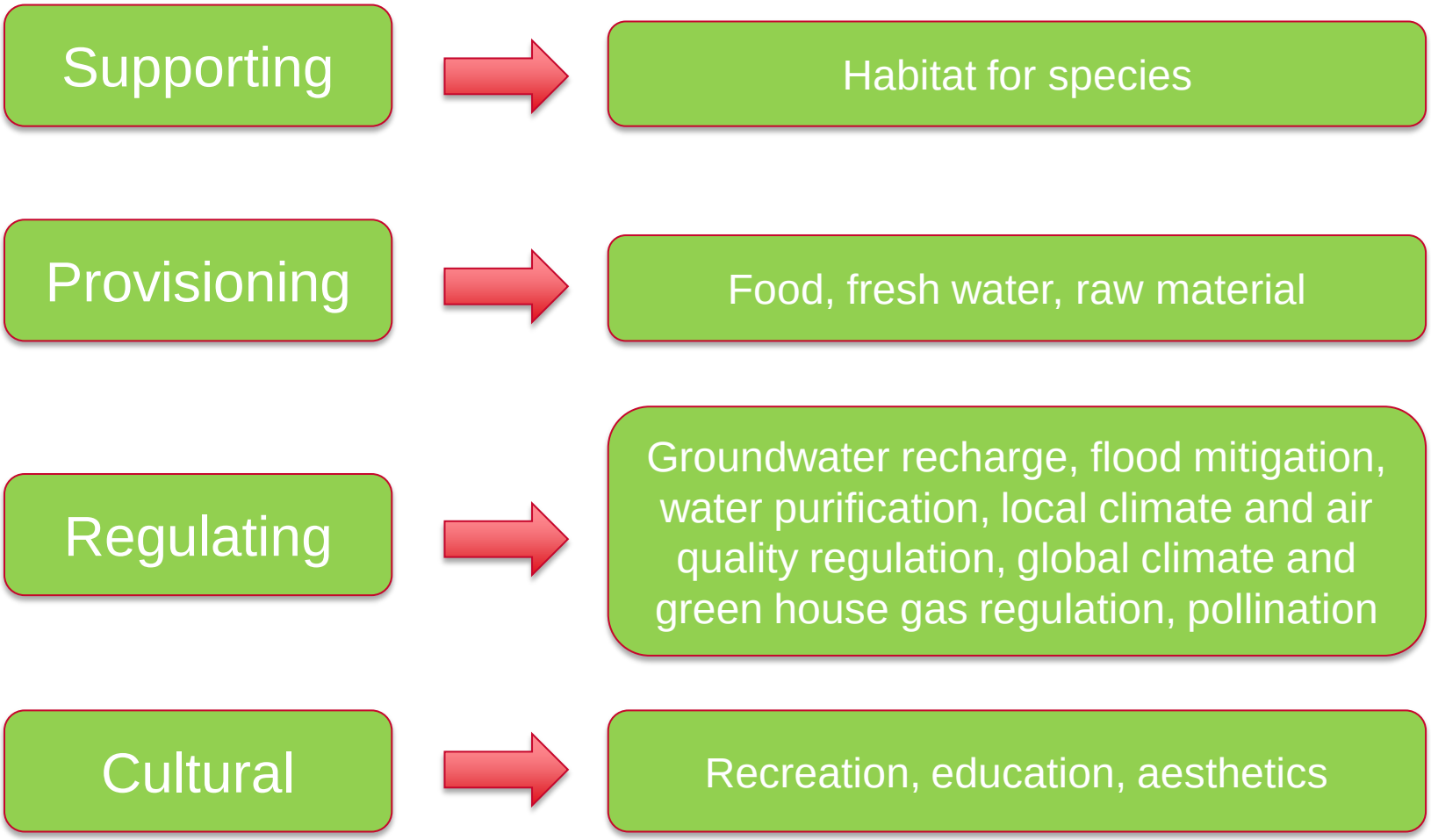
- 2007 – Boyd and Banzhaf
  - Started to distinguish ecosystem services and ecosystem processes.

- **2010 – The Economics of Ecosystems and Biodiversity (TEEB)**
  - Four categories: habitat or supporting, provisioning, regulating, and cultural.
  - Excluded ecosystem processes such as primary production and water cycle.

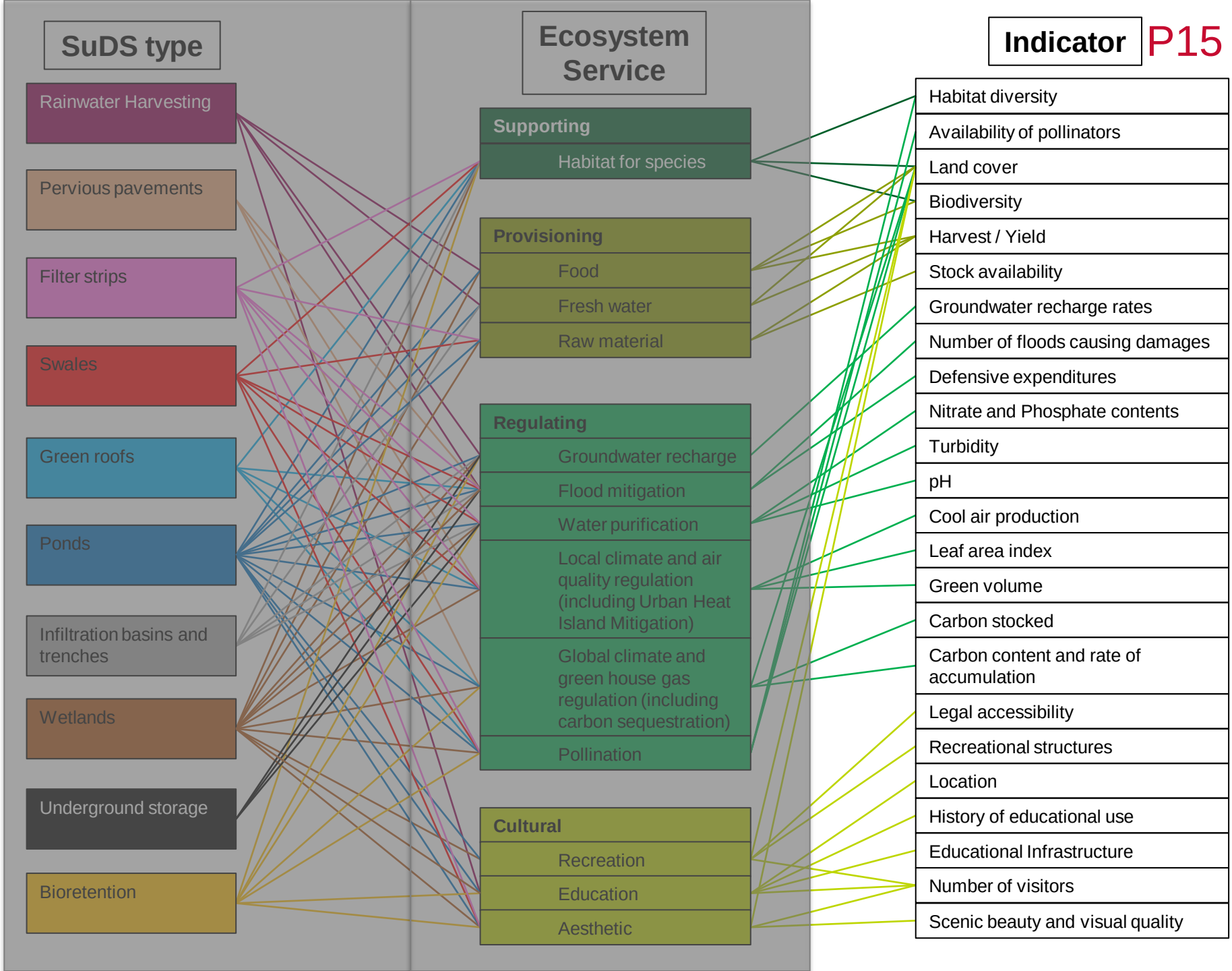
- **2011 – UK National Ecosystem Assessment (UK NEA)**
  - Three categories: provisioning, regulating, and cultural.
  - Excluded supporting services.

- 2011 – Bastiana et. al.
  - Further divide ecosystem services as properties, potentials and services.

For this research



(Costanza et al., 1997; Daily, 1997; Groot et al., 2002; MEA, 2005; TEEB, 2010; World Resources Institute, 2010; UK NEA, 2011)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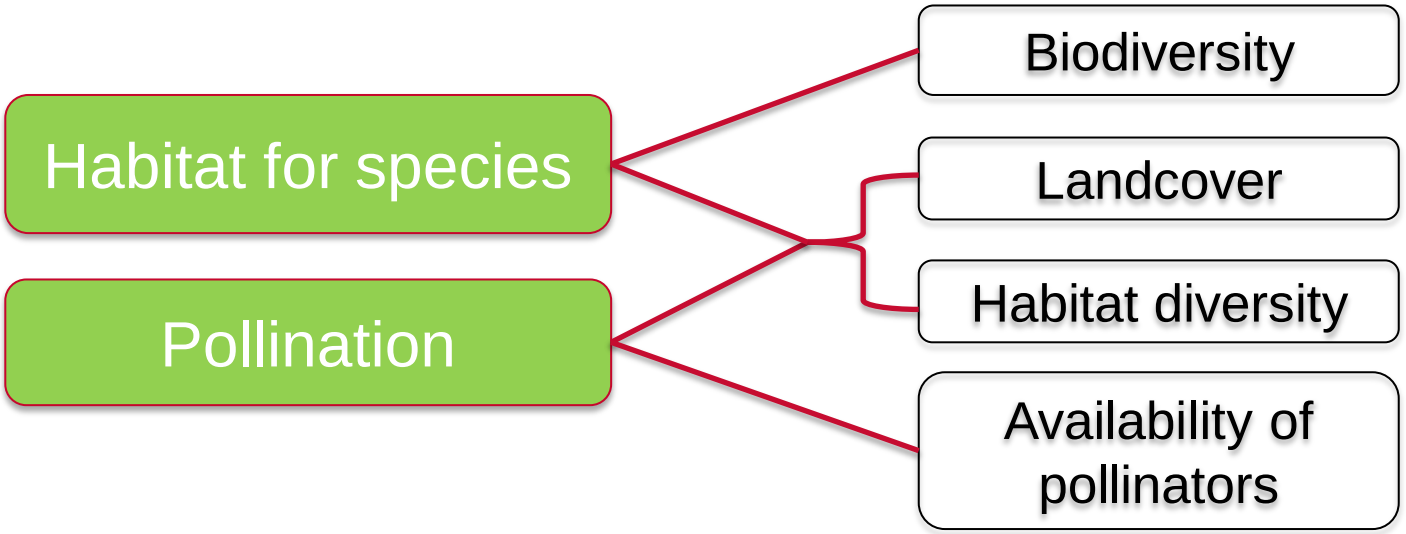
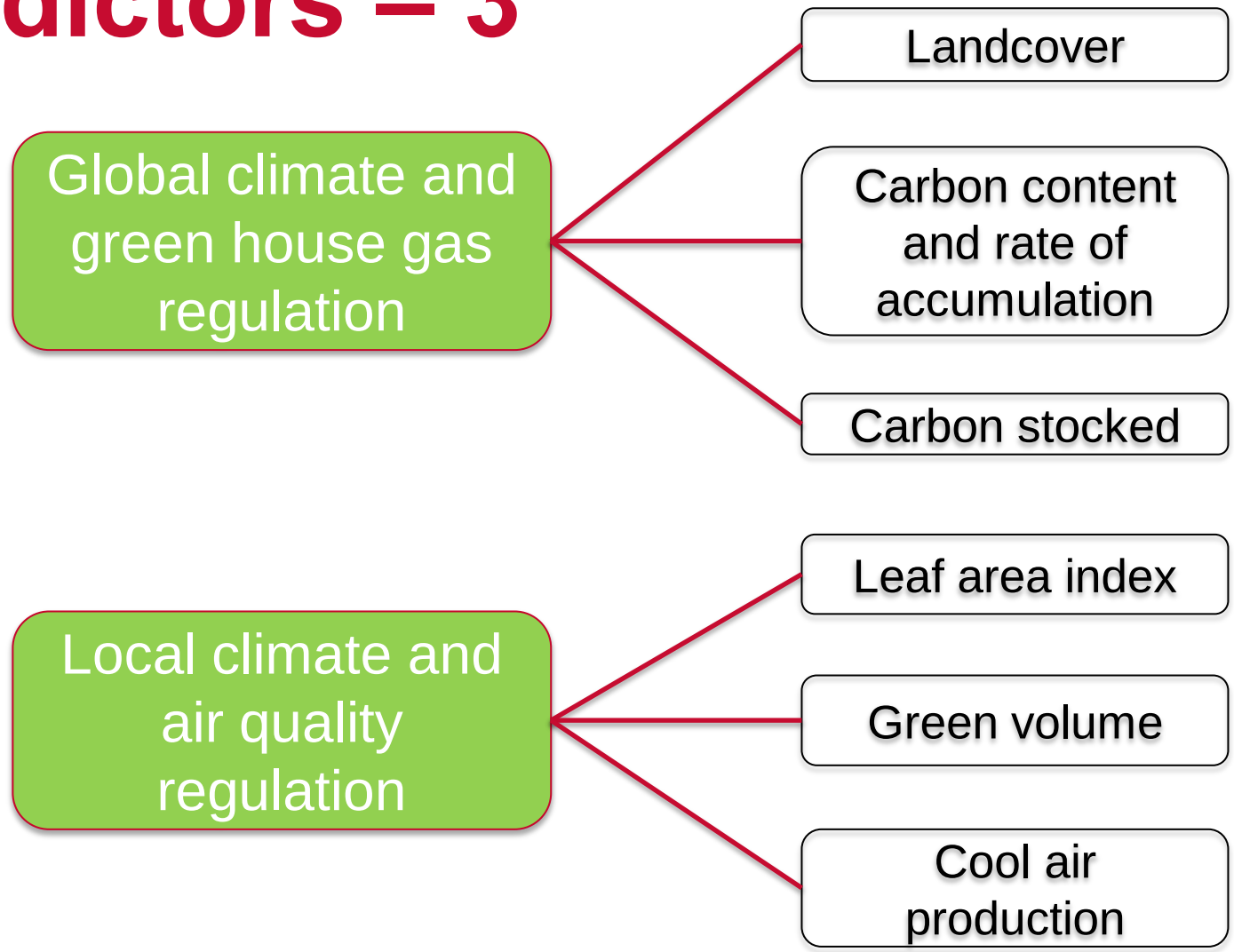
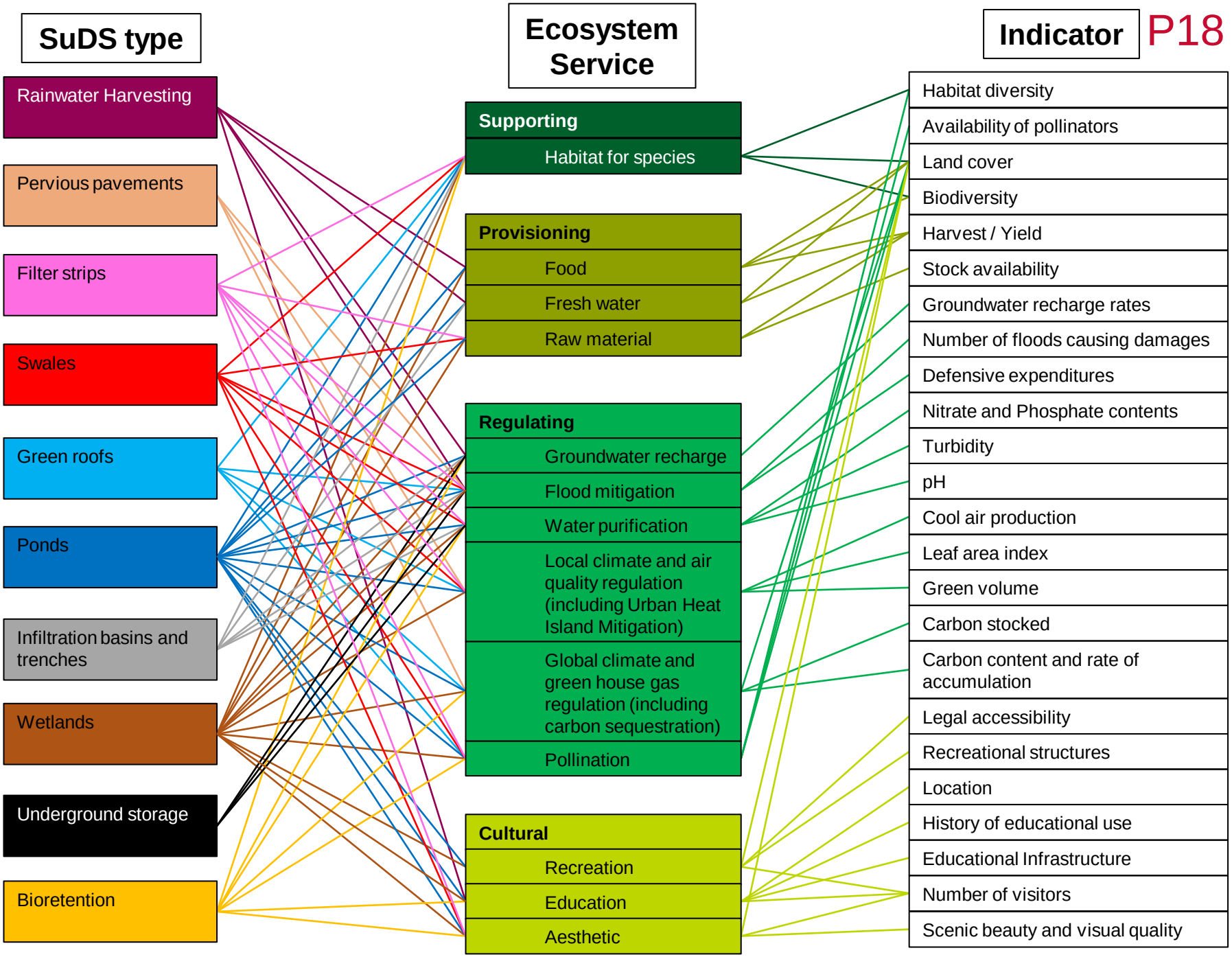
Ecosystem services indictors – 1



Ecosystem services indictors – 3

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Any questions?