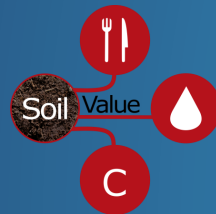




Urban Soil Ecosystem services

Contributing to sustainable urban development

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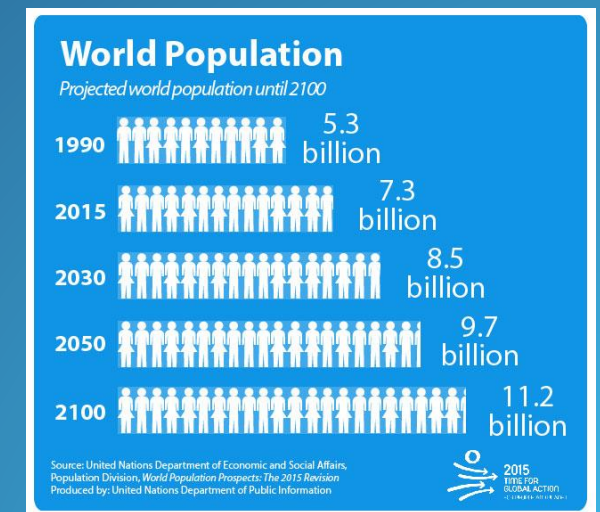
Engineering and
Physical Sciences
Research Council



Urban soil provides multiple ecosystem services



+ growing urban population



Urban soil ES: what do we know?

- Urban soil ecosystem services are increasingly being studied (Morel et al., 2015; Vasenev et al., 2018; Blanchart et al., 2018)
- More emphasis is being placed on the importance of urban soil ES
- Studies often consider ES in general or methods for quantification
- However, there is a gap in **bringing together what we currently know**



We undertook a **systematic literature review** to find out what we know about urban soil ES research

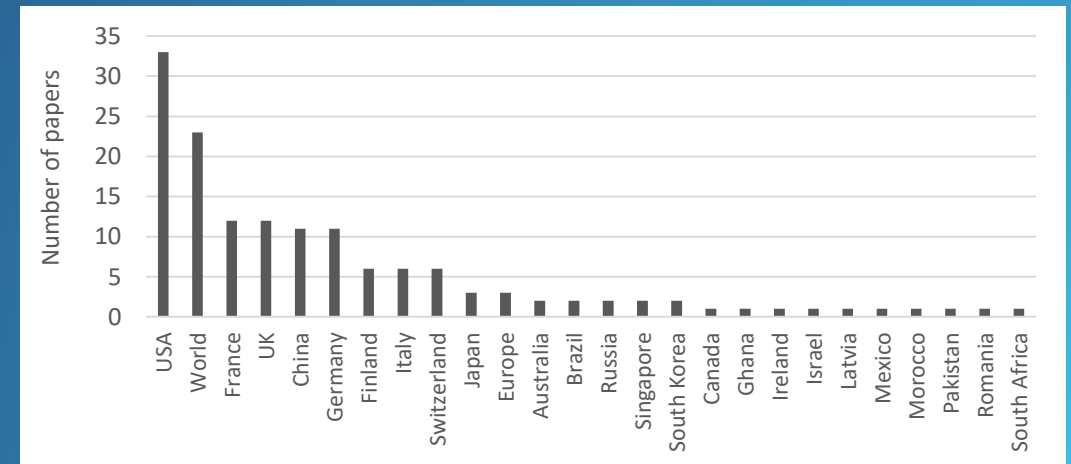
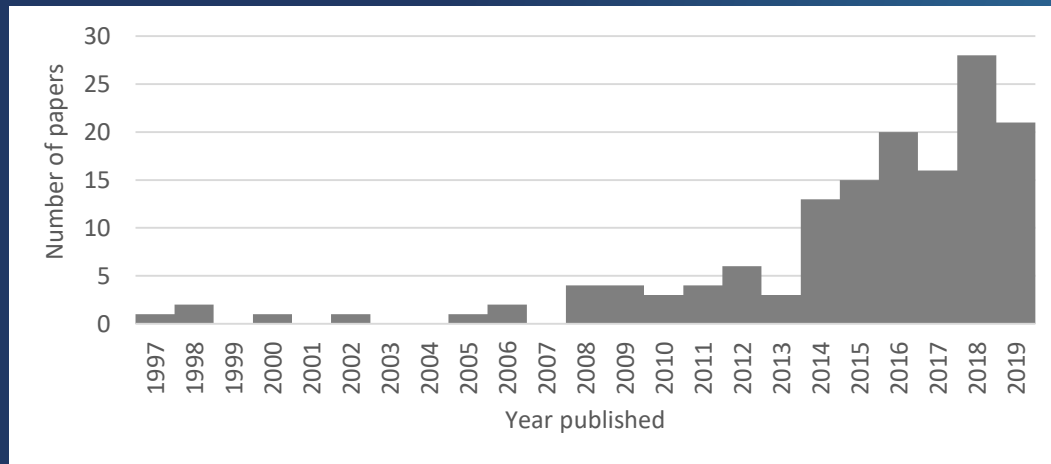
Key questions:

- Which ES are provided by urban soils?
- To what extent have they been studied?
- How they will be altered by future drivers of change?



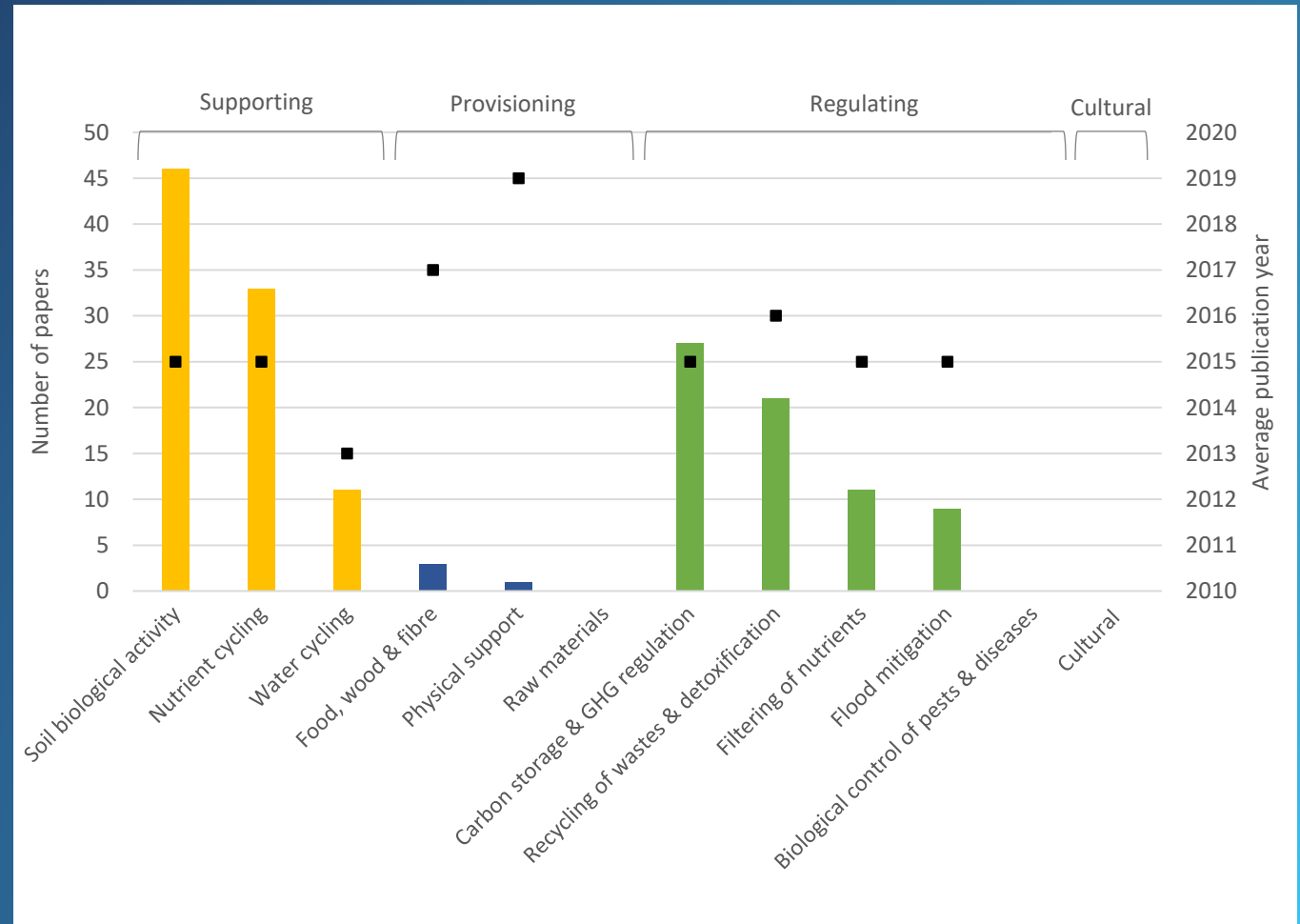
Review: the ecosystem services of urban soils

- Literature is relatively small and recent
- Most research undertaken in the USA, and much in Europe and China
- Many papers take a global perspective i.e. 'world' papers – often review papers that discuss importance or approaches



Which ES have been studied?

- Research focuses on supporting processes (88%)
 - predominance on **soil biological activity** and **nutrient stocks**
 - Less focus on water cycling
- Regulating services also frequently studied (67%)
 - focus on **soil carbon storage** and **recycling of wastes and detoxification**
- Notable gap in provisioning services
 - **urban food rarely studied** – contrast to non-urban soil studies where food is important service from soil
- Gap in studies on cultural services



Which ES have been studied?

Interrelation between services

- Most papers (59%) studied only one ES
- Only 14% studied three ES
- Supporting processes often studied together – shows processes are interlinked
 - E.g. Nutrient cycling & soil biological activity

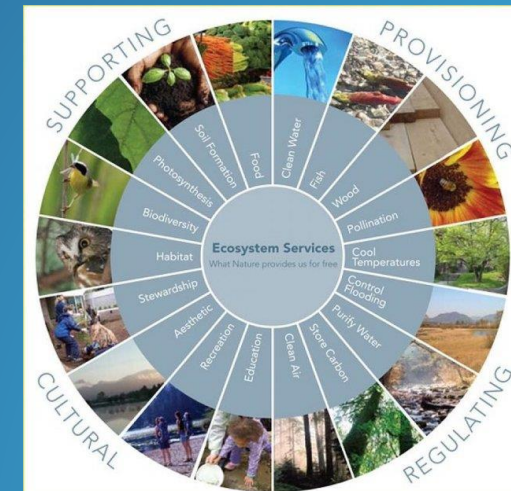
Nutrient cycling



Soil biological activity



Multi-functionality



MEA (2005)

Multifunctionality not quantified

- Lack of services studied together suggests the **multifunctionality of urban soil is being missed**

Key terms in literature: Co-occurrence analysis

Used to explore structure of the research community

3 groupings identified:

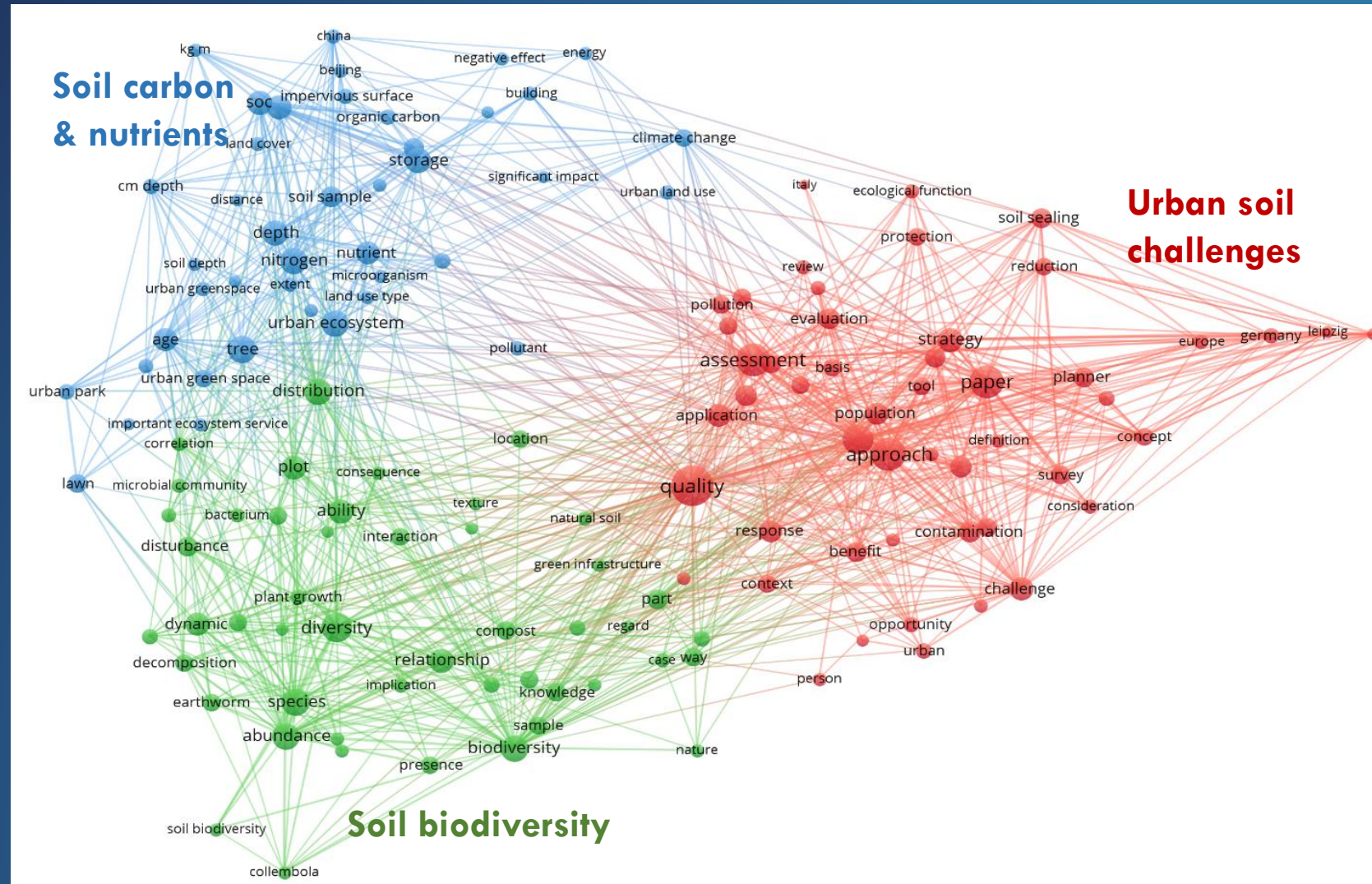
- **Soil carbon & nutrients**
- **Soil biodiversity & activity**
- **Urban soil challenges**

Grouping reflects literature analysis:

- research focuses on **supporting services**
- predominance on **soil biological activity**, **soil carbon** and **nutrient stocks**

Gaps in key terms:

- terms associated with **water**
- Food & **urban growing**
- **Cultural** services not represented



Gaps in knowledge & recommendations

We summarise the main gaps in knowledge and make recommendations for future work:

- **Water** – SUDS and stormwater community to link up with ES community
- **Food** – urban food community – enable urban food to be quantified
- **Cultural** – links between soil and the myriad benefits to people in cities need to be highlighted
- **Interconnection between communities** – aid the study of multiple services and enable inclusion of soil multifunctionality into planning
- **Global research** – research to expand into a broader range of countries
- **Future drivers of change** – soil sealing, climate change, use of technosols



This review provides a big picture overview of what we know about ES from urban soils.

We hope it will enable them to be better managed to support future human wellbeing and urban ecosystems.



Thanks!

The review paper is nearing submission.
Please get in touch if you'd like to discuss further!

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