



Science of Landscape Sustainability: Principles, Core Questions, and Key Approaches

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Heterogeneity matters. Scale matters. Context *matters*.





- * Landscapes are often **cultural**.
- * Coupled Human-Environmental Systems (CHES)

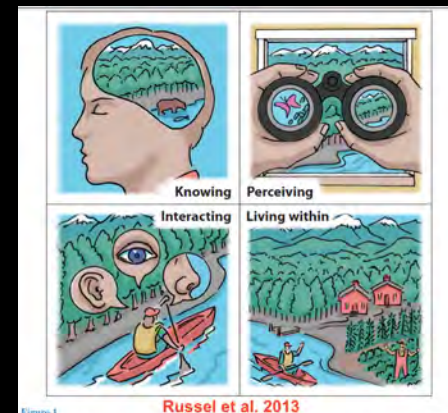


Figure 1
 Russel et al. 2013
 Four channels of human interactions with ecosystems: (a) knowing, thinking about an ecosystem or just the concept of an ideal ecosystem, (b) perceiving, remote interactions with ecosystem components, (c) interacting, physical, active, direct multisensory interactions with ecosystem components, and (d) living within, everyday interactions with the ecosystem in which we live.



LANDSCAPE ECOLOGY – Many Definitions ...

Wu and Hobbs (2007):

- The integration of *science* and *art* of *studying* and *improving* the relationship between spatial *pattern* and ecological as well socioeconomic *processes* on multiple *scales*.

Wu J. and Hobbs R. 2007. Landscape ecology: The-state-of-the-science. In Wu J. and Hobbs R. (eds.), *Key Topics in Landscape Ecology*, pp. 271-287. Cambridge University Press, Cambridge, UK.



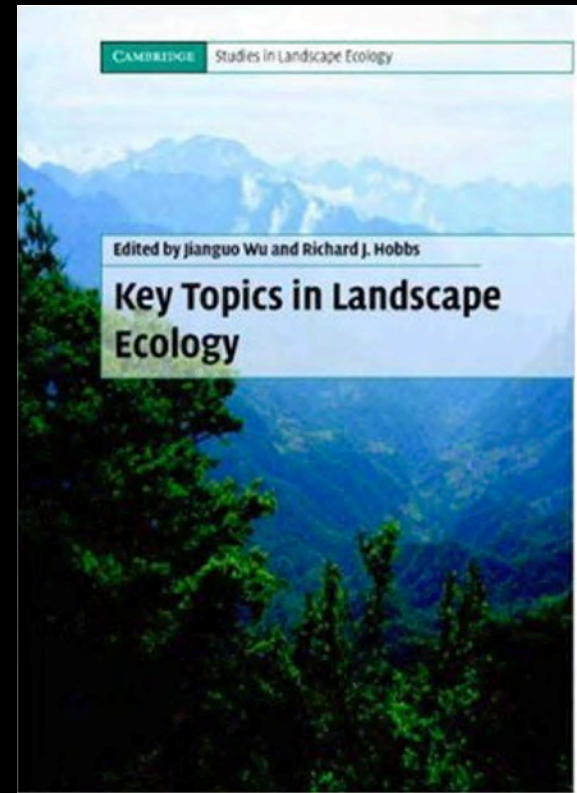
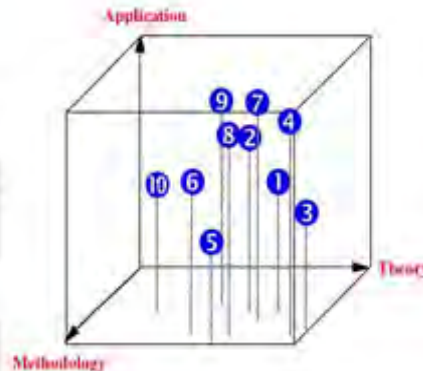
Key Topics in Landscape Ecology

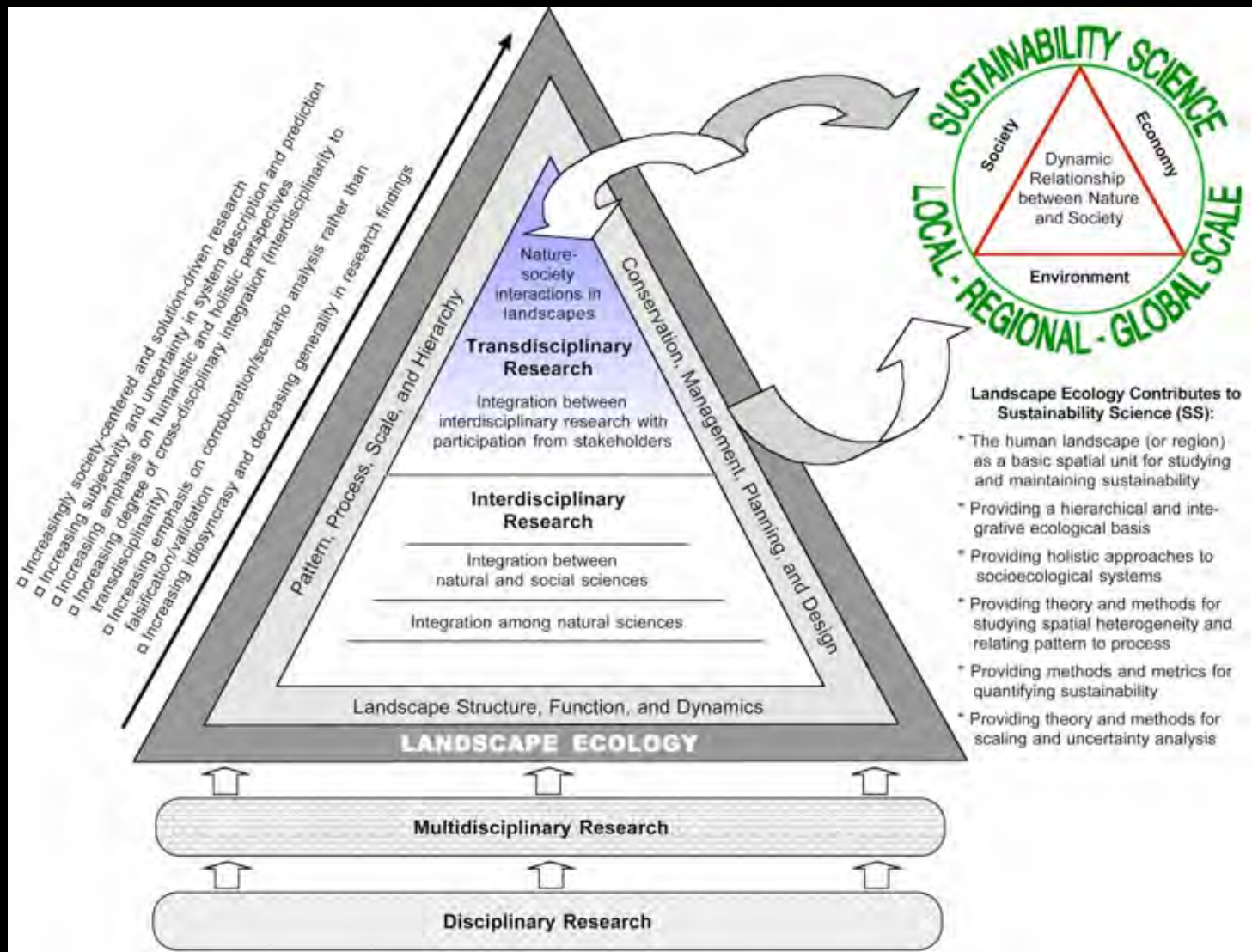
Wu and Hobbs (2002, 2007)

Top 10 Research Topics in Landscape Ecology

Wu, J. & R. Hobbs. 2002. Key issues and research priorities in landscape ecology. *Landscape Ecology* 17:355-365.

1. Ecological flows in landscape mosaics
2. Causes, processes, and consequences of land use and land cover change
3. Nonlinear dynamics and landscape complexity
4. Scaling
5. Methodological development
6. Relating landscape metrics to ecological processes
7. Integrating humans and their activities into landscape ecology
8. Optimization of landscape pattern
9. Landscape conservation and sustainability
10. Data acquisition and accuracy assessment





Wu, J. 2006. Landscape ecology, cross-disciplinarity, and sustainability science. *Landscape Ecology* 21:1-4.

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Landscape Sustainability Science

- To operationalize sustainability science via linking biodiversity, EF, ES, and HWB on landscape/regional scales



Global



Landscape/
Regional



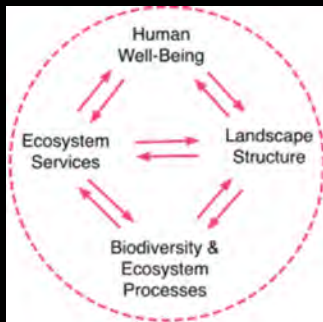
Local

Wu, J. (2013). **Landscape sustainability science: Ecosystem services and human well-being in changing landscapes.** *Landscape Ecology* 28: 999–1023.



Landscape Sustainability Science

- **Landscape Sustainability:**
 - The **capacity** of a landscape/region to consistently provide **long-term**, landscape-specific **ecosystem services** essential for maintaining and improving **human well-being** in a regional context under environmental and sociocultural **changes**.
- **Landscape sustainability science (LSS):**
 - a **place-based, use-inspired** science of understanding and improving the **dynamic relationship between ecosystem services and human well-being** in changing landscapes with **spatially explicit** methods and outcomes.

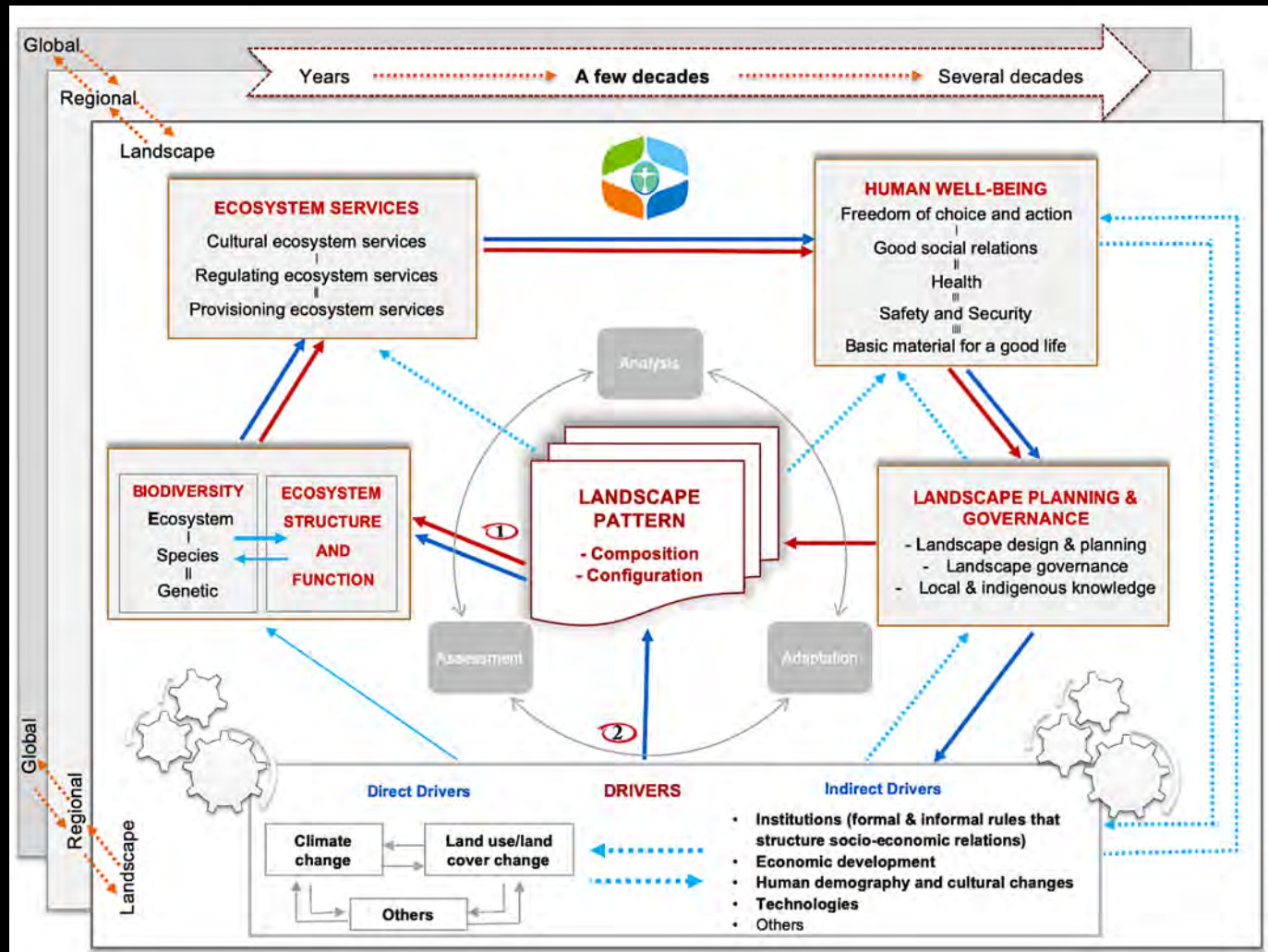


Wu, J. (2013). Landscape sustainability science: Ecosystem services and human well-being in changing landscapes. *Landscape Ecology* 28: 999–1023.

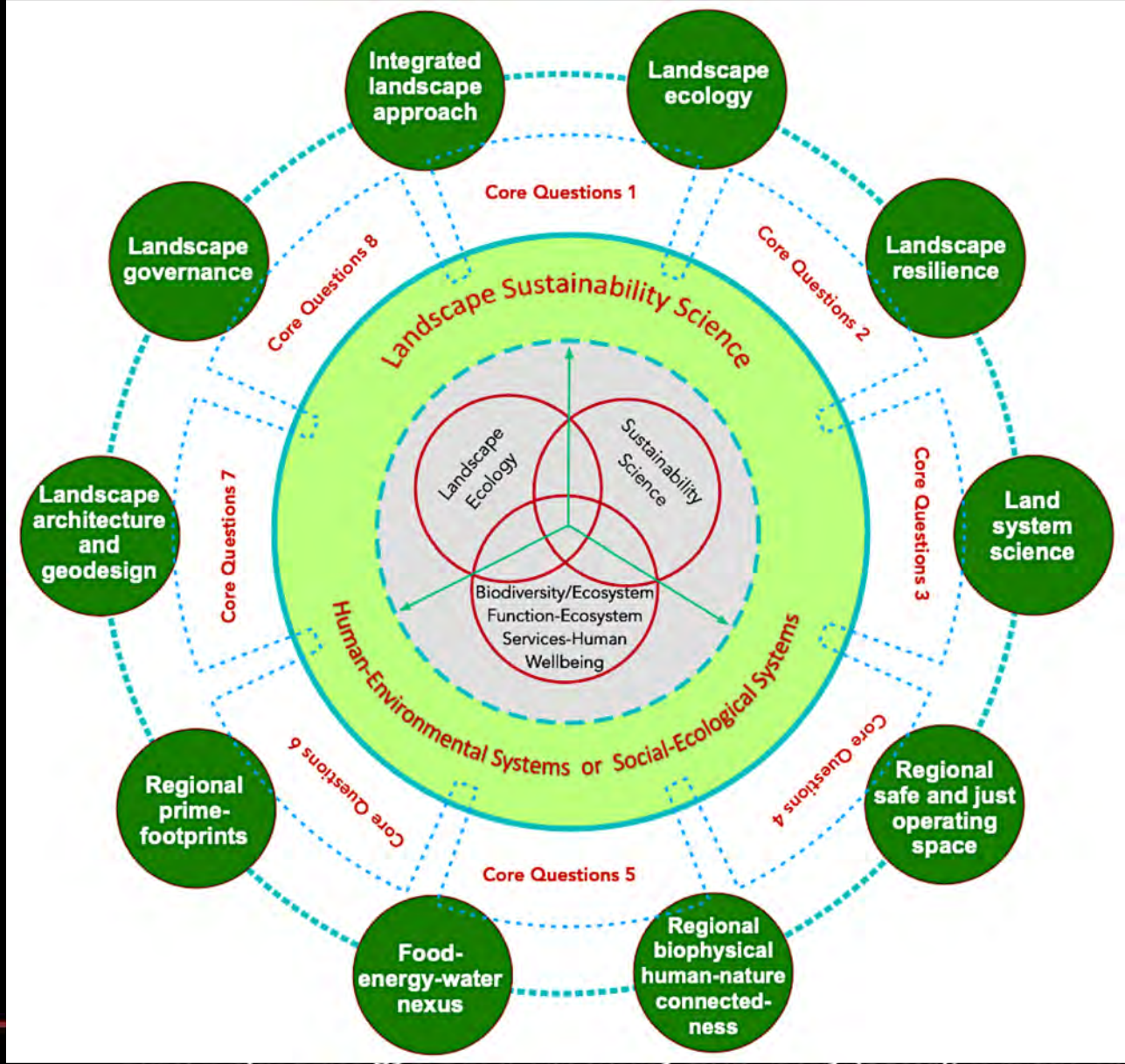


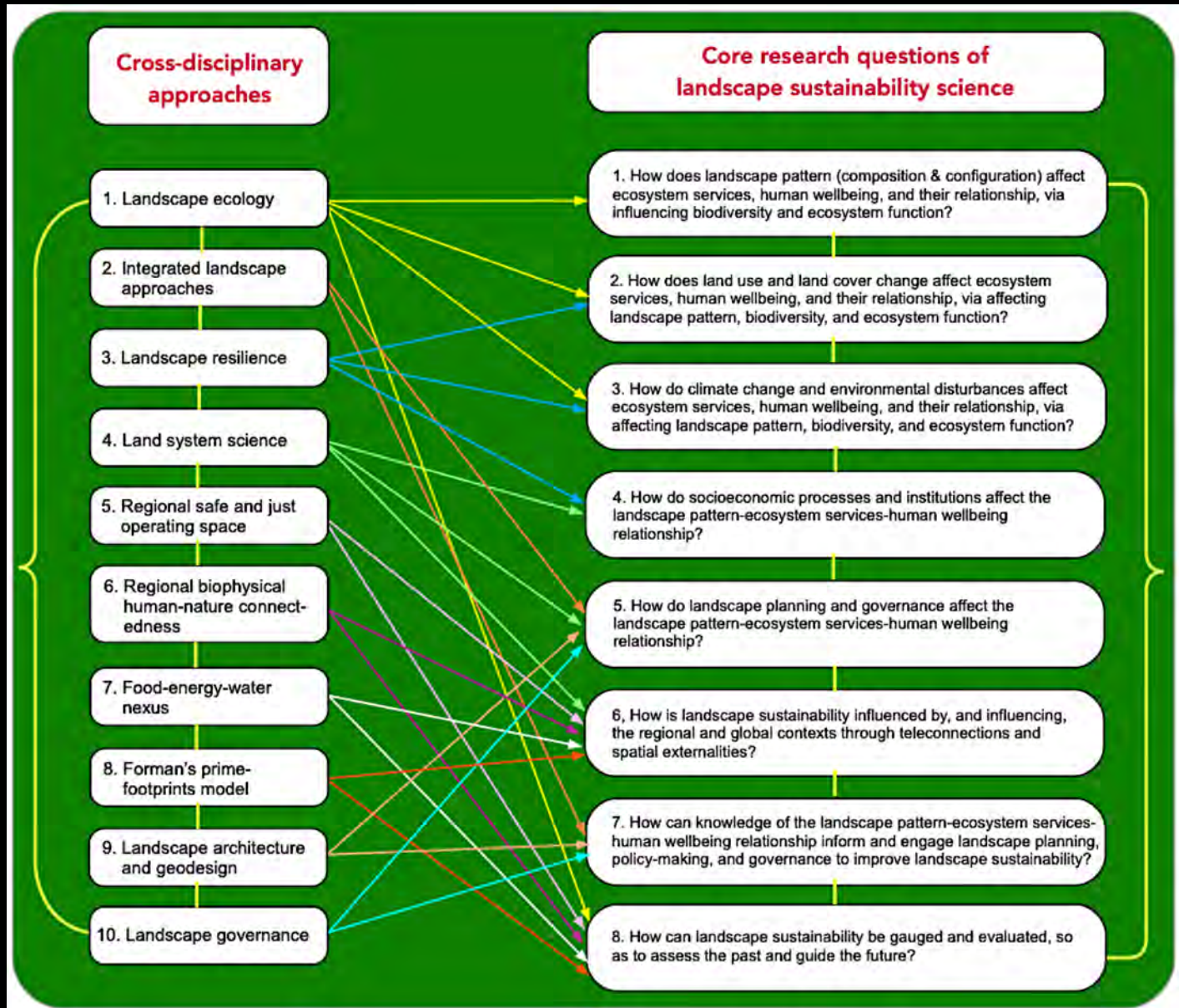
The inner loop (red): LP – Biodiv/EF – Ecosystem Services – HWB – Landscape Planning and Governance – LP
The outer loop (blue): Drivers – LP – Biodiv/EF – Ecosystem Services – HWB – Landscape Planning and Governance – Drivers

Wu, J. 2021. Landscape sustainability science: Core questions and key approaches. Landscape Ecology 36:2453-2485.

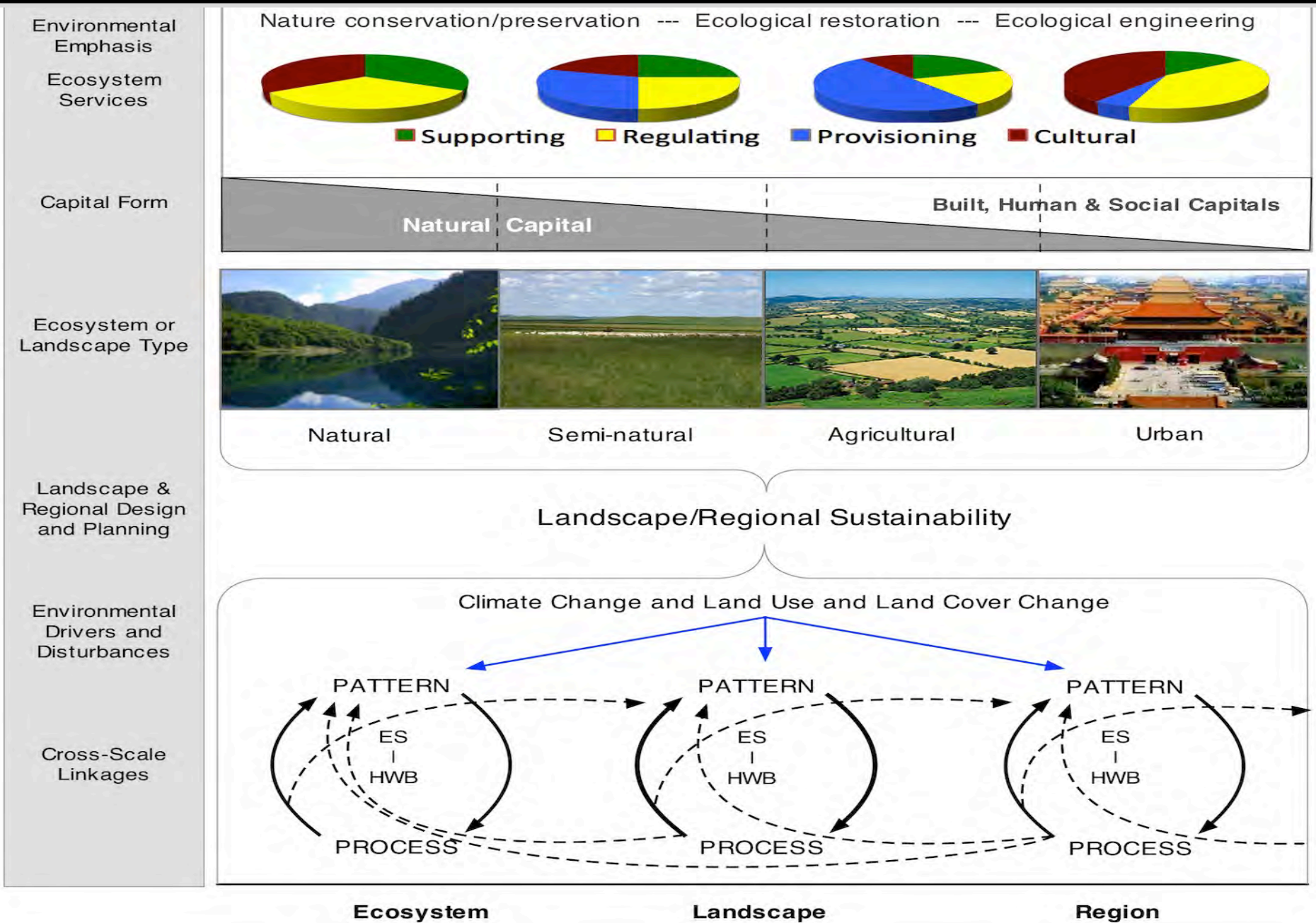


Wu, J. 2021. Landscape sustainability science (II): core questions and key approaches. *Landscape Ecology* 36:2453-2485.





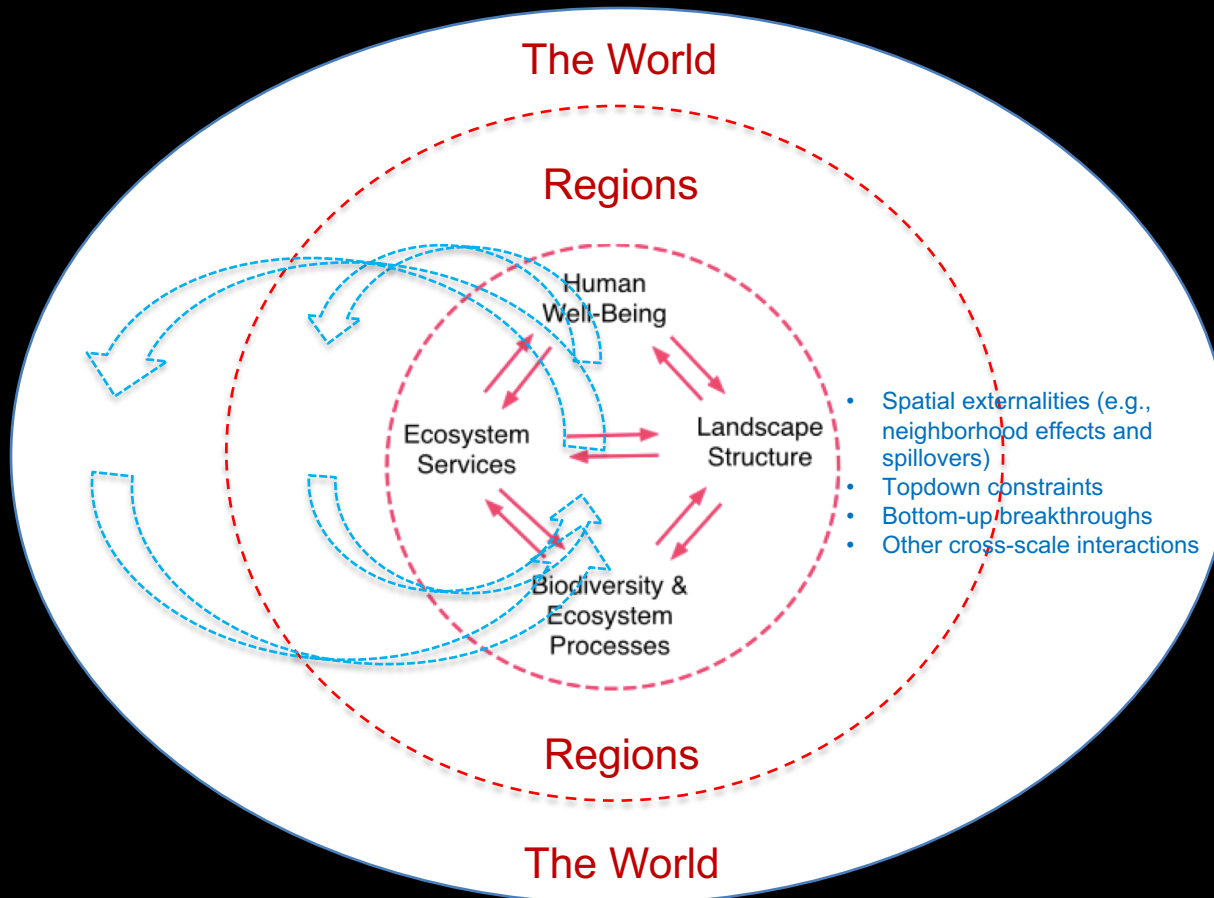
Wu, J. (2013). Landscape sustainability science: Ecosystem services and human well-being in changing landscapes. *Landscape Ecology* 28: 999–1023.





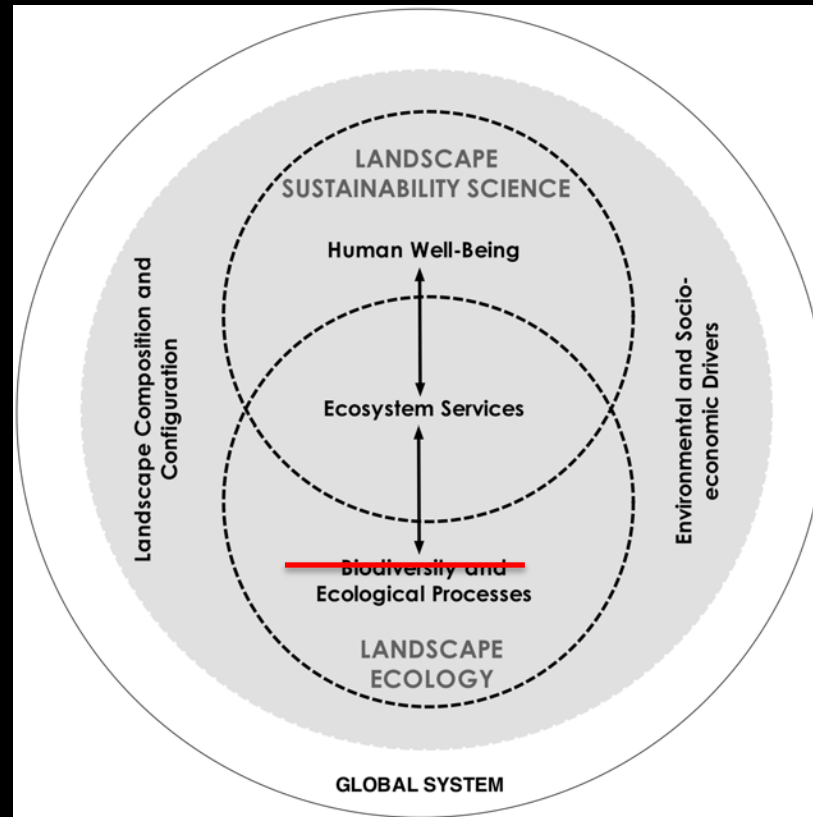
Landscape Sustainability

Linking biodiversity, EF, ES, and HWB on landscape and regional scales

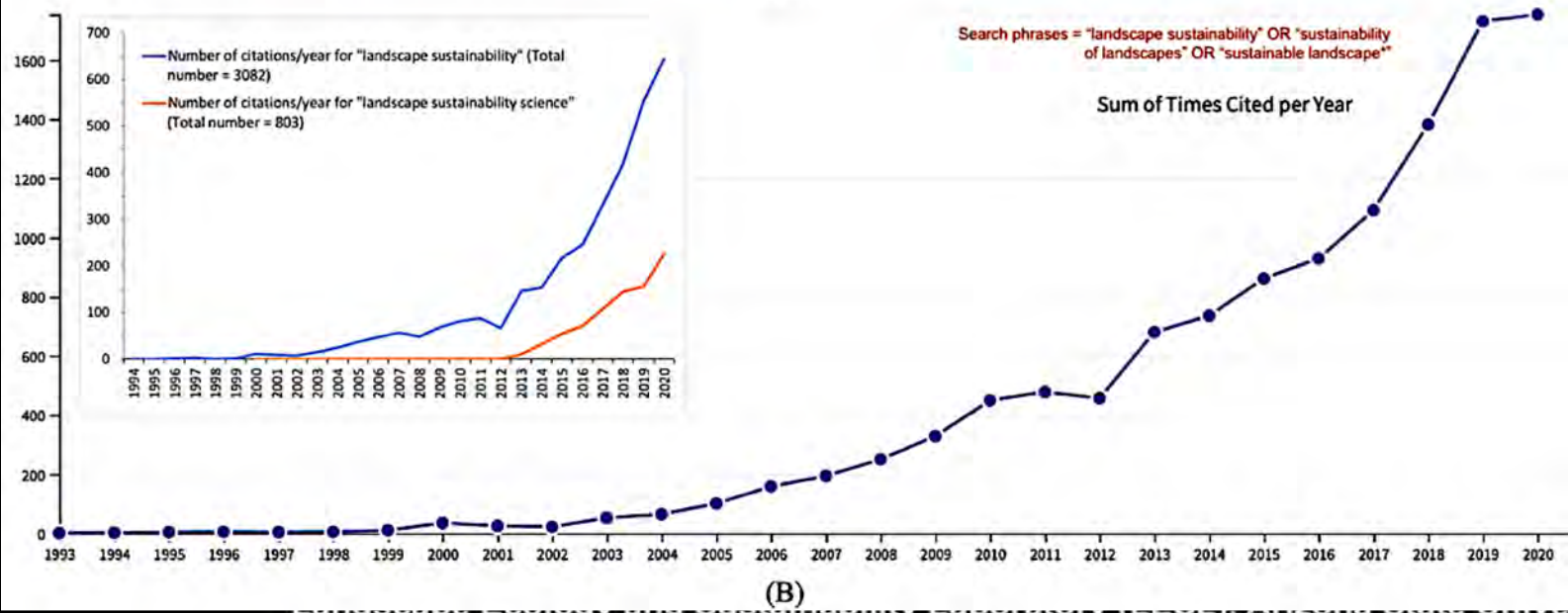
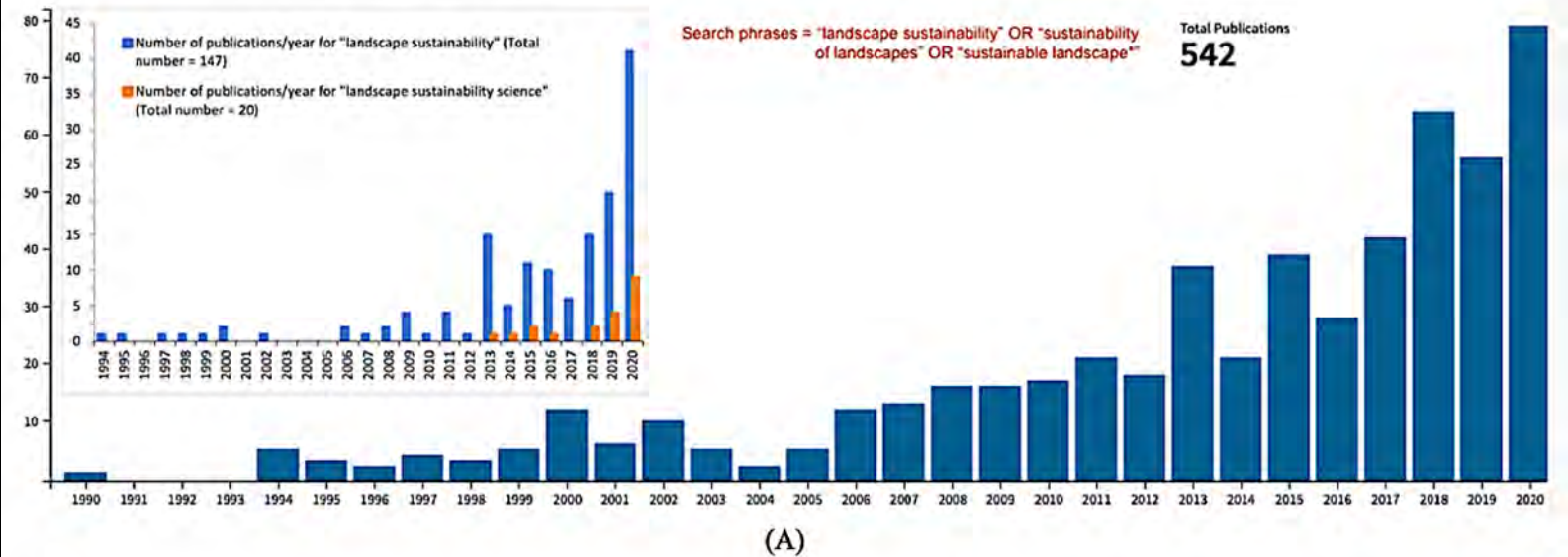




Relationship between Landscape Ecology and Landscape Sustainability Science



Wu, J. (2013). Landscape sustainability science: Ecosystem services and human well-being in changing landscapes. *Landscape Ecology* 28: 999–1023.





Concluding Remarks

- LSS has emerged as an interdisciplinary and transdisciplinary research field that aims to understand and improve sustainability by focusing on the regional landscape scale, while considering local and global scales in the same time.
- To advance LSS, future research not only needs to emphasize the relationships among landscape pattern, ecosystem services, and human wellbeing, but also to proactively integrate complementary approaches across natural and social sciences.
- Landscape sustainability is inevitably connected to the broader regional and global context; but **if global sustainability is to be achieved, our landscapes must be sustained first. It is not the other way around.**

SOS 494/598 | GCU 494/598 | GPH 494/598

Landscape Sustainability: Principles and Approaches

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Selecting your presentation papers and date (graduate students only): **Sept. 14, 2022**

The 1st Exam (open book): **3:00 -- 11:30 PM, Oct. 12, 2022**

The 2nd Exam (open book): **2:30 pm, Dec. 1 -- 11:30 pm, Dec. 6, 2022**

Team project presentation: **Nov. 28 and 30, 2022**

Team project report due: **5:00 PM, Dec. 07, 2022**

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Submission status	Open for submission from	Submission deadline
Open	29 June 2021	Ongoing

