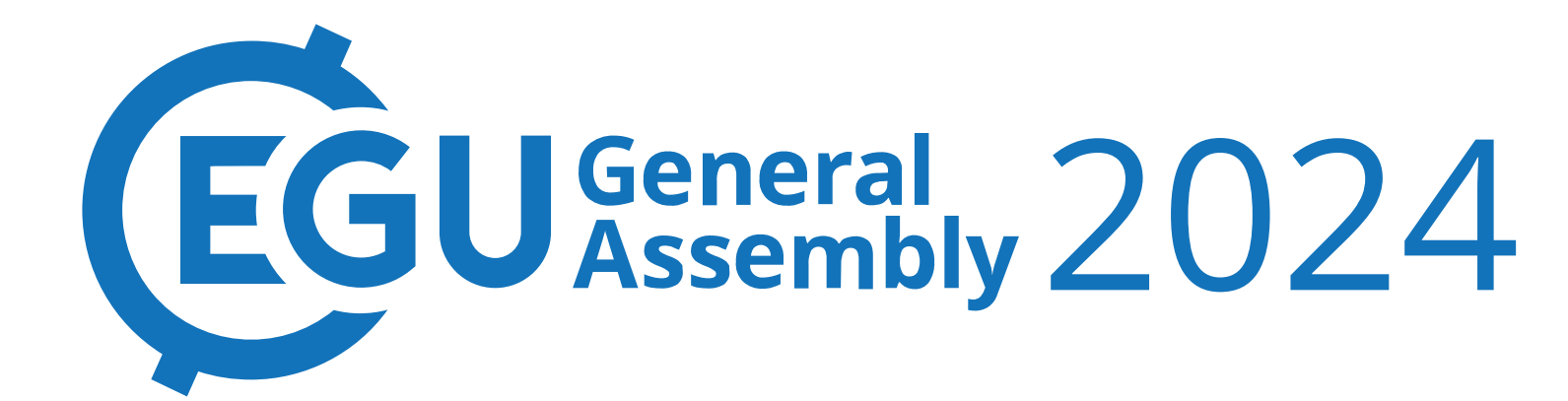


# “Slow science” concept: first insights of perceptions and suggestions in an oceanography laboratory



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### 1. The debate

**Scientist sample**

- 1/3 of the lab participate to the discussion (~45 out of 150)
- All carrier stage and education
- No administrative staff

**Perceived environment**

- Surprising excitement
- No stigmatization for such questioning (no taboo anymore)
- Stimulating ambiance that raise a lot discussions
- Free speaking of everyone

➢ Reconsideration of the environmental scientist’s roles and duties

### 2. Where did the disruptive science go ?

- « **Disruptive index** » of papers and patents (Park *et al.*, 2023)
  - becoming less disruptive over time
- Amount of material and energy throughput (e.g. computational resources, observational systems)
  - Need to increase to achieve new scientific results over time.
- Alike several dynamical systems, the return-on-investment drop when the complexity of the system increases.

As we celebrate the 200 year of the second principle in thermodynamics, we would like to remind that a larger energy input do not necessary imply a larger outcome (work produced) by the system, especially if the energy input is of high entropy or if the system has reduced efficiency.

If the research system happened to be in a falling return-on-investment scheme, it would also be likely trapped in the so-called red queen effect (Van Valen, 1973), where it would be necessary to increase material and energy throughput just keep in pace with the academic environment.

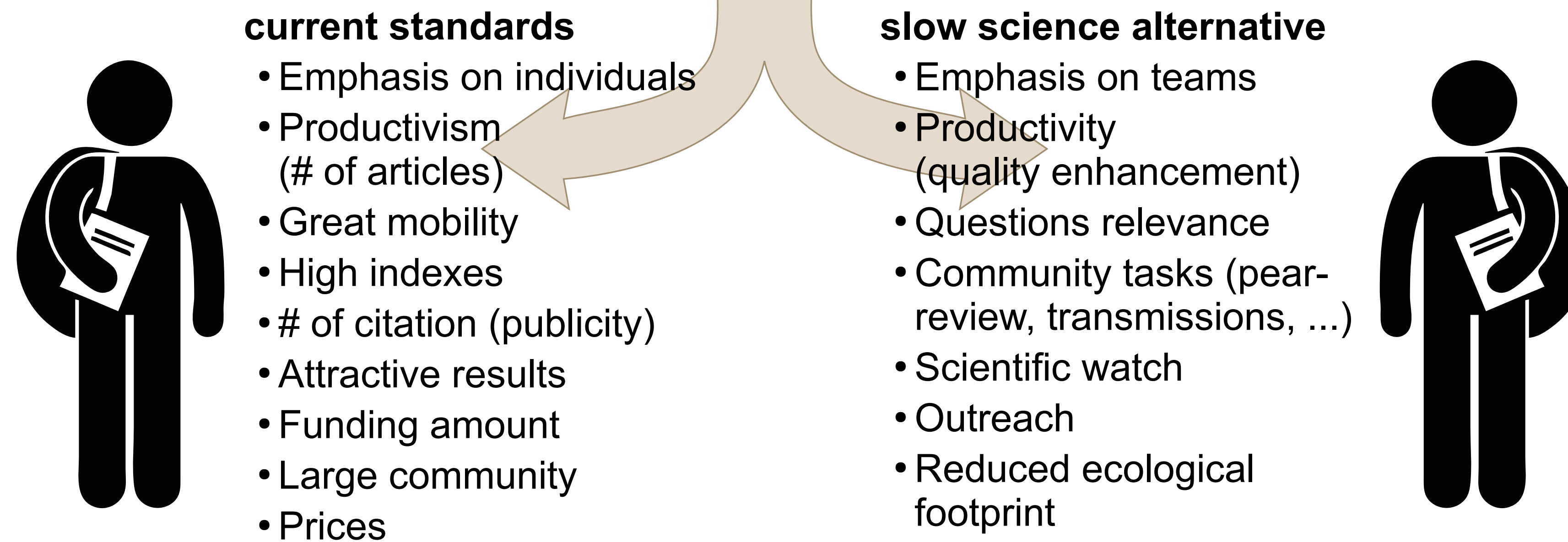
Thus, such as falling return-on-investment trap should be an additional motivation to rethink the quality, more than the quantity, of the research organization. The second law of thermodynamics should motivate us to bifurcate to another research system based on a different rhythm and efficiency.

References :  
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Stengers, I. (2018) *Another Science is Possible: A Manifesto for Slow Science*  
Urai, A.E., Kelly, C. (2023) Point of View: Rethinking academia in a time of climate crisis. *eLife*. <https://doi.org/10.7554/eLife.84991>  
Van Valen, L. (1973) A new evolutionary law. *Evol Theory* 1:1–30  
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**Fig. 1**  
Word map of inspiration to « slow science » term. Below general idea is reworked as the science selection criteria following the actual context and following the slow science idea.



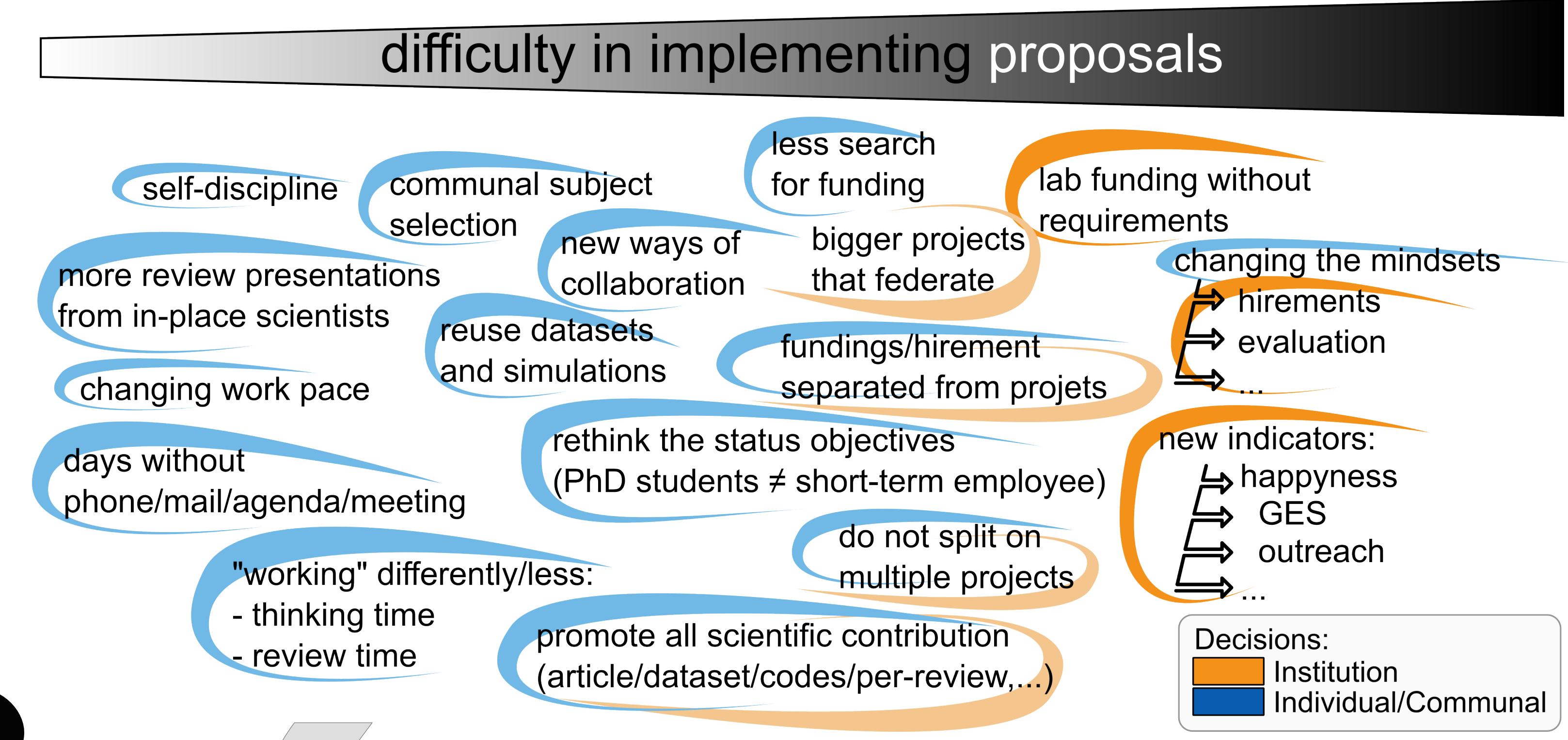
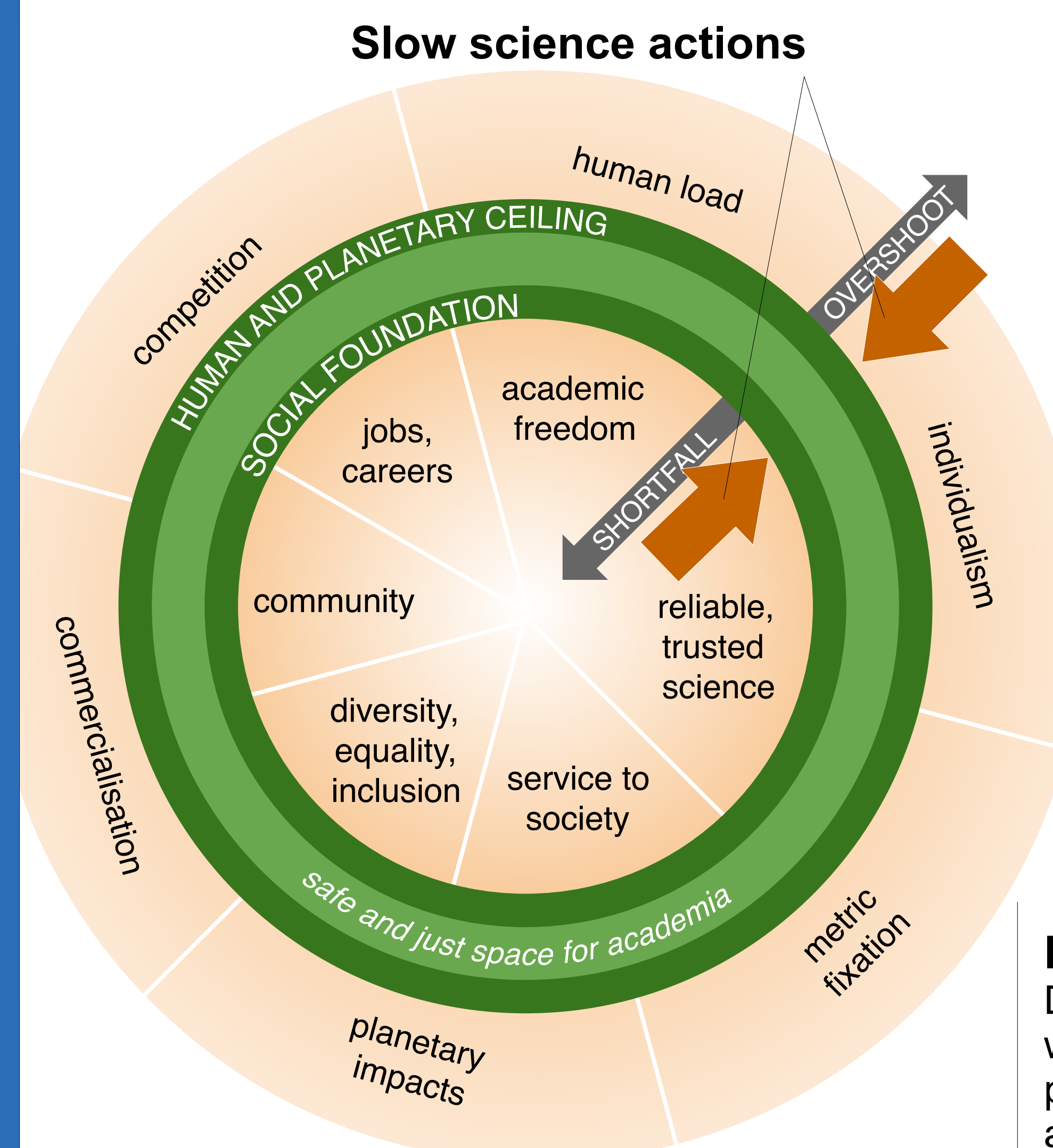
### What is a good researcher?



### 3. Slow science meets the doughnut model (Urai & Kelly, 2023)

- Current academic system pushes too much on the limits
  - ecological (e.g. CO2, plastic, computers)
  - social (e.g. overwork, competition, stress, reporting)
- Proposed changes:
  - Individual: Change our mindset. What is a successful carrier? Promote quality over quantity, slowness over speed. More care on our educational mission on ecological crisis and prepare the students for action and adaptation.
  - Collective: funding, hiring.

**Transformative role**  
Researchers must go beyond alerting and monitoring: "Addressing the climate and biodiversity crisis demands transformative changes in our economies and societies. Academics, both as inhabitants of planet Earth and in their professional roles, should take a leading role in this transformation".



**Fig. 2**  
Collective proposals made to slow the science habits of the community (sorted by difficulty).

**Flourishing propositions, many already feasible.**  
You want to act ? Initiate the discussions in your own department/university as well !

### 4. How to promote early career scientists beyond indicators ?

**Your call ! Add your propositions on a sticky note !**

- Focus on questions rather than expected results (Stengers, 2018)
- Educate colleagues as community (team, department, university at once)
- The changes need to be supported by the in-place researchers to impact the recruitment
- Jury, chair and director researchers need to initiate and support institutional evolution of science recruitment and findings.

**Fig. 3**  
Doughnut academia. Adapting the “doughnut” model of economics to the academic world enables us to visualize the inner social foundations that universities should provide, and the outer human and planetary boundaries that universities need to avoid overshooting. Note that the ordering of elements within the inner and outer rings is random; there is no direct pairing between foundations and ceilings. From Urai & Kelly (2023), adapted from Raworth (2017), under a CC-BY-SA license.