CWTS
Meaningful metrics

Research Evaluation in the Anthropocene

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Today

1. How do we engage with the ‘environmental consequences’ of research in research evaluation frameworks currently?

2. From impact to problematizations (and why).

3. Two examples of problematizations.

4. Towards new quality criteria to incorporate ‘sustainability’ in research evaluation frameworks.

1. The current situation

- There is little attention for ‘the environmental consequences of research’ in the research evaluation literature.

- When considered, it is as impact in research impact assessment frameworks. These are usually designed to trace economic impact, while some of them also engage with other impact domains (social, political, and environmental).

- Impact pathway analysis is a powerful tool to analyze research outcomes as they come to feed into innovation processes and its use spreads across society (often in the form of a material artifact like a technology). But the research process itself is never evaluated in relation to ‘sustainability’, environmental impact is considered to emerge in the use of research outcomes…

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Article

Research impact assessment in agriculture—A review of approaches and impact areas

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ASIRPA: A comprehensive theory-based approach to assessing the societal impacts of a research organization

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Integration of environmental impacts into *ex-post* assessments of international agricultural research: Conceptual issues, applications, and the way forward

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2. From impact to problematizations

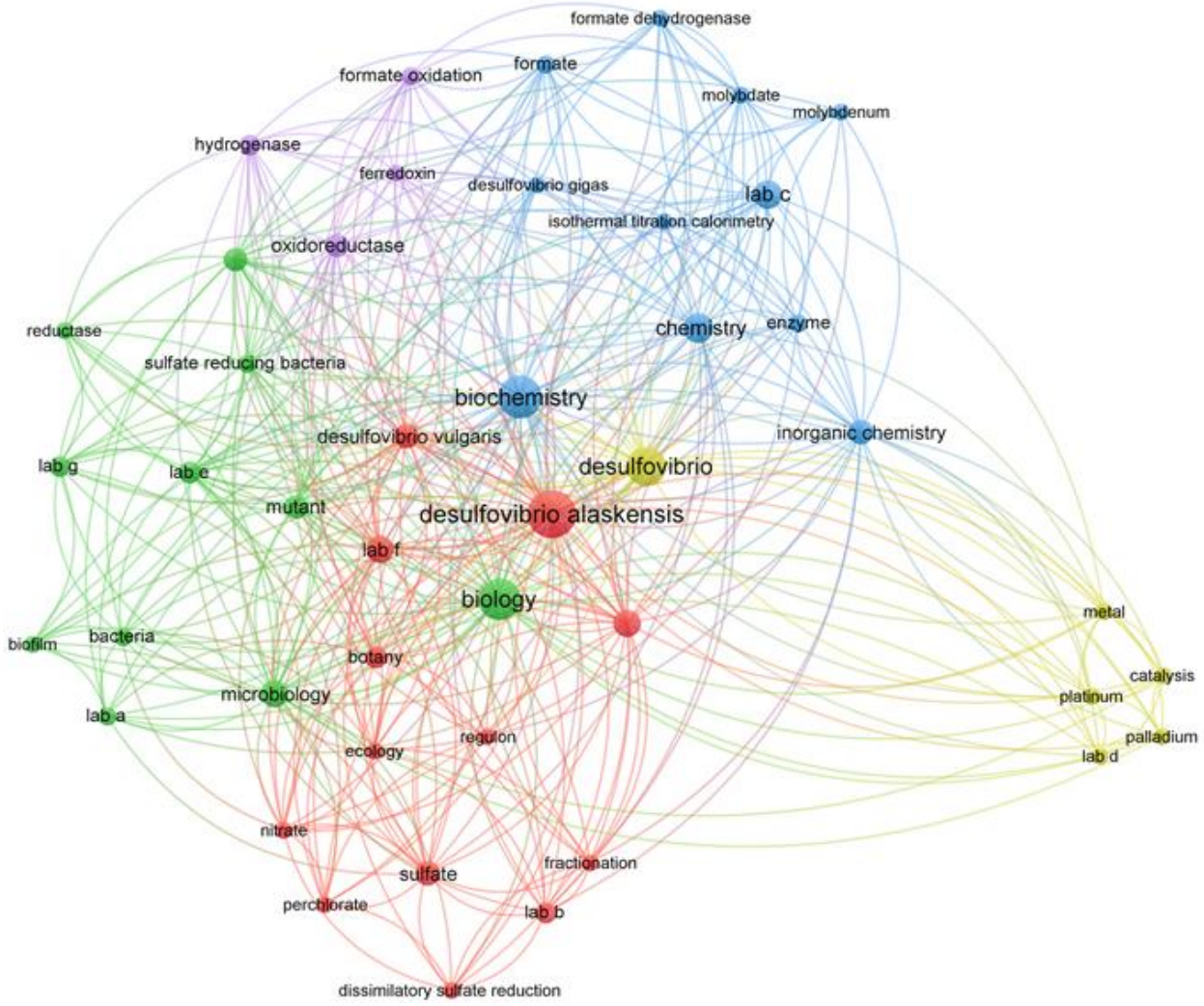
- The formulation of research problems is a core aspect of research.
- Michel Callon calls these ‘problematizations’:

> problems are identified and rendered autonomous; established facts are stated; links are postulated; whole sections of reality are pushed back into the shadows.’ (Callon, 1980: 209).

- Problematizations are proposals for what our collective future might be. They define the problem and its solutions.
- Problematizations are therefore performative, developing a new problematization is also bringing about a new world.
- Problematizations have particular qualities, they are for instance more or less rich in terms of the diversity of actors included and the roles assigned to them.
- Other-than-human creatures also are assigned roles in problematizations. The openness towards other-than-human creatures makes this approach especially useful in the context of the Anthropocene.
- The problematization is currently not an object of evalution in research evaluation frameworks (but it is, in a different way, in the peer review of project proposals)

3. An example

Two problematizations in which Desulfibrio Alaskensis is involved.



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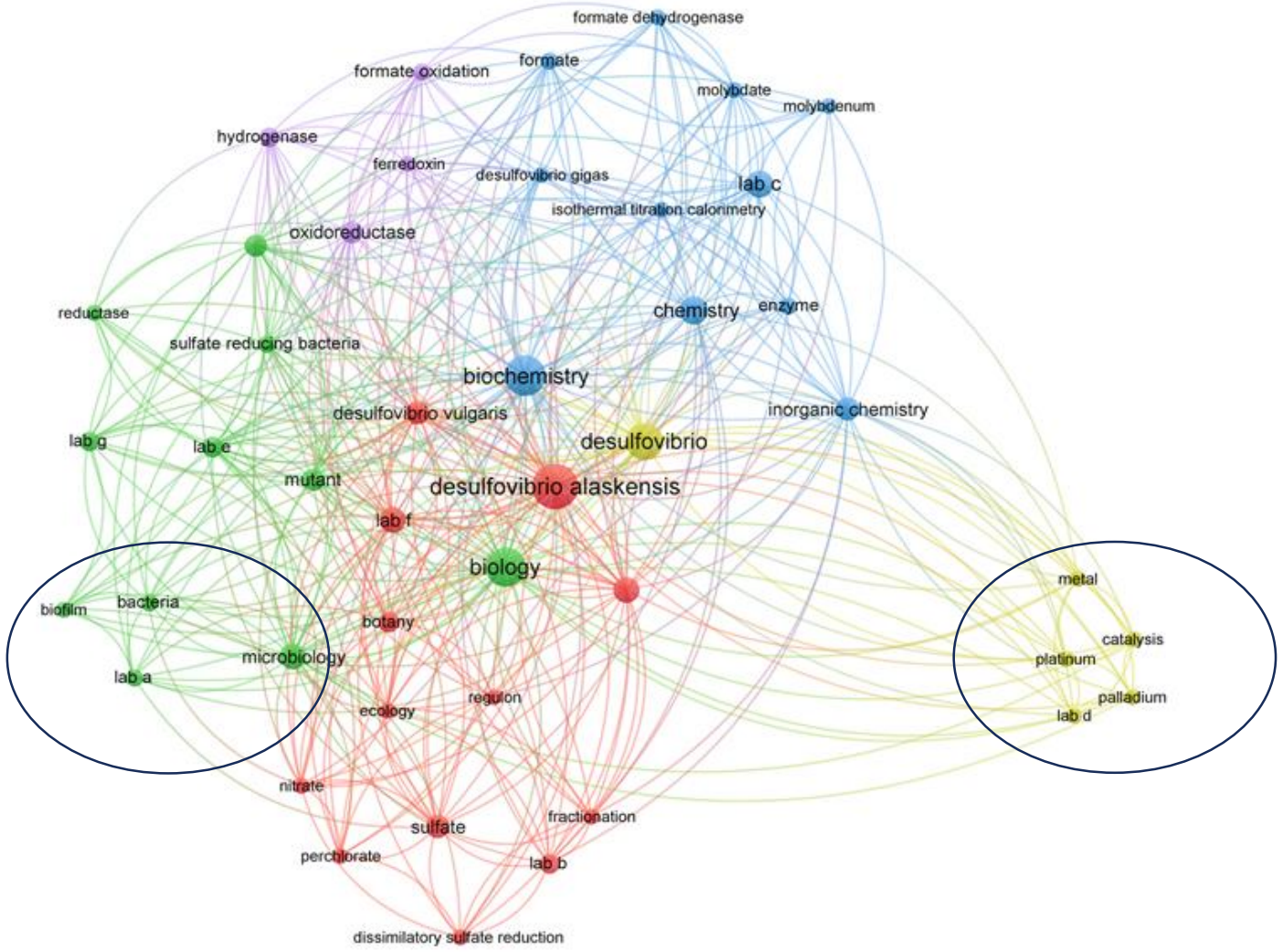

3. An example

Lab A

Sulfate reducing bacteria such as *D Alaskensis* are unwelcome guests in the oil industry. Bacteria colonize the oil pipe and create a biofilm on its surface. Within the biofilm an anoxic region is created in which sulfate reducing bacteria can thrive and further increase corrosion (Korenblum et al., 2005). One way in which this problem has been approached is through using large amounts of biocides to clean the pipes.

Lab A studies less harmful ways of inhibiting the growth of *D. Alaskensis.* The above explores the possibility of using antimicrobial substances secreted by bacteria of the genus *Bacillus* that to prevent *D. Alaskensis* from growing. In another study (Souza et al., 2017) essential oils derived from *Citrus aurantifolia* were enrolled into the task of inhabiting *D. Alaskensis* growth showing positive results. In this way the labs contributes to a world in which oil pipes are cleaned in a more environmentally friendly way (but this is not a world without oil industry).

3. An example

Lab D

The research in Lab D is concerned with rare metals. Platinum for instance is important in various industries, for instance as catalytic converters in vehicle exhaust systems that contain a small amount of platinum. In this process platinum is lost and deposited on the road and, with rain, leads to a contamination of the water table (Capeness et al., 2015). While being extremely valuable, little is done in terms of recycling or resource recovery of these metals. Current resource recovery methods employ chemical processes that involve toxic chemicals and are very costly.

Lab D works on biogenic methods. Various *Desulfovibrio* strains have been shown to be able to produce nanoparticles of metals through its energy production pathways. The metal is taken up from the environment and *Desulfovibrio* is able to transform it. The study shows that *D. Alaskensis* is able to produce nickel, palladium and platinum nanoparticles. Lab D develops practical and cost-efficient ways of employing *D. Alaskensis* in metal recycling and resource recovery as an alternative source for rare metals that are crucial for the circular economy (Capeness et al., 2019a: 8-9). *D. Alaskensis* is thus not an enemy like in the problematization around the oil industry but an ally in the development of a circular economy (but this is not a world without economic growth).

3. A second example

Technology for green growth

The green growth problematization → Modernization has increased carbon emissions and resource use and caused environmental problems. To solve these problems, we need to develop technologies that allow for a decoupling between carbon emissions and resource use on the one hand and economic growth on the other. In this way the economy can continue to grow but in a clean and ‘green’ way.

Technologies needed → high technological interventions such as electric cars, all kinds of batteries, carbon capture technologies, etc.

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Technology for degrowth

The degrowth problematization → Modernization has increased carbon emissions and resource use and caused environmental problems. Economic growth is the cause of these problems and can't be its solution. To solve these problems we should transition to a different political-economic system that has a smaller resource throughput but still allows people to 'live well'. To do so we also need to develop new technologies.

Technologies needed → low technological interventions such as bikes, solar shower bags, washing lines and compost bins. Technologies that are simple, repairable and open-source.

4. How might we evaluate the quality of problematizations?

- The evaluative context is crucial (e.g. a national research evaluation like the REF versus a funding instrument like ERA CoBioTech).

- The diversity of actors, including other-than-human creatures, given a role and voice in the (development of) problematizations and the quality of their engagement.
  - New actors and their (new) considerations?
  - New roles?
  - New relations between heterogeneous actors?

- The extent to which the proposal for the future contributes to achieving the Paris Climate Agreement (and/or other environmental goals and treaties). Example questions we could ask might be:
  - How does the proposal for the future contribute to a better life for humans and other-than-humans, in the global north and global south, whose livelihoods are under threat? Who wins and who loses in the problematization?
  - To what extent does the proposal for the future rely on or prevent large-scale extraction of resources in the global south?
  - To what extent does the proposal for the future contribute to staying within 'Holocene conditions'?
  - To what extent does the proposal for the future rely on a 'technological fix' for climate change?

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