Steering Research and Innovation for the Global Goals
Direction, Forecasting and Inclusion

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First Question of the Aide-Memoir

What it will take to enable a socially just transition towards sustainable development?

Technology, Inequality and Inclusion: Three Issues

1. There is a **weak alignment** between the **prioritisation of Science, Technology and Innovation (STI)** and the **distribution of societal needs** that these STI address (Ciarli and Ràfols, 2019) – **direction**

2. We are undergoing a **technological revolution**, more rapid than those experienced before – **observe future changes to foster inclusion**

3. **Inclusion** may have a positive impact on innovation, structural change, and achieving the SDGs (Saha and Ciarli, 2018) – **inclusion for more and more democratic innovation**

Steering Research and Innovation for the Global Goals (STRINGS)

The Uneven Distribution of Scientific Advances

Science and technology (S&T) contribute to solving and creating societal problems

Well-being improvement/deterioration in relation to these problems are unevenly distributed across society

Scientific advance is unevenly distributed in society and across its diverse demands (Gibbons et al., 1994; Nelson, 2003; Novitzky et al., 2020)

- Health (Evans et al., 2014; Yegros-Yegros et al., 2020)
- Agriculture (Vanloqueren and Baret, 2008, 2009; Carlisle and Miles, 2016)

Some causes: sheer complexity; distribution of resources and power; path dependency

Mapping the Relation between Scientific Priorities and Societal Needs

We suggest a method and a framework to measure the relation between scientific priorities and societal needs

Revealed demands for rice STI explain to a limited extent a country's revealed research priorities on rice (Map) (Ciarli and Ràfols, 2019)

Similar misalignment for STI related to digital?

Global Alignment between STI Priorities and the SDGSs

Steering Research and Innovation for the Global Goals (STRINGS) – (Science map)

- SDG 4 (Education): social science focus (Chart)
  - 4.4.1 ICT skills; 4a1 4.a.1 Schools with Internet & computers; 4b; higher education, including ICT, technical, engineering and scientific programmes
- SDG 5 (Gender equality): no research on digital, across disciplines (Chart)
  - 5b Use of ICT to promote the empowerment of women
- SDG 9 (Inclusive innovation): research on education and technology (interdisciplinary?) (Chart)
  - 9.c Access to ICT & Internet; 9.c.1 mobile networks
- SDG 10 (Reduce inequalities): no mention of digital divide (Chart)

Digital divide and the industry 4.0

AI/Automation and the Future of Work

Three major drivers are expected to influence the future of work in ECE: technological change, international trade and industrial transformation

AI applied to automation can be used in a large range of applications and occupational tasks, and may replace non-routine cognitive tasks requiring non-manual skills (Ford 2015; Frey and Osborne 2015, 2017; Decker, Fischer, and Ott 2017; Manyika et al. 2017)

- Despite disagreements on the size of the impact

AI/automation may change the role of GVCs in distributing tasks, activities, functions and jobs across the globe (Antràs et al. 2006)

The extent to which technological change, the distribution of activities along the GVC, and industrial transformations influence labour markets is mediated by regions' industry specialisation (Ciarli et al., 2018) and skill composition (Utar 2018).

Forecasting future labour markets and skills

Measure future advances in automation technologies and their future uses in the production of goods and services across occupations and industries;

Which of these industries ECE regions will specialise in, and how competitive they will become in the global markets;

Which functions ECE firms will specialise in, along global value chains (GVC);

What skills will be required in association to these changes;

What is the combined impact of such changes on labour markets

Inclusive structural change

The Trade-off between Innovation and Structural Change

- **Innovation nurturers structural change** in economies and societies, and both lead to (economic) development (Syrquin, 1988; Cimoli and Dosi, 1995; Verspagen, 2004; Hidalgo et al., 2007).

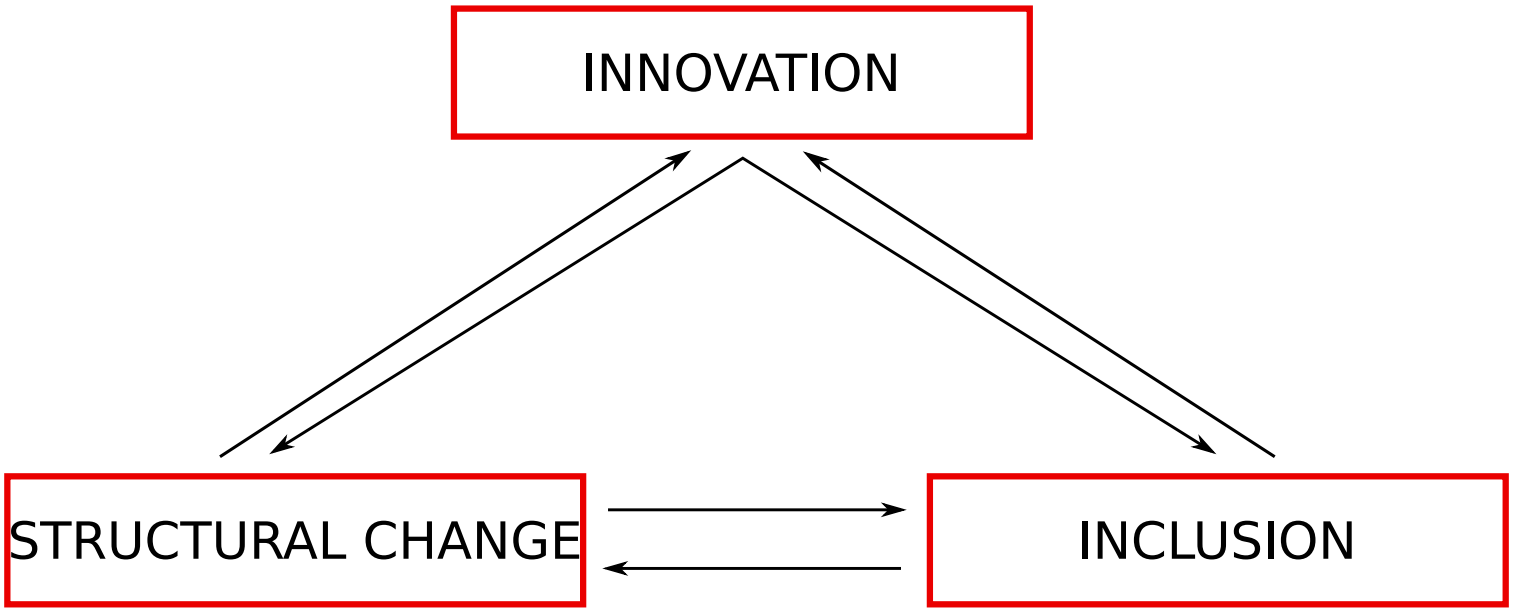
- Innovation is **disruptive** (Schumpeter, 1911), and may have **distributional consequences** (Aghion et al., 2015; Lee, 2011; OECD, 2015)
- **Economic growth and structural change** tend to **reduce poverty** (Ravallion and Chen, 2003), but the extent depends on how income is distributed (Bourguignon, 2003)

- We know little about how inclusion influences innovation and SC

A 3-way Chicken or Egg Problem

Research Question

How are innovation, structural change, and inclusion related over time?



Source: (Ciarli et al., 2020)

Main results and policy implications

So far

- The only variable that seems to reinforce inclusion is inclusion
- If Inclusion has a positive effect on Innovation and Structural Change (which reinforce each other) there seem to be two clear policy implications
  - Improve inclusion, beyond poverty and inequality
  - Make innovation and structural change more inclusive (they do not seem to be so now): **Inclusive Structural Change**

Open questions

1. How can we steer research and innovation on digital technologies in direction that meet the needs of societies, particularly those most excluded? (e.g. interfaces for older people, commuting for parents with care, etc)

2. What instruments (e.g. data science forecasting) and policies (e.g. training) can we put in place to design an inclusive and mobile labour market in ECE?

3. What policy can we put in place to make sure we do not waste talent by excluding parts of the population from the innovative process? Making innovation also more democratic and directed to meet the societal need (back to 1)

Open questions for the panel

What are the progress and challenges from your region in promoting socially just transition to sustainable development?

What impact have digital technologies had in social development and well-being of all in your region? What is their potential role for the future in near and medium-term?

What are some of the potential risks that emerging digital technologies pose to social development and equality?

What are the lessons learned from the COVID-19 in terms of the impact of digital technologies on social development in your region, including leveraging these technologies for the social inclusion of vulnerable social groups?

What are some of the plausible scenarios of the impact of technologies on social development and the SDGs in your region?

What kind of national strategies and policy measures as well as regional and international cooperation would be necessary to enable developing countries to leverage digital technologies for social development?

Many thanks for your attention!

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Setting priorities in research [Back]

Actors in the research system (international/national/sectoral)

Face **trade-offs** in setting priorities, and have different returns from the results of research (Norton et al., 1992) – Model

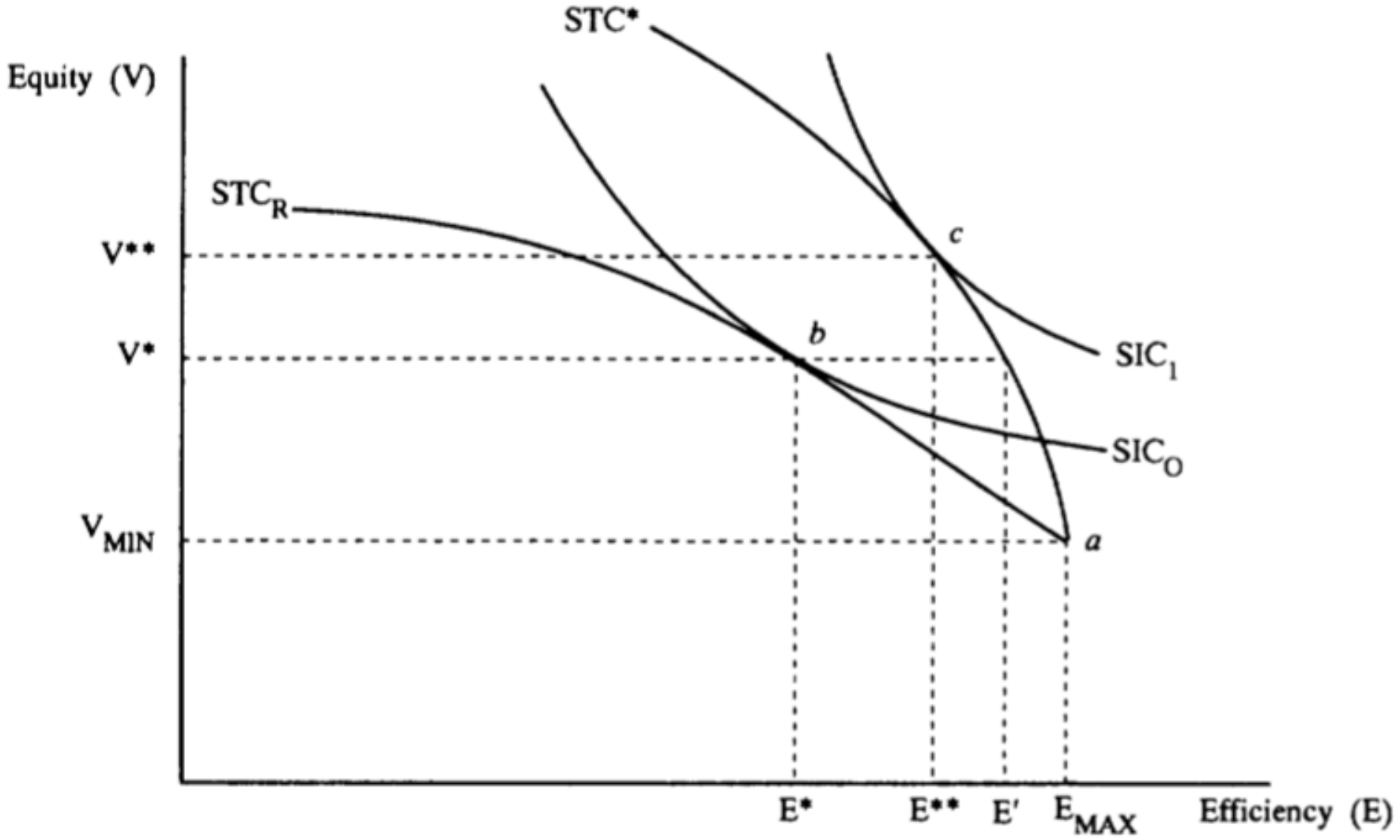
- Different **objectives**: efficiency, distribution, nutrition, ...
- Objectives may not be complementary
- Assumption: possible to ascertain the objectives in a straightforward way (no uncertainty) – e.g societal needs, disease burden, etc

Different actors assign different **weights** to each objective

$\Rightarrow$ Individual allocation of resources

$\Rightarrow$ Overall allocation depends on how influential is each actor involved and on their objectives

"A tradeoff of equity and efficiency using research policy alone and using the least cost policy combination" (Norton et al., 1992) (Back)



Source: Norton et al. (1992)

Identification of demands [Back]

Rice output/**use** (%): *Food*, *Export*, *Seed*, *Processing (food)*, *Feed (animal)*, *Waste*

Rice **calories** (pc human intake of daily calories from rice): need for nutrients

Rice **yields** (productivity): need for increased yields

Fertilisers (chemical fertilisers used per arable land): need to address plant nutrition.

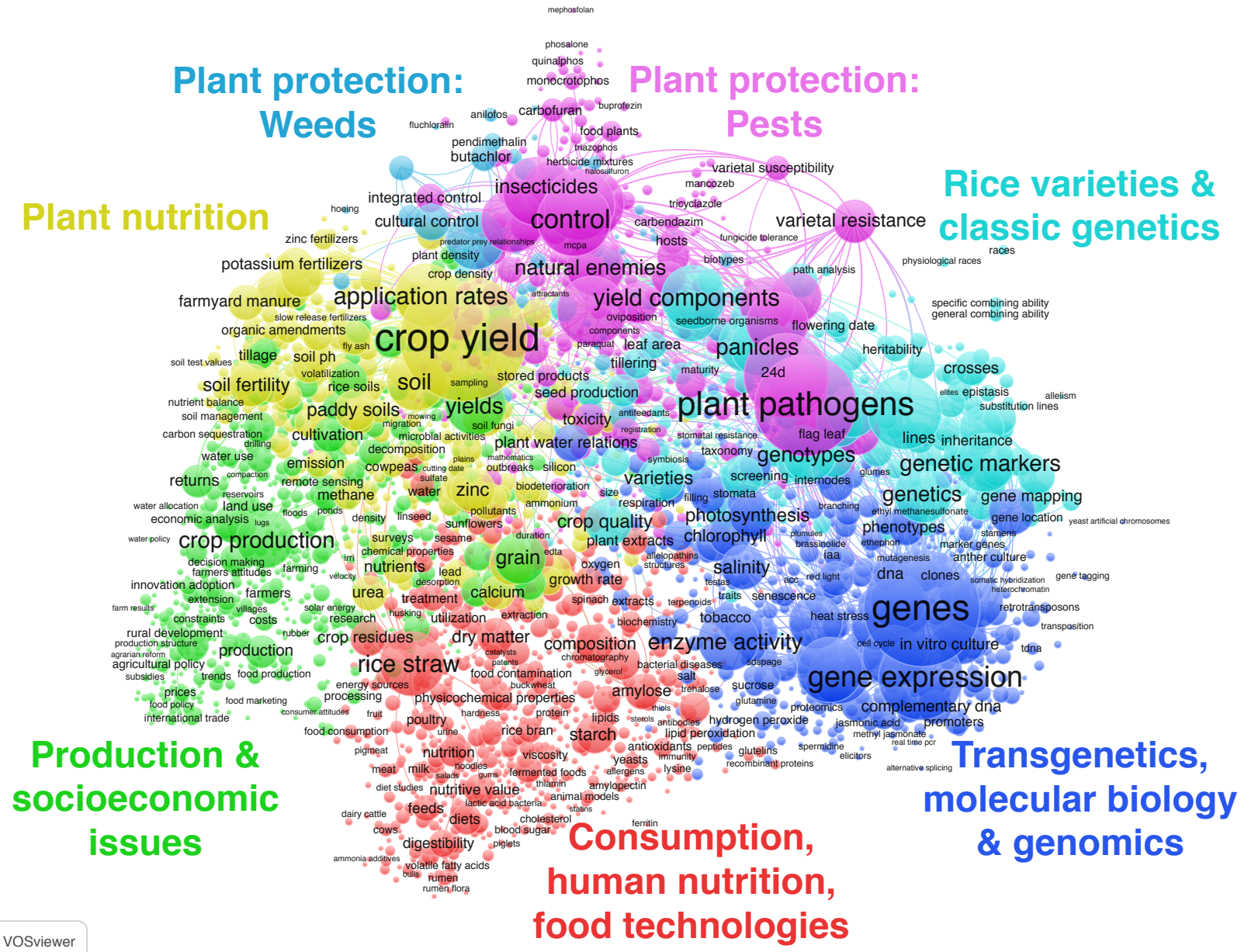
Rice **area** (pc arable land devoted to rice): relevance of the crop in the country

Under nourished (% of undernourished population): need for improving the supply of nutrients

Pesticides (chemical pesticides used per hectare): need for plant protection

Table comparing revealed D and research topics

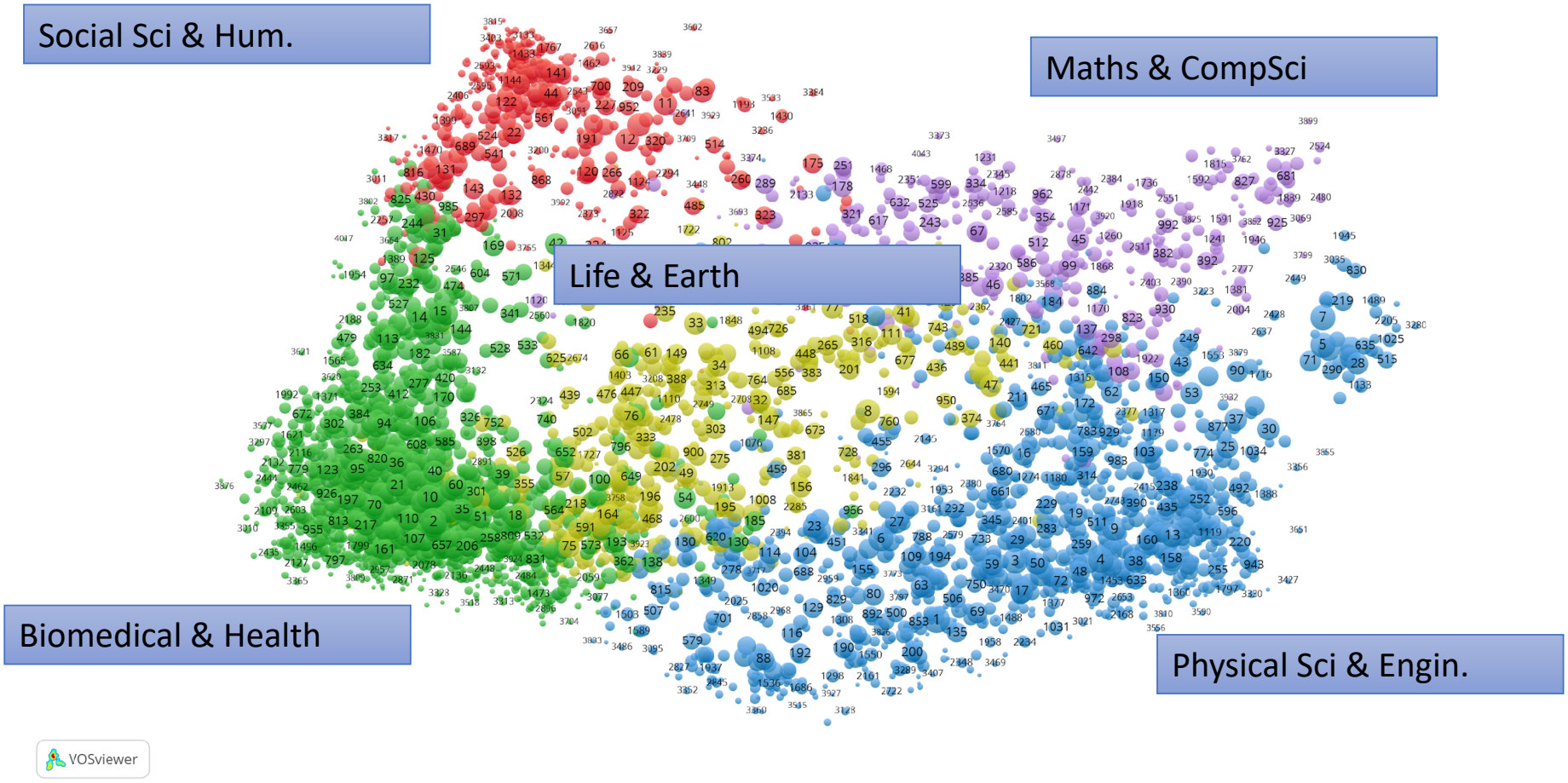
Global map of rice research (CABI: 1983-2012) (Back)



VOSviewer

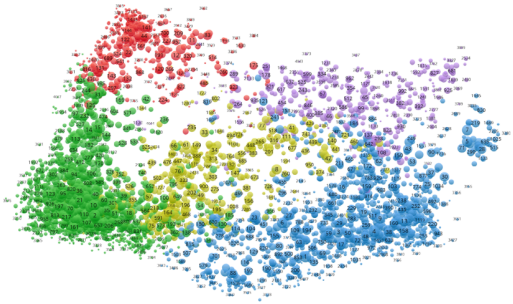
Communities within the WoS science landscape

(publication based classification, 4000 clusters, areas)

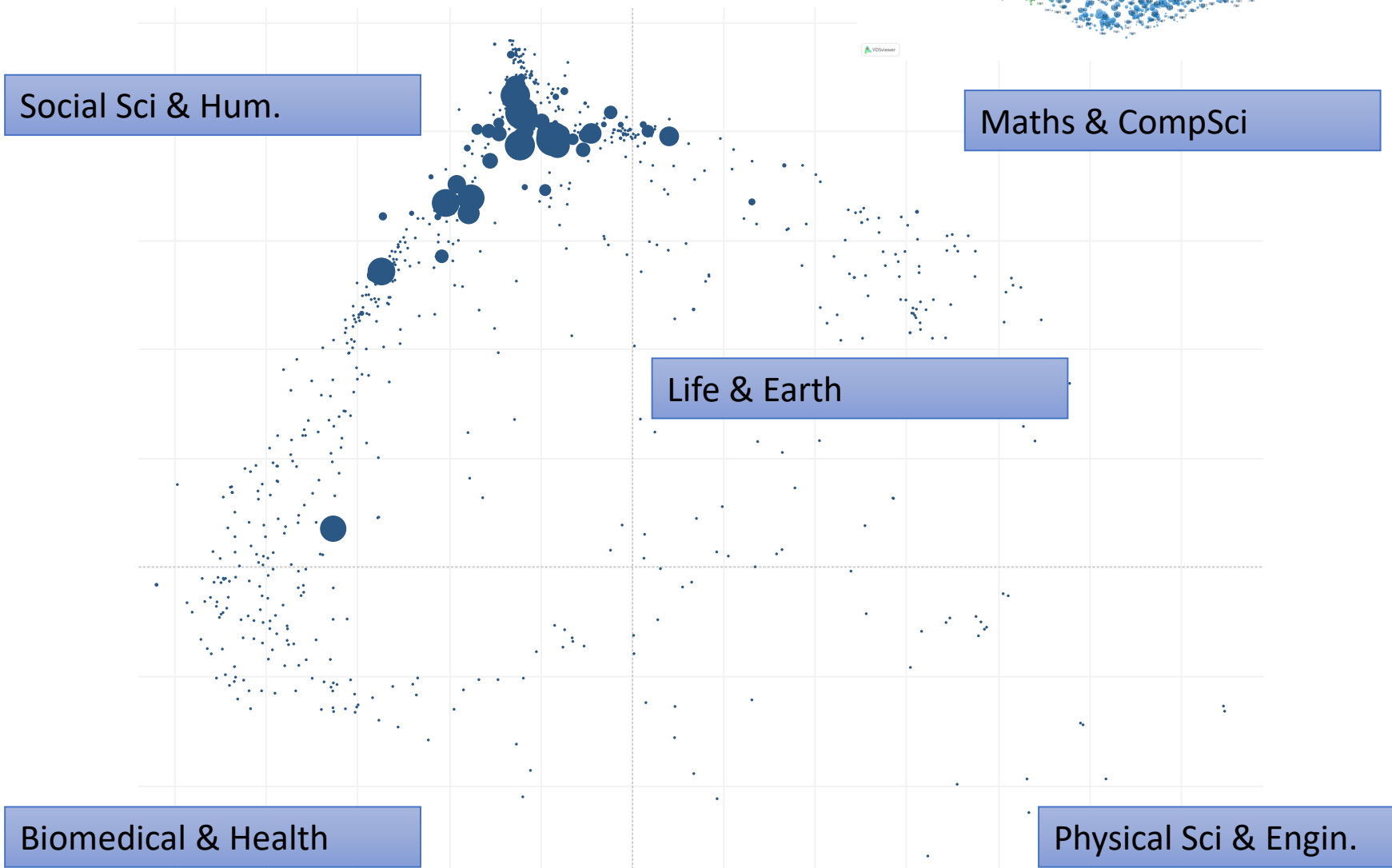


Source: CWTS, University of Leiden

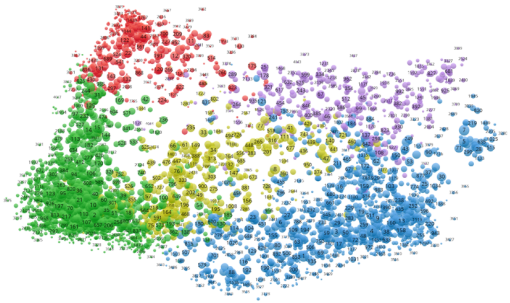
Education (SDG 4) (Back)



Education (SDG 4)



Gender equality (SDG 5) (Back)



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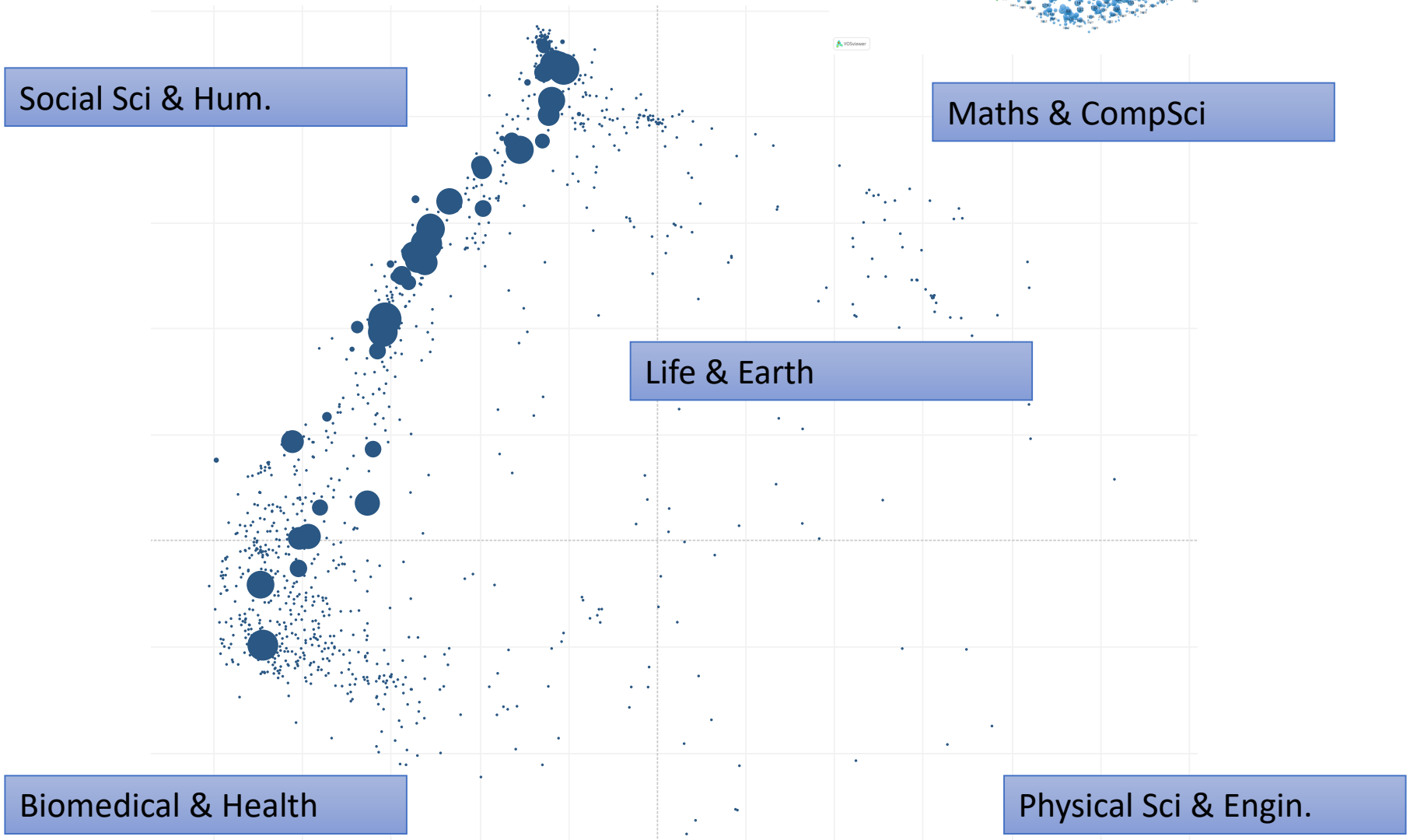
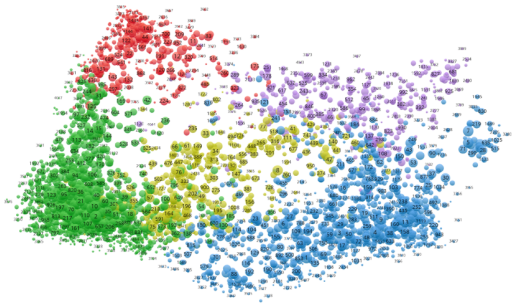
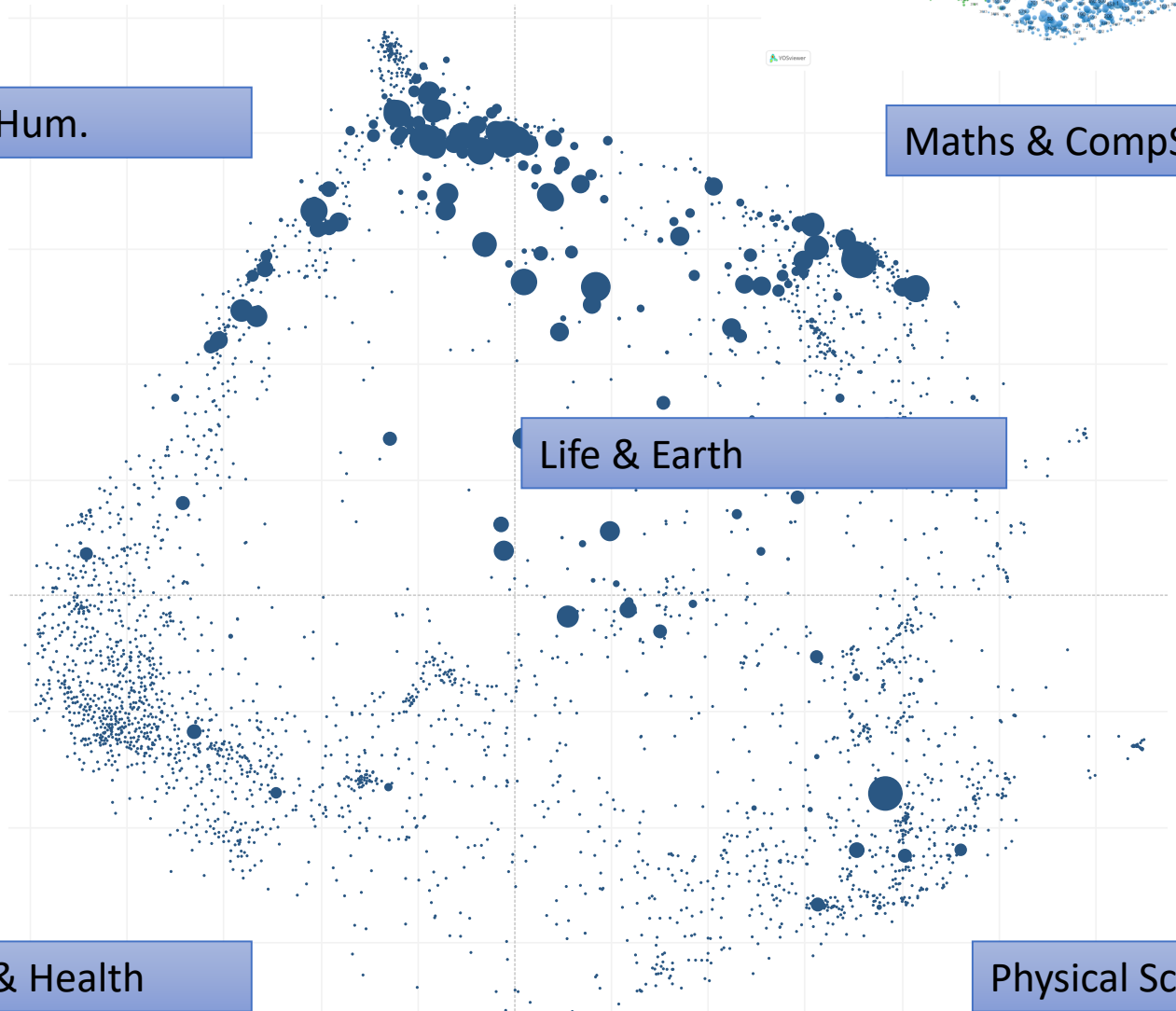


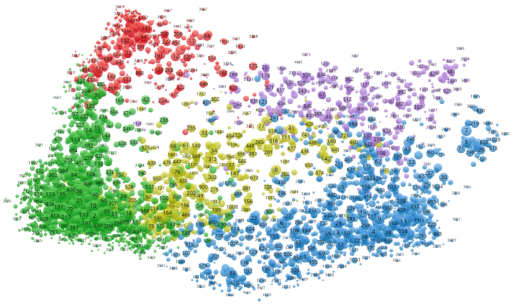
Inclusive innovation (SDG 9) (Back)



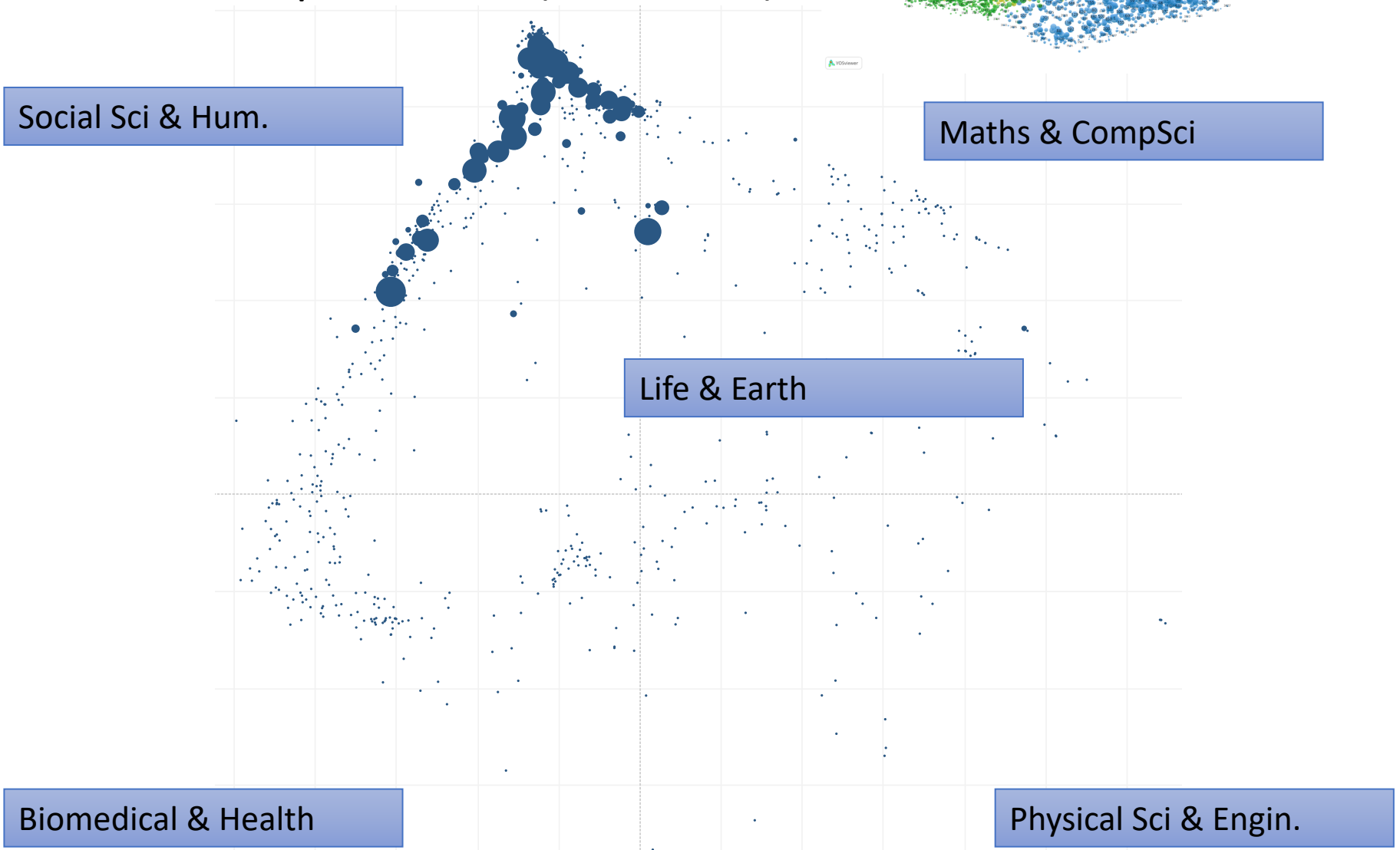
Inclusive innovation (SDG 9



Reduce inequalities (SDG 10) (Back)



Reduce inequalities (SDG 10)



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