



Advanced indicators for research assessment from different perspectives

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Outline

- More details about the advanced indicators to measure citation-based (i.e., scientific) impact;
- More on the use of the developed structure of science;
- Societal connectedness: research finding its way into society.

DORA (sample) recommendations

General Recommendation

- Do not use journal-based metrics, such as Journal Impact Factors, as a surrogate measure of the quality of individual research articles, to assess an individual scientist's contributions, or in hiring, promotion, or funding decisions.

For funding agencies

- Be explicit about the criteria used in evaluating the scientific productivity of grant applicants and clearly highlight, especially for early-stage investigators, that the scientific content of a paper is much more important than publication metrics or the identity of the journal in which it was published.
- For the purposes of research assessment, consider the value and impact of all research outputs (including datasets and software) in addition to research publications, and consider a broad range of impact measures including qualitative indicators of research impact, such as influence on policy and practice.



Diana Hicks,
Paul Wouters,
Ludo Waltman,
Sarah de Rijcke,
Ismael Rafols
Nature,
April 23, 2015,
520, 429–431

The Leiden Manifesto for research metrics

Leiden Manifesto

- Plea for careful, responsible use of research metrics
- High-level principles that need further elaboration in specific contexts
- Large variety of evaluative settings
- Balancing between different principles

10 Principles

1. Quantitative evaluation should support qualitative, expert assessment
2. Measure performance against the research missions of the institution, group or researcher
3. Protect excellence in locally relevant research
4. Keep data collection and analytical processes open, transparent and simple
5. Allow those evaluated to verify data and analysis
6. Account for variation by field in publication and citation practices
7. Base assessment of individual researchers on a qualitative judgement of their portfolio
8. Avoid misplaced concreteness and false precision
9. Recognize the systemic effects of assessment and indicators
10. Scrutinize indicators regularly and update them

Relevant highlights - DORA

- Primarily aiming at Journal Impact Factor;
- Focus on (preventing) use for the assessment of individual articles;
- Arguments regard:
 - Skewed distributions of citations
 - Field specific properties
 - Can be manipulated/ gamed
 - Lack of transparency
- Peer reviewed paper is key for assessment, but
- Other outputs should be considered

Relevant highlights – Leiden Manifesto

- Quantitative evaluation to support qualitative, expert assessment
- Measure performance against research mission
- Protect excellence in locally relevant research
- Account for variation by field
- Recognize systemic effects

Summary of issues discussed today

- Variations of fields/ field specific properties
- Locally relevant research
- Research Performance and Mission
- Other outputs

Field variations



Structure of science

- To create points of reference (e.g., impact normalization);
- To define and use context;
- To define and use content;
- Most common system: Journal categories:
 - Journals
 - 250 fields (journal categories)
 - Expert-based.

Categorization based on journals

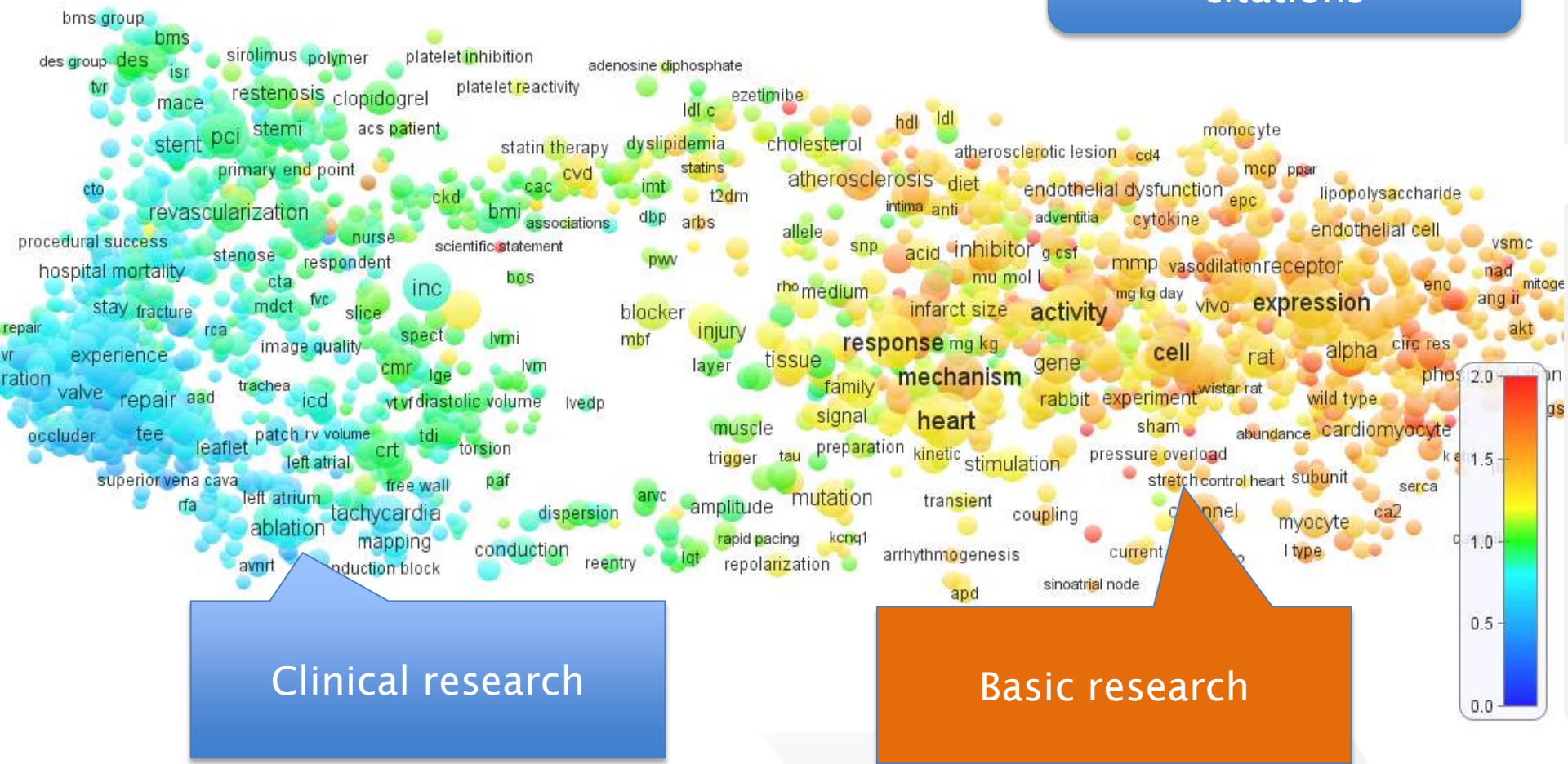
- Advantages:
 - Easy to understand
 - Stable structure
- Problems:
 - ‘Objectivity’
 - Traditional fields
 - Multi-disciplinary/ general journals
 - The role of journals ...

Additional issues with journal-based scheme

- Lack of detail;
- Journal classification does not represent recent developments in science.

Regarding lack of detail (e.g. cardiac & cardiovascular systems)

Color coding indicates citations



Clinical research

Basic research

Alternative: CWTS Publication-based classification

- Citing relations among publications (WoS 2000-2017)
- Algorithmically formed clusters at four different levels (current version)
 - Top level 5 main fields
 - Second level of ~25 fields
 - Third level of ~800 subfields
 - Fourth level of ~4000 research areas
- Disjoint clusters;
- Hierarchical.

Publication-based classification

- Advantages
 - ‘Objective’
 - Independent from journals
 - Dynamic
 - provides more detail
- Challenges
 - Labeling
 - Updates.

Challenges

- Labeling
 - Top level: manually
 - Second level: most frequent journal title words and journal categories
 - Third level: most frequent journal title words
 - Fourth level: most discriminative keywords
- Updates
 - Yearly rerun of algorithm
 - Relocate previous clusters

Structure of science (publication based classification, 4000 clusters)

Social Sci & Hum.

Maths & CompSci

Life & Earth

Biomedical & Health

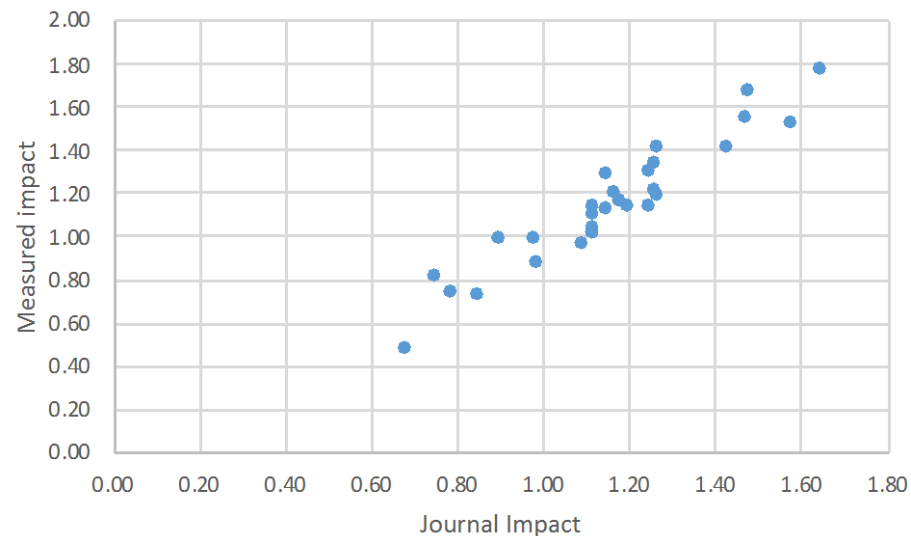
Physical Sci & Engin.

About each cluster (research area)

- All info covered by its publications (journals, authors, affiliations, keywords, etc);
- Total volume (number of P whole period);
- Volume per year (trend);
- Other average stats (n authors, refs, affiliations, share International collaboration, ...);
- Impact (overall and per year)
- Interdisciplinarity?
- ...

How does this help to address field variations

- A structure that is less vulnerable for gaming, manipulation
- Improved citation-based impact measurement (MNCS)
- Improved citation-based journal indicator (MNJS)



**But there is
more**



What else do we know about the clusters?

- The extend to which they are covered by WoS;
- The percentage of papers (co-authored) by industry;
- The percentage of papers not published in English;
- The percentage of papers being cited by patents;
- The percentage of papers being tweeted;
- The percentage of papers mentioned in news items;
- The percentage of papers mentioned in policy documents;
- ...

Structure of science (publication based classification, 4000 clusters)

Social Sci & Hum.

Maths & CompSci

Life & Earth

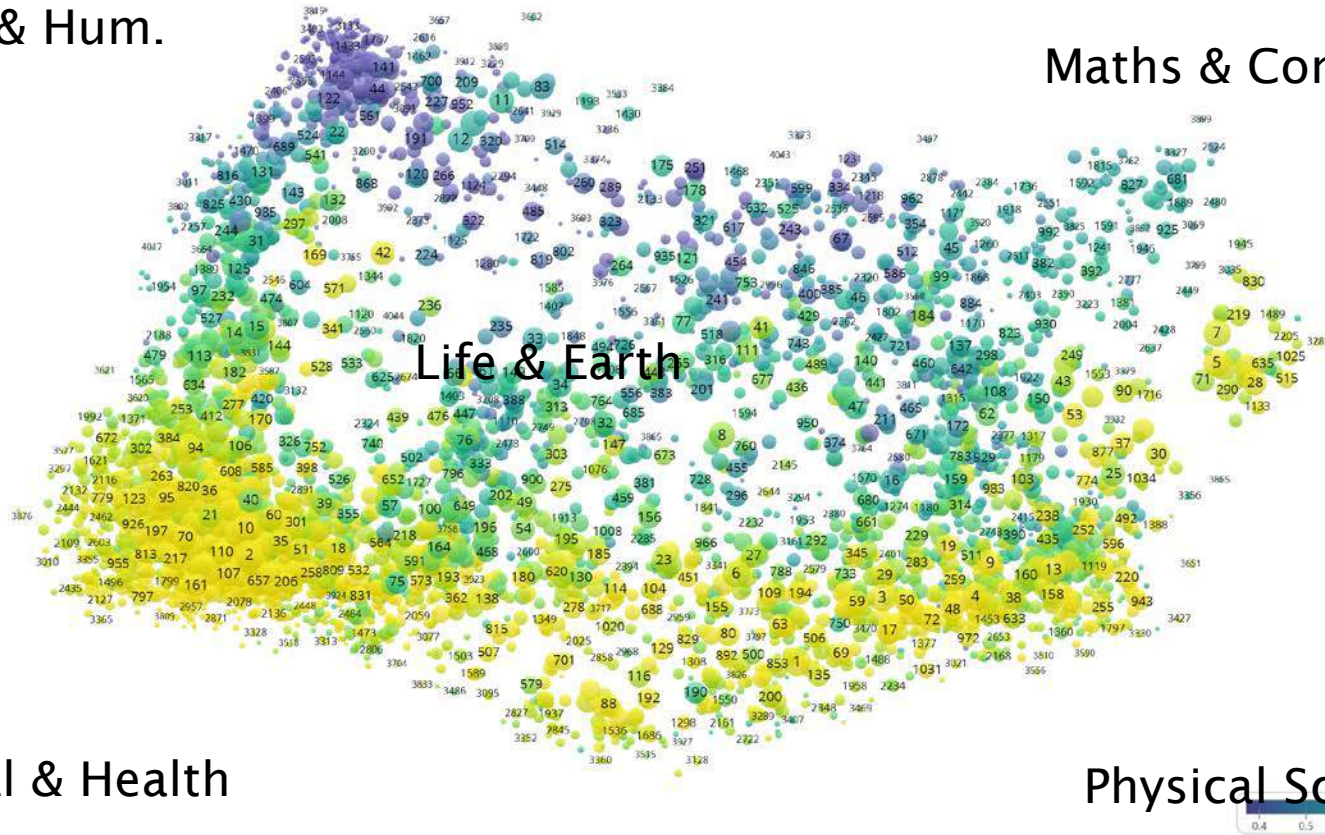
Biomedical & Health

Physical Sci & Engin.

Coverage by Web of Science

Social Sci & Hum.

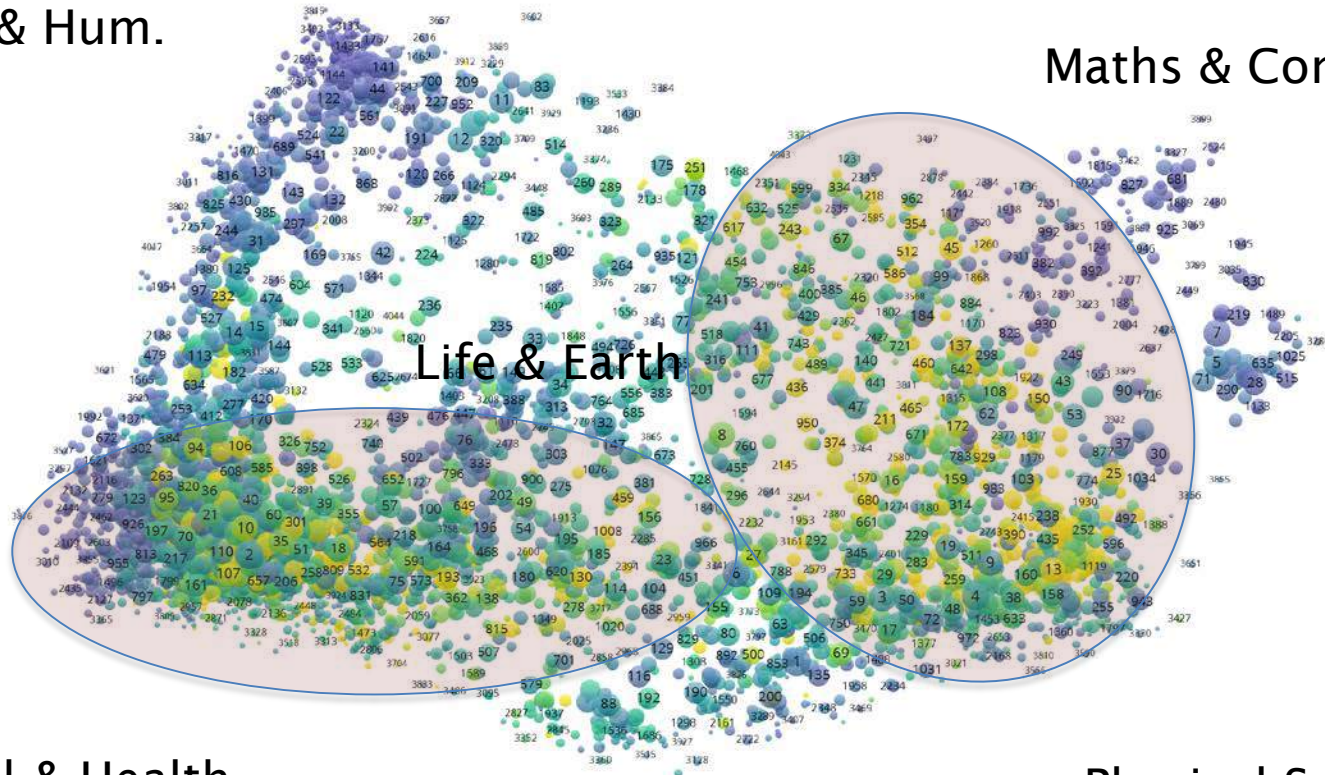
Maths & CompSci



Share (co-)authored by industry

Social Sci & Hum.

Maths & CompSci



Biomedical & Health

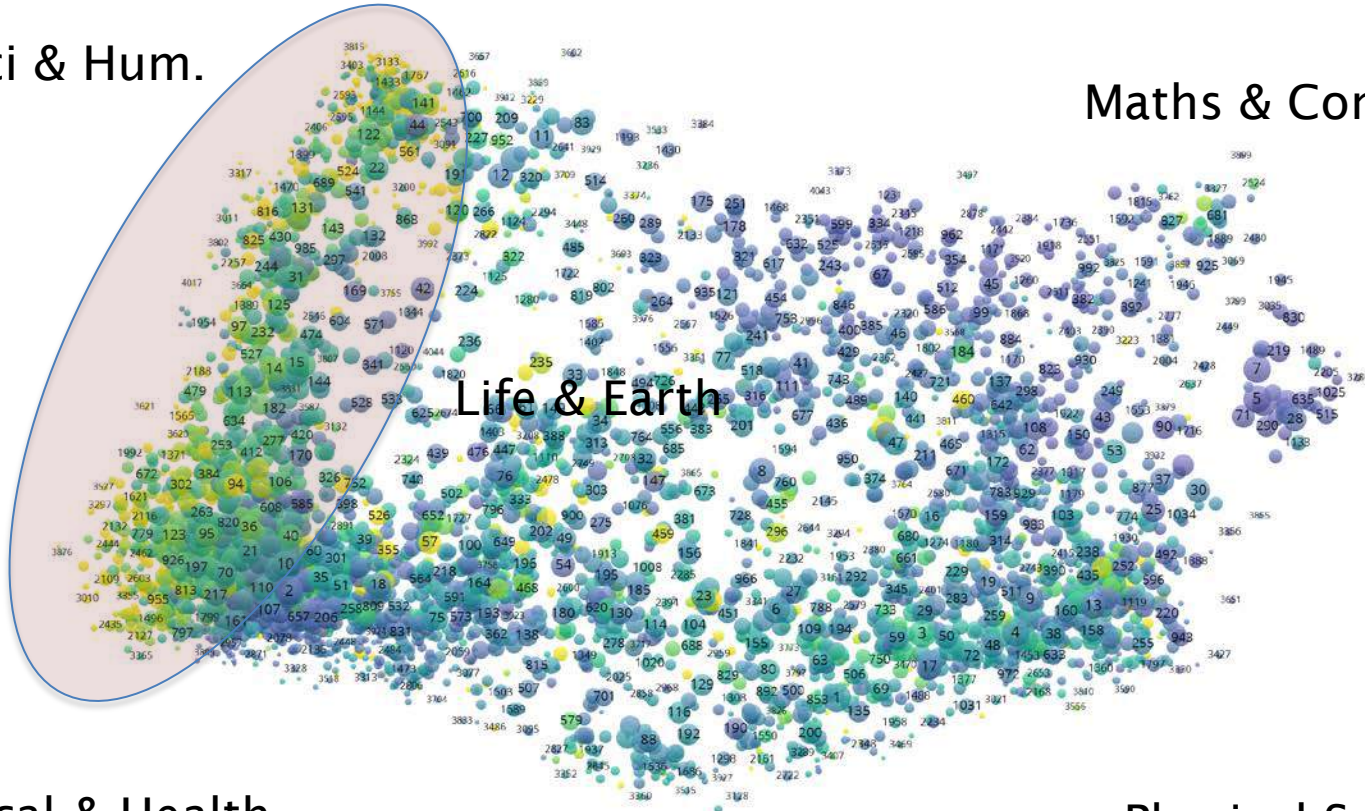
Physical Sci & Engin.



Share of papers not in English

Social Sci & Hum.

Maths & CompSci



Biomedical & Health

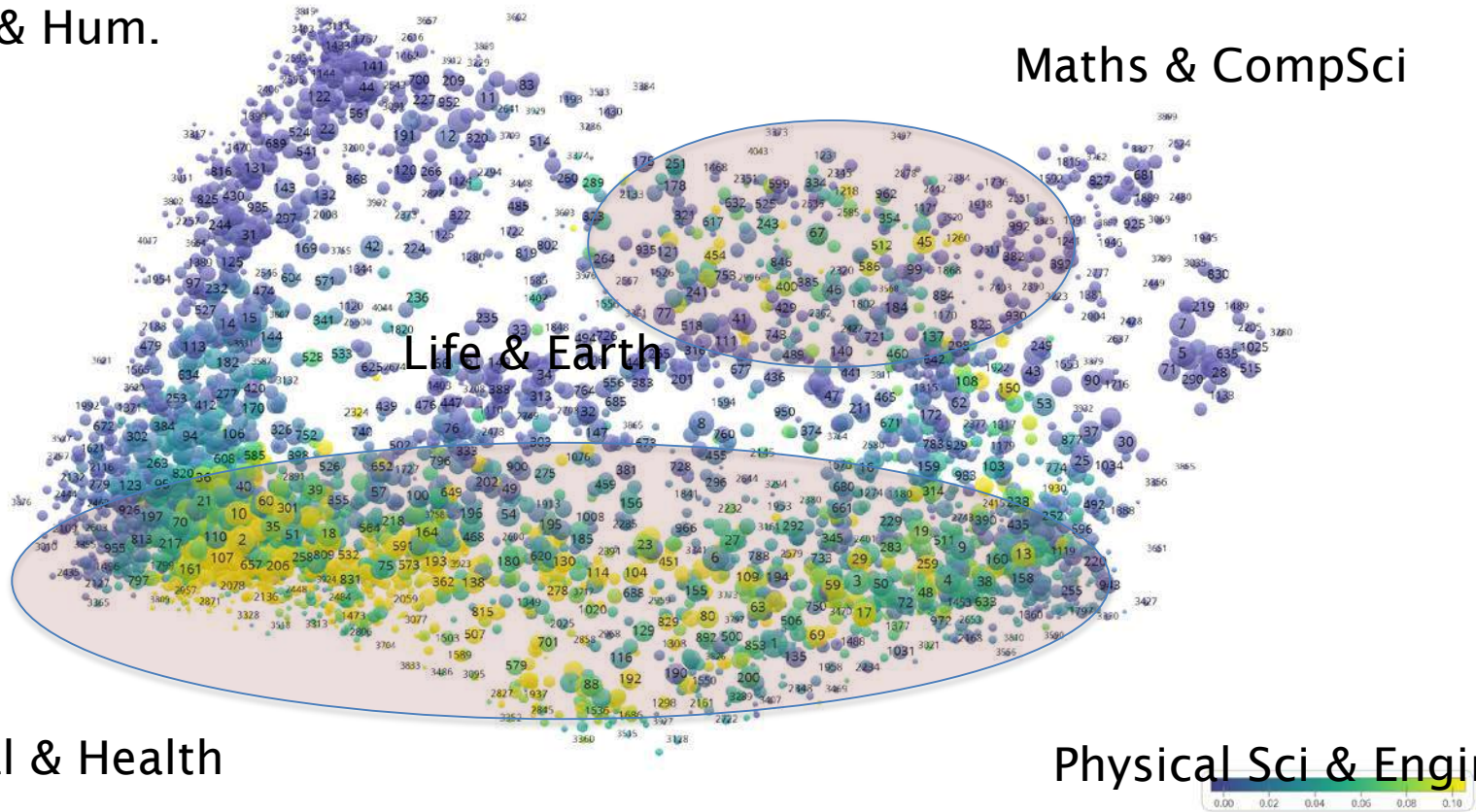
Physical Sci & Engin.



Share of papers cited by patents

Social Sci & Hum.

Maths & CompSci



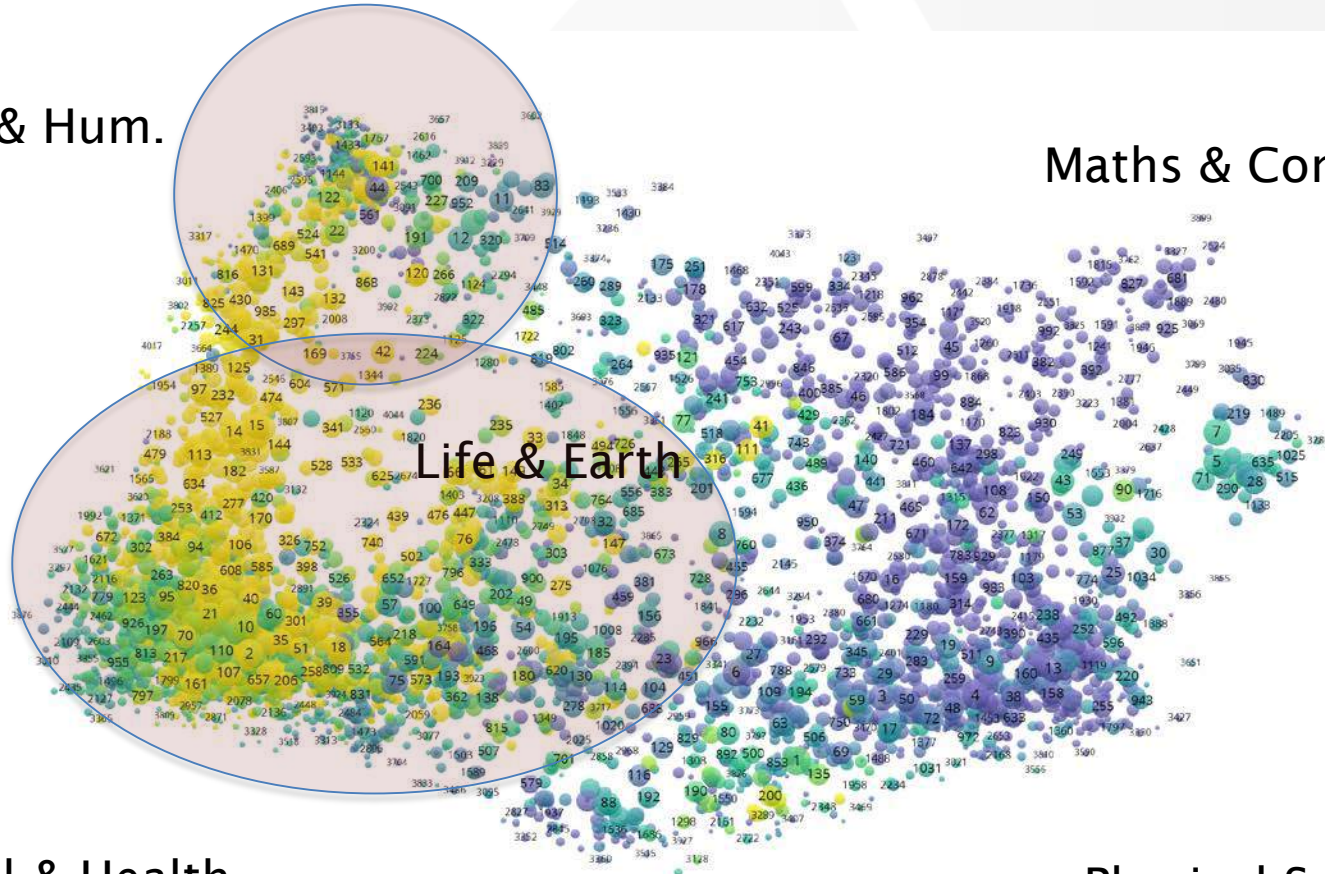
Biomedical & Health



Share of papers mentioned on Twitter

Social Sci & Hum.

Maths & CompSci



Biomedical & Health

Physical Sci & Engin.



Papers mentioned in news

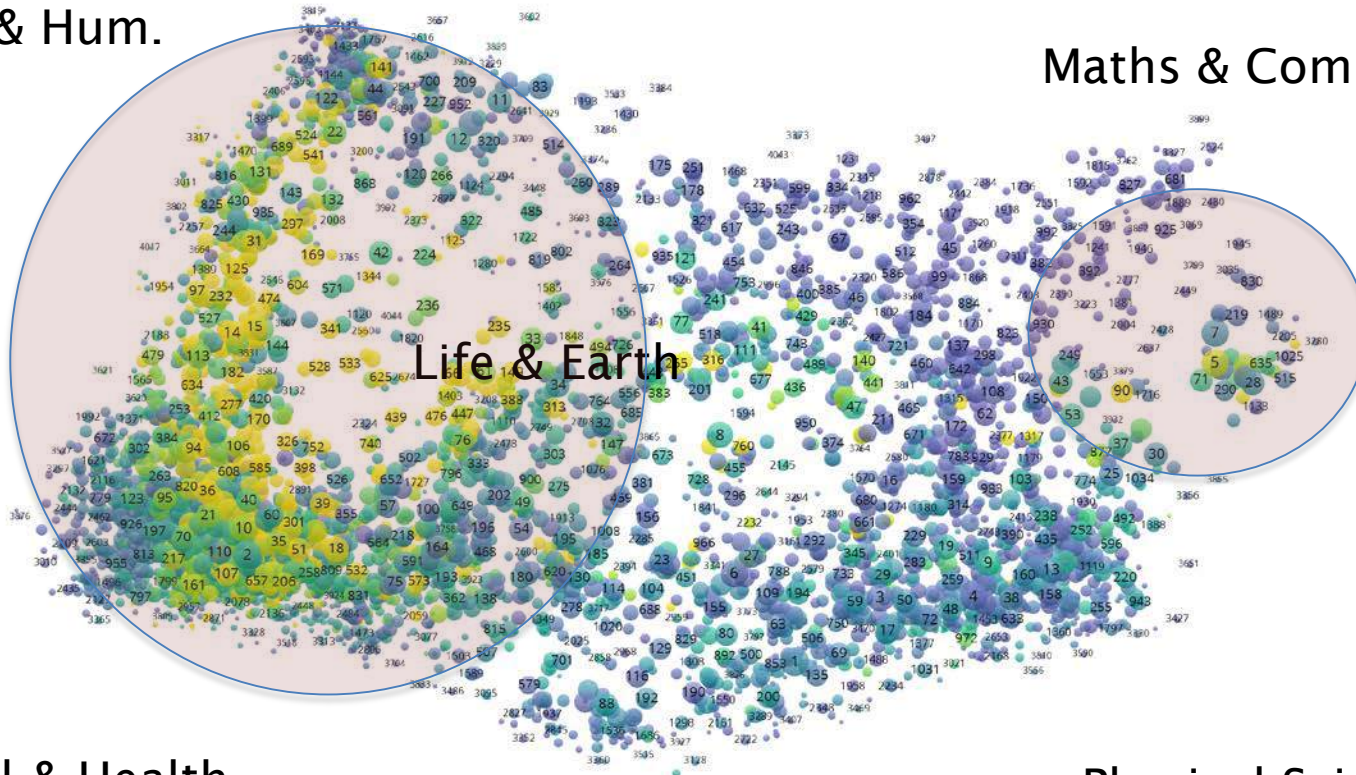
Top list of sources (of over 2,000)

- EurekAlert!,
- The Conversation,
- Health Medicinet,
- Phys.org,
- MedicalXpress,
- Science Daily,
- Huffington Post,
- Bioportfolio,
- Medical News Today,
- Perth Now,
- Alzforum,
- Science Newsline,
- Yahoo! News,
Newswise,
- The Medical News,
- Physician's Briefing,
- Washington Post, ...

Share of papers mentioned in News

Social Sci & Hum.

Maths & CompSci



Biomedical & Health

Physical Sci & Engin.



Papers mentioned in policy documents

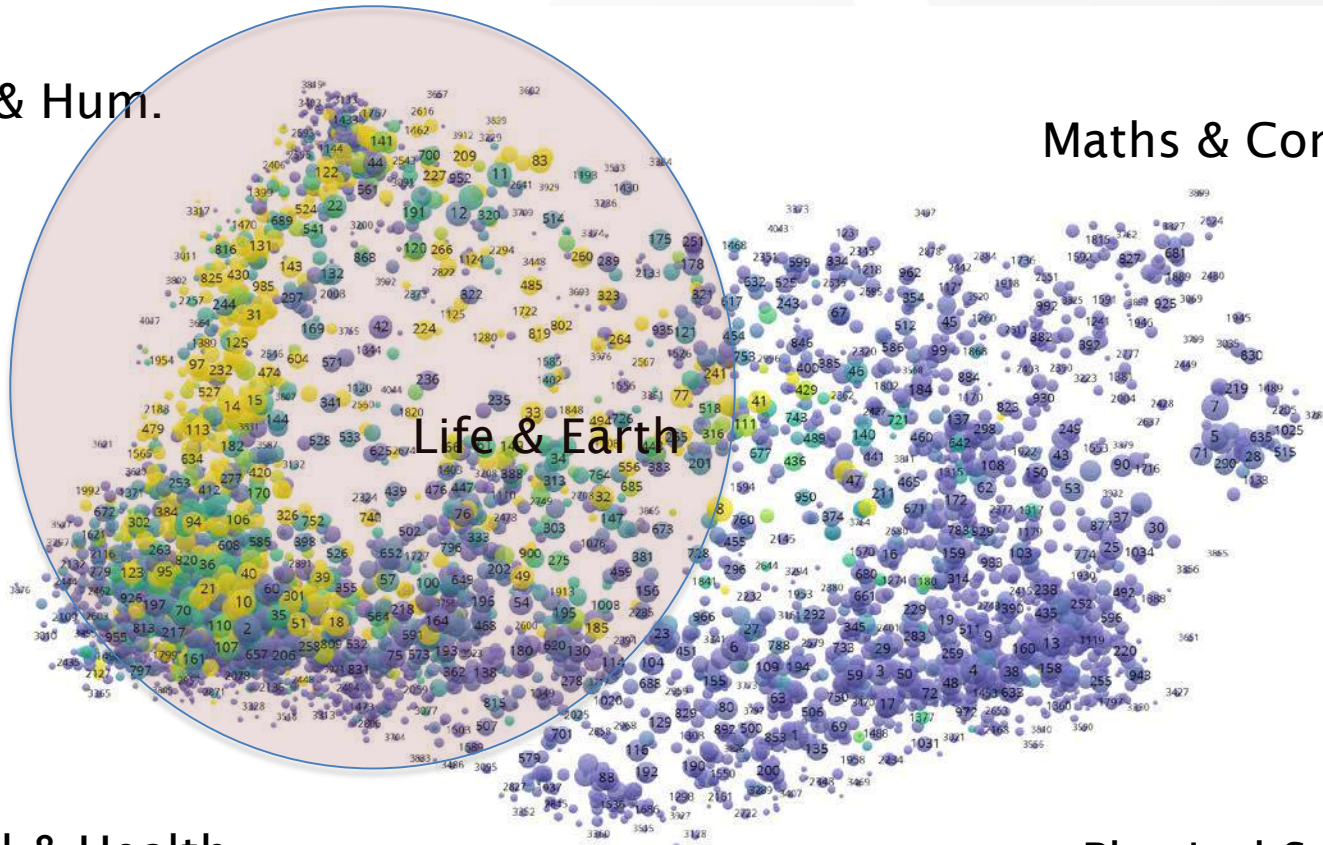
Organizations top list (of over 50)

- National Academies Press,
- World Health Organization,
- Centers for Disease Control and Prevention (CDC),
- National Institute for Health and Care Excellence,
- Australian Policy Online,
- UK Government (GOV.UK),
- The Publications Office of the European Union,
- National Bureau of Economic Research,
- Food and Agriculture Organization of the United Nations,
- World Bank,
- European Food Safety Authority,
- The Association of the Scientific Medical Societies in Germany,
- Overheid.nl,
- Intergovernmental Panel on Climate Change

Share of papers mentioned in policy documents

Social Sci & Hum.

Maths & CompSci



Life & Earth

Biomedical & Health

Physical Sci & Engin.

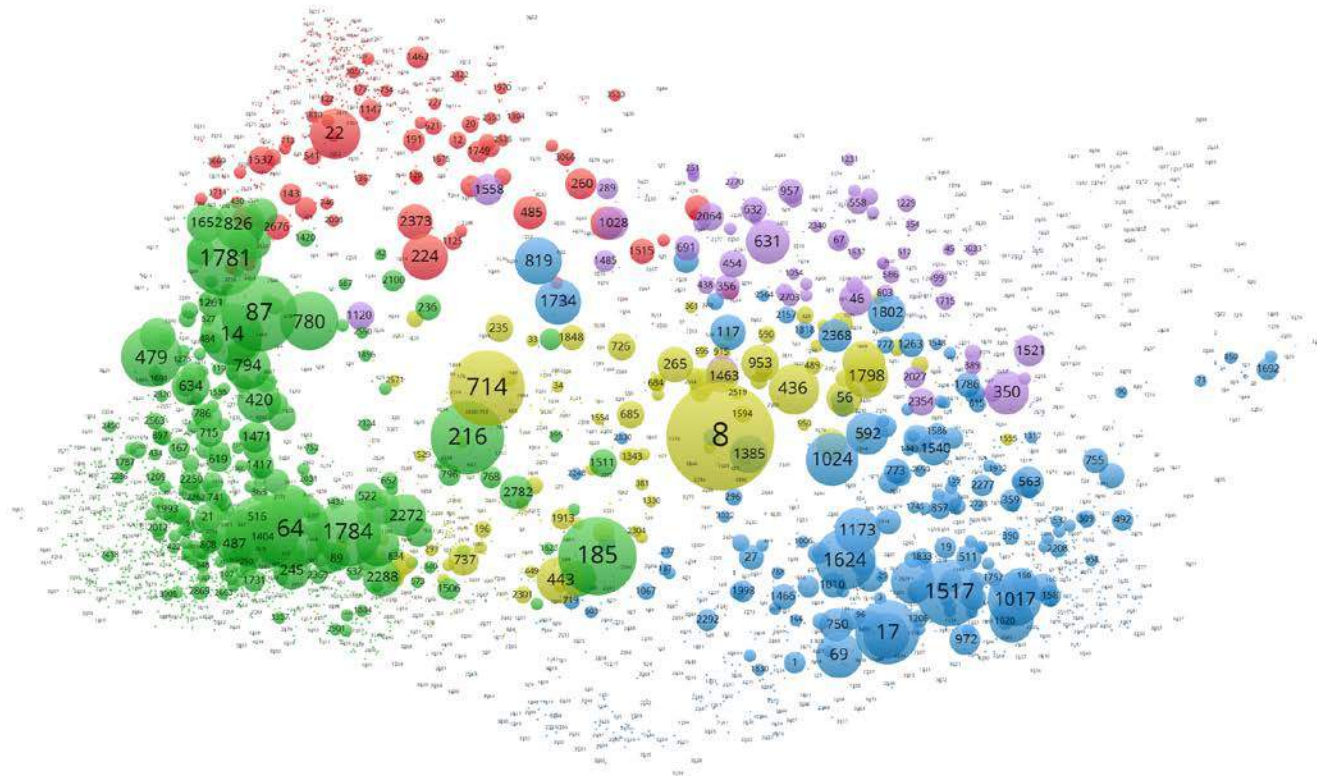


This creates opportunities to monitor societal impact

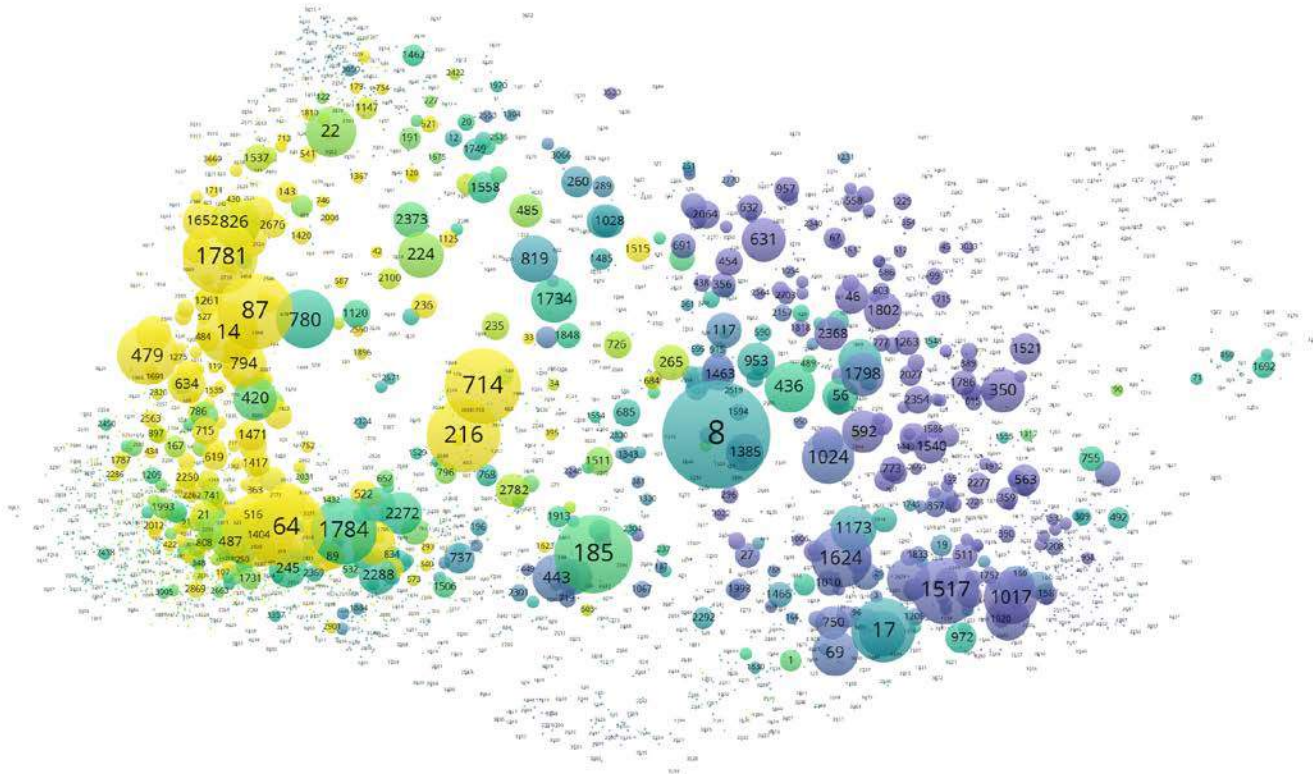
- Premise 1: we frame it as societal connectedness
- Premise 2: societal impact is a collaborative phenomenon

In practice: a Dutch Mission oriented Organization (TNO)

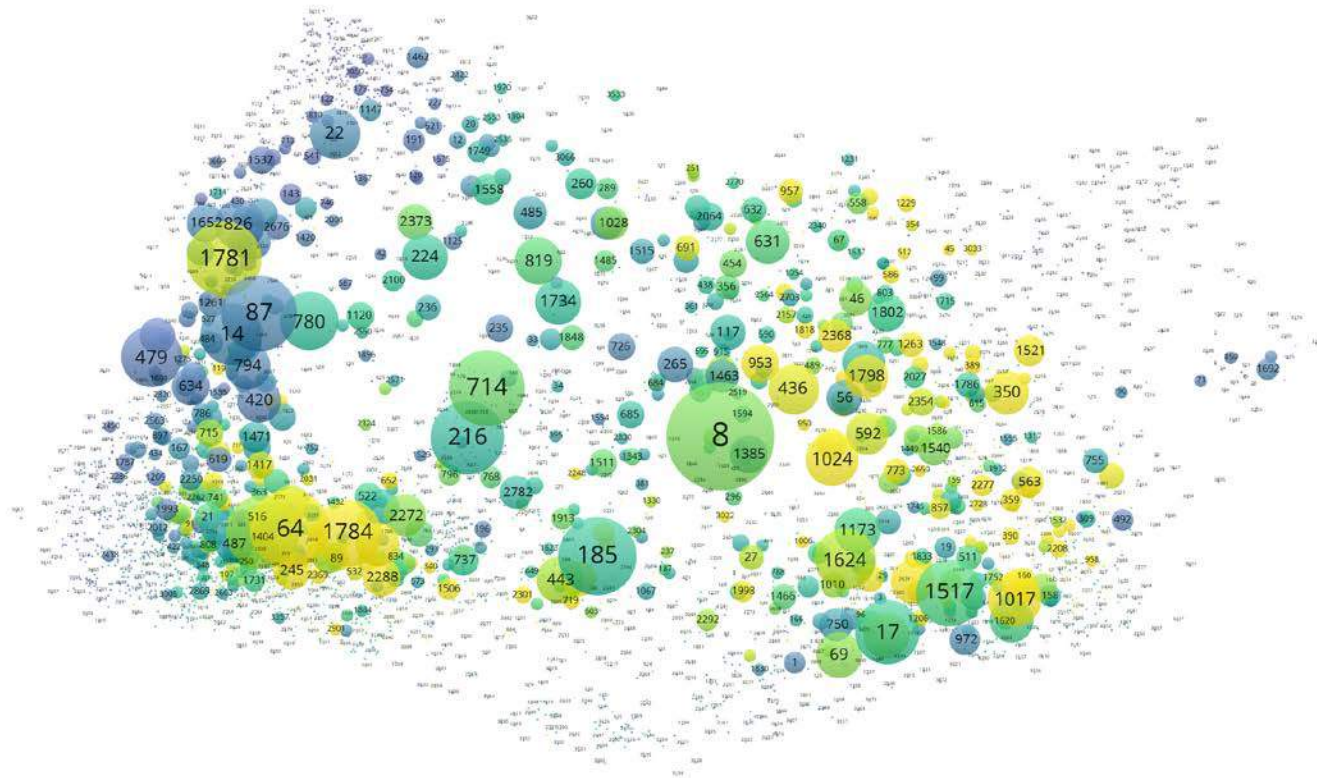
TNO NL Organization for applied research



TNO Twitter



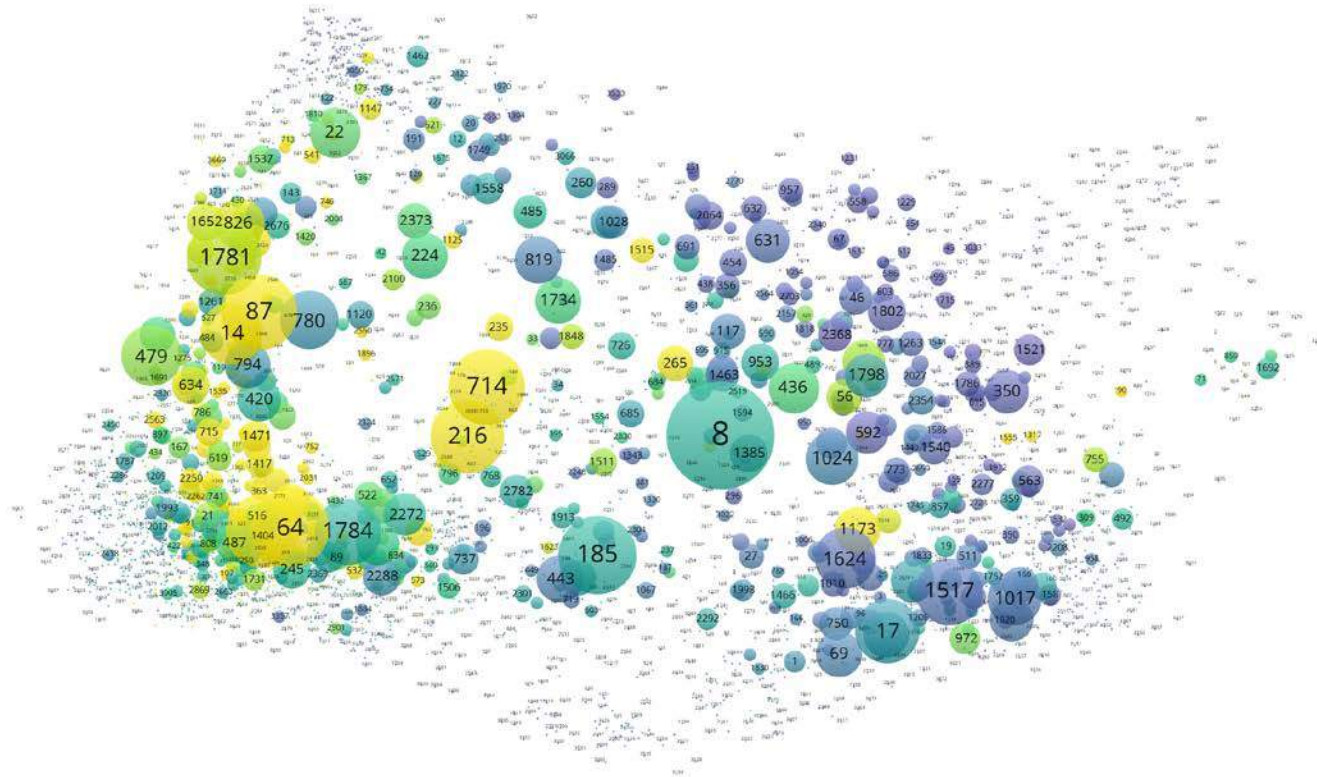
TNO Industry



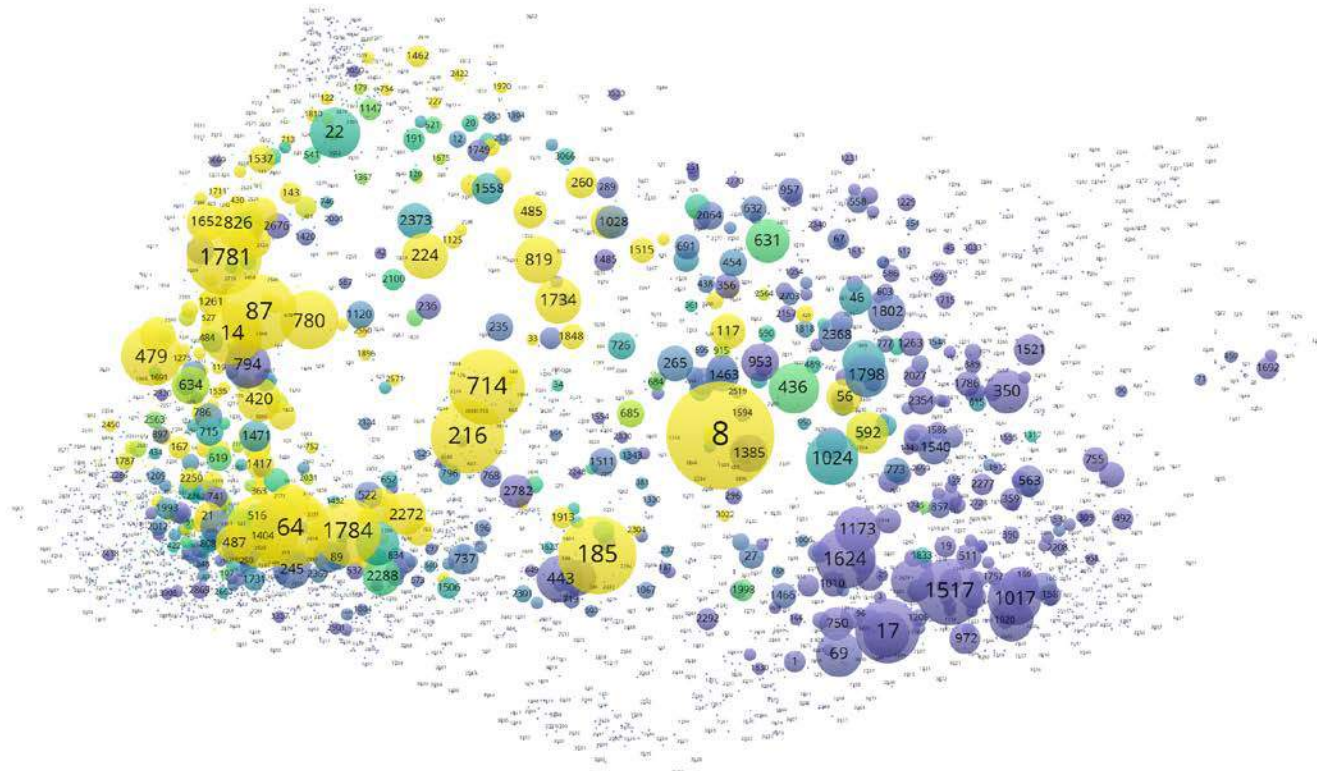
VOŠviewer



TNO news



TNO policy



Finally



Conclusions regarding the 4 issues (1-3)

- Variations of fields/ field specific properties well reflected by cluster characterizations;
- Locally relevant research identified (for instance) by non-English papers;
- Research Performance and Mission linked by indirect implementation via clusters;
- Other outputs: WoS coverage indicator provides evidence to monitor this;
- ...

Other outputs

- Document-based classification provides an opportunity to be more inclusive.
- Current activities of relevance: Crossref, Open citation initiative

Thank you

