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FAIR climate change: emergent data framework

Marcos Gonçalves Ramos , Priscila Ramos Carvalho , Maria de Nazaré Freitas Pereira

COMMITTEE ON DATA
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Objectives

- This paper aims to discuss the importance of a climate change framework focused on two approaches:
- 1) In view of the diversity and complexity of problems related to climate change, it is necessary to standardize metadata in order to improve information retrieval and scientific communication systems.
- 2) Due to the social, economic, political and environmental impacts, it is essential to make available qualified data through FAIR parameters, enabling safe decision making for public or private managers; replication of valid processes for problem solutions; creation and implementation of preventive and inclusive public policies.

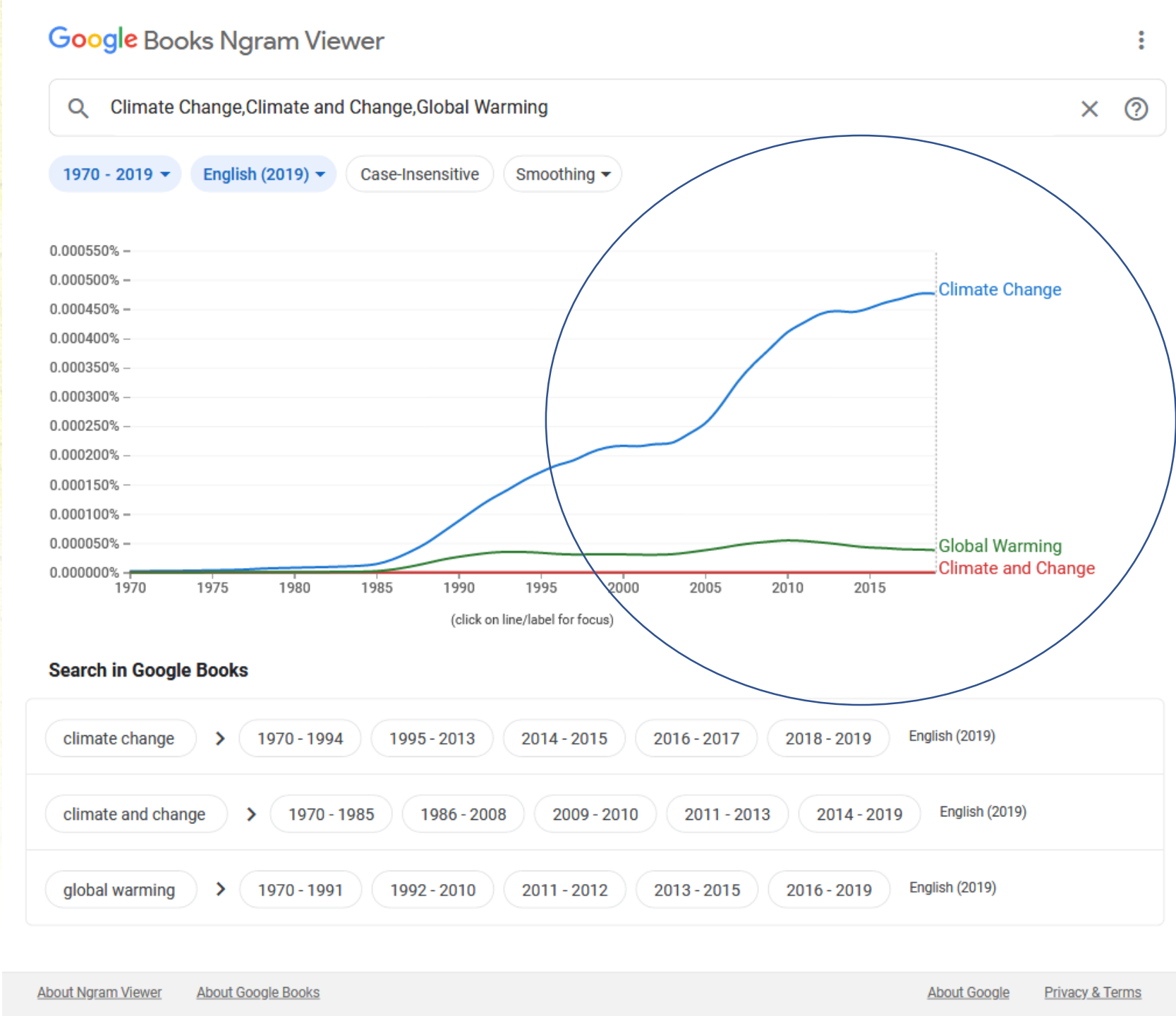
In a general sense, we believe that FAIR principles can be used on both ways, logic as well as semantic tools in a way not only to promote better information retrieval procedures but also to contribute with actions against misinformation related to climate change phenomenon and its effects around the world.

Methodology

- An applied research using graph analysis based on VOSviewer program was carried out in the Scopus and Dimension.AI databases. The search expression outputs for the term "climate change“ were analyzed according to VOSviewer metrics in order to compare the frequency of keywords distribution, the most representative scientific fields and which keywords were closer to the main searching terms on both systems.
- Although there is not a general concept of climate change and its possible global effects are still an open question to long term investigations, we assumed the concept of climate change from The Intergovernmental Panel on Climate Change (IPCC) as a general reference , which defines climate change broadly as “any change in climate over time whether due to natural variability or a result of human activity. (Pielke, 2004,31).

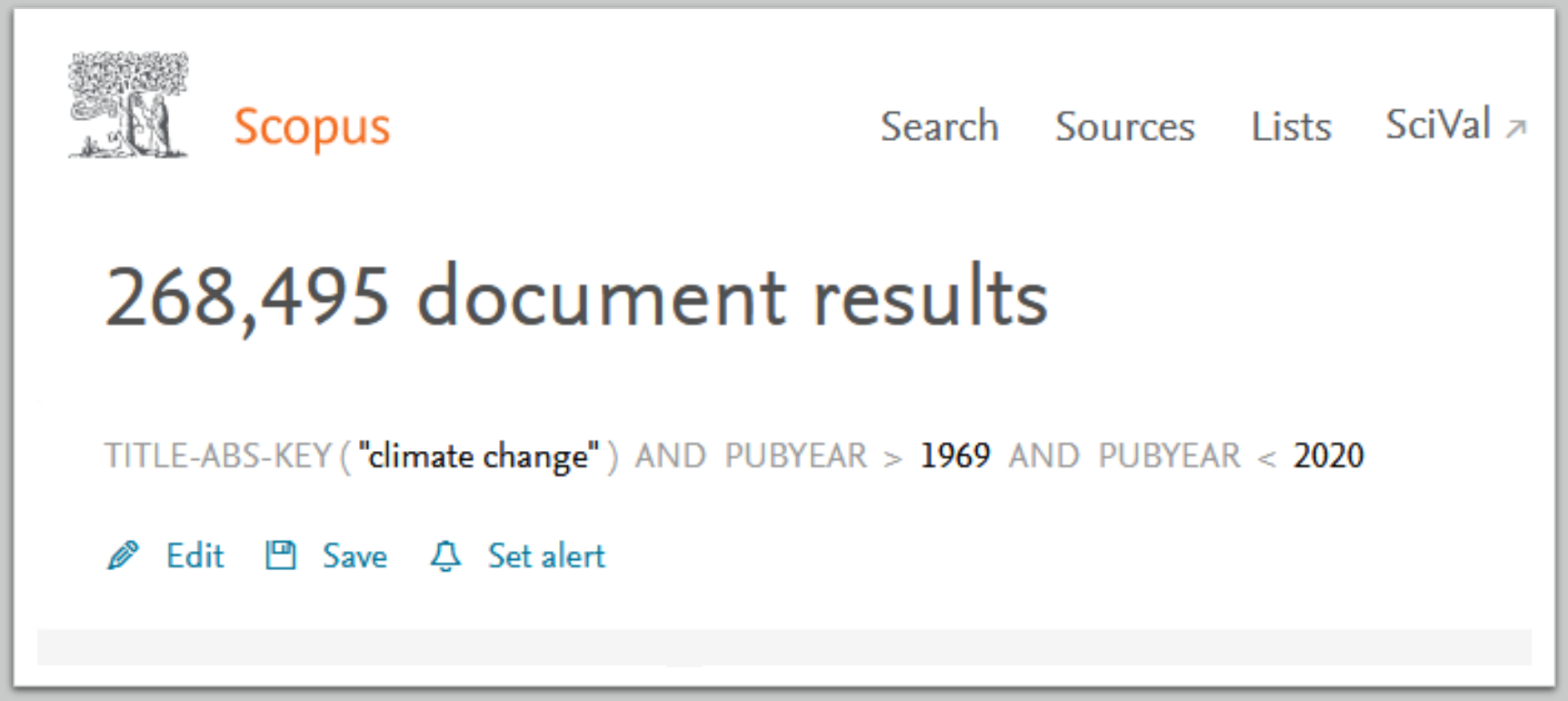
Google Books Ngram Viewer

From the verification of the term climate change in Google Books Ngram Viewer, a tool for visualizing the evolution of terms present in digitized books of the Google Books project, the period from 1970 to 2020 was defined for the search in the databases.

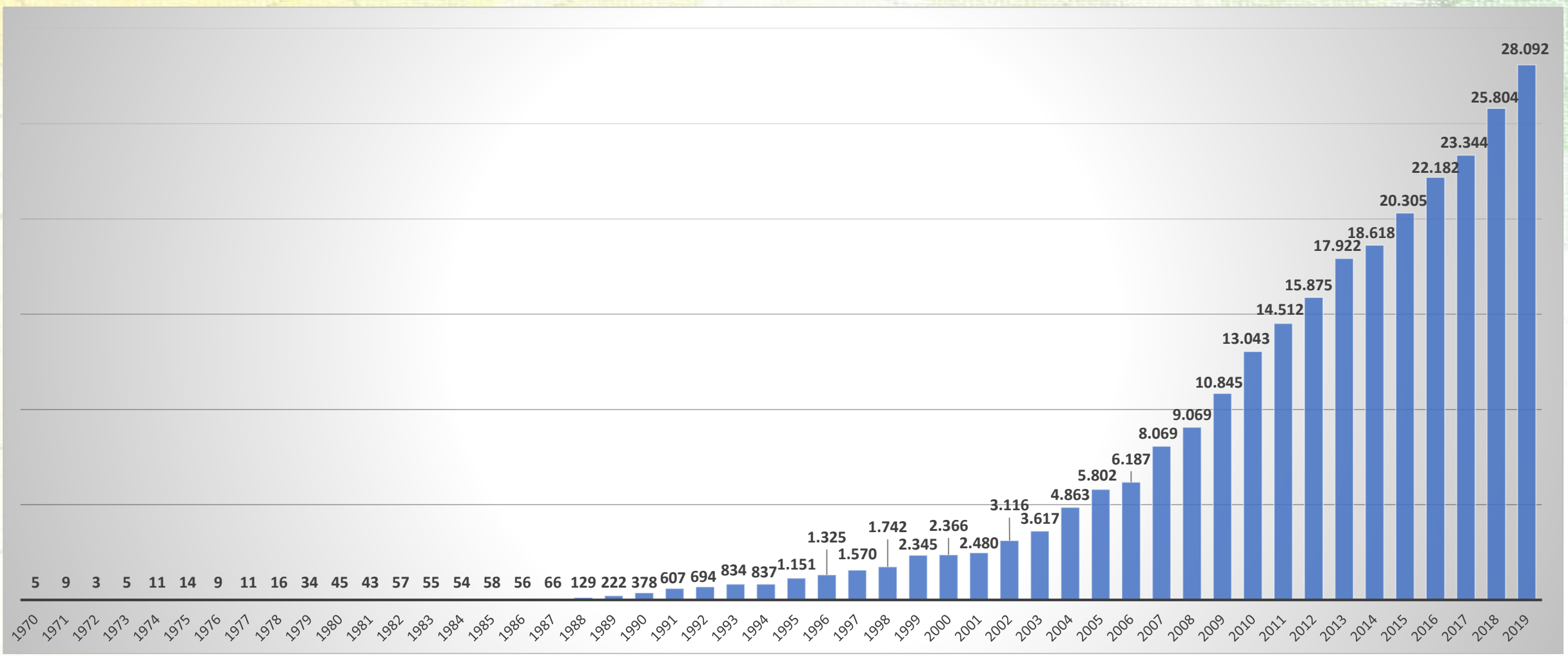


Scopus – Total Results

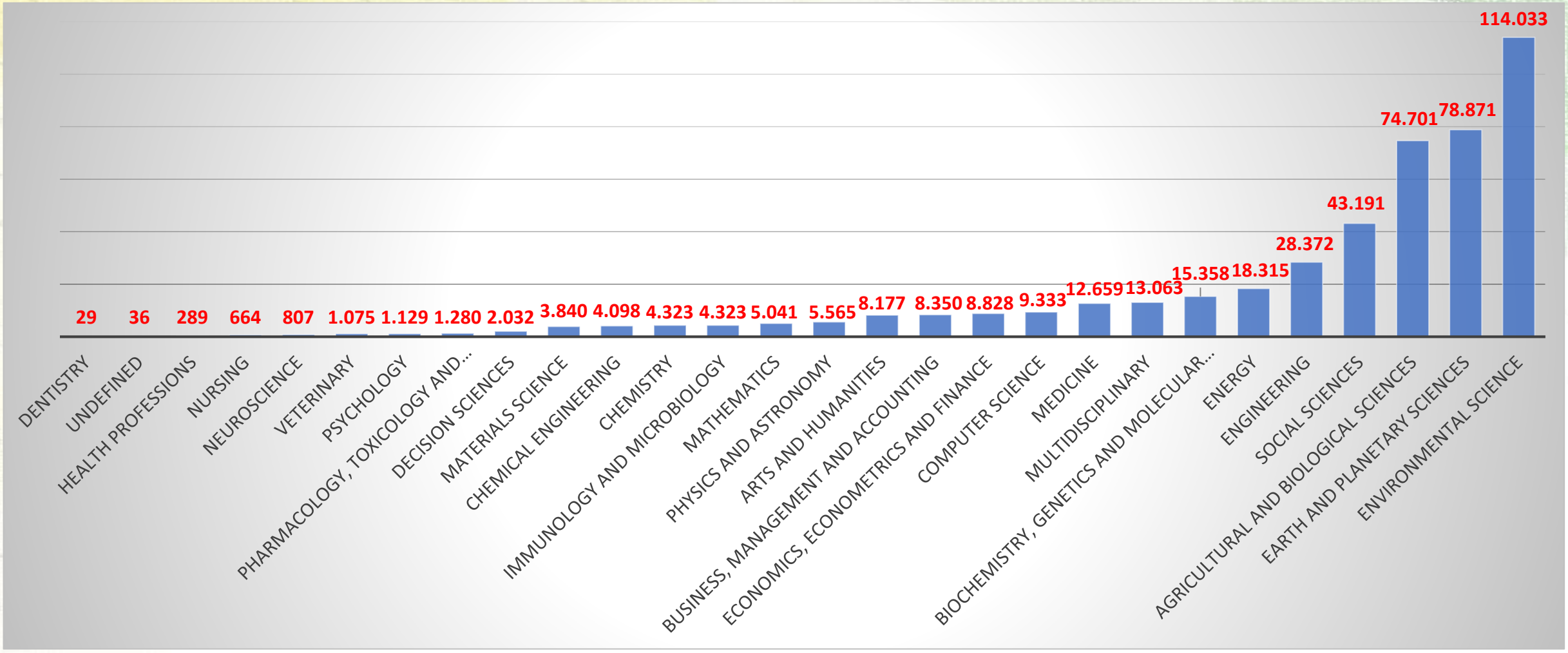
- Search query: TITLE-ABS-KEY (*"climate change"*) AND PUBYEAR > *1969* AND PUBYEAR < *2020*
- Total Results : 268,495
- Sample: 2,000



Scopus – Amount of Articles per Year

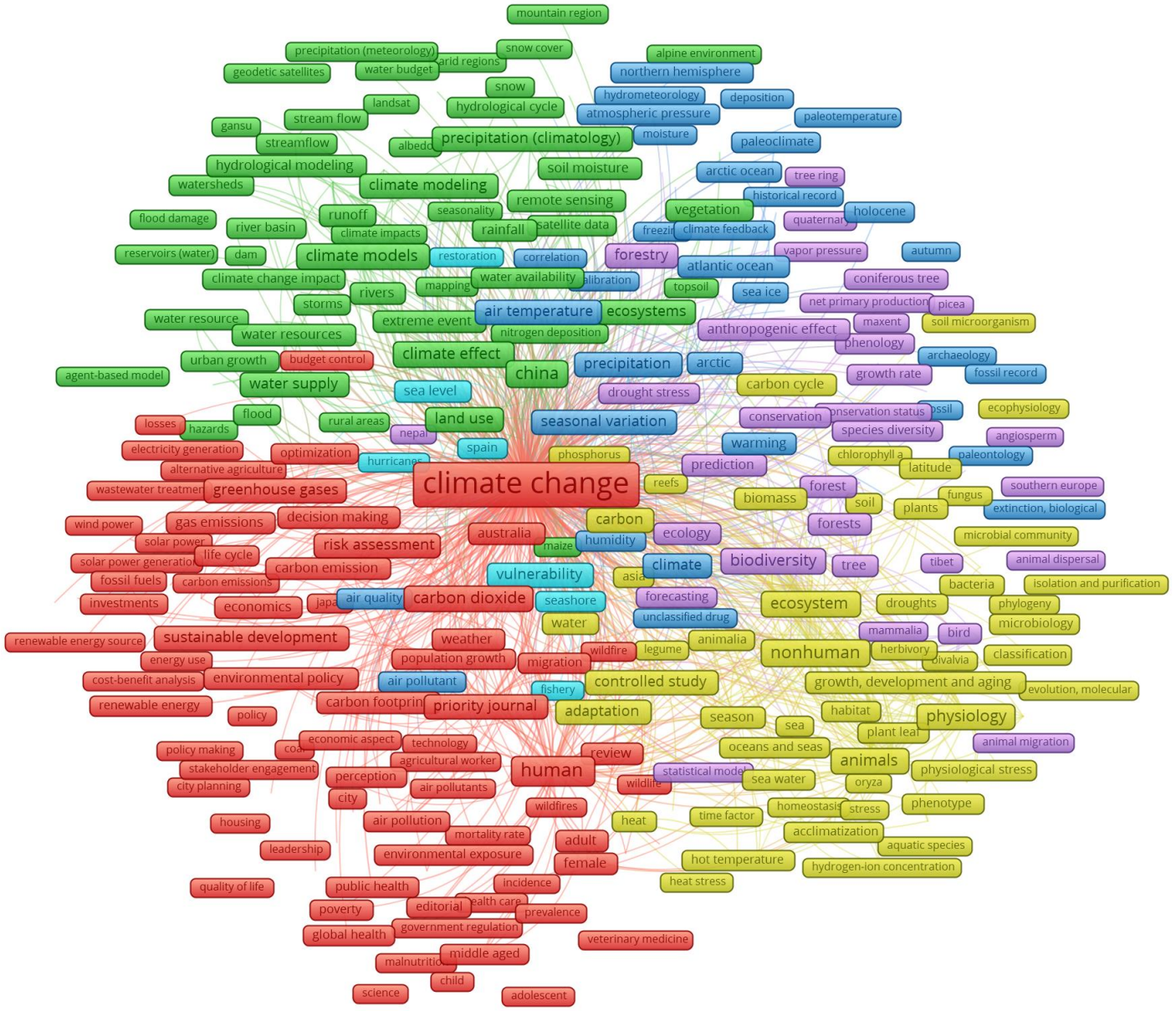


Scopus – Subject Areas



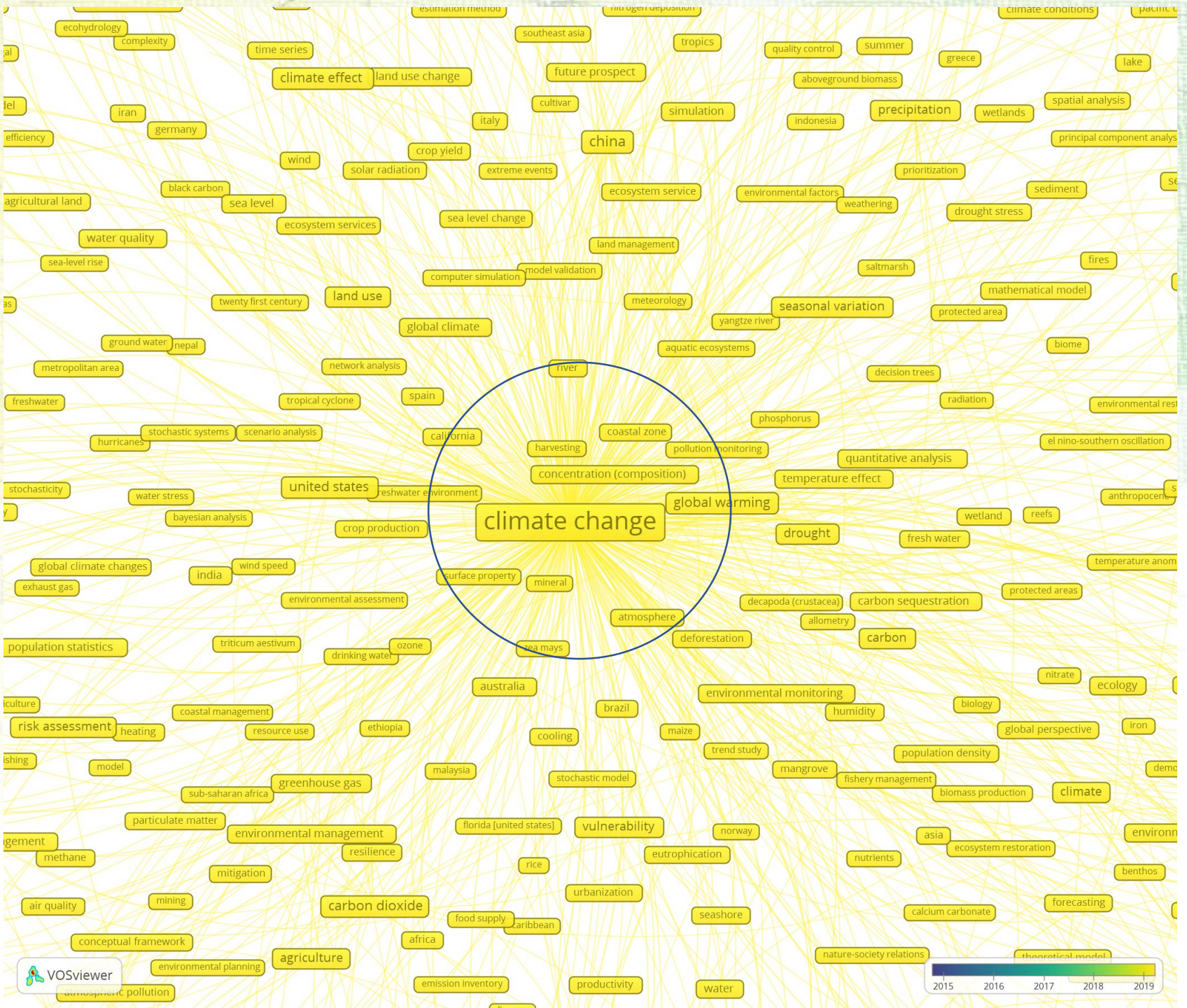
Scopus – VOSviewer 1,215 Terms

The centrality of the term climate change is because it is the most frequent term (1566), followed by human (246), nonhuman (149) and China (149). The graph layout suggest a possible taxonomy for Climate Change based on semantics distances and syntax proximity relations between terms, concepts and keywords used in large databases.



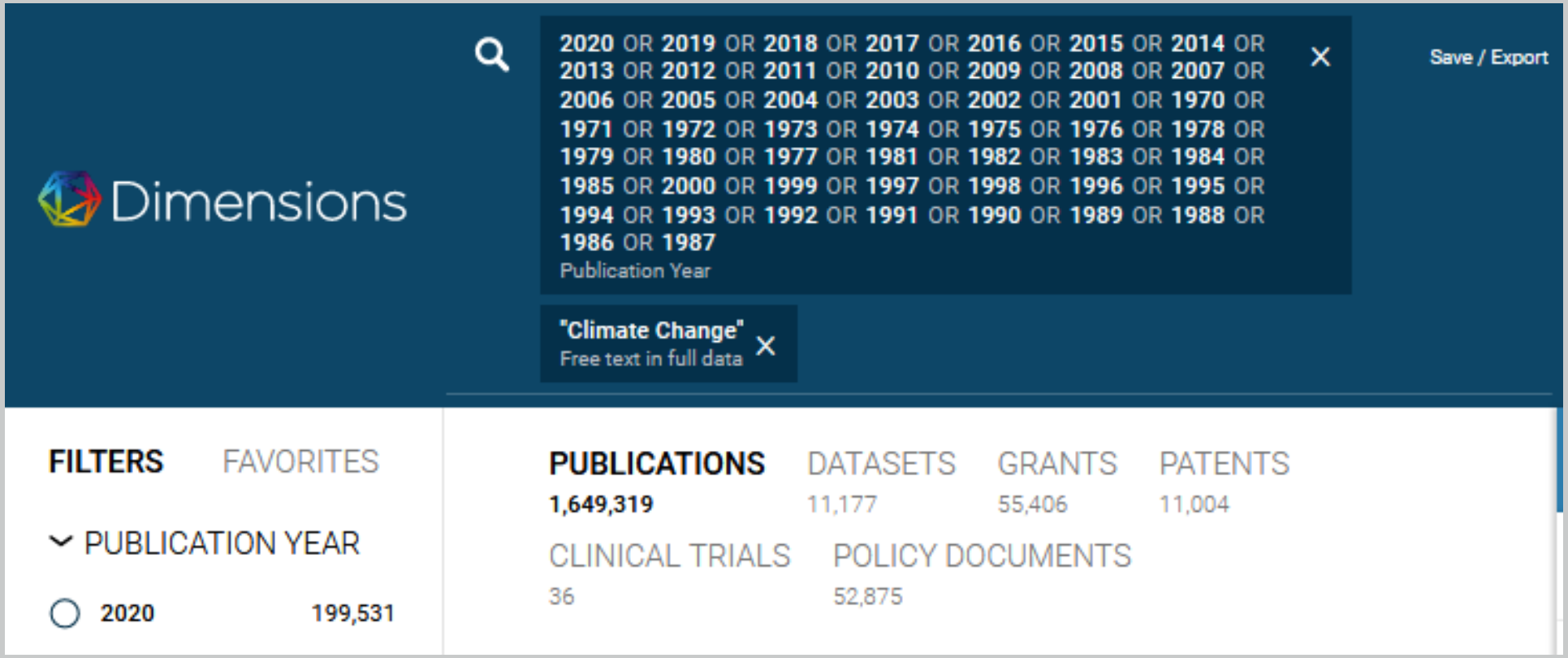
Scopus – VOSviewer Central Nodes

Once we have performed a more detailed study (zoom) about the main terms closer to the searching term ‘climate change’, we notice the proximity with other terms such as “global warming”, “concentration” and “surface property”.



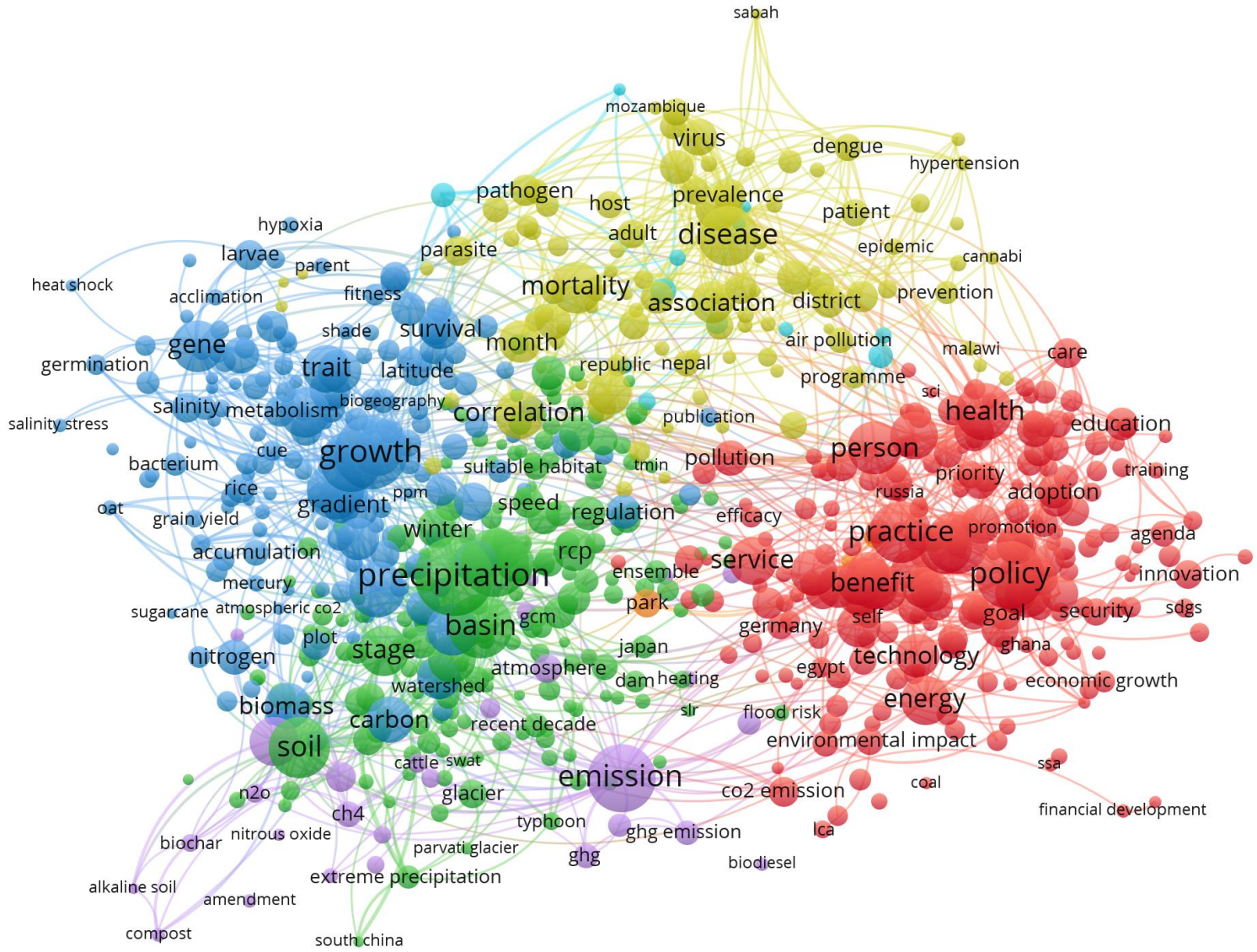
Dimension – Total Results

- Total Results : 1,649,319
- Sample: 2,500



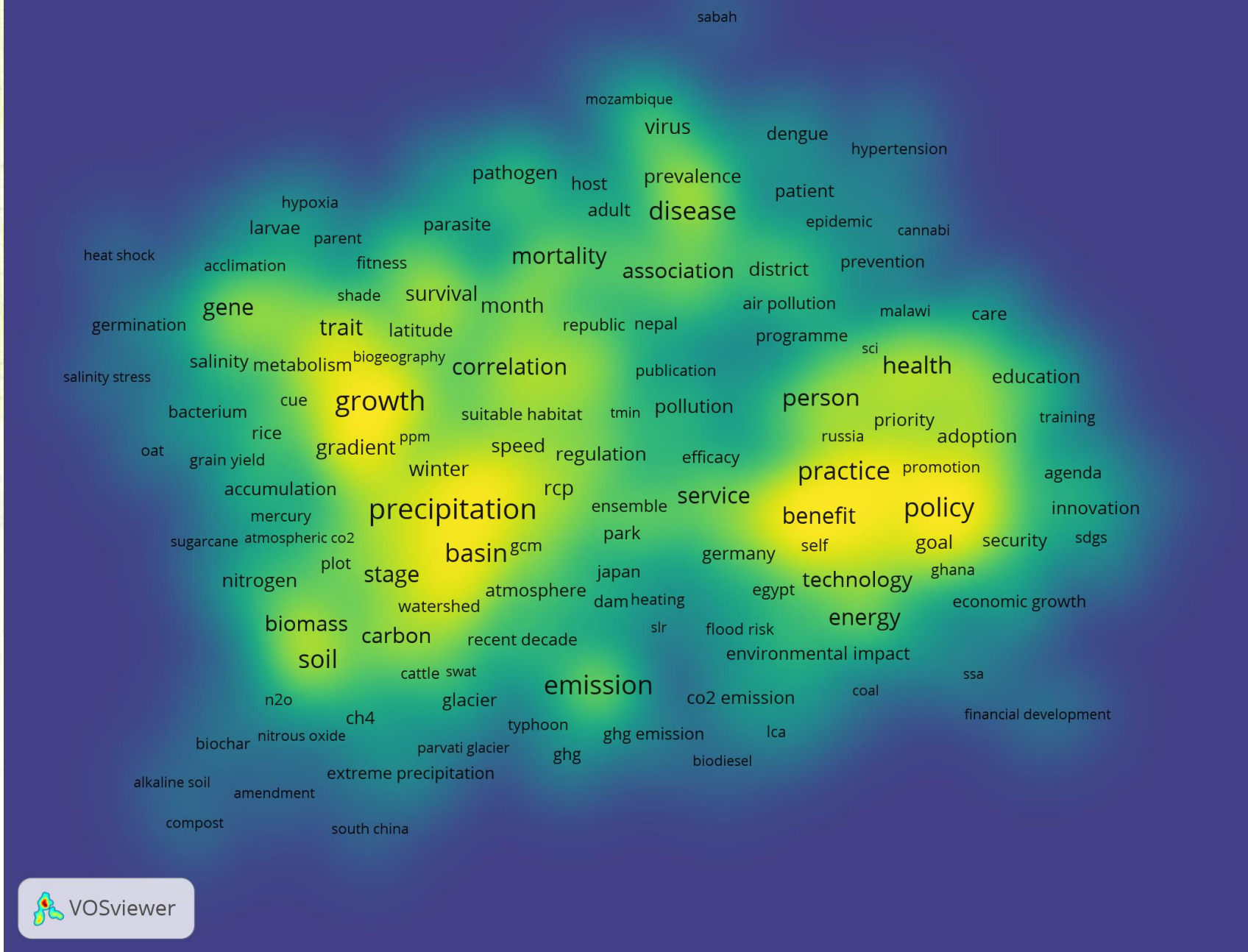
Dimension – VOSviewer 802 Terms

It was noted the lack of a central term in the graph, as well as the dispersion of the clusters arranged by the terms: Precipitation, Growth, Emission, Policy and Disease.



Dimension - VOSviewer

Despite the search term “climate change”, it was not possible to visualize this term due to the variability and dispersion of the terms represented in the graph.



Comparative Analysis

Scopus – Main Terms

- Climate change central node, closer semantic terms:

1. Global warming
2. Concentration (composition)
3. Pollution monitoring
4. Coastal zone
5. Harvesting
6. California
7. Freshwater enviorment
8. Surface property
9. Mineral
10. Atmosphere

Dimension – Main Terms

- No central node, only most frequently terms:

1. Precipitation
2. Growth
3. Policy
4. Warming
5. Emission
6. Basin
7. Challenge
8. Soil
9. Diversity
10. Disease

Considerations

- We realized that broad semantics aspects in the representation of the term climate change in both the databases, which can make interoperability and possible reuse of research data more difficult for different scientific communities, whereas special language controls applying FAIR principles become a standard procedure in large international databases. The higher diversity of the terms used, the more complex become technical indexing procedures in order to promote semantic interoperability that allows more efficient information retrieval.
- We consider that the choices for using controlled terms and metadata throughout artificial intelligence assistants like bots and trolls provide a better visibility for issues, subjects, documents storage in large data base. However, we can never forget those choices implies ethical and political decisions which can influence the perception of a concept and its chain of semantic related terms as shown in the graphs. In addition, the results have demonstrated that the search for climate change in Dimensions AI, brought also terms like “health”, “disease”, “virus”, “dengue”, “mortality “ which may indicate the emergence of new discussions and new approaches on progress.
- The different definitions of climate change along with the ongoing development of sensors, satellites and weather observatory systems, it seems that new concepts for a scalable, rational environment is emerging, that is from natural to human; from social to technological-mediated one. That transition and its practical implications for policy decisions and governance is a current research task on progress.

Draft Framework GOFAIR - Climate Change

The different definitions of climate change, the ongoing development of environment control technologies, the emergence of cross disciplinaries environment sciences and climate change studies; all of these facts inspired us to search for a framework based on fair principles, namely, GOFAIR CLIMATE CHANGE whose first steps for its conceptual and epistemology construction were here presented for further development.

References

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THANKS

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Plenary ePoster Session 1 - Nov. 27, 2020, 17:00-19:00 (UTC)

Poster Link:

https://conference.codata.org/FAIRconvergence2020/sessions/180/poster/85/

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