## International FAIR Convergence Symposium convened by CODATA and GO FAIR

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FAIR climate change: emergent data framework

FAIR

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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.

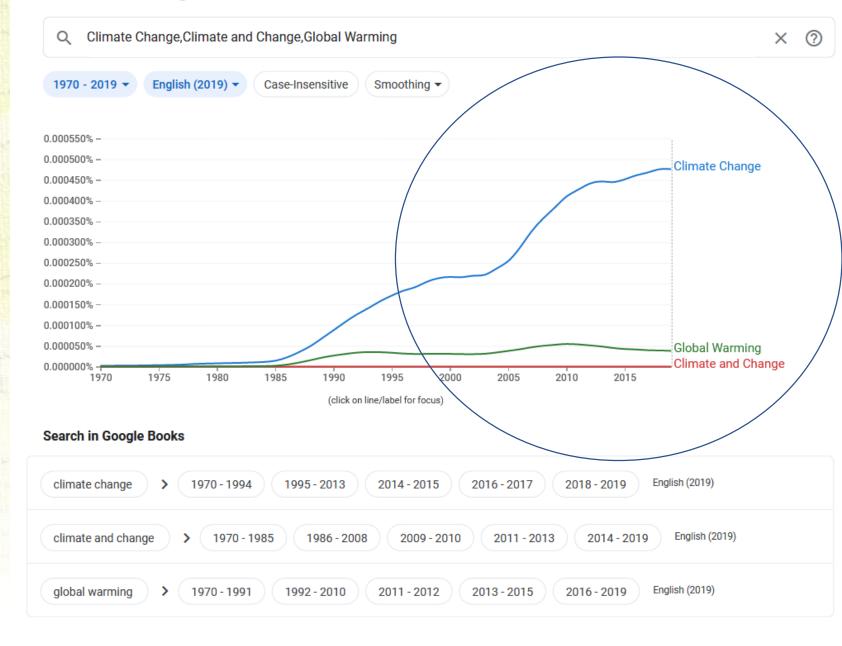
# Methodology

- 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.

#### Google Books Ngram Viewer



# Scopus – Total Results

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



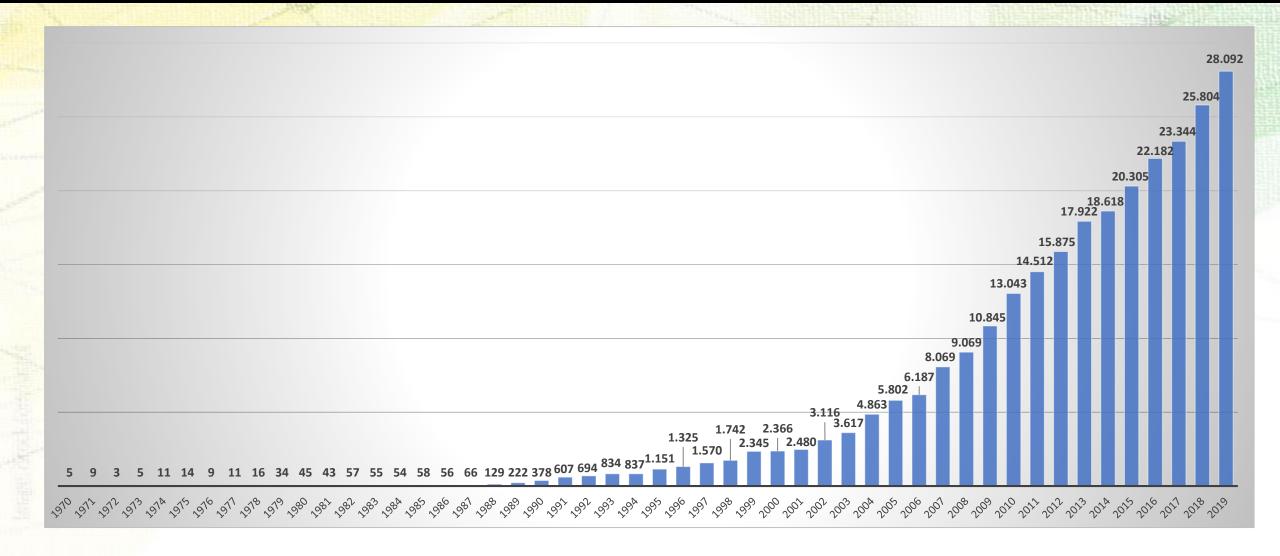
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## 268,495 document results

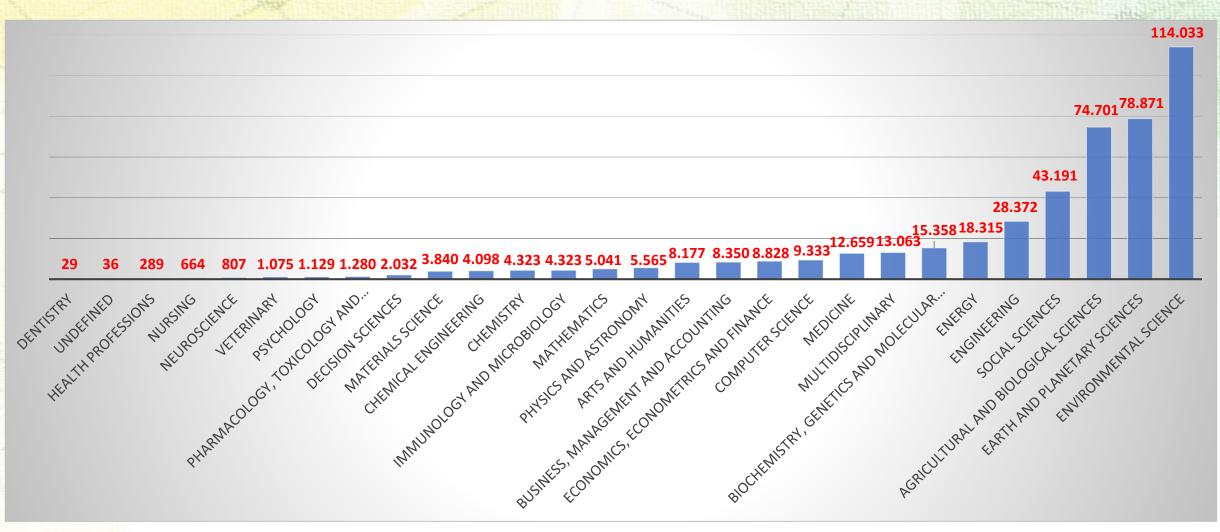
TITLE-ABS-KEY ("climate change") AND PUBYEAR > 1969 AND PUBYEAR < 2020

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## Scopus – Amount of Articles per Year

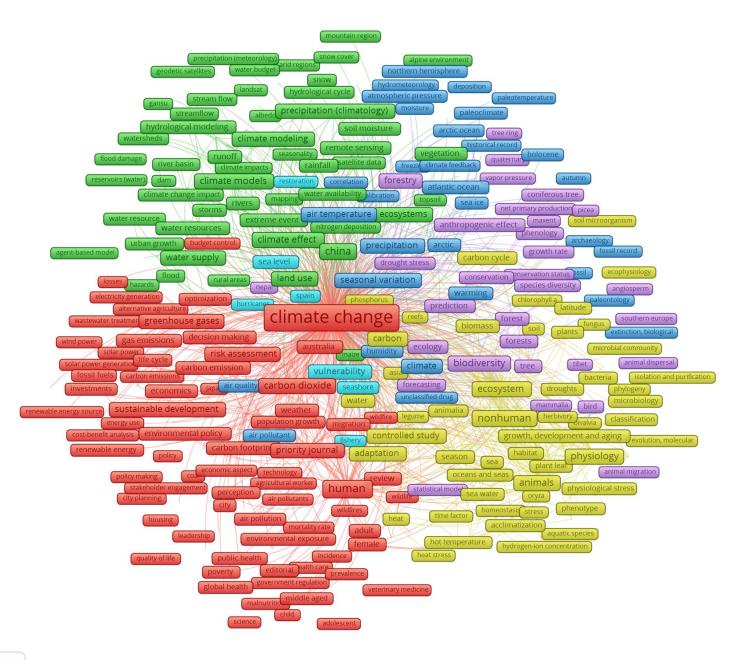


## Scopus – Subject Areas



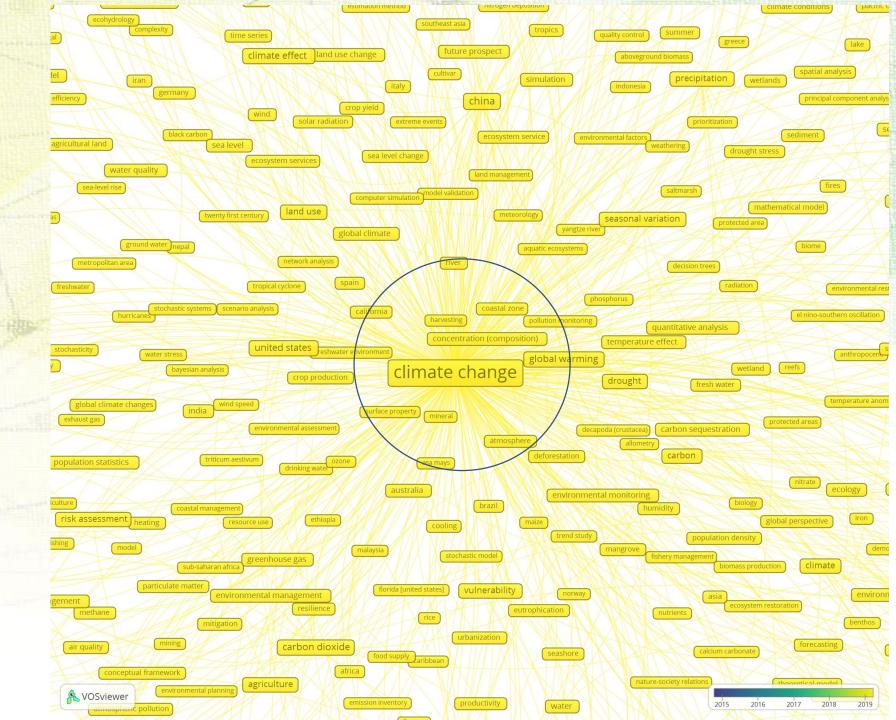
# Scopus – VOSviewer 1,215 Terms

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".



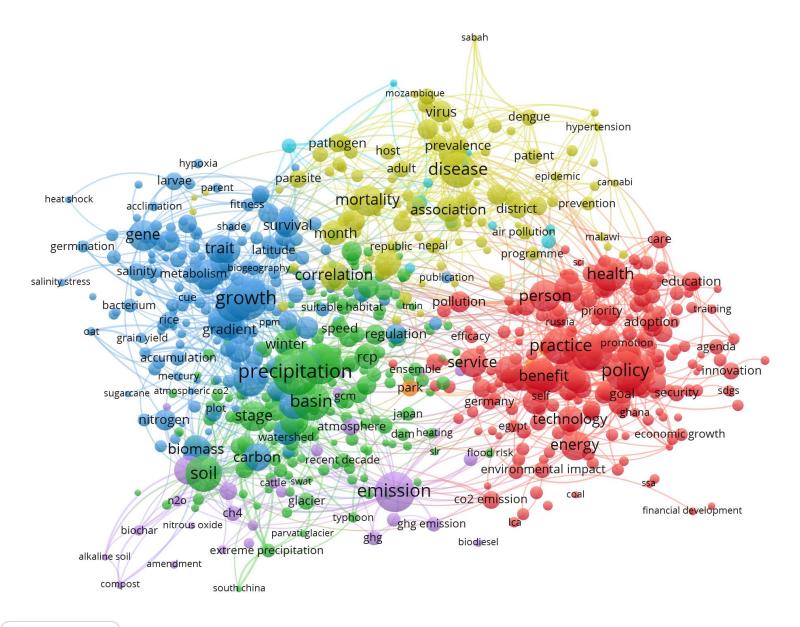
## Dimension – Total Results

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

Oimensions	Q       2020 OR 2019 OR 2018 OR 2017 OR 2016 OR 2015 OR 2014 OR 2013 OR 2012 OR 2011 OR 2010 OR 2009 OR 2008 OR 2007 OR 2006 OR 2005 OR 2004 OR 2003 OR 2002 OR 2001 OR 1970 OR 1971 OR 1972 OR 1973 OR 1974 OR 1975 OR 1976 OR 1978 OR 1979 OR 1980 OR 1977 OR 1981 OR 1982 OR 1983 OR 1984 OR 1985 OR 2000 OR 1999 OR 1997 OR 1998 OR 1996 OR 1995 OR 1994 OR 1993 OR 1992 OR 1991 OR 1990 OR 1989 OR 1988 OR 1986 OR 1987 Publication Year       ✓         "Climate Change"       ✓	Save / Export
FILTERS FAVORITES	PUBLICATIONS       DATASETS       GRANTS       PATENTS         1,649,319       11,177       55,406       11,004	
<ul> <li>PUBLICATION YEAR</li> <li>2020 199,531</li> </ul>	1,649,319         11,177         55,406         11,004           CLINICAL TRIALS         POLICY DOCUMENTS         36         52,875	

# 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.



🔥 VOSviewer

## 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.

mozambique virus dengue hypertension pathogen prevalence host patient hypoxia adult disease epidemic parasite larvae cannabi parent mortality fitness acclimation prevention association district survival month shade air pollution gene malawi care germination trait latitude republic nepal programme salinity metabolism<sup>biogeography</sup> correlation health publication education salinity stress person growth cue tmin pollution suitable habitat bacterium training priority rice gradient ppm russia adoption speed regulation oat grain yield efficacy winter practice promotion agenda ensemble service accumulation precipitation policy innovation benefit mercury park sugarcane atmospheric co2 sdgs goal security basin<sup>gcm</sup> self germany plot ghana japan stage technology nitrogen egypt atmosphere dam heating watershed economic growth energy biomass flood risk carbon recent decade environmental impact soil cattle swat ssa emission coal n2o glacier co2 emission financial development ch4 typhoon Ica ghg emission biochar parvati glacier ghg biodiesel extreme precipitation alkaline soil amendment

compost south china

🔥 VOSviewer

sabah

## **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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- Pielke RA. What is Climate Change? Energy & Environment. 2004;15(3):515-520. doi:10.1260/0958305041494576.
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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/



