

# Comparison of results shown by different search engines for climate-related topics

Tuhina Kumar, University of Duisburg-Essen

## Introduction

In our digital age, information accessibility is essential for informed decision-making. Search engines play a pivotal role in connecting information seekers, advertisers, and content providers. However, this digital transformation comes with environmental concerns. Climate change, driven by human activities, is compounded by carbon emissions from the IT sector, with internet use contributing significantly.

The focus centers on two distinct search engines: Google, a widely-used commercial platform, and Ecosia, an environmentally conscious alternative that directs its profits toward tree planting initiatives. The aim of this research was to find the potential variations in the domains presented by these search engines in response to climate-related queries.

## Research Question

Does Ecosia, with its environmental mission, presents different climate-related search results compared to Google, a commercial search engine?



## Methods

Data collection was accomplished by utilizing the Relevance Assessment Tool (RAT) to aggregate search queries from the two search engines: Google and Ecosia. This involved the initial input of three central thematic seeds: 'global warming,' 'ozone layer,' and 'greenhouse effect.' Subsequently, systematic query expansion was undertaken through a series of iterative steps. As a result of this process, a total of 2,459 distinct queries were accumulated, constituting the fundamental dataset for the analysis.

The first ten search results from Google and Ecosia were analyzed, as research indicates that the majority of clicks occur within this range (Enge et al., 2015). The analysis was conducted using the programming language Python, and Jupyter Notebook was selected as the working environment. The methodology used in the study conducted by Yagci et al. in 2022 was used as reference for this analysis. The frequency of occurrence, the mean position and the standard deviation of the domains was analysed. The Jaccard similarity index for the two search engines was calculated to measure the similarity between the datasets.

The domains were classified by first creating a broad set of categories based on the top 200 unique domains found across the results, and then manually classifying these domains under the decided 9 categories. In order to analyse the category distribution, the data for positions were evaluated cumulatively, along with all positions ranked higher than the positions in question, owing to user trust in search engine ranking for relevance (Guan & Cutrell, 2007).

## References

- Yagci, N., Sünkler, S., Häußler, H., & Lewandowski, D. (2022, October). A Comparison of Source Distribution and Result Overlap in Web Search Engines. *Proceedings of the Association for Information Science and Technology*, 59(1), 346–357. <https://doi.org/10.1002/pra2.758>
- Guan, Z., & Cutrell, E. (2007, April 29). An eye tracking study of the effect of target rank on web search. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. <https://doi.org/10.1145/1240624.1240691>
- Enge, E., Spencer, S., & Stricchiola, J. (2015, August 17). *The Art of SEO: Mastering Search Engine Optimization* (3rd ed.). "O'Reilly Media, Inc."

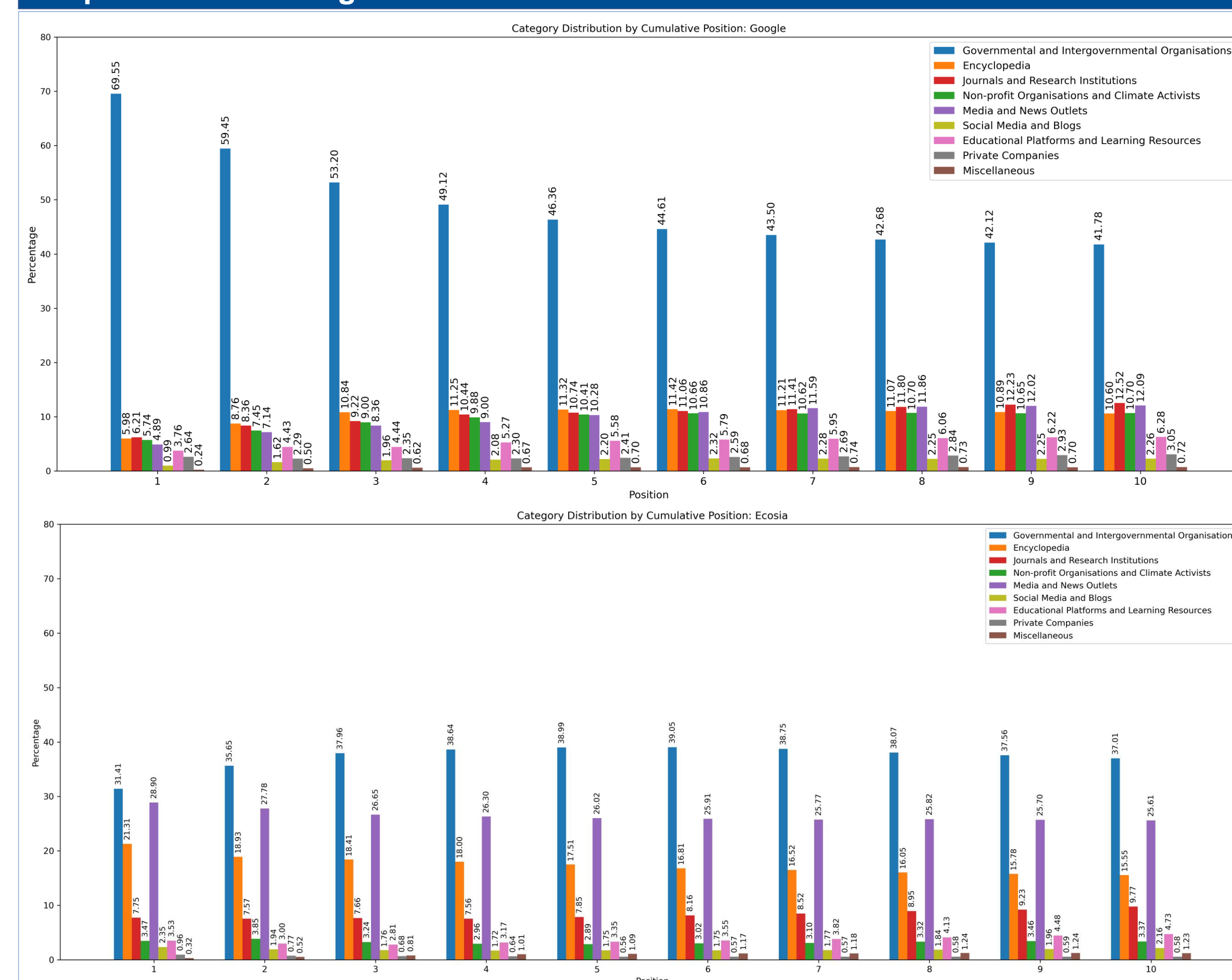
## Results

Top 10 domains for Google and Ecosia on the basis of their count with their respective count of occurrence (#), mean position (M), standard deviation of position (SD) and Category (C) that the domain falls under

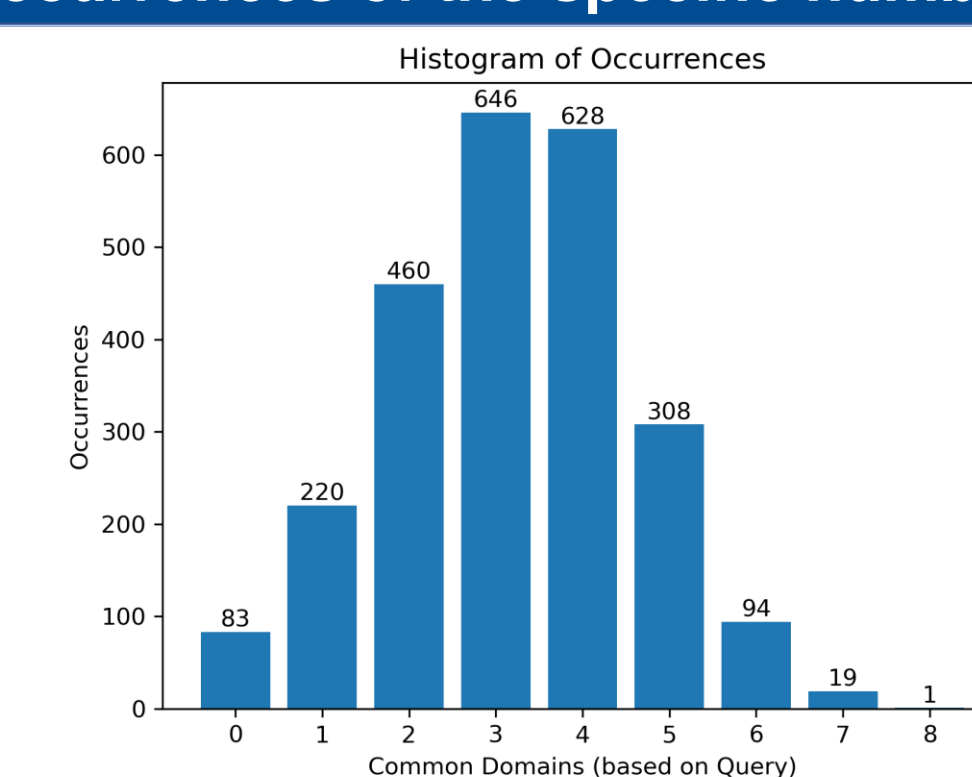
No.	Google					Ecosia				
	URL	#	M	SD	C*	URL	#	M	SD	C*
1	www.epa.gov	1056	3.89	2.90	Gov	www.britannica.com	1901	4.96	2.69	Ency
2	en.wikipedia.org	1038	4.39	2.57	Ency	climate.nasa.gov	1830	4.59	2.70	Gov
3	climate.nasa.gov	810	3.33	2.69	Gov	www.nationalgeographic.org	1419	4.06	2.68	News
4	www.nrdc.org	805	5.24	2.46	NP	www.nationalgeographic.com	1132	4.55	2.32	News
5	www.britannica.com	659	6.22	2.29	Ency	www.epa.gov	1119	5.98	2.66	Gov
6	www.un.org	580	4.83	2.91	Gov	en.wikipedia.org	958	4.80	2.98	Ency
7	www.bgs.ac.uk	542	5.12	2.47	Res	www.un.org	846	4.78	2.38	Gov
8	public.wmo.int	517	4.97	2.84	Gov	climatekids.nasa.gov	557	5.06	2.30	Gov
9	byjus.com	510	5.88	2.75	Edu	www.bbc.co.uk	542	6.84	2.62	News
10	www.nationalgeographic.org	506	5.80	2.64	News	www.bbc.com	487	5.37	2.89	News

Note: \*The categories mentioned in the table are Governmental and Intergovernmental Organizations (Gov), Encyclopedia (Ency), Journals and Research Institutions (Res), Non-profit Organisations and Climate Activists (NP), Media and News Outlets (News), Social Media and Blogs (SoM), Educational Platforms and Learning Resources (Edu), Private Companies (Pvt) and Miscellaneous (Misc)

Percentage distribution of categories of displayed domains for cumulative data of all positions for Google and Ecosia



Count of common domains match, out of 10, for Ecosia and Google for a given search query and the occurrences of the specific number of common domains



Overall overlap: 25%

## Discussion and Conclusion

While Wikipedia's dominance in general queries is well-known, it did not claim the top spot on either search engine for climate-related searches. This highlights a shift in user search behavior toward specialized sources.

Interestingly, governmental and intergovernmental organizations emerged as significant contributors to climate-related information on both search engines. This finding underscores their crucial role in addressing climate issues and suggests that users trust official sources. The study further solidified a preference for credible and verified sources, with "Journals and Research Institutes" and "Media and News Outlets" categories ranking prominently. While Ecosia displayed slightly more repetitive results and a smaller pool of unique domains compared to Google, both search engines showed moderate result dispersion.

The limitations of this study include considering limited climate related themes and retrieval of the data from a single location