

# Climate Change Narratives of Organizations Funded by ExxonMobil

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## Background

### Introduction of ExxonMobil:

ExxonMobil is an American multinational oil and gas corporation that holds the title of the largest investor-owned oil company and one of the big oil companies in both production and market value.

ExxonMobil had extensive knowledge of the climate disruption caused by fossil fuel pollution, but instead of taking the social responsibilities, the company chose to finance an elaborate campaign to cast doubt on the issue (Desmog, n.d.).

From 1998 to 2017, ExxonMobil funded more than 36 million dollars for 69 organizations (Union of Concerned Scientists, 2017). Among them, 50 organizations registered their official Twitter accounts and frequently tweeted about climate science and climate policies.

### Top 4 Exxon Funded Organizations:

- U.S. Chamber of Commerce (67%)
- American Enterprise Institute (11%)
- Manhattan Institute (8%)
- American Legislative Exchange Council (4%)



## Data and Methodologies

### Data Resource and Introduction:

The Twitter API, a programmatic access to retrieve and analyze Twitter data, was utilized to access the Twitter accounts of 50 organizations that received funding from ExxonMobil.

Twitter API accessed approximately 1.4 million tweets from these organizations posted from November 2007 to December 2022. The collected tweets were filtered based on the 32 selected climate change-related keywords. See Figure 1. It results in 34,433 tweets. After removing duplicate tweets, we ended up with 22,940 tweets for our further analysis.

re.sub() function from the Regular Expressions (re) was utilized to preprocess text data.

adaptation	carbon dioxide equivalent	global average temperature	ocean acidification
aerosols	carbon sequestration	global warming	ozone
anthropogenic	climate	greenhouse effect	radiative forcing
biodiversity	climate change	greenhouse gases	renewable energy
biomass	deforestation	hydrologic cycle	stratosphere
carbon cycle	el niño	ipcc	unfccc
carbon dioxide	emissions	methane	weather
	evapotranspiration	mitigation	exxon

Figure 1.1

Figure 1.2

Figure 1.3

Figure 1.4

## Data and Methodologies

- Preprocessing Text Data: module in Python to clean the tweet text by removing URLs, hashtags, punctuations and special characters, numbers, and multiple whitespaces.
- Word Embedding: Applying Google's T5 (Raffel et al., 2020) from the SentenceTransformer model in Python that takes a string (text) as input and returns a 768-dimensional vector as output
- Classification: Utilizing community\_detection function from the util package of "Sentence-Transformers" with text embeddings to identify clusters (https://www.sbert.net/index.html)
- Visualization: Apply UMAP (Uniform Manifold Approximation and Projection; McInnes et al., 2020), a dimension reduction technique, to visualize cluster results.

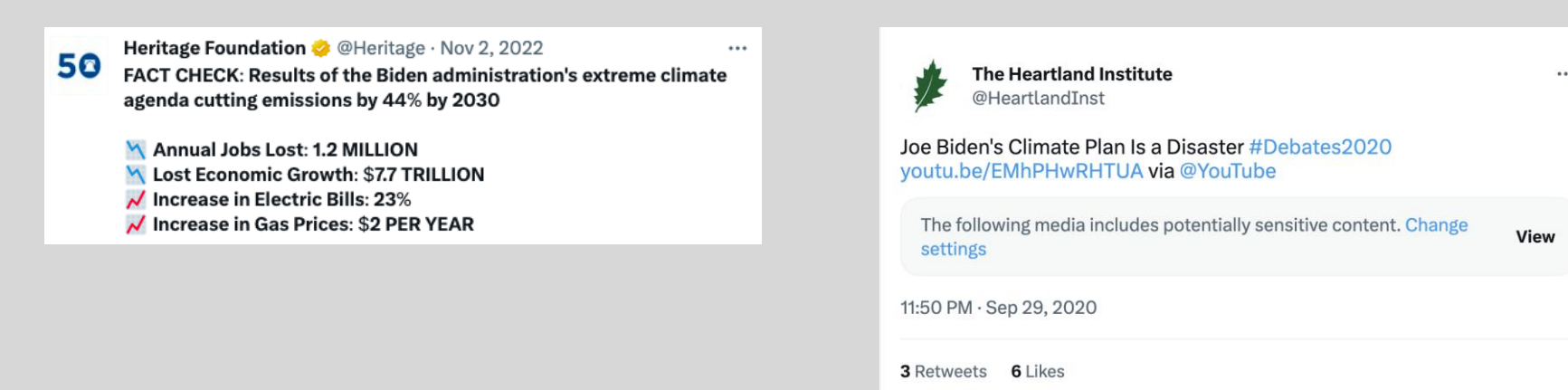
### Analysis Direction:

- Identify topics on all filtered tweets in general
- Identify topics on tweets posted by each organization

## Climate Change Misinformation Topic 1

### Topic 1: Biden's energy plan hurts economic growth

Example Tweets screenshot:

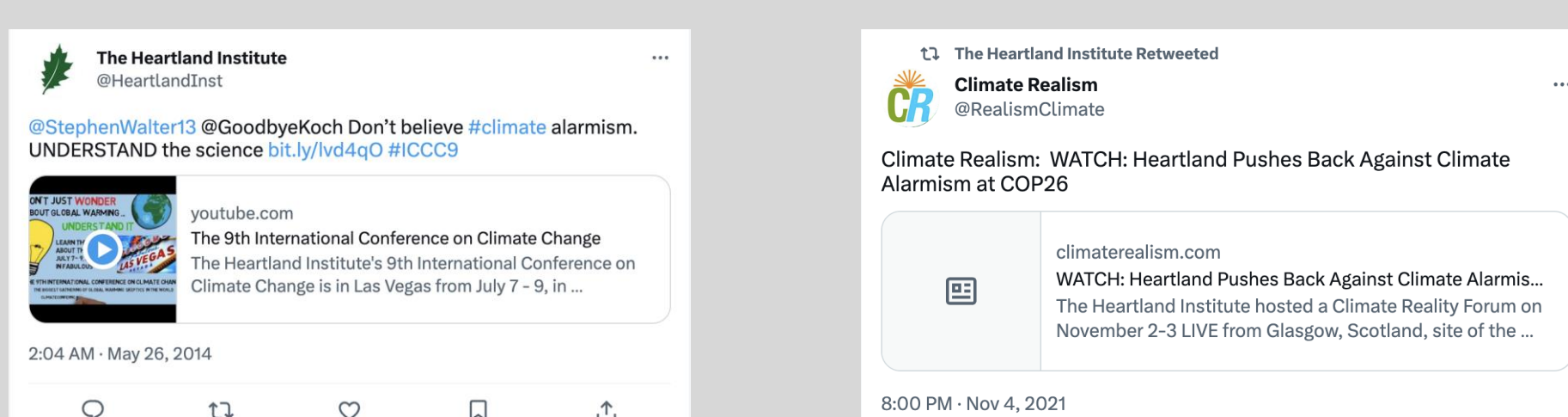


## Climate Change Misinformation Topic 2

### Topic 2: Climate change is not threatening

Despite some natural causes, it's proven that human activities accelerate climate change and impact the whole world. The global surface temperature goes up with the accumulation of greenhouse gas concentrations, resulting in more hot days and heat waves. Climate change is threatening the world along with more severe storms, increased drought, rising ocean, loss of species, more health risks, no enough food and poverty and displacement (source from United Nations|Climate Action). We identified a significant cluster advocating that climate change is not threatening. However, the cluster claimed that climate change is not threatening and it is alarmist.

Example tweets screenshot:



## Classification Results for All Tweets

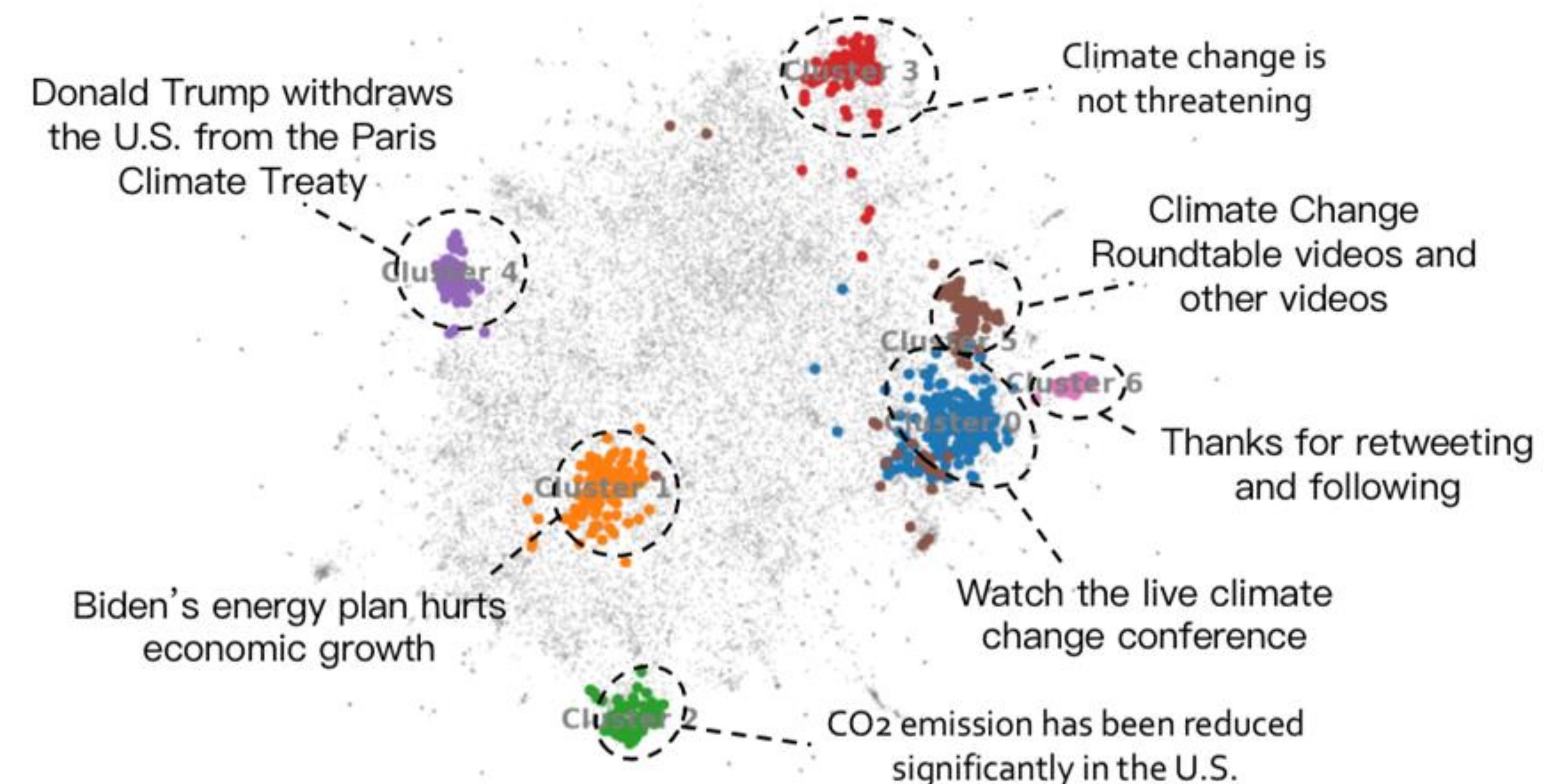


Figure 2

The optimal parameters for 'min\_community\_size' and 'threshold' in the 'community\_detection' function were determined as 100 and 0.85 respectively, from which 7 clusters were identified.

From manually investigations, the main topics of each cluster were identified and shown in the Figure 2.

## Introduction of Top Contributor of Climate Change Misinformation - Heartland Institute

The Heartland Institute is one of the world's leading free-market think tanks. It is a national nonprofit research and education organization based in Arlington Heights, Illinois. Its mission since its founding in 1984 is to discover, develop, and promote free-market solutions to social and economic problems. (Source from Heartland Institute website)

After removed duplicated tweets, we collected 3,897 tweets posted by Heartland Institute since Nov. 2017 to Dec. 2022, from which we identified 9 clusters with our model and almost each cluster talked about climate change misinformation. It claimed that climate change is alarmist and it's not threatening. It even created own Heartland Daily Podcast to spread climate change misinformation and fake science about climate change.



## References

- Heartland Institute Website: <https://heartland.org>
- McInnes, L., Healy, J., & Melville, J. (2018). UMAP: Uniform manifold approximation and projection for dimension reduction. arXiv preprint arXiv:1802.03426.
- Raffel, C., Shazeer, N., Roberts, A., Lee, K., Narang, S., Matena, M., ... & Liu, P. J. (2020). Exploring the limits of transfer learning with a unified text-to-text transformer. The Journal of Machine Learning Research, 21(1), 5485-5551.
- United Nations|Climate Action: <https://www.un.org/en/climatechange/science/causes-effects-climate-change>

## Contact Information

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