



Moral power of youth activists – Transforming international climate Politics?

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ABSTRACT

Youth Climate Activists are important norm entrepreneurs as humanity is increasingly awakening to the realities of accelerating climate change. They push for seeing climate change not merely through cost-benefit analysis frames but through frames of multiple climate justices. But how successful have these activists been in shifting perspectives in the context of international climate politics? This paper aims to investigate (1) to what extent the normative framework advanced by this movement is increasingly penetrating the international public climate debate, changing arguments, priorities, and frames around the annual UNFCCC COP conferences and (2) the key actors pushing for normative change. Using a unique and comprehensive Twitter dataset for the period between 2014 and 2021 revolving around the annual UNFCCC COP conferences and major youth climate protest events we combine various computational methods, including transformers-based topic modelling and social network analysis in this study. We find that indeed the normative framework advanced by the movement has successfully penetrated the discourse around UNFCCC and that youth climate activists were able gain support from central actors outside the movement, which is further contributing to the diffusion of their normative framework. We conclude that while these results demonstrate the moral power of youth climate activists, more research is needed to understand the influence on the actual negotiations outcomes

1. Introduction

The most recent Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment was called “code red for humanity” with the climate crisis clearly accelerating (IPCC, 2021). Unprecedented political action is necessary to prevent the destruction of earth’s life support system that human life and civilisation relies on. The forum at which global political action is negotiated, contested, agreed, and scrutinised is the climate change conference organised by United Nations Framework Convention on Climate Change (UNFCCC), COP (Conference of the Parties), taking place annually since 1995. It brings together delegations from countries and international organisations to set targets on how to limit global warming. These yearly conferences are an important forum where normative questions about climate justice interact with practical debates around climate change solutions and international relations dynamics, defining the space of possible solutions from the local to the global (Falkner, 2019). Research on the annual COPs has focused strongly on COP21 that brought about the breakthrough Paris Agreement (e.g. Dimitrov, 2016; Morgan, 2016; Tobin et al., 2018). Hopke

and Hestres (2018) for instance noted that coordinated information campaigns on climate justice by climate stakeholders at COP21 most likely contributed to the aspirational goal of limiting global warming to 1.5 °C being included in the Paris Agreement. However, since the landmark Paris Agreement, essentially no progress has been made in reducing greenhouse gas (GHG) emissions.

Hopes were high ahead of the COP26 in 2021 in Glasgow, postponed for a year due to the COVID-19 pandemic, because for the first time since COP21, COP26 would see countries disclosing their National Determined Contributions (NDCs), allowing the global public to scrutinise governments on their climate change policies. And there was a clear consensus among international public for government action at COP26 (Buchanan et al., 2022). In the end the outcomes of COP26 were mixed (Mountford et al., 2021; Jacobs, 2021; Owens, 2022). On the positive side, van Asselt and Green (2022) for instance suggest that COP26 marked a major breakthrough with respect to the adoption and institutionalisation of global anti-fossil-fuel norms. According to Green (2018) global anti-fossil fuel norms are a new cluster of global norms that convey the (in)appropriateness of behaviours with respect to fossil

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fuels (e.g. subsidising fossil fuels, producing fossil fuels). [Van Asselt and Green \(2022\)](#) see in the Glasgow Climate Pact, a main outcome of the COP26, that includes the agreement on phasing down unabated coal-fired power, and phasing out inefficient fossil fuel subsidies, evidence for the adoption of at least some anti-fossil fuel norms.

New norms, such as the anti-fossil fuel norms, often emerge through initiatives by so called norm entrepreneurs. Norm entrepreneurs, as defined in foundational work by [Sunstein \(1996\)](#) are actors, who are strongly interested in changing norms or introducing a new ones, because they perceive existing (old) norms or normalised practices (e.g. fossil fuel-based energy production) to be inadequate and/or unjust. Norm entrepreneurs can be states or other societal actors, such as transnational advocacy networks. A prominent norm entrepreneur in the context of climate change politics is Fridays for Future or youth climate strikers, a network that has grown to include millions of school-aged children and University students around the world campaigning for climate action compatible with the Paris Agreement. [Spaiser et al. \(2022\)](#) analysed how Fridays for Future's framework is challenging the normalisation of practices and thinking that prevent us from tackling the climate crisis.

Fridays for Future's normative framework includes anti-fossil fuel norms, but it goes beyond, invoking human rights norms, duty of care for child protection norms and solidarity norms, i.e. climate justice norms with a strong focus on intergenerational justice (see [Spaiser et al., 2022](#)). The movement explicitly sees itself (i.e. youth, children) as an oppressed group ([Bowman, 2020](#)), feeling "moral injury" (i.e. betrayal, abandonment) because of the sheer disregard that societies and governments show for their (future) wellbeing ([Hickman et al., 2021](#)). In this moral injury they feel connected with present-day climate victims ([Bowman, 2020](#), [Marquardt, 2020](#); [Han and Ahn, 2020](#)). After all, the movement consists also of young activists from the Global South, where climate change effects are already devastatingly real ([Nakabuye et al., 2020](#)). Research suggests that young climate activists indeed are making an impact, whether by influencing media's framing of climate change ([von Zabern and Tulloch, 2021](#); [Marquardt, 2020](#)), driving more ambitious climate change policies ([Marquardt 2020](#)), shifting people's attitudes regarding the necessity to take climate action ([Sabherwal et al., 2021](#)), mobilising older generational for climate action ([de Moor et al. 2020](#)) or through climate litigation ([Moore et al., 2020](#)). How their norms permeate discourses around international climate change negotiations remains however underexplored and this paper attempts to address that gap.

The presence of activists at COPs has become commonplace and since 2018 includes youth activists from the Fridays for Future, although youth as stakeholders have been represented at COPs through the Youth Climate Movement (YOUNGO) since 2009 ([Thew et al., 2020](#)). Greta Thunberg, the founder of Fridays for Future, was invited to give a speech at COP24 in Katowice, Poland in 2018 and at COP25 in Madrid, Spain in 2019. Other members of the movement have also been involved in COP24, COP25 and to a lesser extent COP26. But what effect did these norm entrepreneurs have on the COPs and climate change debates around them? Were they successful in shifting common understanding of the climate crisis and how to respond to it? In this paper we provide empirical evidence that the normative frames of the Fridays for Future movement resonated with the international climate change politics discourse.

We compiled a novel dataset of tweets, Twitter users and their interactions relating to the COP conferences between 2014 and 2021, as well as a dataset of tweets, Twitter users and their interactions around the major, global Fridays for Future protest events between 2018 and 2021. Employing a mixed-methods computational approach, including transformers-based topic modelling and bipartite social network analysis, we will answer the following two research questions: 1) To what extent have normative frames from Fridays for Future permeated the global climate politics discourse around the annual UNFCCC conferences and 2) Who are the key actors outside the movement contributing

to the normative change around the annual UNFCCC conferences? Although some have drawn direct relationships between the Fridays for Future movement and their effect on European politics ([Winkelmann et al. 2022](#)), the influence of the youth activists on the outcomes of the COP negotiations while important, are difficult to establish due to the closed nature of negotiations and therefore outside the scope of this paper.

2. International norm change and the role of social movements

Global or international norms (e.g. human rights) are norms that pertain to states and other international actors (e.g. transnational companies) and define what counts as acceptable and desirable or unacceptable and reprehensible behaviour. International actors can expect reward or punishment when adhering to or violating an international norm. Global norms can also set out which policies states that claim to endorse a certain norm, are expected to implement ([Green, 2018](#)). But, norms are not static, actors constantly dispute the meaning and application of norms, which leads to evolution of norms through cycles of application and disputation; and sometimes entirely new norms emerge ([Sandholtz, 2017](#); [Simmons and Jo, 2019](#); [Deitelhoff and Zimmermann, 2020](#)).

The Cycles of Norm Change theory sets out different phases for normative change. Every cycle starts in the first phase with an existing constellation of norms used by states and other international actors to justify their behaviours and judge the behaviour of others (*ibid.*). For instance, economic liberalism is an international normative principle that is usually applied when countries justify their pursuit of fossil-fuel based economic activities ([van Asselt & Green 2022](#)). In the second phase certain norms within the existing normative structure, i.e. their meaning or application are disputed or clashes between existing norms or between existing norms and practices previously not seen through normative lenses, are highlighted ([Sandholtz, 2017](#)). [Spaiser et al. \(2022\)](#) showed for instance that the Fridays for Future movement highlighted that business-as-usual, i.e. the fossil-fuel based economy activities, clash with global norms of human rights and duty of care for child protection.

The third phase is characterised by argumentation. Actors, often norm entrepreneurs, disputing the (normative) status quo as well as actors defending it, need to argue for their position and persuade others ([Sandholtz, 2017](#); [Blondeel et al., 2019](#)). Power plays an important role in norm contestation. Norm entrepreneurs from transnational advocacy networks (e.g. grassroot activists) typically have little instrumental (i.e. explicit power over other actors) or structural power (i.e. power through relative position for instance due to financial resources) in comparison to their adversaries, whether its powerful states or industries (e.g. fossil fuel industry). But they often hold comparative advantage when it comes to discursive power by activating moral principles ([Gunningham, 2017](#)), i.e. they hold moral power. In the fourth phase the dispute-driven normative arguments from phase three lead to a modification of existing norms, depending on the broad support that the competing actors were able to mobilise. The modification outcome can be a strengthening of the status quo, the adoption of new norms, or the change of existing norms, in terms of their meaning and applicability.

This change can be institutionalised through legal documents and agreements. Modified and/or new norms need also to be internalised by actors. What constitutes broad support can vary ([Sandholtz, 2017](#)) and can also undergo various phases, starting with support from some powerful actors and then spreading to other actors through ripple effects. For instance, [van Asselt and Green \(2022\)](#) examined how alliances of early adopters, such as BOGA (Beyond Oil and Gas Alliance, consisting of Costa Rica, Denmark, France, Greenland, Ireland, Quebec, Sweden and Wales) were instrumental for further establishing anti-fossil fuel norms during COP26 and that at the next stage of norm diffusion it will be important that these early adopters persuade medium-size oil producing countries to join, thus increasing moral pressure on large

producers.

There is wide agreement that transnational advocacy networks often play a crucial role as norm entrepreneurs in international norm change (Sandholtz, 2017; Hall, 2022; van Asselt and Green, 2022). They often trigger normative change, and monitor norm implementation, holding actors accountable to their commitments. According to foundational work by Keck and Sikkink (1998) norm entrepreneurs often use information politics, symbolic politics, and leverage politics for persuasion during the contestation and argumentation phase. In terms of information politics, norm entrepreneurs utilise scientific insights (e.g. on climate change) to generate “politically usable information”, i.e. scientific information framed in simple terms of right and wrong to persuade the public and political decision makers. Symbolic politics tactics uses then symbols, actions, and human stories (e.g. about climate change victims) to make sense of the complex science, making an issue emotionally more tangible to the public. In terms of leverage politics, norm entrepreneurs seek moral leverage over more powerful actors, for instance through mobilization of shame. So, norm entrepreneurs try to construct credible, dramatic and morally compelling arguments.

But, for a normative argument to prevail the proposed norm modifications or new norms need to fit in with existing and widely accepted norms (Blondeel et al., 2019). This is because norms are never isolated entities, rather norms are interlinked through complex interlinkages and interactions. Interlinked norms and normative principles that address a common issue area form norm clusters or neighbourhoods. These norm clusters are themselves part of larger norm structures or networks, with several interlinked norm clusters. Norms clusters characterised by a high degree of cohesiveness and synergies and containing institutionalised or legalised norms, are deemed particularly robust (Lantis and Wunderlich, 2022). Hence “...norms that diffuse most readily and gain legitimacy in the system more quickly are fostered in complementary normative ‘neighbourhoods’ where their principles are more closely linked to similar other norms” (ibid., p.8). Established and widely accepted norms can thus have “permissive effects” on new norms (Rosert, 2019).

Norm entrepreneurs use therefore a range on strategies to construct normative congruence, such as framing (e.g. via information, symbolic and leverage politics discussed above), grafting (i.e. joining two norms together), norm transplantation (e.g. applying a norm within a different context), etc. (Lantis and Wunderlich, 2022). And then there are foundational *meta*-norms, i.e. universally accepted principles that all norms are built upon and norms that can mobilise these foundational *meta*-norms are likely to be particularly successful (ibid.). Therefore, transnational advocacy networks organize most effectively around (1) issues involving harm to vulnerable individuals, especially when there is a short and clear causal chain (or story) assigning responsibility; and (2) issues involving legal equality of opportunity (Hall, 2022). This clearly speaks to the Moral Foundation Theory (Graham et al., 2013) and its findings, which suggests that care/harm avoidance and fairness are two of the most fundamental and universal moral foundations.

Finally, for normative arguments to be successful, it is not only important to have convincing arguments, but also convincing actors, beyond the immediate norm entrepreneurs. According to Green (2018) so called norm champions are key for norm diffusion. They can be states, influential individuals (e.g. COP presidents, public figures), or for-profit and non-profit organisations. They are trailblazers, willing to support or try out new ideas brought in by norm entrepreneurs when virtually no one else has done so. For norm entrepreneurs, it is important to persuade a critical number of norm champions, who can act as multipliers. For optimal ripple effects the ideal norm champions are connectors, so actors who have a large number of connections and ideally bridge different groups of actors (Green, 2018; Piedrahita et al., 2018).

3. Data and methods

To analyse the two research questions outlined above, we use a large dataset of tweets acquired via the Twitter Academic API v2. Specifically,

we collected all Twitter data around the annual UNFCCC COP Conferences between 2014 and 2021 (note there was a gap year in 2020 due to the pandemic), gathering data over the two weeks duration of the conference, usually either in November or December, each year. We moreover collected Twitter data around all major, global youth climate strike protest events in 2018, 2019 and 2021 and then merged the datasets by year. Specifically, in year 2018 the data was almost continuously collected throughout November and first half of December capturing a range of decentralised strikes. In year 2019 the data was collected around five global climate strikes: 15 March 2019, 24 May 2019, 20 September 2019, 27 September 2019 and 29 November 2019. In year 2021 the data was collected around three global climate strikes on 24 September 2021, 22 October 2021 and 5 November 2021. Data was captured for the strike day as well as the day before and the day after the strike. To identify relevant tweets, we collected the data based on a set of hashtags for each year (e.g. #COP22), keyword and the official accounts (e.g. @COP22 and @UNFCCC). A full list of hashtags, keywords and account names can be found in the [Supplementary Information S1](#). In total the data collection effort resulted in a dataset of 17,890,106 tweets across ten data sets, seven COP datasets and three Fridays for Future datasets. The ten datasets vary quite significantly in size. A table that provides the full overview can be found in the [Supplementary Information S1](#).

Twitter provides a popular platform for direct, public communication, used by individuals, political groups, governments, organisations, businesses etc. and is hence a valuable data source (Ahmed et al., 2017). Twitter data has been used in the past to understand international climate policy negotiations around the annual UNFCCC conferences. Hopke and Hestres (2018) used for instance Twitter data to understand the different positions on the negotiations and agreements, looking at Twitter communication by media outlets, climate stakeholders, including activists and fossil fuel industry groups. Similarly, Williams et al. (2015) used Twitter to measure the extent of echo chambers in climate change discussions. And Falkenberg et al. (2022) used Twitter data to analyse polarization on climate change around COP between 2014 and 2021 (i.e. COP20-COP26). Similarly, Twitter is a valuable data source for studying social movements, such as youth climate activists (e.g. Boulianne et al., 2020; Spaiser et al., 2022). The main advantage of using Twitter data over media outlets is that the communication on Twitter is direct and unfiltered and allows hence to capture a fuller range of voices and perspectives, including of media outlets, and it allows to identify the dominant frames and themes in the public domain by accounting for retweet and/or like counts. There are of course also issues with Twitter data. Twitter data is for instance not suitable for identifying a representative distribution in public attitudes, as Twitter users are not representative of a population. However, the goal of this paper is not to establish a representative distribution of opinions in a population, rather to capture the public debate around the annual UNFCCC conferences, in which various political actors and stakeholders are involved and past research has shown that most actors and stakeholders are represented on Twitter (Hopke and Hestres, 2018).

To analyse the Twitter data and answer the two research questions, we used a range of methodological approaches, transformers-based topic modelling and discourse similarity analysis for the first research question and social network analysis for the second research question. In terms of pre-processing the data for analysis, we extracted the tweets (along with tweet ID and retweet number) from the data and filtered that data for English language, this reduced the dataset to 12,406,965 tweets. The reason for this is that English is used predominantly in the international public debate on climate change. Still, by filtering for English we may lose some non-English speaking voices in the debate. The second reason for the language filter is that multi-lingual natural language processing is still extremely complex and not to the same extent developed as for English. We furthermore removed all URLs from the tweets. Otherwise, the tweets were left as they are, as the transformers models require full sentence inputs rather than tokens. For topic modelling

purposes, we also removed all duplicate tweets by removing retweets. For social network analysis, we extracted the user ID, username and retweet information from the overall dataset.

3.1. Topic modelling with Transformers-based models

To identify topics within each dataset we used BERTopic, a transformers-based topic modelling algorithm (Grootendorst, 2022). This algorithm combines embedding models, dimension reduction, and hierarchical clustering to create topic representations from data. Transformer models are machine learning, specifically deep learning models developed for natural language processing tasks. BERTopic uses transformer models to extract sentence embedding vectors from text data, i.e. a sentence is taken as an input and a vector is created to capture the semantic information of the sentence. Within the BERTopic architecture, we used an adapted version of the MPNet (Masked and Permuted Pre-trained) embeddings (Song et al., 2020) and specifically the all-mpnet-base-v2 sentence embedding model. The results is a high-dimensional vector representations of sentences which allows to calculate the semantic similarity between documents, tweets in our context (Grootendorst, 2022).

Secondly, the BERTopic architecture uses the Uniform Manifold Approximation and Projection (UMAP) dimension reduction algorithm, which reduces the dimensionality of the MPNet embeddings created earlier, while preserving the underlying structure (McInnes et al., 2018). We set the UMAP parameters to 15 nearest neighbours, 5 components, and used the default 0 minimum distance and cosine distance metrics. To aid reproducibility of the model, we set the random state to 42. The output from this dimensionality reduction step is then fed to the HDBSCAN (Hierarchical Density-Based Spatial Clustering of Applications with Noise) clustering algorithm (Campello et al., 2013). This is a hierarchical clustering algorithm that uses a distance metric (e.g. Euclidian) to calculate the core distance of a data point to its k-th nearest neighbour. A large core distance value suggests few data points close together and therefore a sparse area of data. Due to the UMAP dimensionality reduction at the previous stage this clustering algorithm did not need to be further optimized for high-dimensional data. The clustering algorithm further uses the mutual reachability distance, an indication of the likelihood of a cluster, to spread points apart based on their density. The HDBSCAN model parameters can be customised to guide the number of extracted (topic) clusters. We set the minimum cluster size parameter to $d * 0.0017$ where d is the number of tweets. This parameter sets the boundary for how small the cluster can be, i.e. how many tweets it may contain. Finally, we used a vectorizer model that included both bigrams and unigrams to aid the interpretation of resulting topics and set the minimum document frequency parameter to 20 to ensure that a word appears in a minimum of 20 different tweets before being included in the model.

The output of this multiple step topic modelling procedure includes hierarchically linked and nested topic clusters, key words and bigrams that define those topic clusters, a set of representative documents (tweets in our case) for each topic and estimated probabilities for each tweet to belong to each of the extracted topics. It should be noted that BERTopic automatically produces a -1 -outlier topic cluster that consists of all the tweets that have extremely mixed probabilities and hence are difficult to assign to any single topic. This results typically in a quite large outlier topic, which is difficult to interpret and hence is typically excluded from further analysis and interpretation. To reduce the number of outlier tweets and hence to avoid losing potentially insightful data, we reassigned tweets to a specific topic, if they had at least a probability of 0.1 to belong to that topic. We also corrected the size of topics (number of tweets assigned to them) subsequently by adjusting for number of retweets of each tweet in the topic.

BERTopic is an architecture that is set up to generate best-fit outputs (Grootendorst, 2022), however these can vary depending on the setting of the parameters discussed above. Our goal with the analysis was to

extract interpretable topics, that are broad enough to avoid too many extracted topics and at the same time differentiated enough so we can clearly identify normative topics within the topic space. This principle was guiding our approach when we experimented with different parameter settings and values before arriving at the ones reported above. All analyses were run on a High Performance Computing Nvidia GPU cluster. Python code is available on GitHub (<https://github.com/NicoleNisbett/BERTopic>).

To visualise the outcomes of the topic modelling we represent the topic space of each dataset using hierarchical circular packing that allows for hierarchical embedding of the extracted topics. We created the packed circle figures (see Table 1) using Flourish (flourish.com). For that purpose, we used the hierarchical arrangement of the topics (BERTopic dendrogram) revealed through the topic modelling and the corrected topic sizes as input. Normative topics were highlighted in red. When deciding which topic to interpret as normative we were using the Moral Foundation Theory (Graham et al., 2013) and specifically the moral foundations that have been empirically associated with the climate crisis, which are mainly care (no harm) and fairness (Welsch, 2020). We checked keywords and representative tweets of each topic and if a topic contained strong notions of harm (e.g. fossil fuels as doing harm) or fairness (e.g. intergenerational justice for future generations, human rights, justice for indigenous people etc.) then that topics would be classified as normative.

3.2. Measuring discourse similarity

To answer the first research question, it was important to understand which themes appeared in the climate change debate around the annual UNFCCC conferences, how they changed over time and whether the normative themes are referencing youth climate activists' normative frames. But we wanted also to quantify the extent of commonality between the activists' arguments and UNFCCC conference debates to indirectly measure the impact the young climate activists had on shaping the frames. To measure the similarity of tweets content between COP and Friday for Futures datasets, we used the Jensen-Shannon Distance (JSD) measure, an extension of the Kullback-Leibler divergence (Kullback and Leibler, 1951), and the square root of the Jensen-Shannon divergence (Lin, 1991), defined as:

$$JSD = \sqrt{\frac{D(p||m) + D(q||m)}{2}}$$

where m is the pointwise mean of arrays p and q and D is the Kullback-Leibler divergence.

We measured the similarities based on the normalised word frequency distributions in each dataset, calculating the JSD for each pair of datasets. JSD values closer to zero signify the distributions are very similar while values closer to one suggest more distinct distributions. This measure of divergence or distance has been demonstrated to be applicable to large textual data, for instance to estimate topic coherence between documents (Blair et al., 2020) or to measure to what extent climate scepticism arguments are taken up by mainstream media (Adam et al., 2020). As a robustness check we also verified the results using cosine similarity based on term frequency-inverse document frequency (see Supplementary Information S5).

Finally, to get a better impression of what similarity means more qualitatively we used semantic networks to represent the normative debate around COP26 and the Fridays for Future 2021 discourse to identify common normative frames. The semantic networks are based on bigrams, associations between two words based on the Student t-score, extracted from the tweets data and then visualised within Gephi. Nodes represent words and edges associations between words. Betweenness centrality was used to identify key words and visually the attribute is represented through font size. Association scores were used as the weight attribute for the undirected edges. Modularity was used to detect

Table 1
COP20 – COP26 Topic Modelling Results Overview, Normative Topics listed with number of tweets.

COP20 (2014)		<p>Protest (5202), Pressure (4140), Demands (2923), Future Generations (1534), Fossil Fuels Phaseout (1700), Indigenous Communities (838), John Kerry's Speech (637), Human Rights (483), Stern's Analysis (346), John Kerry's appeal (299), Student Initiative (283)</p>
COP21 (2015)		<p>Future Generations (25,810), Fossil Fuels Problem (19,996), Indigenous Communities (15,031), ISS (14,069), Human Rights (7347), SIDS (8495), Crime (2343)</p>
COP22 (2016)		<p>John Kerry's speech (4414), Indigenous Communities (865), Future Generation (645), Fossil Fuel Phaseout (629), YOUNGO Loss & Damage (600), SIDS (436)</p>
COP23 (2017)		<p>Fiji/SIDS (25,823), Fossil Fuels Problem (11,668), Indigenous Communities (7161), Future Generations (7128), US People's Delegation (627)</p>
COP24 (2018)		<p>David Attenborough (31,883), Fossil Fuels Problem (24,711), Fridays for Future (6733), SIDS (5698), Greta Thunberg (3068), Indigenous Communities (3260), Inter-faith (2492), Pressure (1559), Human Rights (1538), Arnold Schwarzenegger's speech (2058), Future Generations (1142), Just Transition (1073), Greta Thunberg's appeal (503), Trump (284)</p>
COP25 (2019)		<p>Greta Thunberg's speech (53,625), Indigenous Communities (26,883), Fossil Fuel Problem (24,849), Future Generations/Children (22,641), UN General Secretary speech (14,983), Greta Thunberg comments (14,685), Protest (13,115), Greta Thunberg (7137), Loss & Damage (4380), Human Rights (2441), Repression (995), Polluters Out (712), Excluded (284)</p>
COP26 (2021)		<p>Fossil Fuel Problem/Methane (213,791), Indigenous Communities (152,539), David Attenborough's speech (66,747), SIDS (59,658), Future Generations (26,509), Friday for Futures' appeal (22,422), Art (9061)</p>

theme clusters within the semantic network, visually represented through different colours. We followed the methodological approach of Spaiser et al. (2022) in their analysis of the normative framework of Fridays for Future based on Twitter data. We chose 2021 data for this more qualitative exploration as this was the last year of observation in our analysis and allowed us to see the most recent normative frame communalities.

3.3. Social network analysis

To answer the second research question, we applied Social Network Analysis (SNA) to our Twitter data and specifically to the data on (1) Twitter users posting the captured tweets, which we can now attribute to the extracted topics and (2) retweet patterns, i.e., who is retweeting whom regardless of their interaction with normative topics. We specifically built bipartite networks (Fouss et al., 2016) for each COP dataset, where the nodes could be either Twitter users or normative topics and the directed edges would link users, who retweeted each other, or users and topics if the users posted or retweeted a tweet that was assigned to a normative topic. The retweet edges had a weight attribute that represented how often one user retweeted another.

Before creating the full bipartite network, a subgraph was derived from the overall retweet network (2), containing only user nodes with betweenness centrality measures in the top 99.9th percentile. We had two reasons for sub-setting the retweet networks: 1) to reduce the dimensionality of the network for easier plotting, and 2) to produce a list of the most influential users for each COP based on the highest betweenness centrality scores. Betweenness centrality is a popular and well-established measure for calculating the most central, influential nodes in a network (e.g. Xu et al., 2014). Nodes that cross many paths will have a high betweenness centrality. In the context of our data, these are user nodes that have been retweeted by or retweeted many other users, they are the super-connectors and therefore very influential in driving debates. This retweet subnetwork was then combined with the bipartite network of users and topics to understand to what extent the overall most influential Twitter users (based on retweet patterns) were engaged in the normative debates around the COPs.

Within the combined retweet and bipartite network, we used the Page Rank measure to identify the most important nodes, both in terms of topics and users, in the graph. Page Rank was originally developed by Google to measure which webpages were most important based on how many times they had been linked to other pages (Brin and Page, 1998). Page Rank has been also used in social network analysis as a measure of influence (Heidemann et al., 2010). The topic nodes had the highest page rank value due to them having the highest in-degree (highest number of accounts posting tweets assigned to the topic in our case), but there were also user nodes with high page ranks. These user nodes were the ones who were frequently retweeted by other users and hence were more central to the overall COP debates. To what extent these users were integrated within the normative bipartite network was indeed a crucial point of interest in this analysis. All network visualisations (see Table 2) were made using Gephi, applying the Force Atlas 2 layout, and sized proportionally based on the Page Rank measure, calculated within Gephi. All Python code for building the networks before visualisation within Gephi is available on GitHub (<https://github.com/NicoleNisbett/SNA>).

4. Results

4.1. Normative themes COP20 – COP26

Table 1 gives an overview of the topic constellations across the seven studied UNFCCC annual conferences, with a particular focus on explicitly normative topics that are highlighted in red. A general summary of the topic modelling results and the insights they provide with respect to our research question, will be given here (for more detailed description

of the topics and their interrelations, see the [Supplementary Information S2](#)). Starting with COP20 in 2014 in Lima, our analysis suggests that normative topics did feature quite prominently in COP20 but appeared also relatively fragmented. Particularly the public pressure and protests, led by indigenous communities, were mounting high, demanding climate justice and a radical, rapid transition to a post-carbon world. Concerns for future generations, pushed in particularly by YOUNGO, also featured prominently. It seems the normative frames advanced at COP20 set in some ways the stage for the achievements at COP21.

The discourse for COP21 in 2015 in Paris looks quite different in comparison to the topic space of COP20 in Lima. This can be explained with the attention on the breakthrough Paris Agreement, which dominated the discussion and was a key turning point in the international climate change negotiations. Overall, the normative topic space of COP21 appears to be less scattered, more substantially focused with a strong emphasis on the planetary and human rights dimension, with youth, indigenous communities and even International Space Station astronauts uniting in their core demand to save our precious planet for the future.

The debate around COP22 (2016) in Marrakesh is in some ways a continuation of the COP21 debate and the influence of the Paris Agreement is dominating the topic space. Normative topics were less focused and prominent at COP22, key normative actors such as the youth and indigenous communities or SIDS (Small Island Developing States) received much less attention. On the other hand, a new normative theme, Loss and Damage, even though still marginal at this stage, has received some public attention, thanks to YOUNGO's efforts. A fossil fuel phaseout campaign was also launched, linking back to fossil fuel phaseout demands at COP20.

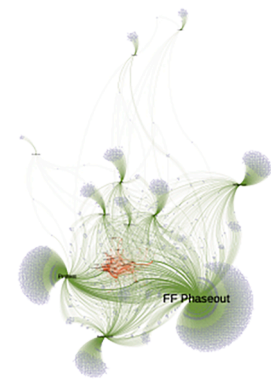
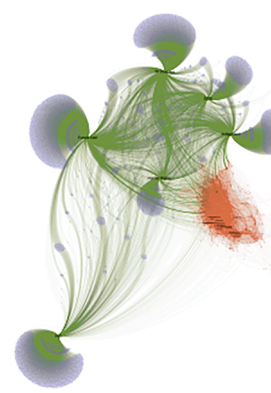

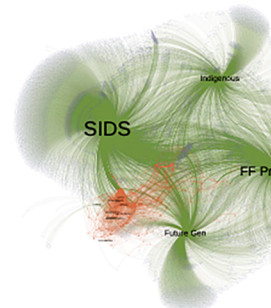
COP23 (2017) was officially held by Fiji, but took place in Bonn, Germany. Fiji was devastated by the Cyclone Winston in 2016, which highlighted the extreme climate change vulnerability of SIDS, who featured prominently with existential appeals at this COP. The COP23 topic space is dominated by practical solutions and specific issues, with only few, but focused normative topics, such as Future Generations represented through YOUNGO, Indigenous Communities and Fossil Fuels as Problem.

COP24 in 2018 in Katowice was the first COP, where Greta Thunberg was invited to give a speech, and looking at the COP24 topics space, clearly the climate strikes by children and youth made a mark. They are also permeating other debates as the normative topics around future generations, duty of care for children protection etc. appear across different topic clusters. Together with indigenous communities, youth activists also brought human rights back on the agenda. But, while the climate striking kids received significant attention during COP24, and have significantly influenced the discourse around COP24, they seem to have also mobilized the norm antipreneurs (climate change deniers, blockers).

The proportion of normative topics reached its height with COP25 in 2019 in Madrid (originally to be hosted by Chile), with at least a quarter of all the topics being normative. Overall, the topic space for COP25 shows that the Fridays for Future movement was successful in further consolidating its impact on the international climate change discourse. The mutual support between the youth movement and indigenous communities also proved powerful and enhanced the voices on both sides, demanding climate justice. But again, we see on the other hand also the mobilization of norm antipreneurs.

In 2020 COP26 was postponed for a year due to the COVID-19 pandemic. The topic arrangement for COP26 (2021, Glasgow) looks quite different, particularly when comparing with COP24 and COP25. The proportion of normative topics dropped from 25 % in COP25 to just 10 % in COP26. Young climate activists were marginalized at COP26, but their messages echoed nevertheless in other contributions (e.g. David Attenborough, MAPA (Most Affected People and Areas) activists), suggesting potentially a lasting normative effect.

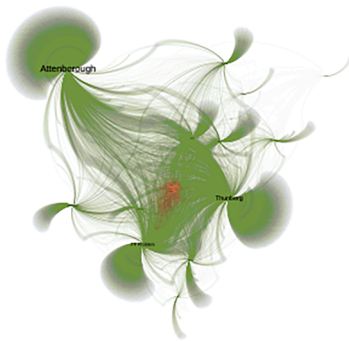
Table 2
COP20 – COP26 Combined Bipartite Graphs Overview (Detailed Descriptions in Supplementary Information S3).

<p>COP20 (2014)</p> 	<p>Fossil Fuel Phaseout (FF Phaseout) had the greatest number of user interactions, strong overlap with the Protest topic, in terms of user interaction. Centrally integrated orange cluster. User nodes with highest page rank: LimaCOP20, CFigueres (Christiana Figueres, then UNFCCC president) and collinrees (environmental campaigner). 0.95 % of the user nodes in the bipartite network were influencers. 38 % of these influencers interacted with the FF Phaseout, 30 % with Protest, 13 % with Future Generations. Core influencers: johnlundin (Colombian Environmental Activist), NiliMajumder (Gender Equality Advocate), collinrees, jorgejhms (Peruvian Environmental Activist), ineeshadvs (Qatar-based climate advocate), SaleemulHuq (Director at ICCCAD, Senior Associate at IIED) and duycks (Senior Attorney, CIEL)</p>
<p>COP21 (2015)</p> 	<p>Considerable overlap between most of the normative topics, with Future Generations and Fossil Fuel (FF) Problem being the largest. International Space Station (ISS) topic at the bottom right, more separated but with links through users to Future Generations, FF Problem, and Human Rights. Separate orange cluster with some links to Human Rights, Indigenous Communities, and ISS. User nodes with highest page rank: UNFCCC, COP21, UN. 1.44 % of the bipartite user nodes were influencers, with the majority interacting with the Future Generations (28 %), FF Problem (25 %), and Indigenous Communities (23 %) topics. Core influencers: NiliMajumder, IENearth (Indigenous Environmental Network), ineeshadvs, johnlundin, @DrSimEvans (journalist), 350 (global climate grassroots movement), and Climat21 (Citizen COP21 Coalition, France)</p>
<p>COP22 (2016)</p> 	<p>Distinct clusters around normative topics, all interlinked. Indigenous Communities, Future Generations and FF Problem most popular. The YOUNGO Loss and Damage (L&D) topic has a considerable overlap with the Future Generations in terms of interacting users. Centrally integrated orange cluster. User nodes with highest page rank: Connect4Climate (World Bank Trust Fund), UNFCCC, and UNEP. 1.92 % of user nodes in the bipartite network were influencers. The majority of these interacted with the FF Problem (27 %), Future Generations, (24 %) and Indigenous (20 %) topics. Core Influencers: NiliMajumder, ineeshadvs, takvera (climate activist), PriceofOil (campaign), 350, estherclimate (climate campaigner), UNYouthEnvoy</p>
<p>COP23 (2017)</p> 	<p>SIDS central normative topic, alongside FF Problem, Indigenous Communities, and Future Generations, all strongly interlinked. Mostly integrated orange cluster, with strong links to SIDS and some links with Future Generations. User nodes with highest page rank: PEspinosaC (Patricia Espinosa, then UNFCCC president), GlobalGoalsUN, and Momentum_UNFCCC. 0.85 % of bipartite user nodes are influencers, with 56 % of these interacting with the SIDS topic, and 22 % with the FF Problem topic. Core Influencers: nolenen (feminist human-rights activist), HansLak (campaigner), collinrees, SaleemulHuq, COP23, BonnGlobal (Federal City of Bonn), FoEint (Friends of Earth International), takvera, ProfStrachan (researcher)</p>

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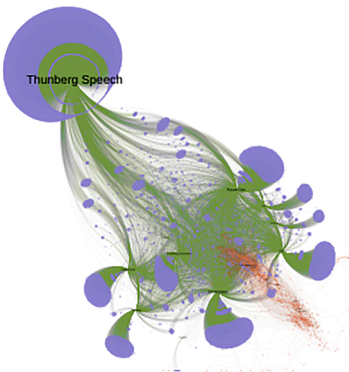
Table 2 (continued)

COP24 (2018)



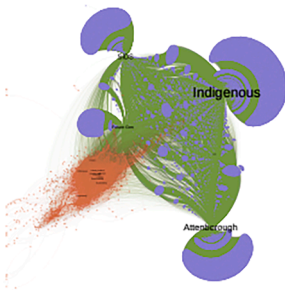
Attenborough, Thunberg, and FF Problem largest topics, all strongly interlinked. Attenborough cluster somewhat distinct, but has especially many links to other topic clusters, showing strong resonance with users across all normative topics. Centrally integrated small orange cluster. User nodes with highest page rank: COP24, UN, UNFCCC, and PEspinosaC. 0.36 % of the bipartite user nodes were influencers, interacting primarily with FF Problem (32 %) and Thunberg (29 %) topic, only 7 % interacted with the Attenborough topic. Core Influencers: collinrees, EWestaway (Food Health SDG campaigner), SaleemulHuq, RalienBekkers (climate action advocate), GretaThunberg, ProfStrachan, takvera, natalieben (Green Party peer), ExtinctionR (Extinction Rebellion)

COP25 (2019)



Thunberg's speech central node, sharing connections to almost all the smaller normative topics, showing strong resonance with users across all normative topics. Separate orange cluster with some links to FF Problem and UN General Secretary speech. Purple pockets indicate intensive interaction of regular users outside normative topics. User nodes with highest page rank: CMNUCC, COP25CL (COP25 Chile), mitecogob (Spanish ministry for ecological transition). 0.53 % of bipartite user nodes were influencers, primarily interacting with FF Problem (27 %), Future Generations (24 %), and UN General Secretary speech, referencing youth activists (12 %). Core Influencers: HansLak, parents4futureG, EllyanneCGithae (11-y. o. Africa's Climate Change Ambassador), collinrees, SaleemulHuq, ElmGrace (young climate justice advocate), vanessa_vash (Vanessa Nakate), GretaThunberg

COP26 (2021)



Indigenous Communities and Attenborough speech largest topic clusters. All normative topics strongly interlinked. Large separate orange cluster with strong links to Attenborough speech, Future Generations, Indigenous Communities and some links to SIDS. Purple pockets indicate intensive interaction of regular users outside normative topics. User nodes with highest page rank: Greta Thunberg, COP26_Coalition (climate justice coalition), and vanessa_vash (Vanessa Nakate, youth climate activist from Uganda). 1.02 % of bipartite users were influencers, 57 % interacting with the Indigenous and 19 % with the SIDS topic. Core Influencers: Eco1stArt (ecological artist), UNBiodiversity, SaleemulHuq, Global Canopy (NGO against deforestation), collinrees, CANIntl (Climate Action Network International), GretaThunberg, vanessa_vash, LossandDamage (Loss and Damage Collaboration)

4.2. Assessing Friday for Future's impact

We have discussed how the normative themes have evolved between COP20 (2014) and COP26 (2021) and the extracted topics suggest that the youth climate activists had a remarkable impact on the overall discourse around the annual climate policy negotiations, influencing and boosting the normative considerations. Here we want to go a step further and attempt to quantify the discursive alignment. Fig. 1 shows the Jensen-Shannon Distance scores between the seven COPs and three annual Friday for Futures tweet datasets. We see that later COPs, starting with COP24 have a greater semantic similarity with the Fridays for Future discourse than earlier COPs, when Fridays for Future was not yet a phenomenon. And the semantic distances even decrease over time, e.g., COP24 (2018) and FFF2018 0.48, COP25 (2019) and FFF2019 0.47, COP26 (2021) and FFF2021 0.44. It seems, although Fridays for Future was not as present at COP26 as at COP24 and COP25, its impact on the discourse lasted.

This is also supported by the distance score between Fridays for Future 2019 discourse, the peak year of the movement and COP26 discourse, which is also 0.44. So, again, it seems although the movement

receded somewhat from the COP as an event, the normative frames of the movement still influenced the COP26 discourse. This suggests that Fridays for Future shifted the discourse with a lasting effect and that it established itself as an actor that can set the frames of how we think about climate change. Additionally, among the earlier COPs, before the ascent for the Fridays for Future movement, COP21 when the Paris Agreement was signed, has the greatest discourse similarity with the Fridays for Future discourses. This suggests that the discourse that resulted in the Paris Agreement was quite distinct and that the normative frames that appear in the Fridays for Future discourse were also particularly pronounced at COP21.

We can zoom into the specific discourses to further understand how the discourses compare. For that purpose, we will look at the Fridays for Future 2021 and the COP26 (2021) discourse, focusing on the normative topics for COP26 (red in Table 1). In Figs. 2 and 3 both discourses are shown as semantic networks. When looking closer at the COP26 normative discourse (Fig. 2) we see that the anti-fossil fuel norm is quite strongly present with calls for phasing out fossil fuels (with a strong focus on coal), ending subsidies for the fossil fuel industry (see also van Asselt and Green, 2022), criticizing their lobbying power, accusing fossil

fuel companies such as Exxon Mobile of pushing humanity to the brink (bottom pink, orange cluster). In the upper dark grey cluster, we see a norm emerging around preserving and protecting the planet that is linked to a duty of care for future generations and young people and children alive today (duty of care for child protection), a theme strongly advocated by Sir David Attenborough. Climate justice references appear in the blue cluster in the middle, a cluster that also references youth. The human right theme appears within the dark blue cluster above and features indigenous activists and other civil society actors pushing the human rights agenda. Stopping deforestation (green cluster) features strongly in this normative discourse as well.

While the Fridays for Future 2021 discourse features themes that are similar to the ones described above for COP26, e.g. human rights (turquoise topic cluster, left bottom), protecting forests (green cluster), climate justice (with purple cluster in the middle and red cluster top right), saving and protecting the planet for the future and duty of care for child protection (orange cluster, bottom), anti-fossil fuel norms (orange cluster), there are also dissimilarities. The Fridays for Future 2021 discourse features much more grievances about broken promises (e.g. blue cluster), which we do not see within the COP26 semantic network to this extent. It is also much more willing to formulate system critique (e.g. #uproothesystem, red topic cluster, right top) in response to the climate crisis and discuss alternatives such as a green new deal (#GNDE, blue cluster, #greennewdeal, red cluster). Listen to science (between the green and purple cluster, middle), a normative demand, the movement made from the beginning, is also missing within the COP26 discourse. Overall, it appears Fridays for Future was successful in setting or boosting normative themes around responsibility to protect the planet linked to (1) duty of care for child protection and future generations (intergenerational justice), (2) human rights, i.e. protect humans and their rights (incl. right to life) around the world and (3) anti-fossil fuel norms, i.e. necessity to abandon fossil-fuel-based practices and industries that endanger human life (see also Spaiser et al., 2022).

4.3. Actors of change (SNA)

The focus of our second research question is on the actors, as we want to understand who is driving normative discussions around the annual UNFCCC conferences and how influential they are. Table 2 below provides an overview of the bipartite networks for each COP between 2014 and 2021 with a summary description. The nodes represent either normative topics (green), regular users (purple) or influencers (orange). The edges are colored based on the edge target, so green if it's a user-to-topic or influencer-to-topic edge, purple if it's user-to-user edge, or influencer-to-user edge, and orange if it's a user-to-influencer edge or influencer-to-influencer edge, where the influencers are users in the 99th percentile of betweenness centrality in the retweet network, irrespective of their engagement with the normative topics. Across all COPs, while only a tiny proportion (around 1 %) of users in the bipartite network were also influencers, among the 50 top influencers almost all interacted at least once with a normative topic (see Supplementary Information S3 and S4).

These seven combined retweet and bipartite networks across the seven COPs between 2014 and 2021 allow us to understand the changes over time in terms of how various actors have engaged with normative themes. In the earlier COPs we see actors being more evenly distributed across various normative themes, while in the later COPs more central normative topics appear that attract large proportions of actors, for instance Indigenous Communities, David Attenborough Speech (with strong reference to duty of care for children protection) and SIDS in COP26. Quite notable is COP25, where the concentration of user interactions with the Greta Thunberg Speech theme is dominating the bipartite network.

To answer the question of who is driving the normative discourse, we need to pay attention to the influencers, who engage intensely with

normative topics. Throughout all the COPs these are campaigners, activists, advocates, NGOs etc., some of whom, such as Saleemul Huq (Director at the International Centre for Climate Change and Development (ICCCAD) in Bangladesh), Collin Rees (Campaigner at Price of Oil), have been a normative force throughout. These normative entrepreneurs receive support from journalists (Thomas L. Friedman, Simon Evans, Megan Rowling, Adam Vaughan), researchers and research institutions (Michael E. Mann, Stockholm Environment Institute, Peter Strachan), UN bodies and officials (UN, UNFCCC, UNICEF) and even some industry sectors (e.g. KPMG, We Mean Business Coalition). Support from policy makers on the other hand has been rare and until recently came usually from green parties, e.g. Elizabeth May (Green Party Canada), Christine Milne (Green Party Australia), Denis Baupin (Green Party France), Natalie Bennett (Green Party UK).

Youth climate activists joined the diverse group of norm entrepreneurs from COP24 onwards and their influence has been growing ever since. So much so, that in the case of COP25 they (Greta Thunberg, Vanessa Nakate) along with other climate justice groups (COP26_Coalition) have become genuinely central discursive actors with page ranks scores that surpass even official UN Twitter accounts that usually dominate. And at COP26 we have also seen a few more policy makers (not just from the Green Parties), and core negotiators adopting and diffusing normative frames, such as Zac Goldsmith (former UK Minister for the International Environment and Climate), Nicola Sturgeon (First Minister of Scotland), Alok Sharma (UK COP26 President) or Nigel Topping (COP26 Champion). In fact, already at COP25 we begin to see some change, in terms of more official political bodies (e.g. EU Commission's Directorate-General for Environment) and representatives (e.g. Gonzalo Muñoz Abogabir, COP25 Champion) joining normative debates, often explicitly interacting with youth climate activists' themes. They are not driving the normative debate, but they are very important multipliers and connectors, i.e. norm champions.

5. Discussion

With respect to our first research question, we clearly see evidence (topic modelling results, Jensen-Shannon Distance scores, semantic network comparison) that the normative discourse of the youth climate activists permeated the global climate politics discourse around the annual UNFCCC conferences. Their climate justice normative framework around duty of care for child protection, the responsibility to respect human rights and hence the responsibility to protect climate change victims in the Global South, has resonated strongly, with a peak at COP25 and a more indirect, diffused continuation at COP26. To achieve this resonance, youth climate activists made use of a range of tactics, from information politics and symbolic politics, where they linked the scientific information on climate change (Thiery et al., 2021) with their story as children and climate change victims, betrayed by world leaders, i.e. making use of leverage politics by mobilising shame. They also made use of norms interconnections and norms clusters, building their normative arguments on existing, well established normative frames such as human rights and duty of care for children protection (outside climate change politics) (see also Spaiser et al., 2022).

They were also instrumental in further strengthening anti-fossil fuel norms that were already present at COP20, linking them explicitly to the duty of care norm, i.e. making clear that continuation of a fossil-fuel based economy is incompatible with caring for children and other climate change victims. Anti-fossil fuel norms could only be successful as they were linked to established norms of human rights and duty of care for children protection. So, in the norm change cycle process of contestation of the status-quo (fossil-fuel based economy and the norms upholding them, such as economic liberalism) and argumentation, a new norms cluster seems to emerge, including some established norms with modified, expanded meaning and new norms, such as the anti-fossil fuel norms that are embedded in this cluster.

In terms of the second research question, over the course of the COPs since 2018 youth climate activists were able to recruit influential actors, who were increasingly starting to reference and champion their normative frames. Specifically, youth climate activists established successfully normative alliances with various other climate justice campaigners and promoters, but they were also successful in gaining support from influential figures and organisations, who helped the movement to diffuse its normative messages, such as David Attenborough, Antonio Guterres (UN Secretary General), Gonzalo Muñoz Abogabir (COP25 Champion), Alok Sharma (COP26 president), various NGOs (e.g. European Climate Foundation, Ecologistas, Power Shift Africa). Norm champions outside of the movement bring increased legitimacy and wider awareness of the norms, they are key connectors diffusing new normative frames to key players in the global climate change politics arena.

At more recent COPs even some government bodies and representatives (and not just from SIDS countries and Green parties) have started to adopt the youth climate activists’ and other normative narratives. It seems governments are taking note of the shifting discursive positions; the overtone window of policies is shifting. But, there are limitations to what we can conclude from the data we have. Not only are causal inferences not possible in this complex, multiple feedback systems and with explorative analysis of observational data, but Twitter data is also limited. The most influential actors and decision makers might not be as visible on this social media platform, as they engage very minimally with the Platform (e.g. negotiators). Negotiations are taking place often behind closed doors and negotiators are not allowed to tweet about negotiations, hence it is difficult to establish what influence the (normative) discourse has on the actual negotiations. However, there is some evidence for norm adaptation among policy makers and even institutionalisation of anti-fossil fuel norms as [van Asselt & Green \(2022\)](#) demonstrated.

Given we use Twitter data to study the public discourse around the annual UNFCCC COPs, the question about what role digital spheres play in these public discourses, arises. Generally, the role of digital spaces within international climate negotiations has greatly increased. Specifically, given the difficulty for many advocacy organisations to gain in-person access to the UNFCCC conferences, these digital spaces allow them to participate in the negotiations. The online UNFCCC COP platform allows delegates, who are unable to travel to the conference to virtually access plenary sessions, informal meetings, and side events ([Klein et al. 2021](#)). But open digital spaces also provide insights into the various frames and narratives that make up the public discourse in an unfiltered, genuine way, as there is no intermediary, like the media. And the space is used by activists, observers, and political actors alike. [Hall \(2022\)](#) has shown moreover that online spaces allow transnational

advocacy networks to mobilise supporters on-line and off-line. Harnessing their digitally networked power they can shape public opinion for instance on climate change and put pressure on policy makers.

Yet, our results suggest that physical presence of the young climate activists and the norm champions they were able to mobilise, does indeed have an effect on the extent to which their normative frames permeate the public discourse. For example, COP24 and COP25 show an increase in volume of the normative topics, specifically around the presence of Greta Thunberg at the conferences and the content of her speeches at the two events. Likewise, the presence of norm champions at the conferences, even if through a recorded video message, seems to increase the likelihood of their message featuring in the public discourse around the respective COP. For example, David Attenborough’s speech at COP26, featuring some normative frames advanced by young climate activists, was quite prominent in the public discourse around COP26.

6. Conclusion

[Spaiser et al. \(2022\)](#) argue that the Friday for Future normative framework has a great potential to drive forward wider social change, building on recent analyses that explore the possibilities for positive social tipping dynamics that could stabilize the Earth’s Climate ([Otto et al. 2020](#)). [Otto et al. \(2020\)](#) identified six social systems, where positive social tipping can occur, one of them being the norms and values system. A critical condition is predicted to be reached “if the majority of social and public opinion leaders recognise the ethical implications of fossil fuels and generate pressure in their peer groups to ostracize the use of products involving fossil fuel burning” (*ibid.*, p. 2360). Based on previous research they estimate that a committed minority of roughly 25 % would be sufficient to tip the status quo. Furthermore, once moral norms start to influence legislation further spreading of the new norm can be achieved.

Norm entrepreneurs such as transnational advocacy networks and norm champions, which can be opinion leaders, state actors etc. have an important role to play in reaching the critical condition. At early stage new/changed norms are likely to diffuse from norm champions to early adopters, who share a common identity with the norm champions. Once a critical mass of actors have adopted a norm, a cascade will be triggered whereby most of the remaining actors will rapidly adopt the norm ([Green 2018](#)). Even countries, who strongly rely on fossil fuels for instance are likely to adopt the norm as the social costs for failing to adopt the norm will become unbearably high once only very few countries remain, who hold out. Civil society and social movements within the late adopter countries can further help to tip them toward norm adaptation (*ibid.*). However, for the successful tipping to occur in the first place, [Otto et al. \(2020\)](#) stress that substantial political effort is

	COP20	COP21	COP22	COP23	COP24	COP25	COP26	FFF2018	FFF2019	FFF2021
COP20	0.00	0.41	0.44	0.44	0.44	0.46	0.48	0.55	0.55	0.56
COP21	0.41	0.00	0.39	0.39	0.39	0.41	0.41	0.50	0.50	0.52
COP22	0.44	0.39	0.00	0.36	0.39	0.41	0.46	0.54	0.53	0.55
COP23	0.44	0.39	0.36	0.00	0.35	0.37	0.42	0.52	0.51	0.53
COP24	0.44	0.39	0.39	0.35	0.00	0.35	0.40	0.48	0.48	0.51
COP25	0.46	0.41	0.41	0.37	0.35	0.00	0.39	0.49	0.47	0.49
COP26	0.48	0.41	0.46	0.42	0.40	0.39	0.00	0.47	0.44	0.44
FFF2018	0.55	0.50	0.54	0.52	0.48	0.49	0.47	0.00	0.37	0.44
FFF2019	0.55	0.50	0.53	0.51	0.48	0.47	0.44	0.37	0.00	0.41
FFF2021	0.56	0.52	0.55	0.53	0.51	0.49	0.44	0.44	0.41	0.00

Fig. 1. Jensen-Shannon Distance score measuring semantic discourse similarity. Bigger (darker red) numbers indicate greater distance, smaller number (lighter red) greater similarity. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

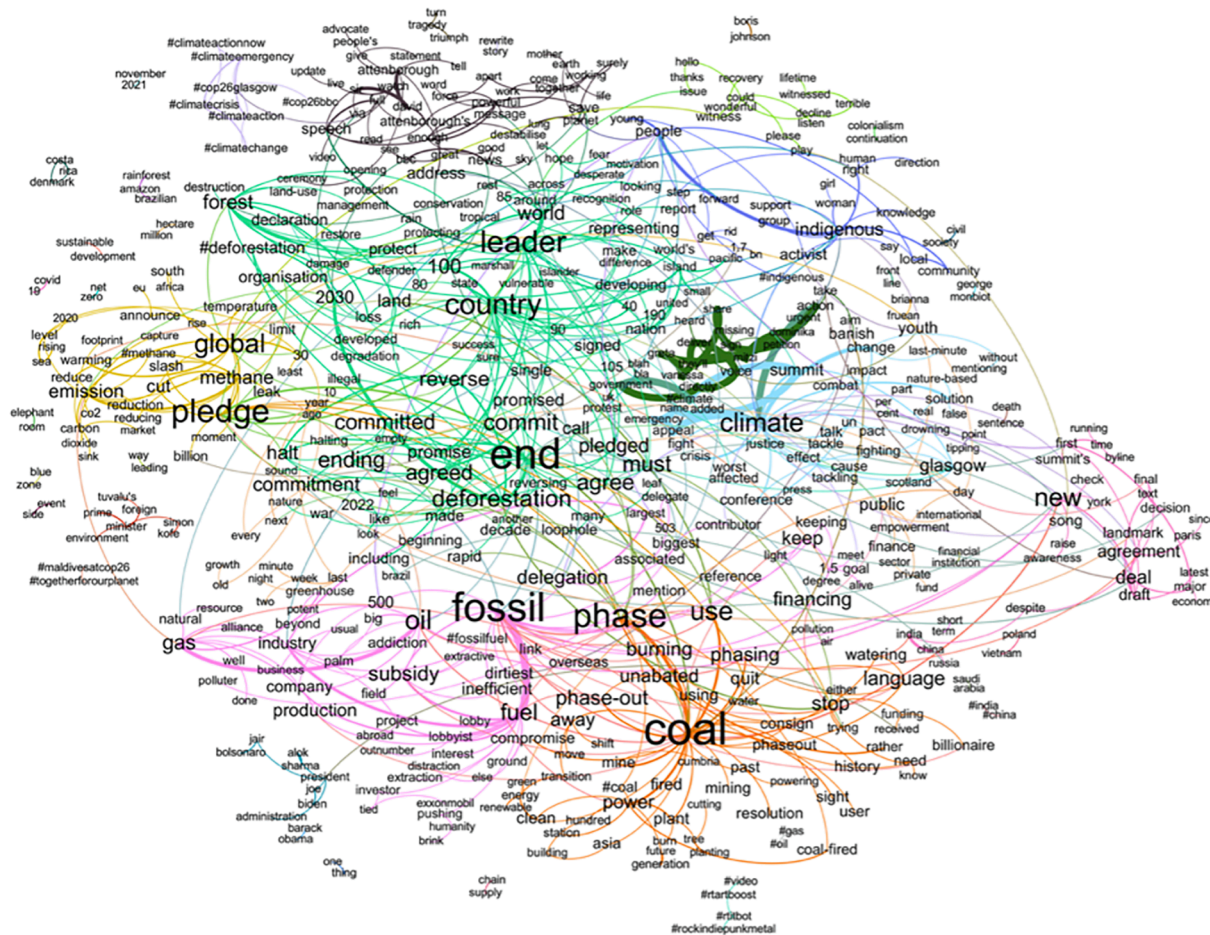


Fig. 2. COP26 Semantic Network of Normative Topics. Nodes are words, with more central, frequent words appearing larger, and edges representing collocations of words. Colour are representing fine-grained topic clusters.

required, as well as persistent pressure from civil society, especially from the young, intellectually, and social justice-oriented groups, who initiated the normative change in the first place.

This is particularly true as there are financially and politically very powerful actors (e.g. fossil fuel industry) involved, who so far were quite successful in preventing effective measures to stabilize the Earth’s climate and they are pushing back against the new emerging norms and the actors, who promote it. They are the ‘norm antipreneurs’ (Bloomfield 2016) that invest lots of efforts in preventing the normative change and hence the social tipping among others by deploying “moral” counter-frames that attempt to justify their harmful practices (e.g. helping the world’s energy poor) (Green 2018). Indeed, when looking at the topic space for COP24, COP25 and COP26, we see that at the same time as youth climate activists were given central stage for their normative appeal, a reappearance and strengthening of the denial topic occurred. This suggests the youth climate activists have also provoked a pushback from norm antipreneurs.

Recent research by Falkenberg et al. (2022) seems to back our observation with extensive empirical evidence. Our research also shows that governments have not yet been moved to entirely subscribe to this new normative framework. One reason for this is the still strong entanglements between various governments and the fossil fuel industry (Mann 2021). And yet, despite a lack of instrumental and structural power and despite massive mobilisation by norm-antipreneurs defending the fossil fuel status quo, youth climate activists hold a remarkable discursive, moral power that allowed them to initiate normative change in collaboration with other activists and norm champions. It will be important now to maintain the momentum and moral pressure and to

reach out to further norm champions.

Future research should focus on understanding how tipping is delayed by norm antipreneurs and how this can be averted. Indeed, as Nyberg et al. (2016) note, before a tipping occurs “awareness of others’ non-adoption tends to work against change” (p.43). Green (2018) believes that civil society will be crucial here too to undermine opponents’ counter-mobilisation, because activist groups have considerable discursive and symbolic power. In the battle over ideas and legitimacy the morally based frames of climate activists have a clear argumentative advantage (Stirling et al., 2019) and threaten to stigmatize and delegitimise powerful players such as fossil fuel companies. If tipping in the social system of norms and values succeeds then the normative change can amplify many other social tipping processes (Otto et al. 2020, Winkelmann et al, 2022), such as the tipping in financial markets, making investments in fossil fuels morally untenable or even illegal. The exact mechanisms of these coupled tipping processes should be a focus of future research. What is clear, however, is that the normative system is quite a central social domain that has strong links to all other domains and can amplify the tipping processes in the other domains.

CRedit authorship contribution statement

Nicole Nisbett: Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Visualization, Writing – original draft, Writing – review & editing. **Viktoria Spaiser:** Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Visualization, Writing – original draft, Writing – review & editing, Funding acquisition.

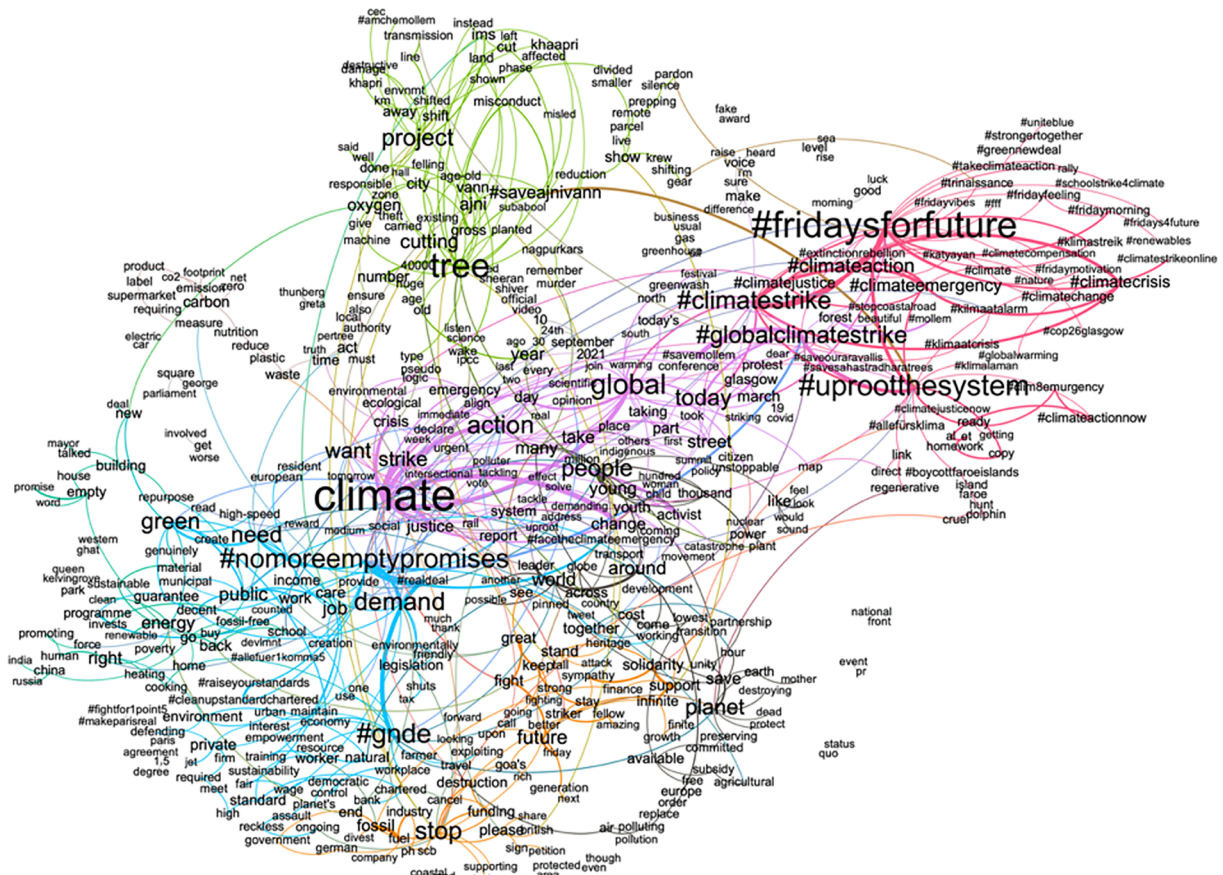


Fig. 3. FFF2021 Semantic Network. Nodes are words, with more central, frequent words appearing larger, and edges representing collocations of words. Colour are representing fine-grained topic clusters.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The link to the code is shared in the main paper

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.gloenvcha.2023.102717>.

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