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Abstract

Seven years on from the first declaration of climate emergency, we will undertake a large-scale text analysis of local government climate strategy documents of 196 climate policies over 140 local governments in Australia from 2016 to the end of 2022. We utilise topic modelling to depict the commonalities and divergences of key topics/policy frames in the climate policies of local government in Australia.

1 Introduction

We live in an era of intensified threats from climate change because the related risks have fundamental implications for how we live in, and govern, urban areas. The Intergovernmental Panel on Climate Change (IPCC) Working Group III (2022) calls for a significant, immediate shift in urban climate governance (UCG) to address climate change effects. UCG is the management of cities involving decision making and climate policy implementation to meet the needs of urban populations. The purpose of UCG is to transition the analysis from specialist climate policy to examining how climate change is influencing broader urban governance and contributing (or not) to climate transformation (meaning systematic, lasting impacts on various aspects of urban governance such as adapting policies, infrastructure, and practices to adapt with and mitigate the effects of climate change (Castán Broto et al., 2020). UCG continuously increases complexity owing to the rising number of climate policy actors such as governments, businesses, city networks, and non-governmental organisations. The diversity of climate policy actors exacerbates confusion but can enhance outcomes and likelihood of implementation (Kuyper et al., 2018). But alarmingly, to date there is no evidence internationally and domestically to suggest that distinctive strategies of UCG are emerging (Castán Broto et al., 2020). For example, cities manifest piecemeal adoption of new technologies, innovative behavioural approaches and alternative governance methods (van der Heijden, 2022).

In addition, often urban climate studies focus on a small selection of cases studies that runs the risk of neglecting much broader trends in climate governance, and understood at scale may well provide a more substantive leverage to enable change (Wolfram et al 2019:2).

Recently, studies are emerging with a focus on scale mainly utilising topic modelling and other computational tools to analyse climate policies and climate emergency declaration documents. Hsu & Rauber (2021) used topic modelling and network analysis to identify themes and relationships in climate actions in a large dataset of over 9000 actors, including cities, companies, regions and countries. They found a high degree of group similarity, and some evidence of orchestration of actions within subsets of actors, but also noted that opportunities to connect and share strategies had been missed. As well as topic modelling, Sachdeva et al. (2021) used logistic regression to identify common factors among cities with net zero targets, and found four themes in language use which were linked with more ambitious targets: the use of specific metrics, identification of sources of emissions reduction, discussion of governance, and discussion of community engagement. An analysis of large-scale policy framing patterns are yet to emerge. We extend studies to determine whether the natural language capabilities of topic modelling can perform more sophisticated policy analyses. In our study, we utilise topic modelling to analyse climate policies from 196 Australian local governments, comparing those who did produce a climate emergency declaration with those who did not. The topics generated in this analysis act as "policy framing patterns", where we detect the

similarities and differences in the policy discourse utilising the Declaration of Climate Emergency to organise our policy documents.

Our study contributes to the urgently requirement of developing new ways to systematically analyse how urban governance is being reconfigured (or not) because of climate change and in turn, to better understand the intentional pathways for institutional change to bring about system-wide shifts for future urban climate action and its governance. In the absence of evidence on climate action implementation we utilise policy documents as data, for assessing the levels of ambition in the implementation of climate action, Here our focus is on creating a better understand of detecting real-world Policy Change.

In this paper, we first outline our methodology, results of the topic modelling. Then, in our discussion, we outline the similarities and differences between local government climate policy documents in Australia that did declare a climate emergency declaration with those who did not. We conclude with outlining the impact of our study to the better understanding the fast evolving climate policy landscape.

2 Methodology

Our approach aims to capture and compare climate policy topics related to local governments in Australia that have declared a climate emergency with those that have not. To identify the policy topics, we developed a dataset that includes 196 local government climate policies in Australia from 140 local governments. The total policies for local governments that have declared a climate emergency include 93 from 70 councils (short call: Climate Emergency Declaration [CED] dataset). The total policies for local governments that have not declared a climate emergency include 103 from 70 councils (short call: non-CED dataset). The climate policy landscape is complex, and a response to climate change can be found in various policy documents, e.g., a standalone climate policy, local strategic planning or sitting within a larger agenda of sustainability or environment. For our dataset, we included only policies that have a primary focus on climate change in their title, such as having the word 'climate' or one of the following key phrases related to climate action: 'net zero', 'emissions', 'energy', 'adaptation', 'renewable energy', 'climate resilience', 'cooling the city' and 'climate mitigation'. As 2016 marked the beginning of the climate emergency movement (with the first declaration), we selected relevant policies published between 2016-2022. However, in some cases, we included policies published before 2016 if no recent policy was available. We developed our dataset of local governments climate policies using automated Google searches, and manual internet searches. Due to limitations with established portals like the Carbon Disclosure Project, which included only 14 climate policies from 537 local governments, the researchers developed their own dataset. We identified over 670 policy documents but focused on 196 for detailed analysis. LDA (Latent Dirichlet Allocation) topic modeling was applied to these documents to uncover latent patterns by comparing word clusters, termed topics, which consist of frequently co-occurring words throughout the corpus. We argue that the word clusters generated by topic modeling could be interpreted as frames, which represent different ways of discussing a topic policy frames (Bohn & Roggee, 2022; YIa-Anttila et al., 2022). We used qualitative inspection of the top three to four words of each topic to identify internally valid frames. In summary, the word co-occurrence patterns that emerge represent patterns of using certain words to talk about it, which approximate policy framing patterns.

The LDA method helped analyze the importance of these topics by examining the weight of each topic within a document. The study settled on 30 topics through a trial-and-error approach, ensuring the topics were distinct and not overly general. This process is consistent with recommendations from prior studies (Carron-Arthur et al., 2016; Szekely and vom Brocke, 2017). An overview of the topics was provided in Table 1, covering both CED (Climate Emergency Declaration) and non-CED datasets.

During the analysis, nine irrelevant policy documents were found only in the non-CED dataset, representing about 1.3% of all identified policies. These documents were disregarded in the final interpretation.

Each policy document's distribution of topics as probabilities was considered, with total probabilities summing to 1.0. The researchers focused on the most dominant topic in each document, inspecting approximately two to three policy documents per topic and around 70 climate policies per dataset. Representative texts were

identified for the dominant words in each topic, detailed in Supporting materials.

The study noted limitations of topic modeling, such as the infrequent use of a word not necessarily indicating its lack of importance and the potential to miss emerging trends. Additionally, the period from 2016-2022 had significant events that could have influenced climate action, including key international reports like the IPCC 2018 report and the UN Environment Programme's 2019 Emissions Gap Report. These events were acknowledged as contributing factors alongside the climate emergency declaration movement.

3. Results

Error! Reference source not found. and 2 present our results of the topic modelling, labels of the topics.

4. Discussion and Conclusion

This research provides a timely investigation of the Climate Emergency policy framing patterns in local governments in Australia. The size of our dataset enables us to draw conclusions, although limited to Australia, and we conclude that dominant topics between both datasets include a representation of topics with a focus on mitigation, adaptation and equity and social justice. The impacts of climate change, mainly natural disasters, were also dominant in both sets of topics closely linked to unique place-based challenges; for example, coastal councils seek to develop relevant climate strategies to address coastal erosion and other related hazards.

We identified growing maturity of the development of sustainable practice and patterns in the policy document for both datasets (CED with 9 identified sustainable practices and patterns to 3 in the non-CED dataset). Moreover, as highlighted in our analysis in equity and social justice, the technological focus of local governments in dominant topics did not necessarily prioritise the inclusion of equity and social justice. We start to see the beginning of embedding equity and social justice in the climate policy response, but attempts are at best incremental, such as in the dominant topics feature attempts to the extent of access to technology like electric charging stations. Both datasets attributed evidence of the attribute coordination, partnerships, and advocacy for action.

The set of non-CED topics illuminated a greater focus on adaptation and a greater duplication/similarity of at least four topics in the model. This points to the possibility of a less

Table 1:Topic labels for CED dataset
1. Identifying actions' impact area, external collaborators and enablers
2. Modelling scenarios to calculate and reduce emissions and move away from 'business as usual'
3. Reducing greenhouse gas (GHG) emissions, using LED streetlights and working with contractors
4. Local governments' actions based on master plans for reducing GHG emissions
5. Abatement of carbon dioxide emissions and the replacement of diesel
6. Council functions, endorsement and energy reduction with retrofit
7. Climate crisis, highlighting sustainable mode of transport and learning from the pandemic
8. Building alliances, collaboration with other councils and other levels of government and evaluation of policies
9. New jobs and Sustainable Development Goal of affordable and clean energy
10. Innovation in energy use and delivery to prepare for carbon pricing
11. Cost and energy saving (per annum) and responsibilities, and waste management and timeframes
12. Teamwork and organisational support to deliver the action plan
13. Building resilience to disasters such as coastal erosion and bushfire
14. Attention to vulnerable aged population and managing bushfires
15. Effectiveness of actions, carbon sequestration, adaptive actions and sustainable supply chain
16. Reducing emissions from farming and agriculture, protecting endangered animals
17. Alignment between different groups, proposals and different levels of governance
18. Enabling community-led ideas and skills
19. Roadmap for reducing the emissions to achieve carbon neutrality
20. Preparing for natural hazards and reducing the reliance on external sources of food and energy
21. Urban cooling by greening the urban surfaces
22. Adaptation to the seasonal changes in the climate
23. Revegetating catchments and supporting farmers for sustainable practices
24. Strategies for a thriving nature and its interconnection with humans
25. Drawing on the knowledge of Aboriginal Registered Parties to protect cultural sites from climate change impacts
26. Coastal hazards and the impact of COVID-19 on the progress of the plans
27. Encourage the public for their sustainability achievements through awards, determination to drawdown carbon dioxide and eliminate emissions by encouraging divestment and retrofitting divestment and retrofitting
28. Eliminating plastic, greening the area, enabling affordable access to accredited renewable energy and preparedness for climate impacts
29. Generating and saving energy (kWh) from rooftop solar panels and the abatement of emissions
30. Anticipating and approving budgets and resources and finding indicators for assessing the impacts of actions

Table 2: Topic labels for non-CED dataset
1. Climate risk assessment
2. Coastal retreat: A framework for long-term adaptation
3. Energy use and GHG footprint
4. Maintaining and expanding urban forest, increasing canopy cover and improving native species
5. GHG emissions reduction, with a focus on reducing transport and landfill emissions and methane
6. Managing coastal erosion
7. External partnerships and inclusion of vulnerable people in risk treatment
8. Saving energy by using heating, ventilation and air conditioning (HVAC) and smart systems
9. Climate-proofing houses
10. Climate Change Adaptation Governance Assessment
11. Renewable energy action
12. Abatement capacity to reduce emissions—mainly solar uptake and fleet transition
13. Bushfire mitigation/scenarios
14. Rising sea levels
15. Risk management based on the location of assets
16. Storing carbon in the soil
17. Transition to a hydrogen hub, with storage technology and stations
18. Critical responsibilities to stress—adaptation
19. Waterwise city
20. Coastal hazard risk management and adaptation
21. Achieving net zero via electric cars
22. Coastal management
23. Recommendation and evaluate
24. Disaster resilience
25. Topic removed
26. Fleet transition and carbon offset
27. Topic removed
28. Sustainable food production and the circular economy
29. Leadership, alliances and advocate on climate action
30. Wave exposure and vulnerability of cliffs

complex response to climate action with a dominant focus on adaptation. Diverse technology solutions present within the non-CED climate policies are due to more local governments within this cohort focusing on energy transition as their key policy response rather than a wider remit of responses required for a climate change policy—for example, the Energy Strategy & Implementation Plan 2020–2025 from the Dubbo Regional Council, the Cabonne Shire Council's Renewable Energy Plan and the City of Bayswater's Emission Reduction and Renewable Energy Plan. Offsets were also noted as a dominant topic, but this focus was not presented on CED topics.

The CED dataset topics included a more explicit focus on accelerated action including the emphasis on modelling scenarios to calculate and reduce emissions and move away from 'business as usual'; enabling community-led ideas and skill; draw down carbon dioxide and eliminate emissions by encouraging divestment; incorporating First Nation knowledge; prioritization of actions; and a more holistic way forward by incorporating Sustainable Development Goals

There is a pressing need for clarity on the current policy landscape and the evolution of climate action, especially as we near 1.5 °C of global warming. Our text analysis of local government policies in Australia identifies the dominant topics and offers insights into Australia's local government climate policy landscape. While we observe in the CED data set a shift from business-as-usual practices to more accelerated actions in the CED dataset, we are still far from achieving the radical transformations necessary to meet our ambitious net zero targets by 2050.

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