CLIMATE POLICIES IN DECARBONIZATION STRATEGIES.

A COMPUTATIONAL APPROACH

AUTORES

Margarida Fontes
LNEG - Laboratório Nacional de Energia e Geologia, Lisboa, Portugal

margarida.fontes@lneg.pt

Tiago Alves
Iscte – Instituto Universitário de Lisboa, DINÂMIA'CET, Lisboa, Portugal

tiago_louro@iscte-iul.pt

Nuno Bento
Iscte – Instituto Universitário de Lisboa, DINÂMIA'CET, Lisboa, Portugal

nuno.bento@iscte-iul.pt

LINHA INTEGRADORA DO DINÂMIA'CET-ISCTE

Innovation and Transition to Sustainable Societies

PALAVRAS-CHAVE

Transformation
Policy
Decarbonization strategies
Artificial intelligence

The transition to a low-carbon society should accelerate to avoid an increase in the temperatures above 1.5° to 2°C, and this is unlikely to occur without policy intervention (IPCC, 2022). Given the complexity of the problem to be addressed, recent debates have increasingly pointed to the need of adopting a broader view on policy intervention (Weber and Rohracher, 2012; Hekkert et al., 2020). This entails a move beyond a single focus on economic competitiveness and growth, towards a focus on societal problems or "grand challenges", leading to the emergence of the concept of transformative innovation policy (Schot and Steinmueller 2018; Dierks et al, 2019). This new rationale implies the consideration of a much broader range of policy objectives, targets and instruments, as well as the notion that a mix of policies needs to be deployed to achieve the desired goals (Rogge and Reichardt 2016). While this policy rationale has started to enter innovation policy agendas, it remains to be seen to what extent it is reflected in the actual policies being implemented (Casula, 2022; Peñasco et al., 2021). On the other hand, it is also unclear whether the directions set by those policies align with the visions and strategies for decarbonization and whether there are still uncovered areas.

Different strategies are possible to accelerate the transition to a low-carbon society. In this research, we utilize a computational approach to analyze the alignment of existing climate policies with strategies for decarbonization. We begin by deploying a previously constructed typology of decarbonization pathways based on a computational review of 1 million articles (Alves et al., 2022). This exercise involved processing article content, identifying topics as transition strategies, and constructing a conceptual framework. We then use a bottom-up, data-driven approach to compare the linguistic representations of decarbonization research with the descriptions of over 3,000 climate policies, manually collected from publicly available international databases. Our methodology leverages sentence representations (Reimers et al., 2019) to capture the context-dependent notions in text. By locating the policy within the research articles underlying the typology, we find that some interventions are embedded in the decarbonization strategies, while others are transversal to several strategies.

The research will enable to find adequate intervention points to trigger the desired pathways. The effectiveness of policies to address deep decarbonization and sustainable development goals (SDGs) will benefit from their alignment and consistency with the objectives and visions collectively adopted (Sachs et al., 2019). Though, the capacity of the policies to catalyze transformations will depend on the actual conditions, and namely on the extent to which there are tipping points and critical thresholds that can amplify the effects of the initial intervention (Farmer et al., 2019). For example, the dissemination of more efficient technologies such as appliances or electric vehicles, or the switch to shared means of transportation may accelerate only once a certain level of adoption is reached. The results will improve the knowledge about the capacity of the

policies to unleash different strategies of decarbonization beyond supporting particular technologies or behaviors. The results will also show possible policy mixes, as well as areas of decarbonization that are not sufficiently covered by existing policies and that require more attention in the future.

REFERÊNCIAS

Lista completa de Referências
https://docs.google.com/document/d/1yt_RRvP0Nok6HTEj1tMr6o1bDEiKdSEu/edit?usp=share_link&ouid=112861107769745985112&rtpof=true&sd=true

Climate Policies in Decarbonization Strategies. A computational approach

Margarida Fontes
Tiago Alves
Nuno Bento

REFERENCES

Alves T., Ribeiro R., Bento N. (2022). "WP1 – Typology. Part 1: Description of Pathways and Dimensions." Internal Report, Sus2Trans Project. December 2022.

Casula, M. (2022). Implementing the transformative innovation policy in the European Union: how does transformative change occur in Member States? *European Planning Studies*, 30, 2178-2204.

Diercks, G., Larsen, H. & Steward, F. (2019). Transformative innovation policy: Addressing variety in an emerging policy paradigm. *Research Policy*, 48, 880-894.

Farmer, J. D., Hepburn, C., Ives, M. C., Hale, T., Wetzer, T., Mealy, P., ... & Way, R. (2019). Sensitive intervention points in the post-carbon transition. *Science*, 364(6436), 132-134.

Hekkert, M.P., Janssen, M.J., Wesseling, J.H, & Negro, S.O. (2020). Mission-oriented innovation systems. *Environmental Innovation and Societal Transitions*, 34, 76-79.

Peñasco, C., Anadón, L. D., & Verdolini, E. (2021). Systematic review of the outcomes and trade-offs of ten types of decarbonization policy instruments. *Nature Climate Change*, 11(3), 257-265.

Reimers, N., & Gurevych, I. (2019). Sentence-bert: Sentence embeddings using siamese bert-networks. arXiv preprint arXiv:1908.10084.

Rogge, K. S., and Reichardt, K. (2016). Policy mixes for sustainability transitions: An extended concept and framework for analysis. *Research Policy*, 45, 1620–1635.

Sachs, J. D., Schmidt-Traub, G., Mazzucato, M., Messner, D., Nakicenovic, N., & Rockström, J. (2019). Six transformations to achieve the sustainable development goals. *Nature Sustainability*, 2(9), 805-814.

Schot, J. and Steinmueller, E. (2018). Three frames for innovation policy R&D, systems of innovation and transformative change. *Research Policy*, 47, 1554-1567.

Weber, K. M., and Rohracher, H. (2012). Legitimizing research, technology and innovation policies for transformative change. *Research Policy*, 41, 1037–1047.