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2021-12-15

Repo , P , Matschoss , K & Mykkänen , J 2021 , ' Examining outlooks on sustainability transitions through computational language analysis ' , Environmental Innovation and Societal Transitions , vol. 41 , pp. 74-76 . <https://doi.org/10.1016/j.eist.2021.10.028>

<http://hdl.handle.net/10138/337777>

<https://doi.org/10.1016/j.eist.2021.10.028>

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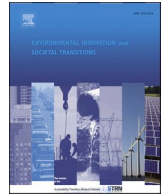
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Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Environmental Innovation and Societal Transitions

journal homepage: www.elsevier.com/locate/eist

Examining outlooks on sustainability transitions through computational language analysis

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ARTICLE INFO

Keywords:

Energy transitions outlooks
Topic modelling
Unstructured texts
Right-wing populism
Political science

ABSTRACT

This viewpoint exemplifies how advances in computational text analysis allow for analysing novel data for transitions studies. Applying the specific technique of topic modelling to plenary talks related to energy in the Finnish parliament during 2008–2020 illustrates how the approach can be of use to transitions studies. In particular, it aids in exploring the dynamics of diverging perspectives, such as by right-wing populists and the greens, on outlooks for energy transitions. We sketch how computational text analysis can further contribute to transitions studies.

1. Introduction

Transitions scholars have excelled in formulating research agendas, which provide outlooks for more sustainable futures (Köhler et al., 2019) and scholars from other fields have also increasingly become involved in transitions studies (Hansmeier et al., 2021). Nevertheless, transitions studies have been at times criticized for accentuating technological matters over at the expense of social interests (Sorrell, 2018). Although transitions scholars widely use documents as sources and apply qualitative methodologies (Zolfagharian et al., 2019), written accounts from and for people and organizations become more difficult to analyse when their internal complexities increase and scope grows.

Against this setting, we argue that computational natural language processing methodologies deserve attention in transitions studies. They could complement traditions such as analyses of content, thematic and discourses while providing opportunities to examine large textual corpora such as policy programmes, online discussions or scientific journals (Savin and van den Bergh, 2021). Qualitative methodologies have merits, but these do not scale easily to large sets of unstructured data, which may limit the detail and structure of analysis.

We demonstrate the potential of the computational language approach by examining how debates on energy transitions evolve over a long period of time. As data we use transcriptions from the plenary sessions of the Finnish parliament from 2008 to 2020. These constitute a large longitudinal textual corpus which contains a multitude of detailed issues that are difficult to cover systematically, for instance through discourse analysis or examination of voting behaviour. Particular attention is given to right-wing populism – identified in political science as having a polarizing effect on energy policy in Europe (Četković and Hagemann, 2020) and as shifting attention away from the green parties as promoters of sustainability transitions and green agendas (see Leipprand et al., 2017; Debus and Tosun, 2021). Our results provide political outlooks on what can be achieved in sustainability transitions concerning energy.

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<https://doi.org/10.1016/j.eist.2021.10.028>

Received 16 June 2021; Received in revised form 21 October 2021; Accepted 25 October 2021

Available online 8 November 2021

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Finnish debates are politically interesting because energy use per capita is high in Finland and a wide range of energy sources are being deployed, ensuring that political energy choices are indeed viable. Major current activities include the construction of nuclear power plants and wind parks.

In our analysis, we apply topic modelling and more specifically Latent Dirichlet Allocation (LDA), which is a popular and robust methodology suitable for analysing large sets of unstructured texts (Blei et al., 2003). It is based on machine learning and used to identify patterns of collocating words, which constitute topics. Nonetheless, this methodology has limitations concerning interpretation skills required to make sense of the outcomes created by a probabilistic process. Accounting for texts in different languages also calls for efforts, although automated translations and text cleaning procedures help.

2. Demonstration: comparison of polarized political takes on energy

We perform topic modelling to examine how differently right-wing populists (Finns Party, Blue Reform and Change 2011) and the Green League address energy in their plenary talks in the Finnish parliament (The Parliament of Finland 2017; The Parliament of Finland (2020) The Parliament of Finland). The data consists of 5881 transcribed instances, which were distributed evenly between the two party factions. The methodology requires setting a number of modelled topics and after trials ranging from four to 20 topics, modelling was conducted with five topics, which was assessed to achieve a useful comparison. These topics were named by the authors after considering modelling outputs such as key words and modelling metrics.

Fig. 1 shows how the topics evolve over time for right-wing populists and the Greens. The largest topic for the political adversaries concerns a *General energy discussion* and the role of energy. This topical share is mostly lower for the right-wing populists, indicating that their take is more specific than the Greens'. Indeed, populists highlight the topics of *Domestic energy policy* and *Housing certificates*, which both resonate with populist traditions of valuing the national over the international and opposing intrusions of what is perceived as the individual's personal sphere.

The Greens have traditionally focused on *Renewables and nuclear energy*, but that seems to have given way to *Climate targets*, which is also highlighted by the populists. While the methodology of topic modelling is not particularly suitable for distinguishing between favourable and critical assessments, it can be assumed that political polarization concerning sustainable transitions is evident here (Ćetković and Hagemann, 2020) and contributes to competitive inter-party politics (Carter and Little, 2020).

Overall, the results recognize differences and polarization between the political factions representing right-wing populism and green agendas. This observation is based on the examination of expressed content and thus reflects the relative differences and similarities in plenary talks rather than examinations of ideologies, voting behaviour or power relations. At the same time, revealing

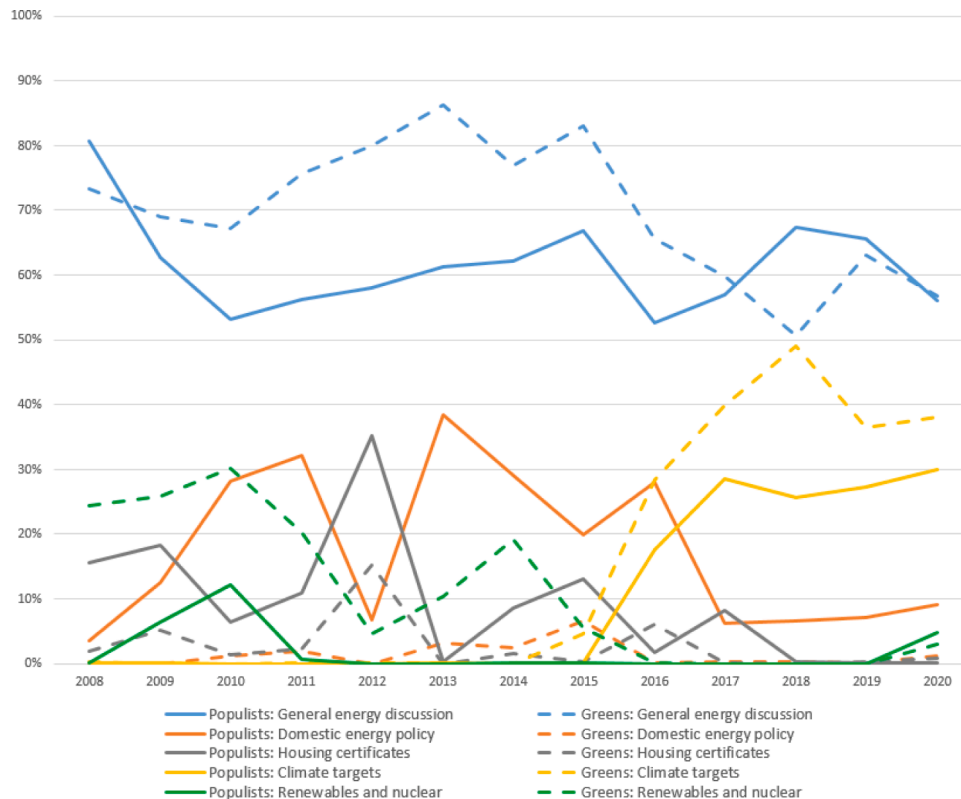


Fig. 1. Shares of energy topics addressed by right-wing populists and the Greens in the plenary debates of the Finnish parliament, 2008–2020.

such results are valuable when recognizing political outlooks for achieving sustainability transitions.

3. Prospects for transitions studies

This article demonstrated how computational linguistics can connect to sustainability transitions research agendas, embrace new methodologies, complement established methods, and accomplish synergies with other social sciences (Köhler et al., 2019; Hansmeier et al., 2021). There are many methodologies for natural languages, which all assist in discovering transitions insights that may otherwise go unnoticed. Their application would resonate with Hansmeier et al. (2021) in that data collection and analytical methods should better consider complexity in sustainability transitions and make note of the inter- and transdisciplinary character of the field.

Strategies, position statements, roadmaps and online discussions from a great variety of actors such as companies, industries, policymakers and citizens are examples of data, which are interesting from the perspective of sustainability transitions and are useful to examine in coordination with computational language-analysis tools. Transitions scholars can apply new methodologies to strengthen research agendas, for instance by comparing how transitions progress geographically, by integrating insights across the social sciences, and by assessing how transitions take place in connected socio-technical systems (see Savin and van den Bergh, 2021; Köhler et al., 2019). Transitions dynamics could further examine the agency of various actors as well as differing institutional logics.

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.

Acknowledgements

The corresponding author would like to thank the Strategic Research Council of the Academy of Finland for the funding of the research (GA 314325) in the Smart Energy Transitions project and Sanna Markkinen for assistance in the collection of energy related plenary debates at the Finnish parliament in 2016–2020.

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