https://doi.org/10.1038/s41467-026-71711-6

Climate futures require politics

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Climate action is shaped as much by politics as by technology and economics. The Shared Socioeconomic Pathways (SSPs), central to mitigation and adaptation assessments, do not yet include a quantitative representation of political development. We outline a research agenda to systematically integrate political dimensions into climate scenario modelling.

The Intergovernmental Panel on Climate Change's (IPCC) seventh assessment cycle (AR7) has begun. Scientists have started to assess the literature on feasible and just climate and sustainability scenarios. The recommendations of the IPCC Workshop on the lessons learnt from the use of scenarios in AR6 point to the need for political science expertise to improve scenarios[1]. One key aspect highlighted in this report is political development[2], including the quality and effectiveness of institutions, rule of law, and maintenance of peace. These factors have not yet been incorporated systematically and quantitatively into the Integrated Assessment Models (IAMs) used to generate pathways of climate action that are assessed in the IPCC. Findings of the IPCC have substantially influenced global climate action. If the omission of political development biases the conclusions drawn from scenario analysis, then the real-world merit of the scenario-based findings is called into question. Therefore, the purpose of this commentary is to suggest steps to improve the incorporation of political development in scenarios during the AR7 assessments and beyond.

Quantitative integration of political development into scenarios remains an underdeveloped area of work. At first glance, this is surprising because political development shapes action against environmental challenges such as climate change and biodiversity degradation. Political development encompasses a wide range of factors (e.g. equity, civil society or geopolitics), but two are critical for climate action: Political institutions[3–8] and violent conflict[9,10] affect the capacity to adapt to and cope with climate impacts, and are decisive determinants of policy adoption and its effective implementation[11]. In addition, explicitly accounting for institutions would enable a more systematic exploration of relevant related issues such as equity[12]. However, most global scenarios still lack quantified representations of political development, reflecting persistent disciplinary segmentation and the limited integration of political and social science insights into modelling frameworks, even as recent scholarship calls for broader cross-disciplinary engagement to better represent governance, justice and institutional dynamics in future pathways[13]. The reasons for this include the impermeability of disciplinary boundaries and political science research's limited interest in modelling the global future. Consequently, the scenario-based analyses did not incorporate indicators of political development from the outset. However, institutions and violent conflict have been quantified using reliable indicators in political science research. This commentary calls for the integration of the most amenable indicators of political development into scenario frameworks through enhanced interdisciplinary collaboration. We also acknowledge that politics can raise questions about who has a voice in developing scenarios. While this topic is relevant, it is beyond the scope of this commentary.

We focus on the quantified Shared Socioeconomic Pathways (SSPs)—the five core societal scenarios that are the basis of most analyses of climate futures[14]. A robust assessment and accounting of the political realities of climate mitigation and adaptation would require incorporating established theories, concepts, and indicators from governance, peace, and regime research from political science.

Indeed, the SSP scenario narratives refer to some aspects of political development[15]. Work has begun to assess how it affects the feasibility of climate action[16]. However, this is incomplete since (i) the used concepts are vague and applied inconsistently; (ii) political development is still omitted from the critical step of making quantified assessments of climate projections; and (iii) resulting available projections therefore tend to break markedly from historical trends[17]. As a consequence, the current SSPs do not yet sufficiently reflect critical drivers of vulnerability and political shortsightedness, hence likely overestimating the feasibility of future climate action. This is a significant drawback, as scenario-based analyses explore global development paths (including addressing 'what-if' and 'how-to' types of questions) in a range of plausible futures.

The analyses featured in Fig. 1 showcase the problem with the existing SSP scenario framework. Here, critical aspects of political development are modelled as outcomes of the quantified variables of the socio-economic pathways. Political development does not deteriorate even in the scenario with highest challenges for climate action. This does neither sufficiently reflect the 'real world' plausibility of eroding peace and democratic institutions, nor the underlying scenario narratives. In SSP3 'regional rivalry', the quality of rule of law stagnates (Fig. 1a) or improves (Fig. 1b) rather than deteriorates, as assumed in the scenario narrative. In effect, these projections fail to provide a suitable worst-case scenario for political development because the core SSP drivers produce too optimistic lower bands of projections. This illustrates the necessity to conceptualise and model socioeconomic and political development in a more interactive manner to ensure that projections correspond with underlying scenario assumptions and the narratives. In addition, most SSPs have yet to recognise that political development is not a one-way process. Instead, it interacts with climate outcomes; for example, protests against increased fuel prices may curb mitigation ambitions.

A small but growing research community is using quantitative methods to provide projections of political development for scenario-based climate change research (e.g. Fig. 1). For example, projections of elements of good governance[18] and rule of law along the SSPs are part of a larger modelling effort to evaluate the potential to meet the Sustainable Development Goals[19]. Political scientists have also quantified

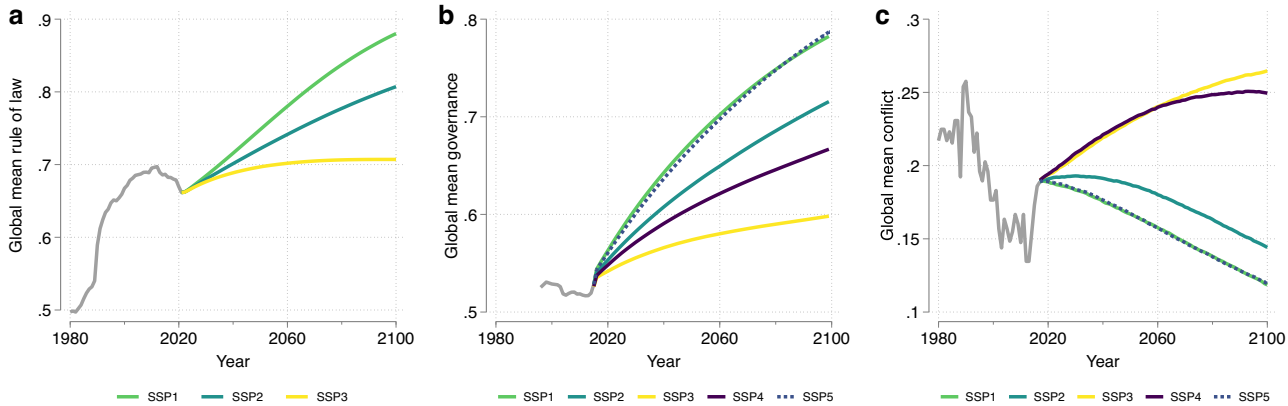

Fig. 1 | Examples of existing quantifications of political development along the SSPs. a Shows historical and projected global rule of law score for SSP1–SSP3[22]. These rule of law projections indicate a slight improvement in global average conditions even in SSP3, thus signifying a better situation than what has been the case for most of recent history. The same pattern is found for effectiveness of governance in **b**, which shows historical and projected global governance score for SSP1–SSP5[18]. **c** Shows historical and projected global conflict likelihood for SSP1–SSP5[19]. Here, projections for SSP3–SSP4 suggest a growing risk, since population size, which grows rapidly in these scenarios, is a strong determinant of conflict in this model. Even so, the end-of-century conflict rates do not exceed that experienced in recent decades and they thus constitute rather conservative estimates of worst-case outcomes. All graphs reflect unweighted global averages of country-level estimates. For further information on indicators of political development see the SSP Extension Explorer (https://ssp-extensions.apps.ece.iiasa.ac.at/ accessed on November 1st, 2025).

violent conflict across the SSPs and the implications of including it for GDP projections[19,20].

On the short-term, political development can be addressed in AR7's scenario-related work by more empirical research that validates solid, systematic theoretical assumptions about the relationship between political development and climate mitigation and adaptation[21]. Although political science has made significant quantitative progress in examining this relationship, systematic literature reviews are essential for developing theories. In a first step, Working Groups II and III of AR7 should assess the literature systematically to understand how political factors enable or constrain the feasibility of adaptation and mitigation options. Secondly, any activity aiming to integrate these relationships into the SSPs should start with a comprehensive open-source inventory of established concepts and suitable indicators of political development. This inventory would serve as the basis for activities such as improving narratives and enhancing the availability of political development indicators within existing SSPs (i.e. improving the type of modelling shown in Fig. 1).

As a more ambitious and mid- to long-term step, we propose a comprehensive agenda to incorporate political development within the SSP framework in an integrated manner. This should allow political developments to evolve endogenously with climate outcomes rather than treating them as fixed scenario inputs. Such an approach would help to enhance the existing scenario space that is dominated by techno-economic assumptions. This should include the following elements:

- An *advanced dynamic simulation setup to account for feedback loops complemented with political development* that would generate new, consistent socio-economic development projections.
- Addressing *cross-cutting challenges*, such as coherence among scenario elements.
- Systematic integration of *findings from qualitative analyses* of the relationship between political development and climate change mitigation and adaptation.
- *Development of detailed narratives of potential political development* through expert elicitation that ensure diverse perspectives and sources of knowledge. This would consider the critical political implications for climate mitigation and adaptation outcomes, including uncertainties, policymaking processes, violent conflicts, and geopolitical tensions.
- *Extension of the aspects of political development* mentioned here, and consider factors such as equity, geopolitics, or the feasibility of people's willingness to change their behaviour.

From a methodological standpoint, such an approach would necessitate a broader range of stakeholders who participate in scenario generation and contribute to exploring what is desirable or feasible from different perspectives. This could include scenario co-development approaches and serve as an important intermediate step to validating as well as providing a means to include more voices while also ensuring the usability of the extended political scenarios for decision-making.

From a knowledge-creation perspective, the scenario research community needs to expand. Given the importance of marshalling the best scientific evidence to evaluate climate futures, this call should serve as the basis for creating a broader community studying political futures as part of the scenario development process. This requires more 'translators'—political scientists who bring in expertise in quantifiable political development—who then are welcomed and engaged with the IAM community on the modelling side. In turn, the political science community needs to be made aware that scenario modelling is an under-explored market for political scientists. Furthermore, seeking targeted funding to initiate a model intercomparison activity would allow for robust quantifications of political uncertainties and enable cross-model validation. This initiative would strengthen the credibility and comparability of new quantifications of political factors.

Overall, by creating a more comprehensive scenario framework that robustly accounts for political development, the scientific

community can better anticipate global challenges and offer more robust guidance for policymakers facing ever more complex futures. While some parts of the climate change research community may feel cautious about adding political elements, as we have argued above, dismissing them also carries risks.

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Received: 10 October 2024; Accepted: 26 March 2026;
Published online: 17 April 2026

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Acknowledgements

We thank three anonymous reviewers for their constructive and insightful comments, as well as the editor for support throughout the review process. We would also like to express our gratitude to Christopher Wingens (German Institute of Development and Sustainability) for providing the data underpinning Fig. 1a. EB acknowledges the support of the European Union's Horizon 2020 research and innovation programme under the European Research Council (ERC) Grant Agreement No. 951542-GENIE-ERC-2020-SyG, 'GeoEngineering and Negative Emissions pathways in Europe' (GENIE). EG acknowledges funding from the Natural Sciences and Engineering Research Council of Canada (NSERC), grant number RGPIN-2023-05610. HB acknowledges support by the European Research Council (ERC) Grant Agreement no. 101055133 (POLIMPACT). SIL acknowledges support of the European Research Council (ERC) Consolidator Grant Agreement No. 724191 (FASDEM).

Author contributions

Conceptualisation: J.L., H.B., S.I.L., E.G. and M.A. Visualisation: H.B., Data curation: H.B. and M.A. Writing—original draft: JL, Writing—review: J.L., H.B., S.I.L., E.B. and M.A. Writing—editing: J.L., H.B., S.I.L., E.B., E.G. and M.A.

Competing interests

EG is a Research Scientist at Environment and Climate Change Canada but did not write this article in that capacity. The views expressed here are those of the authors and do not reflect the views of the Government of Canada or Environment and Climate Change Canada.

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Peer review information *Nature Communications* thanks E Smith and the other anonymous reviewer(s) for their contribution to the peer review of this work.

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