The Cost of Large-Scale Transitions: Introducing Effective Targeted Incentives

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Societal case

The energy transition in the Netherlands (and Europe) is a crucial step towards achieving a more sustainable and environmentally responsible future. This research on targeted interventions can play a vital role in facilitating this transition by identifying effective strategies for promoting the adoption of renewable energy technologies. By focusing on geographical trade-offs, synergies, and optimal solutions, the study aims to maximize the positive impact of sustainable energy adoption across diverse regions and communities, thereby contributing to several Sustainable Development Goals (SDGs).
The energy transition is closely linked to SDG 7 (Affordable and Clean Energy), SDG 9 (Industry, Innovation, and Infrastructure), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action). By examining the role of targeted interventions in accelerating renewable energy adoption, this research can help identify innovative approaches for addressing regional disparities and optimizing the allocation of resources, fostering a more inclusive and equitable energy transition.
The societal aspects of this research lie in its potential to contribute to reducing greenhouse gas emissions, improving energy security, and promoting economic growth and job creation in the renewable energy sector. Furthermore, by considering the unique characteristics and needs of various agents in the energy market, this research can inform tailored strategies that maximize the benefits of renewable energy adoption while minimizing potential negative consequences such as inequality and unfair distribution of incentives.

Scientific case

This study focuses on determining the optimal targeted interventions that can minimize the total cost of incentives while maximizing the adoption of sustainable energy technologies. Building on insights from previous studies on social tipping (1), optimization of institutional incentives (2), group identities (3), and social influence (4), the methodology combines computational models with microeconomic analysis and incorporates elements of psychology and sociology to better understand the behavioral aspects of decision-making. The research will involve developing models to propose novel behavioral experiments, inspired by the controlled experiments in predicting social tipping (1), to investigate the real-world implications of targeted interventions and the underlying social dynamics.
By exploring minimal but fair incentives, the interdisciplinary approach is concerned with the welfare implications of the energy transition, ensuring a balance between efficiency, fairness, and inclusivity, resulting in a more equitable energy transition (2). Integrating ethical considerations allows the development of strategies that take into account the potential consequences of targeted incentives on different segments of society (3,4).
Expected outputs of this research include the development of tailored intervention strategies, identification of key drivers and barriers to renewable energy adoption, and insights into the role of group dynamics and social influence in shaping individual and collective choices (1,4). Through the synergy of computational science, microeconomics, ethics, psychology, and sociology, these findings can contribute to the design of effective policies and programs that promote a sustainable and inclusive

energy transition while addressing potential ethical concerns related to the distribution of incentives and inequalities arising from targeted interventions (2,3). This comprehensive approach ultimately aims to improve the overall welfare of individuals and communities involved in the energy transition process.

1. Andreoni, J., Nikiforakis, N., & Siegenthaler, S. (2021). Predicting social tipping and norm change in controlled experiments. *Proceedings of the National Academy of Sciences*, *118*(16), e2014893118.
2. Wang, S., Chen, X., Xiao, Z., Szolnoki, A., & Vasconcelos, Vítor V. (2023). Optimization of institutional incentives for cooperation in structured populations. *J. R. Soc. Interface*, *20*: 20220653
3. Ehret, S., Constantino, S. M., Weber, E. U., Efferson, C., & Vogt, S. (2022). Group identities can undermine social tipping after intervention. *Nature human behaviour*, 1-11.
4. Efferson, C., Vogt, S., & Fehr, E. (2020). The promise and the peril of using social influence to reverse harmful traditions. *Nature human behaviour*, *4*(1), 55-68.

Contribution to the aims and success indicators of ENLENS

A. This research will seed an interdisciplinary framework for designing and implementing targeted interventions that promote sustainable (energy) transitions. After this abstract research phase, the project aims to refine and validate the models and strategies through novel experiments, and then engage various stakeholders in larger grants to facilitate the real-world application of research findings and the long-term sustainability of the project. The seed money provided by ENLENS will foster collaboration between the Computational Science Lab @IvI, the Center for Research in Experimental Economics and Political Decision-making @ASE, and stimulate existing collaboration with Princeton University and the College of Social Sciences and Humanities at Northeastern University, USA.

B. This project contributes to the UvA-community of interdisciplinary research and ENLENS by bringing together expertise from computational science, microeconomics, ethics, psychology, and sociology. By addressing complex aspects of energy transitions — identifying effective policies that promote renewable energy adoption and a more inclusive energy transition — the research highlights the importance of a collaborative and interdisciplinary approach to tackling sustainability challenges and aligns with ENLENS's vision of fostering innovative solutions for sustainable development.

C. The project will broaden the community beyond the PIs by focusing on:
Outreach and dissemination: The project will contribute to ENLENS and UvA-Sustainability outreach by forging new collaborations, organizing seminars sharing research findings, and actively disseminating work through publications, conference presentations, and media engagement, showcasing the innovative and interdisciplinary nature of the research and its potential impact on sustainable energy transitions.
Collaboration with external stakeholders: A workshop and at future stages we will engage with stakeholders, fostering new collaborations that provide valuable insights, data, and resources for sustainable energy transitions. These partnerships will ensure the research remains relevant and applicable to the practical challenges faced by stakeholders in promoting sustainable energy transitions.
Links with education: The project will create opportunities for students to participate in interdisciplinary research and integrate findings into relevant courses, such as in the new Master's program Complex Systems and Policy, enriching the curriculum and raising awareness of interdisciplinary approaches to sustainability challenges. The models will be implemented in user-friendly interactions for education and communication purposes.

Budget

Personnel costs (researchers, assistants) (FNWI): €5,000
a. Project lead (PI): -
b. Research assistants: 2x€2,500
Justification: Two research assistants will help with model development and model implementation in a user-friendly way, adequate for education and communication purposes.

Travel expenses (for collaboration, conferences, research stay at NE) (FNWI): €5,000
a. Airfare: €2,500
b. Accommodation: €2,000
c. Local transportation and per diem: €500
Justification: Traveling will be used research stays of the involved PhD student either at Northeastern University or Princeton University, USA. This type of funding is not available for the PI or the student at the moment.

Equipment, software, and data acquisition (FNWI): €750
a. Computers time and software licenses: €500
b. Data acquisition and subscriptions: €250
Justification: Contribution to equipment and licences for the RAs will be necessary for the development of the user interface.

Workshop, seminar, and conference organization with workshop larger with outreach to the public/industry/municipality (FEB): €3,500
a. Venue rental: €-
b. Invited speaker fees and travel expenses: €3000
c. Promotional materials and catering: €500
Justification: We will organize a larger workshop with outreach to the public/industry/municipality.

Miscellaneous and contingency (FNWI): €1,250
a. Unforeseen expenses, such as additional travel or equipment costs: €1,250
Justification: Self-descriptive.

Total budget: €15,000