ENLENS: Energy Transition Through the **Len**s of **S**DGs

1. **Title:** How much biomass for the Dutch heat and electricity sector – and which, from where?

2. **Main applicant:** Elisabeth H. Krueger (e.h.krueger@uva.nl, assistant professor, FNWI-IBED)
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3. **Societal case**

The fuel-mix of a 'net zero CO2, no natural-gas' energy sector is highly uncertain. Especially choices on biomass, currently a key non-fossil resource, will depend on constraints of space and resources, technological innovation, and on socio-political dynamics: As most biomass is imported, contestation regards concerns on cross-boundary global trade networks, and implications for food security (SDG2) and aquatic and terrestrial biodiversity (SDG14&15). Current debates are confusing, as they do not distinguish between biomass flows and origins. We will contribute to a more informed debate by focussing on flows linking specific end uses and potential sources for these end uses.

We select three end uses on which experts' estimates of biomass demand differ, due to varying estimates of societal preferences regarding use of biomass rather than electrification in heat production, and on the role of biomass as one source for electricity generation (1): (i) *heat for industry* (estimates for 2050 demand vary from -100% and +280% compared with 2020); (ii) *heat for built environment and horticulture* (from -100% to +3544%) and (iii) *electricity generation* (from -100% to +218%). We will involve experts, Dutch and EU/global south NGOs, energy firms, etc (fig1), enabling us to clarify normative differences and explore agreements.

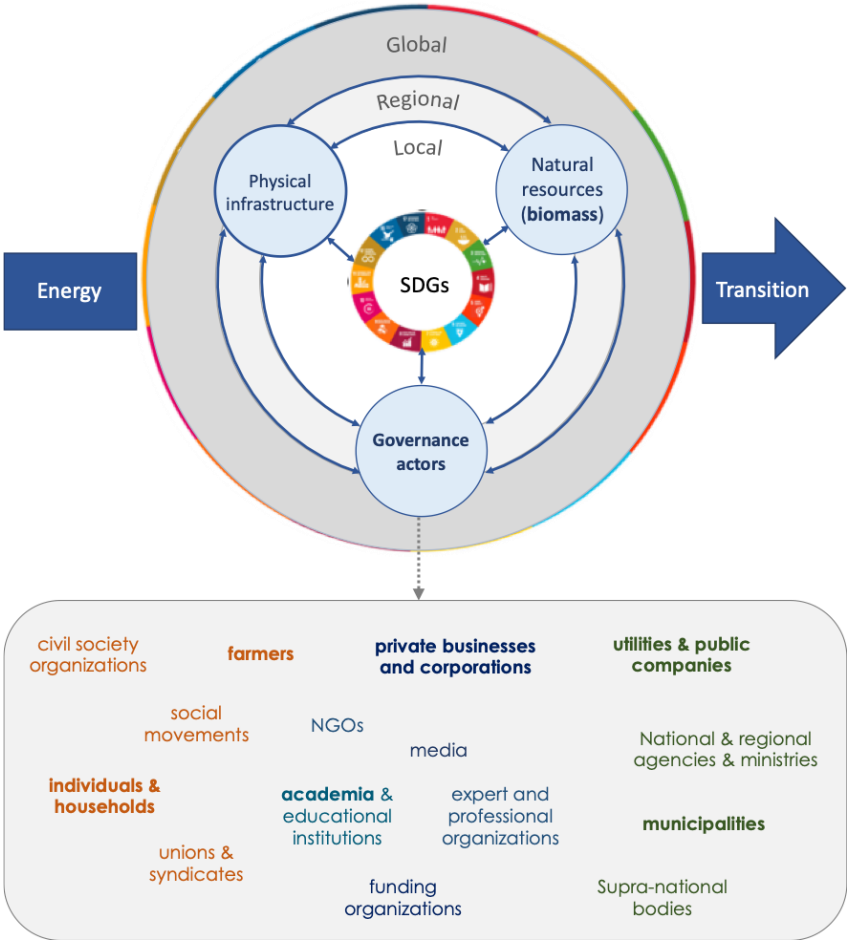

Figure 1: Cross-scale SETS approach with focus on stakeholders and the biomass sector.

4. **Scientific case**

Against this background, the central research question is: *What are the ramifications of the projected use of biomass in the Dutch heat and electricity sector across the SDGs, and along the entire supply chains; and what governance arrangements could provide the required warrants?*

As the interactions among natural, infrastructural and governance elements, and among the involved stakeholders along the supply chains will shape the demand for and use of biomass in the context of the energy transition (2, 3), it is critical to move beyond technology- and resource-based perspectives. Hence, we will conceptualize the energy transition within a social-ecological-technological system (SETS) governance context (see fig 1), as developed earlier for the water sector (4, 5), to analyze the specific supply chains available for certain end uses and technological choices and their SDG implications; and integrate it with interactive and collaborative modeling and design (6–8). Working with stakeholders in the sector, we will develop a discussion and design support system, apply it to typical cases, and propose an initial structuring of the societal debate and governance. Case studies will draw on secondary analysis of literature, document analysis, stakeholder involvement (interviews and a workshop), and analyse the data using mixed methods.

5. **Contribution to the aims and success indicators of ENLENS**

A. How will your project evolve after the proposal research/activity?

We plan to expand the method to be developed and lessons from exploratory studies on key cases regarding the biomass-for-heat-and-electricity sector to the energy sector at large, and to work with stakeholders in the sector to further establish a discussion and design support system. This work will contribute to the development of a broader effort on participatory research and modeling on the energy transition across faculty at UvA.

B. Why and how does your project contribute to the UvA-community of interdisciplinary research and ENLENS more specifically?

IBED ecologists will contribute their expertise on the environmental impacts of biomass production on soils, water, and ecosystems in different regions of the world, and trade-offs with biodiversity and food production, while social scientists from the AISSR will provide their expertise on governance and stakeholder interactions that determine the trajectory of the biomass sector in the Netherlands. We will embed this and follow-on in the interdisciplinary UvA-IAS, contributing to and drawing on its Futures of Energy initiative as a platform for substantive discussion and its POLDER (Policy Decision-support and Evidence-based Reasoning) Centre (https://polder.center/), which, like the proposed project, integrates complexity-based analysis and design with stakeholder involvement.

C. How will your project contribute to broadening the ENLENS community?

(C1:) As noted, we use a collaborative research approach, with stakeholders co-defining the analytical framework as well as co-design supply chains and governance. The IAS context will provide a consolidated platform for enrolling experts on SDG goals from various disciplines and consolidating this researchers-stakeholders network. (C2:) We will integrate this research into our respective teaching activities in the Earth Sciences MSc track Environmental Management, and involve Master students into this research as part of the student's course work, and can later be expanded to be the topic of their interdisciplinary Master thesis. (C3:) Outreach and dissemination through involved stakeholders, *Energeia*/*Tijdschrift Milieu* etc. and social media and public debate.

6. **Budget**

The requested 30 k€ will be used to pay for hiring a student research assistant to work across the two supervisors in IBED and AISSR (25 k€) and for a workshop (5 k€). It will serve

as seed money to strengthen the links across the two faculties, as well as across stakeholders in the POLDER platform.

References:

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