

## ENLENS: Energy Transition Through the Lens of SDGs

1. **Title: Carbon capture and utilization – the potential of keeping CO<sub>2</sub> as feedstock in the Netherlands**
2. **Main applicant:** Sonja Pullen ([s.pullen@uva.nl](mailto:s.pullen@uva.nl), assistant professor, FNWI)  
**Co-applicant:** Mark van der Veen ([M.L.vanderVeen@uva.nl](mailto:M.L.vanderVeen@uva.nl), associate professor, FEB)

3. **Societal case**

Society is facing a tremendous challenge as we are at the forefront of a transition from a fossil fuel-based society to one that runs on renewables. This not only involves the complete change of current energy supply systems, but also a complete reform of the chemical industry, as most industrial feedstocks currently stem from fossil resources. While alternative solutions are intensively researched and developed (e.g. “electrification of the industry”), the current systems will continue running for a while until they can be fully replaced by carbon neutral systems. Currently, the Netherlands and many other EU countries aim to mitigate the CO<sub>2</sub> emissions by its capture and storage in remote locations, often outside of the EU.<sup>1</sup> This does not only imply severe social and political consequences; also the economic potential of CO<sub>2</sub> as feedstock for the chemical industry is completely neglected in this scenario. Our research contributes directly to the SDGs 8, 9 and 13.

4. **Scientific case**

In order to evaluate and rationalize this view scientifically from different perspectives, within this ENLENS program we will address the following questions:

- 1) What are the main sources of CO<sub>2</sub> emissions in the Netherlands and what are the current strategies for mitigation?
- 2) What alternative strategies are available at what timeline and what are the anticipated financial cost and benefits?
- 3) What is the current political framework in the Netherlands around Carbon Capture and Storage versus Utilization?
- 4) How can we use this information to communicate our views to society and politicians, preventing rushed decisions?

We will address the abovementioned questions by an interdisciplinary approach, combining the perspectives of chemistry and economics. This will include a comprehensive literature review, interviews with experts in the field, and case studies of relevant processes. We will further take a look at running joint initiatives between industry and researchers.

Utilization of CO<sub>2</sub> ranges from its direct use in greenhouses to its conversion into base chemicals such as methanol, formic acid or cyclic carbonates. We will focus our study on the latter part, in order to investigate what are the minimum requirements (*i.e.*, efficiency, stability, scale) for novel catalytic processes for converting CO<sub>2</sub> into these chemicals in order to be competitive with exporting captured CO<sub>2</sub> and storing it underground.

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<sup>1</sup> POSITION PAPER DE WAARDE VAN KOOLSTOF IN HET NOORDZEEKANAALGEBIED,  
<https://www.noordzeekanaalgebied.nl/uploads/23-1051-koolstof-rapport-omgezet-spread-en-met-links-def.pdf>

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

*A. How will your project evolve after the research/activity. What is the long-term goal? (ENLENS aims at initializing new activities that may carry on thereafter (seed-money))*

The proposed research will provide important insights into current national strategies for CO<sub>2</sub> mitigation and evaluate the potential of alternative strategies, that integrate CO<sub>2</sub> capture and conversion into useful chemicals. The findings will contribute to the development of more informed and effective policies and strategies for transitioning to circular carbon industry, where emitted CO<sub>2</sub> is efficiently captured and fed back into chemical industry.

The long-term goal of this research project is to identify the best strategy for developing a circular carbon economy. With this seed project we will kick-start our interdisciplinary collaboration. We believe that coupling technological development closely with society and economics will ensure that the transition will succeed fast and efficient. Therefore, to continue joint research (and educational) efforts, we intent to seek larger funding in future.

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

As an interdisciplinary team of PIs from two different faculties (business and natural science), we will stimulate interdisciplinary research across our faculties to highlight different aspects of the complex problem from both our viewpoints. Mitigation of CO<sub>2</sub> emissions is a central part of the energy transition according to sustainable development goals, and our project will thus be a key stepstone of the ENLENS program.

*C. ENLENS aims at broadening the community beyond the group of project PIs. Describe how your project will contribute to this goal*

The results of our study will be published as a white paper, which shall serve as a guide for Dutch and international policy makers, but also investors and funding agencies. In addition, shorter focused academic publications and/or newspaper articles may be published during the project to inform the public about our findings. We will contribute to ENLENS activities such as the Future of Energy seminar series, and communicate the results also on the ENLENS website. We will further reach out to our existing networks like AMCEL for whom this work has a direct relevance. And we will connect to other ENLENS initiatives.

## 6. Budget

For each of the three involved faculties (FEB and FNWI), we request a budget of 15k€ to be used as follows: We aim to hire two (part time) student research assistants from the honors programs (one from each faculty) to assist in the technological and socio-economic analysis. We aim to start as soon as possible after the decision for the call has been taken. The project will be spread over 1 year to allow enough time for the development of the analytical framework, collection of empirical data and publication of a white paper.

We will be in close contact and have regular meetings throughout the whole project time. The interdisciplinary nature of the project makes it difficult to find funding from other sources.