Research group: Sostenipra

Institute of Environmental Science and Technology·UAE

SENTINEL — SUSTAINABLE ENERGY TRANSITIONS

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Supervisor:
Dr. Cristina Madrid López

Advancing environmental assessments for renewable energy planning

The policies that guide the renewable energy transition is informed by energy system optimization models (ESOM). ESOMs hardly ever include any environmental parameters and when they do, it is only GHG emissions. In Spain, the national energy plan (PNIEC 2021-2030) has been developed using an adaptation of the TIMES ESOM that does not consider environmental impacts such as raw material extraction or water use. ENVIRO is an environmental assessment tool developed in the H2020 Project SENTINEL that complements ESOMs and that will be used to assess the strategies proposed in PNIEC.

In this TFM the student will assess a wide range of environmental impacts of renewable energy sources (photovoltaic (PV), thermosolar (TS), wind, geothermal or biomass) with the objective of assessing the sustainability of the energy decarbonization strategies proposed in PNIEC. This study will help to develop the ENVIRO module and will be supported by the data and models developed within the SENTINEL Project. (www.sentinel.energy)

We will answer questions such as: What is the environmental impact of increasing solar energy in the electricity mix of Spain? Or of increasing the electric vehicle fleet? What are the environmental trade offs of installing thermosolar panels in buildings?

Main aim: To check the environmental feasibility of PNIEC scenarios of implementation renewable energy technological innovation

Main Tasks:

1. To perform a literature review on the environmental impacts on PV and TS.
2. To create Life Cycle inventories (System processes) for PV and TS energy technologies in different locations and for different innovations
3. To develop data input for ENVIRO covering scenarios of PV and TS implementation in PNIEC
4. To perform an LCIA of the selected technologies using OpenLCA or Brigthway2
5. To perform the MuSIASEM of the selected scenarios of implementation
6. To write a paper for submission in a peer-review journal.

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Advancing environmental assessments for energy planning- impact assessment coefficient library

The policies that guide the renewable energy transition is informed by energy system optimization models (ESOM). ESOMs hardly ever include any environmental parameters and when they do, it is only GHG emissions. This results in the exclusión of other environmental impacts such as water use, raw material extraction or biodiversity loss from the list of parameters used to design the future clean energy pathways. ENVIRO is an environmental assessment tool developed in the H2020 Project SENTINEL that complements ESOMs.

In this TFM the student **will develop a LCIA coefficient database of selected technologies** to be included in the internal structure of the ENVIRO module. This study will help to develop the ENVIRO module and will be supported by the colleagues of the SENTINEL Project. (www.sentinel.energy)

Main aim: To built a LCIA coefficient database to feed the internal modelling of ENVIRO

Main Tasks:
1. To review geothermal , wind, solar and biomass energy related LCI data in Gabi, Ecoinvent, NEXUS and other LCI databases
2. To create Life Cycle inventories (System processes) for different technological innovations using Open LCA or Brigthway2
3. To create the pool of LCIA methods to be used in the calculation of the coefficients
4. To create the LCIA coefficient database
5. To Calibrate the database using current case studies of the SENTINEL Project
6. To write a paper for submission in a peer-review journal.

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Research topic: The use of materials in new technology products (TFM9)

- Research line: Resource management for a Circular Economy
- Research group: Sostenipra

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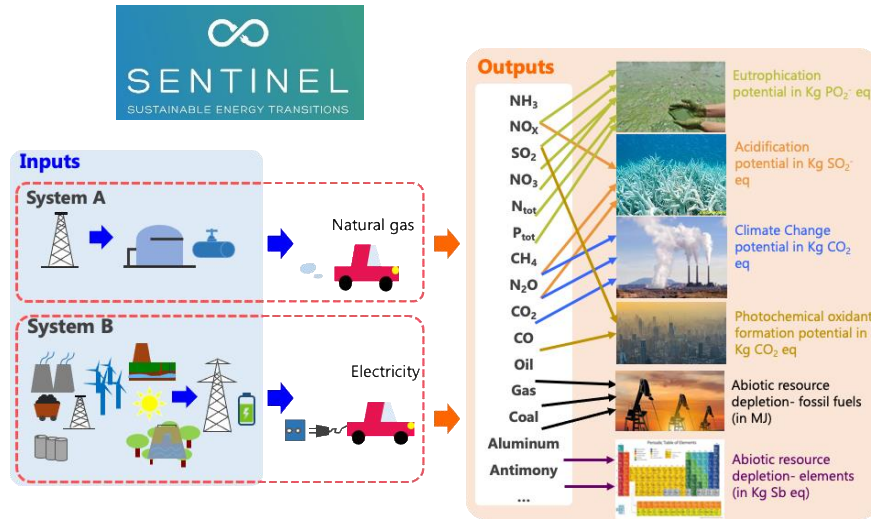
Advancing on the modeling of raw materials and their potential environmental impacts in Energy System Models (ESM)

Europe aims to become climate neutral by 2050. About 75% of the EU's greenhouse gas emissions are generated by the production and use of energy. Increasing the share of renewable energy sources is crucial to meet the 2050 goal. However, current ESM do not reflect on the potential environmental impacts, especially those related to raw materials availability.

Within the EU project SENTINEL, ICTA-UAB is developing a modelling tool called ENVIRO. ENVIRO combines Life Cycle Assessment (LCA) principles within a Multi-Scale Integrated Assessment of Socio-Ecosystem Metabolism (MUSIASEM). In this Master Thesis, the student will help build up a library of Life cycle inventories related to renewable technologies and discuss about LCA indicators that can help monitor the potential environmental impacts in a 2050 energy scenario.

Main aim: To generate new LCI datasets for the assessment of renewable technologies in ENVIRO

MAIN TASKS:

1) To review LC inventories for background systems (materials important for energy technologies) and foreground systems (renewable energy technologies) available in Ecoinvent 3.7, Gabi and other databases as GLAD.

2) To perform a literature survey and collect LCI published in peer-review journals.

3) To generate the life cycle inventory data in DoSE-LCADB, and advance on the import/export of data to other tools and software, for the ENVIRO library.

4) To review LC indicators for resource use, and to suggest potential improvements.

5) To write a peer-review paper for submission in a peer-review journal.

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