Designing sustainable and acceptable DAC carbon removal systems in territories

IFPEN-ESTIA Thesis
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CONTEXT

- Direct air capture (DAC) is considered essential to remove CO_2.
- However, as these facilities scale up to the kilometre level, their deployment strongly influences territories:
  - Land footprint
  - Energy and water consumption
  - Materials use
  - Societal perception issues and risks
  - Co-activity and job creation
  - Territory supplying carbon removal services (CDR)
  - Climate action
  - Sovereign territory in renewable CO_2
- Hence the need, from the outset, to have tools and frameworks to design sustainable and socially acceptable DAC systems through an ***eco-innovation*** approach.

IFPEN and ESTIA invite you to become a pilot partner of a thesis to create a territorial eco-innovation framework *for DAC systems, in partnership with public, industrial and civil society stakeholders.*

This thesis aims to **co-design**, with pilot territories and their stakeholders, a **Territorial Eco-Innovation Framework** dedicated to DAC, as well as **decision-support tools** to guide the deployment of these technologies in territories.



👉 **Join the stakeholder committee!**

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The approach

OBJECTIVE

Design a territorial eco-innovation framework to steer DAC product-service systems towards sustainable and socially acceptable trajectories from the upstream phases.

METHODOLOGY

Theoretical review on DAC, territorial eco-innovation and societal perception.

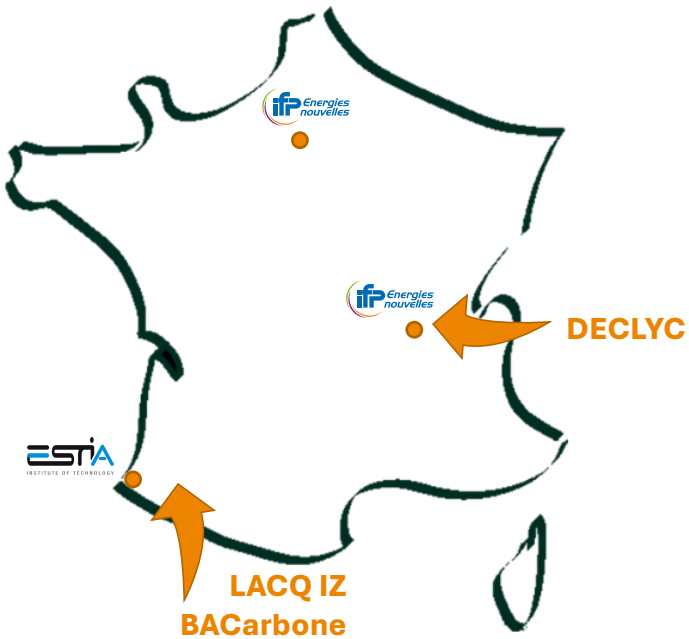
Ex-ante diagnosis of DAC impacts (territorial LCA type: land, water, energy, etc.).

Co-construction of the framework with stakeholders (workshops, exchanges, lessons learned).

Validation through tests/experiments: confronting the eco-innovation framework with concrete cases, iterating towards a more operational version.

An approach is carried out in partnership with pilot territories and their local stakeholders to use real field data.

Pilot territories and partner network



The network of pilot partners is set to expand to include **public and industrial stakeholders**, and **civil society** from the territories concerned.

ZIBaC = industrial and territorial grouping united to reduce its greenhouse gas emissions.

DECLYC for the Lyon region and LACQ IZ BACarbone for Lacq

Deliverables and benefits



A Territorial Eco-Innovation Framework for DAC, with an initial version then enriched.

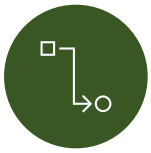


Prototype decision-support tools to:

- analyze the territorial impacts of DAC,
- integrate local resources and stakeholders.



Scientific publications, which strengthen the credibility of the approach.



Trajectories to reduce local impacts (water, energy, pollution).



Anticipating controversies around DAC.



Stronger integration of local stakeholders in deployment trajectories.



More sustainable DAC deployment, better aligned with territorial issues.

Benefits for partners

Public authorities

- Practical recommendations to frame the deployment of DAC in their territory.
- Tools to assess the environmental territorial impacts of DAC projects *ex ante*.
- A possible contribution to a common framework to guide planning and development decisions.

Industry

- Deployment guides to design DAC projects:
  - better integrated into territories,
  - more robust in terms of resources,
  - more socially acceptable.
- Decision-support tools to choose less risky siting trajectories (use conflicts, local controversies).

Civil society

- Participation in the co-construction of the Territorial Eco-Innovation Framework, with the possibility of integrating their concerns into a framework that will structure DAC projects.
- Access to elements for understanding and discussing future DAC projects, based on a territorial and social analysis.
- Contribution to defining socially acceptable trajectories for DAC.

Why become a pilot partner?

As a pilot partner:

- you actively contribute to the **co-construction** of the framework and tools,
- and you benefit from **feedback** that could feed your territorial and/or industrial challenges.



In practice, what does the stakeholder committee do?

- Participation in exchange and co-construction workshops;
- Regular exchanges with the doctoral student to share your expertise, vision and challenges;
- Contribution to steering the project through feedback on the work;
- Participation in follow-up webinars to learn about progress and discuss results.

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