

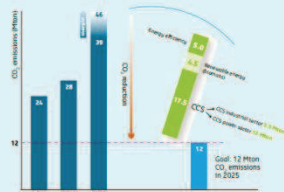


CCS and the barriers for its fully deployment in the Port of Rotterdam

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Introduction

The Rotterdam Climate Initiative (RCI) has the ambitious of reducing 50% of its CO₂ emissions by 2025 while promoting the economy in the Rotterdam region. CCS plays a vital role in achieving this goal: it'll be responsible for about 65% of CO₂ emissions reductions.



Research Goal

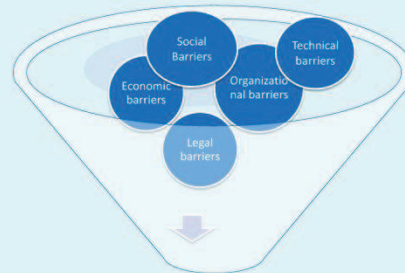
CCS is a complex project with many interviewing factors. Besides the high interest of major public and private players, the lack of knowledge about these factors impose barriers for a fully successful implementation of CCS.

Research aim: identify and assess the main barriers for developing CCS from the perspective of different types of stakeholders. Which barriers are more important and how they influence each other.

Scientific contribution: improve the understanding of project complexity from the point-of-view of a project that is on early phase of development.

Methodology

Literature Review:



Short list with 7 main barriers from literature

Survey with CCS experts

Ranking of the barriers (AHP model)

Mutual influence of the barriers (DEMATEL model)

Strategies to better manage CCS barriers

Relevance for PoR

- Identification of the main bottlenecks and the most influential factors affecting CCS projects;
- Development of a better framework for the decision-making evaluation process.;
- Development of strategies to better manage CCS projects and to more efficiently and effectively allocate resources.



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Curriculum Vitae:

Juliana Sara da Silva has a background in chemical engineering and an Erasmus Mundus Master in environmental studies. During her career, she worked as a trainee in a steel industry and then worked two years and a half in project departments of chemical industries, being my last job at Dow Chemical. During this period, she also concluded a MBA in Administration. Currently she is in her third year of her Erasmus Mundus PhD program in Sustainable Energy Technologies and Strategies (SETS) with association with the University of Comillas, in Madrid and the Royal Institute of Technology, in Stockholm.

Juliana is supervised by Prof. Dr. Paulien Herder and Dr. ir. Rob Stikkelman.

Research:

In the Netherlands, the Port of Rotterdam, whose industries are responsible for 85% of CO₂ emissions in the area, have an ambitious CO₂ reduction target. Envisioning keeping its lead position during the energy transition to sustainable energy economy, the port aims at realizing 50% reduction by 2025 compared to 1990. Around 65% of this amount is expected to be achieved via CCS initiatives.

However, implementing CCS is not an easy task. CCS is a complex project, characterized as having several intertwining factors, which hinders a successful development and implementation process and makes the outcomes difficult to predict. These complex factors, here defined as barriers, exist and impose hard constraints for a proper continuation of the project. The consequence is that, even with a high interest of major public and private players, CCS initiatives in the Port of Rotterdam are still in the beginning phase.

In terms of scientific gap, I've observed that most researches focus their studies on project complexity only of projects that have already finished or are in advanced stages, such as during front-end development (FED) phase. It's missing in literature a proper understanding and analysis of the factors affecting complexity of projects on very early stage of development, when several unknowns, uncertainties and risks are involved.

Another limitation of the current literature is the lack of studies that quantitatively prioritize and analyze the interactions among the several complex factors and dimensions. In a complex system, different factors, which are connected directly or indirectly, may have different reasons: economic, technological, regulatory, social.. Each of them with different influence, importance and impact on the system.

They are very diverse and difficult to assess. Under the constraints of limited resources (information, budget, knowledge, manpower, time), there are no action that can overcome all these barriers simultaneously. A sort of prioritization is needed. An appropriate decision-making (DM) approach is then necessary to prioritize these barriers and allocate resources more efficiently and effective.

Therefore, the purpose of my research is twofold. First I aim at understanding complexity from the point-of-view of a project that is on early phase of development. For that, I'm analyzing CCS projects being developed in the Port of Rotterdam. My objective is to identify and assess the main complex factors that can be considered barriers for the development and implementation of CCS from the perspective of different stakeholders. I believe that divergent points-of-view can seriously jeopardize the progress of the CCS project, once that a consensus during the decision-making process is more difficult to be achieved.

Second, I want to determine which complex factors are the most important ones and how they influence each other. For that, I'll apply a hybrid multi-criteria decision method (MCDM), combining two quantitative methods: the Analytic Hierarchy Process (AHP) and the Decision Making Trial and Evaluation Laboratory (DEMATEL). AHP is applied to prioritize and rank complex factors in terms of their contribution to complexity of CCS projects. DEMATEL is used to define and describe the interactive relations and dependences between the different factors via a causal-effect relationship map. These methods are able to quantify the subjective judgment of decision makers in a way that can be measured and evaluated. In the end, I'll conduct a series of interviews where strategies to better manage these barriers are discussed and developed.

The proposed methodology can be highly benefit the take-off of CCS projects in the Port of Rotterdam. The outcome of my research can help decision-makers to identify the main bottlenecks as well as the most influential factors affecting CCS projects, developing a better framework for the decision-making evaluation process. Thus, strategies can be designed to better manage these projects and resources can be more efficiently and effectively allocated.