Co-funded by the European Union

Carbon Rhine Route (CO_2RR)

Establishing the first commercial international multi-modal CO_2 removal value chain in Europe

Risk mapping workshop – Briefing

26 June 2024

With participation of the Swiss Federal Office for the Environment

Regionalwerke Baden

Airfix

Carbon Impact

ChemOil Logistics AG

Northern Lights

south pole The Climate Company

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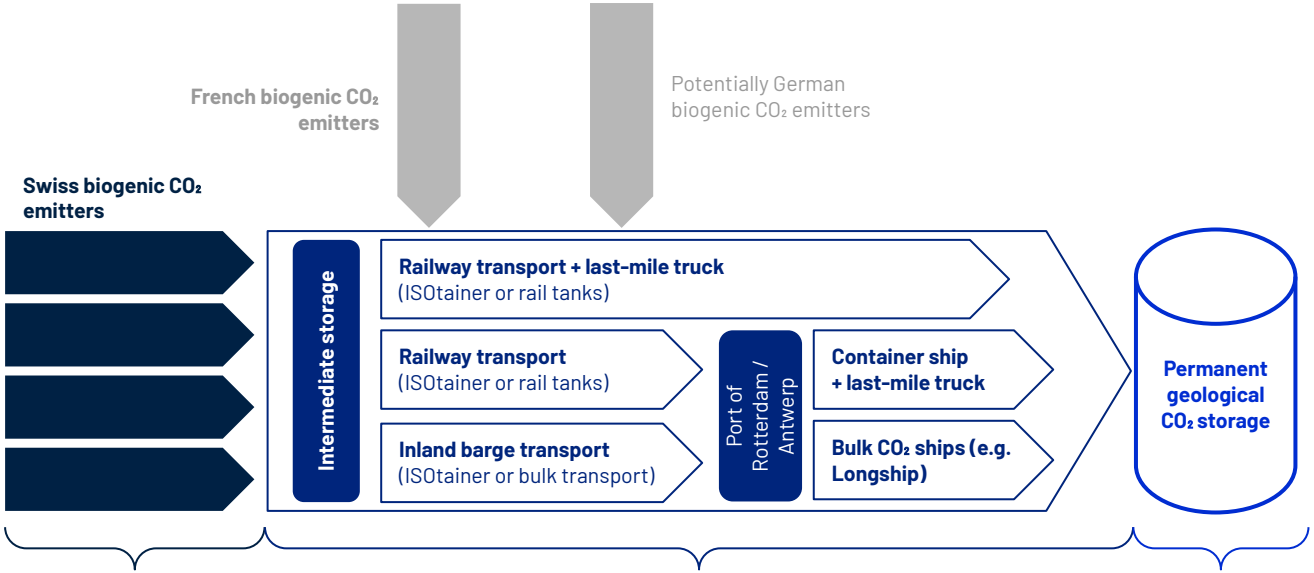
Indicative agenda

10 mins	Background and introduction
10 mins	Risk identification – discussion
45 mins	Risk mapping – impact and probability
45 mins	Risk mitigation – strategy and measures
10 mins	Next steps

Project objectives and approach

By establishing the first commercial international multi-modal CO_2 transport value chain in Europe, the project will demonstrate the feasibility and viability of creating such value chains for all parties, with an innovative focus on resolving the issues around business models and risk sharing, and ensuring all parties have the incentive to continuously improve the efficiency of the value chain from a cost and emissions perspective.



WP 1 – Onboard emitters and establish a roadmap to sequester 1 million tCO_2 by 2030

WP 2 – Establish framework agreements for onshore & offshore transport to storage sites

WP 3 – Establish the framework agreement for geological CO_2 storage

WP 4 – Develop innovative business models and risk sharing structures

WP 5 – Reporting and knowledge community

WP4: Innovative business models and risk-sharing structures

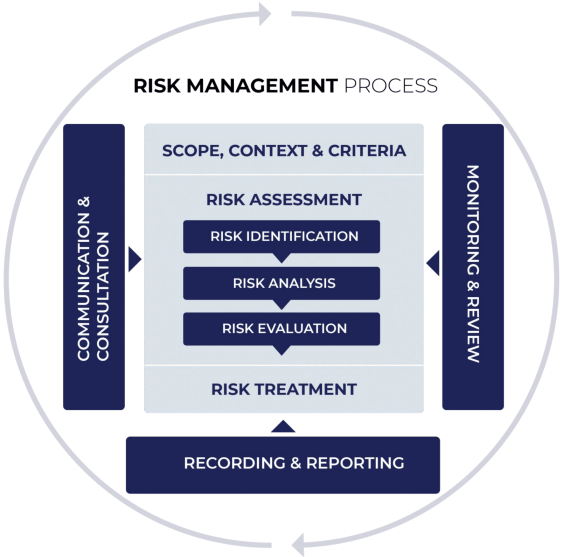
A transversal WP, integrating emitters and T&S providers. And focusing on financial viability.

- ➔ In context of WP4 (*cf notes for further info*), and as first step to developing innovative business models and risk-sharing mechanisms, the aim is to identify and map risks across the CO_2 value chain.
- ➔ Because of time constraints, this workshop will only cover the identification and mapping of risks.
- ➔ The assessment of risks, including mitigation strategy, will have to be covered in a follow-up session.

Risk management process

The ISO 31000 standard on risk management defines six steps for the risk management process that provide general guidance on how to effectively identify, analyze and assess risks.

1. **Communication and consultation**: Ongoing involvement and information of relevant stakeholders to make informed decisions and involving different disciplines.
2. **Scope, context and criteria**: Defining objectives and understanding external and internal factors, developing risk criteria to use in the assessment.
3. **Risk assessment**: Identifying, analyzing and prioritizing risks by understanding uncertainties, consequences and probabilities.
4. **Risk treatment**: Selecting and implementing actions to minimize, avoid, share, transfer or accept risks.
5. **Monitoring and review**: Continuously monitoring performance and periodically reviewing to adapt to changes in the environment and ensure objectives are achieved.
6. **Recording and reporting**: Documenting and communicating the process and its results to inform management and stakeholders, including new risks and recommendations for improvement.



Source: Advisera

Risk management for BECCS/BiCRS projects

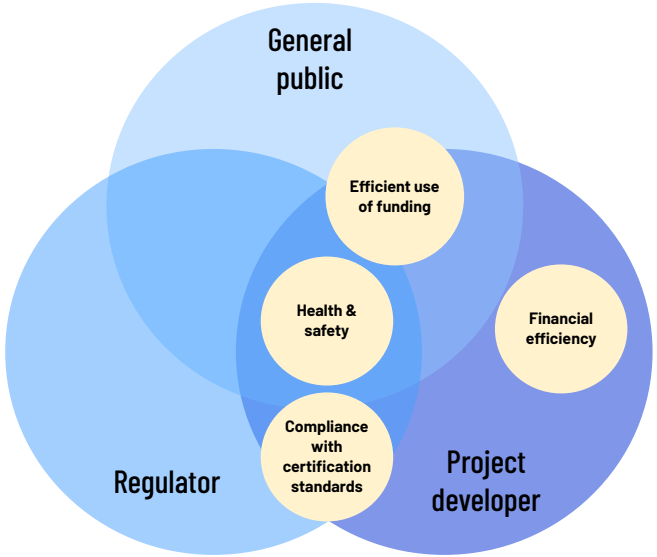
- **In the context of BECCS projects, risks exist across the value chain (capture, transport, storage) and the entire project life cycle (from planning to long-term storage).**
- A more robust risk assessment can allows stakeholders to understand how decisions, mitigation measures or events in one part of the system can affect risks in other parts.
- **Discussions about risks in the BECCS field are often confusing due to differing views on what risk means and which risks are of interest.**
- The analysis should be conducted based on the needs of the stakeholders. To understand these, four broad categories of interest must be considered:
    1. **BECCS value chain**: Which part of the capture-transport-storage system?
    2. **Time frame**: Which step of the project life cycle?
    3. **Risk aspects**: Which category of risks?
    4. **Metrics**: Which metrics are used?

Stakeholder	Value chain	Project life cycle	Risk category	Metric
Regulatory authorities Project developers Service providers General public ...	Capture Transport Storage Certification	Planning Construction Operation Post-closure	Technical Regulatory Economic Health & safety ...	EUR EUR/tCO_2 Lost CO_2 Rankings

Source: M.C. Gerstenberger et. al. (2012)

Different and overlapping requirements

- Different stakeholders may have different or overlapping requirements.
  - These differences also extend to the level of detail required and the way in which this is communicated.
- An important outcome of the risk analysis should be to effectively communicate that the risks have been thoroughly considered and potential risks are well understood.



Source: M.C. Gerstenberger et. al. (2012)

Risk taxonomy for the CO2 value chain

Status	Risk type	Phase	Risk category	Main impact	Probability	Impact	Mitigation strategy
Active	Threat	1 - Construction	1 - Regulatory and political	Cost	1 - Rare	1 - Insignificant	Avoid
Dormant	Opportunity	2 - Operation	2 - General market	Price	2 - Unlikely	2 - Minor	Reduce or mitigate
Retired		3 - Construction and operation	3 - Financial	Scope	3 - Possible	4 - Moderate	Transfer
		4 - Post closure	4 - Project management	Quality	4 - Likely	8 - Large	Accept
			5 - Technological		5 - Very likely	16 - Very large	
			6 - Supplier				
			7 - CDR demand				
			8 - Stakeholder and reputational				
			9 - Health & safety				
			10 - Environmental				
			11 - O&M				
			12 - Transport				
			13 - Storage				
			14 - Societal				