

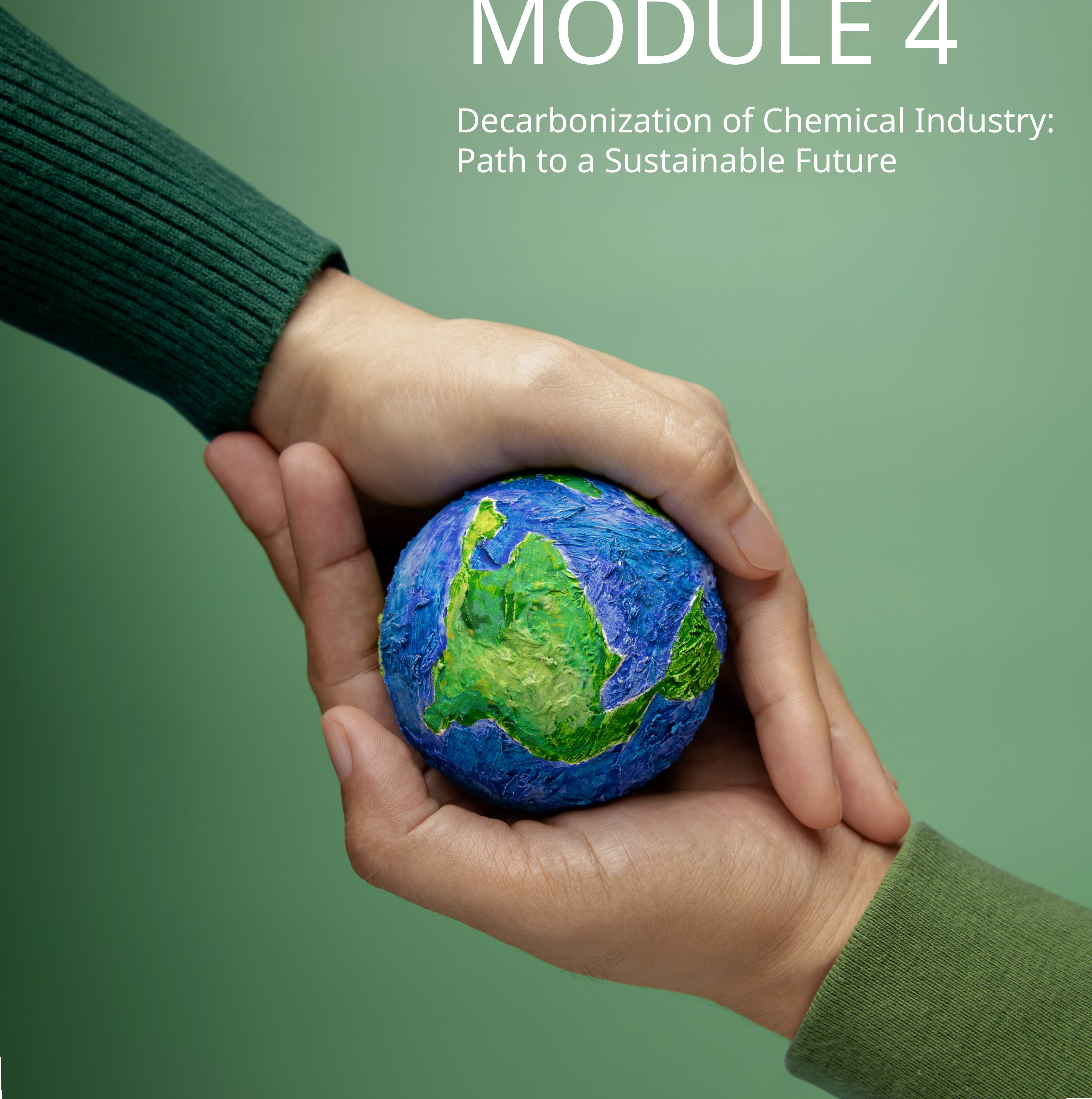


Ministry of Ecology and Natural
Resources of the Republic of
Kazakhstan



MODULE 4

Decarbonization of Chemical Industry:
Path to a Sustainable Future



Educational Module: "Decarbonization of the Chemical Industry: Path to a Sustainable Future"

Module Objective: Develop participants' awareness of the importance and urgency of decarbonizing the chemical industry in Kazakhstan, provide an understanding of key sources of greenhouse gas emissions, present methods for assessing decarbonization and climate risks, and offer an overview of the most effective measures and technologies for achieving sustainability.

Expected Outcomes:

By the end of the module, participants will be able to:

- Identify the main sources of greenhouse gas emissions in the chemical industry of Kazakhstan.
- Evaluate and interpret target indicators and decarbonization metrics in the industry.
- Determine the most significant climate risks for companies in this sector.
- Analyze and compare various measures and technological solutions for decarbonization in both the short-term and long-term perspectives.

Organizational Forms:

- Lectures: Presentation of information on decarbonization, sources of emissions, and target indicators.
- Group Discussions: Discussion of climate risks and their prioritization for companies in the sector.
- Case Studies and Examples: Analysis of successful practices by companies implementing decarbonization projects.
- Interactive Surveys: Assessment of participants' understanding and readiness to implement decarbonization.

Content:

Informational-Theoretical Part:

1. **Introduction to decarbonization:** The importance of reducing greenhouse gas emissions in the context of climate change and the sustainability of industrial sectors
2. **Major sources of emissions:** An overview of the stages of extraction, processing, and transportation that affect the level of carbon emissions.
3. **Target indicators and metrics:** Presentation of decarbonization metrics, measurement methods, and their significance for tracking success.

Practical part:

1. **Climate risk assessment:** Group work to identify and prioritize the most significant climate risks for companies in the chemical industry.
Analysis of Measures and Technologies: Discussion and comparison of various technological and strategic solutions for reducing emissions in the short-term and long-term.
2. **Development of Decarbonization Plans:** Developing practical action plans for implementing measures and technologies within companies, considering climate risks and unique characteristics.

Conclusion:

Summary of the Module: Emphasis on the importance of each company's involvement in the decarbonization process to achieve sustainability and reduce negative impacts on the environment and climate.

Detailed content:

"The Concept of Decarbonization and Climate Challenges in the Chemical Industry"

The lecture will present current data on the impact of the chemical industry on climate and greenhouse gases. Participants will learn about the main sources of emissions associated with various stages of production, as well as the climate risks that could affect business stability.

Part 1: Introduction to Decarbonization and Its Significance

- **Definition of Decarbonization:** Explanation of the concept of decarbonization as the process of reducing greenhouse gas emissions (primarily carbon dioxide) to mitigate climate change and achieve sustainable development.
- **Importance of Decarbonization in the Chemical Industry:** Discussion of the role of the chemical industry in climate change, major sources of greenhouse gas emissions, and the urgency of taking action.

Part 2: Climate Challenges and Their Impact on the Industry

- **Key Climate Challenges:** Overview of the main climate challenges facing the chemical industry, including changes in weather conditions, environmental regulations, and resource instability.
- **Examples of Companies and Issues:** Presentation of real-life examples of companies that have faced climate challenges, such as production shutdowns due to weather disasters or shifts in legislation.

Part 3: Decarbonization Goals in the Chemical Industry

- **Key Goals of Decarbonization:** Discussion of the main decarbonization goals for the chemical industry, such as reducing energy consumption, transitioning to clean energy sources, and optimizing processes.
- **Examples of Successful Decarbonization Goals:** Presentation of examples of companies that have successfully set and achieved their decarbonization goals, including reductions in emissions and improvements in efficiency.

Part 4: Sources of Decarbonization Funding

- **Investments and Financing:** Examination of various funding sources for implementing decarbonization measures, including internal investments, government support, subsidies, and private investors.
- **Green Bonds and Standards:** Overview of the concept of "green bonds" and other financing mechanisms aimed at environmentally sustainable projects. Mention of standards and certifications to verify decarbonization efforts.

Conclusion:

Summary Overview: Key concepts and ideas presented in the lecture, highlighting the importance of understanding climate challenges and the urgency of implementing decarbonization measures in the chemical industry. A concluding statement on how participants can contribute to this process and the significance of these efforts for the future of the industry and the planet as a whole.

2 Group Work "Identification and Prioritization of Climate Risks"

Group Work "Identification and Prioritization of Climate Risks" is a key part of the seminar on decarbonization of the chemical industry. Its goal is to facilitate the analysis and understanding of the most significant climate risks facing the industry, as well as to develop a strategy for prioritizing actions to mitigate these risks. The group work will include the following stages and questions:

Stage 1: Identification of Climate Risks

At this stage, participants should identify a wide range of potential climate risks that could impact the chemical industry. This may include:

- **Changes in Weather Conditions:** What extreme weather events (floods, droughts) could impact operations and infrastructure?
- **Changes in Water Resource Availability:** How might changes in water levels and availability affect the production process?

- Environmental Regulations: How changes in environmental regulations and legislation might impact the chemical industry?
- Shifts in Resource Demand: How changes in the global economy and consumer demand might affect the market for your products?

Stage 2: Assessment of Risk Significance

After identifying the risks, participants should assess their significance in terms of impact on business and the environment.

Discussion questions may include:

- What is the likelihood of each risk occurring?
- What could be the potential consequences for operations, safety, and the company's reputation?
- Which risks may have the greatest impact on greenhouse gas emissions?
- Which risks are long-term, and which might manifest in the near future?

Step 3: Risk Prioritisation and Strategy Development

At this stage, participants select the most significant and likely risks and determine priority measures for managing them.

Discussion questions:

- Which of the identified risks should be considered the most critical for the company?
- What actions and measures can reduce the impact of these risks on operations?
- What innovative technologies and approaches can help minimize these risks?
- What is the optimal sequence and timeline for implementing these measures?

Stage 4: Presentation and Discussion of Results

Each group presents the results of their work, discusses them with other seminar participants, and receives feedback. This creates a platform for exchanging ideas and best practices for managing climate risks in the chemical industry.



Group Work "Identifying and Prioritizing Climate Risks" helps participants gain a deeper understanding of the climate challenges that may impact their companies and how to develop the most effective strategies for decarbonization and sustainable development.

Lecture "Decarbonization of the Chemical Industry: Technologies and Pathways to Emission Reduction"

This lecture will provide an in-depth overview of the most effective and applicable technologies for decarbonization. Special attention will be given to both short-term measures and long-term strategies that will help the industry reduce its carbon footprint.

Part 1: Technological Pathways to Decarbonization

- Green Chemistry: Introduction to the concept of green chemistry and the use of biodegradable, renewable, and biocompatible materials.
- Low Carbon Footprint Processes: Discussion of technologies that reduce carbon emissions in production processes.
- Electrolysis and Hydrogen Processes: Overview of the role of hydrogen as a green energy carrier and its applications in the chemical industry.

Part 2: Approaches to Assessment and Planning for Decarbonization

- Product Lifecycle: Examination of the methodology for lifecycle analysis to assess the carbon footprint.
- Strategic Planning: Approaches to developing decarbonization strategies for chemical industry companies.

Part 3: Examples of Successful Practices

Innovative Companies and Project: Presentation of Examples of Chemical Companies Successfully Implementing Decarbonization Technologies: SABIC (Saudi Arabia, EU), Evonik Industries (Germany), Dow Chemical Company (USA + 160 countries)

Part 4: Challenges and Perspectives

- Technical and Economic Challenges: Analysis of the challenges companies face when implementing new technologies.
- The Future of Decarbonization in the Chemical Industry: Discussion of prospects and trends in the development of clean and efficient technologies.

Conclusion: Summary of the Lecture: Emphasis on the importance of adopting decarbonization measures in the chemical industry for sustainable development and reducing negative impacts on the environment and climate.

4. Digital Survey "Assessment of Readiness and Interest in Implementation"

After completing the module, participants will take an interactive survey to assess their understanding of decarbonization, readiness to implement new methods and technologies, and interest in collaboration and knowledge sharing in this area. Questions for the interactive survey:

- What processes lead to Scope 1 and 2 greenhouse gas emissions at your company?
- Does your company have established decarbonization goals?
- Assess the technical and economic feasibility of implementing decarbonization measures at your company (from 1 - low to 5 - high):
- What measures have already been implemented at your company?
- Assess the IMPACT that a risk may have on your company and the PROBABILITY that the risk will materialize (from 1 - low to 5 - high):

Action	Technologically possible	Economically justified
Transition to alternative energy sources		
Use of green hydrogen		
Carbon capture and storage		
Transition to alternative energy sources		

Risk	Impact	Possibility
Credit risk: Access to capital		
Regulatory risk: Stricter legislation		
Market risk: Taxation of imports		
Customer risk: Loss of markets		
Operational Risk: Changes in precipitation levels		
Operational Risk: Extreme temperatures		
Operational Risk: Extreme weather conditions		
Operational risk: Water scarcity		

5 Final Discussion and Action Plan

The module concludes with a discussion of the survey results and the development of an action plan. Participants exchange ideas on the steps each company can take to improve its environmental performance and long-term sustainability.

This educational module provides participants with a comprehensive understanding of the climate challenges associated with the chemical industry and trains them in practical methods for reducing greenhouse gas emissions. It allows participants to assess the current situation in their companies, exchange experiences, and build a knowledge base for making sustainable decisions in the future.