

Planet Positive Chemicals in Japan

Unlocking new roles of the Japanese chemical industry in achieving scope 1–3 net zero and safeguarding the Global Commons

One-page Summary

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Acknowledgements

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Japan International Research
Center for Agricultural
Sciences (JIRCAS)

This research was funded by Mitsubishi Chemical Corporation.

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One-page Summary

Introduction: Japan committed in 2020 to achieving net zero greenhouse gas (GHG) emission by 2050 and has since formulated a number of policies and laws to support the transition. Globally, businesses are pushing for net zero, including scope 3. However, the chemical industry, including Japan's, faces significant challenges arising from the need to deal with the carbon contained in most of its raw materials and products, among others. In addition, it must address other sustainability issues regarding the Planetary Boundaries¹ (e.g., plastic pollution and biosphere integrity) without shifting the burden from one category to another. Furthermore, the Japanese chemical industry must deal with limited renewable resources, a waste system reliant on incineration, and a declining population, while leveraging its strengths, such as its efficient waste collection system, generally supportive policies towards industry, and the large country economy.

Objective and methodology: In this report, we present four quantitative pathways for the Japanese chemical industry to achieve scope 1, 2, and 3 net zero emission, as supported by a peer-reviewed academic paper². In addition, we aim to provide insights into competitive strategies and corresponding actions by combining information derived from the pathways and existing knowledge of the Japanese chemical industry to serve as a bridge between the industry's current state and a desired future. This report covers seven basic chemicals, considering GHG emission from scopes 1, 2, and 3 (categories 1 and 12).

Key Findings: A combination of Japan's 20% population decline by 2050 on the one hand and circular economy measures in the downstream of the supply chain on the other could reduce the chemical demand. Although pathways are not forecasts, such a general trend urges the industry to seek alternative business approaches. Of the four net zero pathways, two rely on CCS and fossil feedstock; one extensively uses alternative feedstocks (e.g., recycles and bio-based feedstock) without CCS;

and the other uses both alternative feedstocks and CCS. By 2050, the production processes and feedstocks will undergo significant changes by retrofitting steam crackers and shifting to methanol-based processes. Although these measures will lead to higher costs for net zero chemicals in 2050, the impact on the production cost for consumer products in 2050 will be minimal. However, the biggest challenge is to overcome the current cost gap when renewable resources are still more expensive.

Recommendation: To achieve net zero, the chemical industry in Japan must secure key resources such as bio-based feedstock and CCS while maximising recycling, because access to these resources will determine the maximum possible supply of chemical products under scope 3 net zero for a company or country. After developing a new production process at a smaller scale using these new resources, leadership needs to be demonstrated for investment in a full-scale commercial plant, while collaborating externally to secure access to key resources, future demand through coalitions with downstream customers, and supportive policies. Japan can learn from past lessons in nurturing markets for "green" products and in investing in large-scale production facilities. Thus, industry reorganisation in the upstream chemical industry could accelerate this transition. The future role of the chemical industry and its value proposition may shift towards supporting climate change mitigation, adaptation, and plastic pollution prevention, as opposed to pursuing higher product performance at the expense of sustainability. As its traditional customer industries now seek to add more value through software than the hardware in which chemical products are used, this change underscores the need for the chemical industry to shift its role. Our recommendations may also apply to chemical industries in other countries and regions with similar constraints.

1 Rockström J. et al., Planetary Boundaries: Exploring the Safe Operating Space for Humanity. *Ecology and Society* 14(2): 32 (2009), <https://www.ecologyandsociety.org/vol14/iss2/art32>

2 Kanazawa D. et al., Scope 1, 2, and 3 Net Zero Pathways for the Chemical Industry in Japan, *Journal of Chemical Engineering of Japan*, 57, 2360900 (2024), <https://doi.org/10.1080/00219592.2024.2360900>

October 2024

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