



Technology assessment and design of new directions of innovation by adopting “Imaginary Future Generations” – a case study of hydrothermal technology

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Abstract

Professor Hara’s research group proposed a novel method for evaluating future potentiality of technologies by applying the concept of “Imaginary Future Generations (IFGs)”—an effective approach for examining current decision-making from the perspective of future generations. Using hydrothermal technology as a case study, they conducted a discussion experiment involving students and experts to evaluate the technology from both present and IFGs’ perspectives, thereby validating this methodology. The results revealed that compared to conventional evaluations looking forward from the present, adoption of IFGs qualitatively changed the content of the social implementation scenarios for hydrothermal technology. It also redefined the positioning and value of the technology within future societal scenarios, altering research and development requirements and the relative importance of evaluation indicators. Findings of the research demonstrated the significance and effectiveness of incorporating the perspective of IFGs into technology assessments to design the direction of technological innovation.

Significance of the research and Future perspective

Methods for evaluating the future potentiality of technologies and their impact on future society from a long-term perspective have not been sufficiently developed until now. The approach proposed in this study, incorporating the perspective of IFGs, should contribute to the development of a new methodology for multidimensionally assessing the future potentiality of promising technology seeds. It also aids in pioneering approaches for designing the direction of technological innovation from a sustainability perspective.

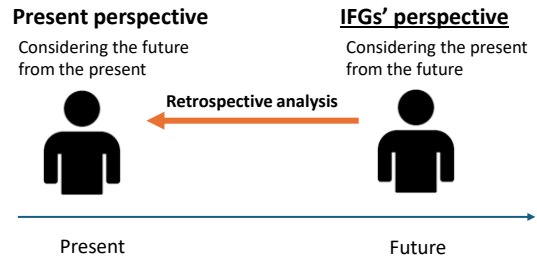


Fig. 1 Adoption of “Imaginary Future Generations (IFGs)”

Background & Results

Recently, research on “Future Design” has advanced, focusing on designing societal mechanisms to pass on a sustainable society to future generations. Among promising approaches, the concept of “Imaginary Future Generations (IFGs)” has been studied. Professor Hara’s group has shown the significance of introducing this mechanism in their previous research. This study builds upon these findings.

This study took “hydrothermal reactions,” a promising technology seed contributing to solving resource and energy issues, as its case study. A total of 23 participants—18 undergraduate and graduate students and 5 faculty members from the Interface Science and Technology Area, Division of Materials and Manufacturing Science, The University of Osaka (at the time)—took part in discussion experiments. They were divided into four groups and conducted four rounds of technology evaluation discussions. Group members remained fixed for all four sessions. Participants first examined the technology’s societal implementation scenarios and future potentiality from a “present perspective” (Session 1), then also considered it from the viewpoint of IFGs (Sessions 3 and 4). For the future potentiality evaluation, seven indicators were identified considering the technology’s characteristics. Participants completed questionnaires after each discussion session to assess the relative importance of each indicator.

The results showed that evaluation outcomes differed between assessments from the present perspective and those from the IFGs’ perspective. Furthermore, the IFGs approach suggested that it enables consideration of new societal implementation scenarios unconstrained by current limitations. It also indicated that the societal value and positioning of the technology become relativized, leading to changes in technology development requirements.

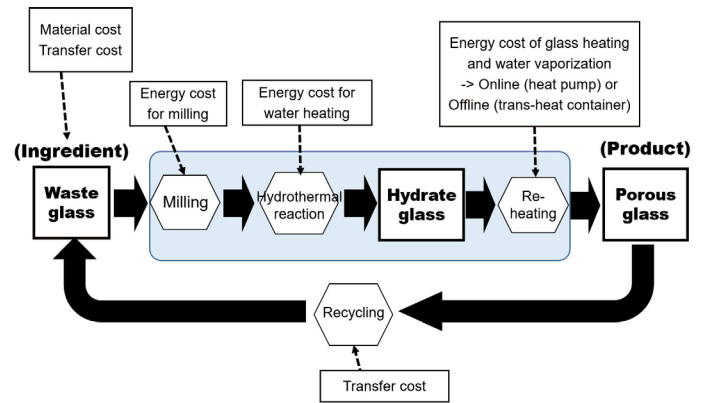


Fig. 2 Processes of manufacturing using hydrothermal technology¹⁾

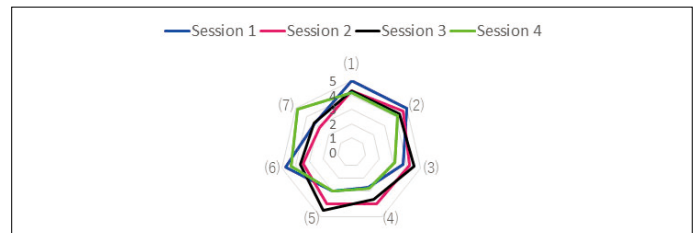


Fig. 3 Evaluation results for Group A (Comparison of the results from the four evaluations)¹⁾
* Evaluation using a 5-point scale (1–5 points) for 7 indicators. The average score per participant were calculated.

Patent

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Keyword

- 1) Hara, Keishiro; Miura, Iori; Suzuki, Masanori et al. Assessing future potentiality of technologies from the perspective of “Imaginary Future Generations” – a case study of hydrothermal technology. *Technological Forecasting and Social Change*. 2024, 202, 123289. doi: 10.1016/j.techfore.2024.123289
- 2) Hara, Keishiro; Arai, Takanobu; Liao, Ziyi et al. Designing research and development strategies for sustainable supply systems of rare metals from the perspective of “Imaginary Future Generations” – A participatory deliberation experiment. *Journal of Cleaner Production*. 2025, 486, 144445. doi: 10.1016/j.jclepro.2024.144445

(Hara Lab.): <https://www.cfi.eng.osaka-u.ac.jp/hara/en/>
(Hara Research Base for Future Design): <https://www.cfi.eng.osaka-u.ac.jp/fd-research/en/>

Future Design, Imaginary Future Generations, technology assessment, technology innovation, deliberation experiment