RIETI Discussion Paper Series 22-E-045

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https://www.rieti.go.jp/en/

RIETI Discussion Paper Series 22-E-045
May 2022

Changes in Perception and the Effects of Personal Attributes in Decision-making as Imaginary Future Generations: Evidence from Participatory Environmental Planning*

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Abstract

In this study, we conducted a Future Design deliberation workshop on the theme of the "3rd Environmental Master Plan" of Suita City, Osaka Prefecture, over four sessions in 2019, with the participation of both city residents and officials of the city government. To condition the deliberations of participants, we adopted the method of Imaginary Future Generations (IFGs) and analyzed its impact on their future vision of the city in 2050, policy options needed to shape that future, and changes in their perceptions. We also investigated how the adoption of IFGs affects the relationships between personal attributes and the changes in their perception. The results of variance analysis and multiple linear regression analysis based on data from the deliberations and questionnaire surveys of participants conducted after each session revealed the following: 1) The content and quality of the 2050 vision of society and policy options conceived from the perspective of the IFG differed from those conceived from the perspective of the current generation; 2) IFG heightened certain perceptions, such as "a sense of crisis about the future" and "a shared recognition of goals that are desirable for society as a whole"; and 3) Although the degree of "critical thinking", as a disposition of individuals, influences the heightening of perceptions in decision-making from the perspective of the current generation, when IFG is adopted, it seems that the degree of "critical thinking" is no longer a factor in heightening these perceptions. These findings could be useful for designing mechanisms to facilitate sustainable decision-making that considers the interests of future generations.

Keywords: Imaginary future generations, Critical thinking, Perception change, Participatory environmental planning, Personal attributes
JEL classification: D02, Q01, Q56

*This study was supported by Grants-in-Aid for Scientific Research (Research Project Numbers: 21H03671, 20H00053, 19H04338 and 17H00980) from the Japan Society for the Promotion of Science. This study was also conducted as a part of the Project "Macroeconomic Policy and Political Philosophy toward Economic Growth" undertaken at the Research Institute of Economy, Trade and Industry (RIETI). We would like to express our sincere appreciation to Suita city for organizing the Future Design workshop.

1. Introduction

Various sustainability problems, such as climate change and resources depletions, are increasingly threatening the foundations of humanity (Rockström et al., 2009; Komiyama and Takeuchi 2006; Kates et al., 2001). These are long-term challenges, which involve intergenerational conflicts of interest. However, despite government plans aimed at the decarbonization of energy systems and at resource recycling at both national and local levels, these issues are not typically viewed as intergenerational. While there have been numerous efforts and research involving stakeholders to envision sustainable futures and to resolve such environmental and sustainability problems by means of scenario planning and backcasting approaches (Höfer and Madlener, 2020; Nikolakis, 2020; Pereverza et al., 2019; Kishita et al., 2016; Reed et al., 2013; van der Voorn et al., 2012; Robinson et al., 2011; Mander et al., 2008), the benefits and preferences of future generations have rarely been considered explicitly in such plans (Kuroda et al., 2021; Hara et al., 2019). Essentially, long-term issues such as these should not be considered or decided only from the perspective of the current generation, rather, they should instead be considered from a long-term perspective, with an examination of the impacts and benefits to future generations (Saijo 2020, Hara et al., 2019).

In recent years, the concept of Future Design which is the design and praxis of social systems to succeed a sustainable society to future generations by overcoming intergenerational conflicts, has been increasingly studied and practiced (Saijo 2020, 2018, 2015; Hara et al., 2019; Hara 2016). An important focus of research on Future Design has been the question of how to design social systems to generate "futurability" (Saijo 2020, 2018), to facilitate decision-making and actions that consider the preferences of future generations in an explicit manner. Extant social systems, such as markets and democracy, serve to meet the needs of the current generation, but they are incapable of incorporating the interests of future generations (Saijo 2020). It is therefore difficult to adequately address long-term intergenerational challenges using conventional approaches that are based on these existing social systems. This point is clearly illustrated by the various problems that the human beings encounter. On the issue of climate change, for example, global greenhouse gas emissions have continued rising (IPCC, 2014), despite the wide range of research, technological developments, and policy initiatives that have been conducted to date. It seems that there are still major hurdles to the social transformation that is needed to establish a carbon-neutral society. The issues addressed in this study are related to energy and resource management at the local government level. These are long-term challenges in the sense that the local planning needed to address these issues requires vision design and policy planning from a long-term perspective in a way that incorporates the perspective of future generations.

Future Design has increasingly been the focus of considerable research and implementation, and social systems and mechanisms have been investigated to facilitate decision-makings that consider the preferences of future generations. One particularly promising approach that has been proposed is that of Imaginary Future Generations (IFG). Through experiments, field experiments and practices, IFG has been demonstrated to be effective for real-world decision-making and vision design as it avoids shortsighted decision making and reconciling intergenerational conflicts (Kamijio et al., 2017; Saijo 2020; Hara et al., 2021; Hara et al., 2019). For example, it has been shown that the decisions and visions of groups tasked with representing a future generation in decision-making processes are more innovative than those of groups that look at issues from the standpoint of the current generation (Saijo 2020; Hara et al., 2019). Other studies have shown that considering the benefits to a future generation makes it possible to propose

measures necessary for sustainability that could potentially impose a burden on the current generation (Uwasu et al., 2020), and when the perspectives of both the current and future generations are considered, judgments and decisions can be made from a more holistic perspective (Hara et al., 2021; Nakagawa et al., 2017). Other studies focused on the relationships between personal attributes and disposition, and the acquisition of future perspectives (Nakagawa et al., 2019a; Kuroda et al., 2021; Hiromitsu et al., 2020; Hara et al., 2015). Nakagawa et al (2019a) reported that the higher level of critical thinking or generativity are more likely to facilitate future-oriented choices. Hiromitsu et al (2020) argued that cognitive aspects of interpersonal reactivity are useful for defending the future generation's interests.

Despite these studies, none have analyzed how the perception and disposition of participants in a real-world, local government policy-planning deliberation process relate to the adoption of a future generation perspective. In addition to IFG, various methods for stimulating identification as an IFG are possible, but no studies have analyzed how the different types of treatments using IFG relate to people's perceptions, personal attributes, and disposition. Clarifying these relationships may yield valuable suggestions and information about the design of social mechanisms that can generate "futurability" in people, and support sustainable decision-making, and actions that consider future generations.

For this study, we conducted a workshop over four sessions in Suita City, Osaka Prefecture in Japan, in 2019. The workshop was part of the city government's policy planning process relating to the formulation of its "3rd Environmental Master Plan." Both ordinary residents and city officials participated in the deliberations, which focused on three themes—"energy", "resource recycling", and "cross-sectional priority themes". In the workshop, participants were asked to formulate a vision of the city's future in 2050 both from the perspective of the current generation and the perspective of an IFG, and to propose the policy options that were needed to shape those future visions. In addition to analyzing the effects of adopting an IFG perspective, we examined the relationship between futurability and personal attributes. More specifically, using data obtained from the discussion sessions and from questionnaire surveys of participants, we examined the following questions: 1) Does the adoption of an IFG change the future vision or policy proposals of participants compared to when they examine issues from the perspective of the current generation?; 2) How does the adoption of an IFG change the perception of participants?; and 3) How does the adoption of an IFG affect the relationships between personal attributes and disposition of participants and changes in their perception?

By shedding light on the relationships among personal attributes, dispositions, and the "futurability" of human beings, this study will yield knowledge that is useful for the design of social mechanisms that facilitate the sustainable decision-making and action in ways that consider the perspectives of future generations.

2. Methods

2.1 Framework of the workshop

Suita City is a bedroom community with a population of approximately 370,000 located in the northern district of Osaka Prefecture. Over four sessions in 2019, we conducted a workshop on the theme of the city's 3rd Environmental Master Plan, which the city government was in the process of researching and formulating. Both ordinary residents and city officials participated in the workshop.

Through a process of public solicitation at city hall, we extended an open invitation to city residents to

apply to participate in the workshop. As a results, applications from 24 citizens were accepted. Four officials involved in environmental administration and water services at city hall also joined, resulting in a total of 28 participants. Of these 28 participants, there were 17 were men and 11 were women, ranging in age from their 20s to 80s. The 24 citizens were divided into five groups that were selected to reflect an even balance in ages and genders. Including one group composed of the city officials, there were six groups in total. Throughout the four workshop sessions, the group members remained constant.

The workshops were conducted on March 30, 2019 (Session 1), April 13, 2019 (Session 2), June 23, 2019 (Session 3), and August 31, 2019 (Session 4). Each session lasted approximately three hours. The themes for discussion in the workshops were the three pillars of the city's environmental master plan: 1) Energy systems for a low-carbon society; 2) Resource recycling; and 3) Cross-sectional priority themes (especially themes relating to fostering environmental awareness). Each group was tasked with discussing one of these three themes.

The discussion themes were assigned to groups as follows. Two groups discussed energy (hereafter referred to as "Energy A" and "Energy B"), two groups discussed resource recycling ("Recycling A" and "Recycling B"), and two groups discussed cross-sectional priority themes ("Cross-section A" and "Cross-section B"). The group made up of city officials was group Cross-section B, while the citizens were all divided among the other five groups.

The mission of the workshop participants was firstly to envision and examine the state of Suita City in 2050 and then, in accordance with their theme, to study and formulate measures and policy options for adoption in the city's 3rd Environmental Master Plan for the eight year-period from 2020 to 2028.

2.2 Designing discussion processes

As explained in the introduction, the aim of the workshop was to envision the images of social situation of Suita City in 2050 through discussions, to propose policy options for building a framework of the city's environmental master plan, and to analyze the effectiveness of adopting IFG for conditioning discussions. In accordance with this objective, we designed the discussion contents and processes for the four workshop sessions as follows. In Session 1, groups discussed their themes from the perspective of the current generation, but in Sessions 2 to 4, they had to engage in discussion from the perspective of an IFG. We designed the workshop this way to enable us to observe how the shift of perspective from the current to future generations changed the decision-making of the groups. In designing the discussion processes for Sessions 2 to 4 in particular, we applied findings from earlier Future Design studies in order to generate "futurability" among participants. Specifically, we referred to Hara et al. (2021), who used the mechanism to shift the perspective within individuals from current generation to future generations. In addition, we referred to the method shown in Nakagawa et al. (2019b) to obtain retrospective perspective. Table 1 shows a summary of the discussions held at each session. The following explains the details of each treatment and the contents of each session.

- **Session 1: Envisioning the society of 2050 and assessing policies (from the perspective of the current generation)**

In Session 1 of the workshop (March 30), the participants formulated a future vision for Suita City in 2050 from the perspective of the current generation. Based on the future vision, they then discussed and

assessed a draft of the city's environmental master plan. Firstly, Suita City officials provided the participants with basic information and data relating to the group's discussion theme, e.g., about city population trends and environmental conditions. The city officials also presented their thoughts on the city's policies through to 2028 relating to "energy", "recycling", and "cross-section", which were the three basic themes of the city's environmental master plan. After receiving this information, each group discussed its imagined vision of Suita City in 2050. The discussions focused most heavily on the following three aspects of the city—the state of the city, infrastructure, and industry; the state of the environment; and the state of human life (lifestyle and work style).

After sharing their visions of the city's future in 2050, the groups discussed and assessed a draft of the city's environmental master plan and the measures (policy options) that should be considered in accordance with the vision. Discussion focused on the points of agreement with the city's current policies, points that need to be improved or revised, and new measures and perspectives that need to be added.

- **Session 2: (1) Assessment of past policies, (2) Envisioning the society of 2050 and assessing policies (as an IFG)**

In the first half of Session 2 (April 13), the groups reviewed the environmental policies that Suita City implemented in the past and they analyzed and assessed the past policies from the perspective of the current year, 2019. More specifically, they looked at the city's past waste management policies, which are characterized by 1) subsidies for food waste composting equipment (introduced in 1991); 2) five-category separated waste collection (introduced in 1992); and 3) use of colorless and semi-transparent garbage bags (introduced in 2004), and they analyzed them in the light of their particular theme. Firstly, a city official (not one of the workshop participants) provided some background on the introduction of these policies at the time, along with an outline of the policies, and the results and outcomes of their implementation, including specific data. After receiving this information, each group was asked to assess these past policies from the perspective of the current generation in the form of a message to the city officials involved in drafting the policy at the time. We applied this method because previous studies showed that formatting the process in this way helps participants to acquire the perspective of a future generation (Nakagawa et al. 2019b).

In the second half of Session 2, the groups began to hold discussions from the perspective of an IFG. Firstly, one of the authors explained the importance of thinking from the perspective of an IFG, projecting a visual presentation (picture-story show) (Nakagawa and Saijo, 2021) which summarizes the experiences of people who had previously participated in discussions as a representative of an IFG (Hara et al., 2019). After the presentation, all of the participants discussed their topics from the perspective of an IFG in 2050. Participants were advised to imagine traveling 30 years in time to 2050, without aging at all, and living as a citizen in Suita City. From that perspective, the participants were then asked to describe in detail the society of Suita City in detail (i.e., industrial activities, lifestyle, social systems and urban infrastructure) as well as environmental conditions in the city in 2050. Finally, based on their group's shared vision of Suita City in 2050, the participants looked back in time to the past society of 2019 and specifically discussed the policies that should have been considered or adopted by the city officials who formulated the environmental master plan in 2019.

- **Session 3: Creating a past timeline up to 2050 (as an IFG)**

Maintaining the perspective of an IFG in 2050 from Session 2, in Session 3 (June 23), the participants created a past timeline (past roadmap) connecting the images of the 2050 society that they depicted in Session 2, back to the society of 2020, which is the starting year of the 3rd Environmental Master Plan. In accordance with their timeline, they then reconsidered the policies that should have been addressed in 2019. Each group started by reviewing its discussion about the policies proposed and shared in Session 2. Assuming that these policies were reflected and implemented in some way in the 3rd Environmental Master Plan, then, from the perspective of an IFG of 2050, the groups created a past timeline from 2020 to 2050 (i.e., to the present of an IFG). In their discussions about creating the past timeline, the groups were asked to assign particular importance to two questions: 1) How was the city's current environmental situation (energy, recycling, and cross-section) achieved between 2020, when the policies were first considered, and their current time period of 2050 as an IFG ?; and 2) To achieve the environmental condition of 2050, what challenges arose and how were these challenges overcome? Through the above discussion process, the participants worked to reconsider and revise the policies that the city should have considered in 2019.

- **Session 4: Presentation of final policy proposals (as an IFG)**

In the final session, Session 4 (August 31), continuing from the perspective of an IFG of 2050, the groups worked to formulate a message for the citizens and officials of Suita City in 2019. More specifically, each group wrote descriptive summaries of the social and environmental conditions of Suita City in 2050 and selected three particularly important policies or initiatives that Suita City citizens and officials should consider implementing after 2019, along with the reasons for their choices. Their "Vision of Suita City in 2050" and "Priority measures to be considered" were presented in the form of a message from the future. Finally, the groups offered their assessment and advice about the draft (revised) version of the environmental master plan that was being considered by Suita City in 2019 from the standpoint of an IFG.

The contents and results of the four discussion sessions are described later. As explained above, the contents of the discussion in Session 1, from the perspective of the current generation, and the topics of the discussion in the second half of Session 2, from the perspective of an IFG, were the same, i.e., 1) the images of society (Suita City) in 2050, and 2) the policies and measures that should have been considered in 2019. This means that decision-making and discussion contents can be compared depending on the different perspectives (i.e., those of the current generation and an IFG). The subsequent discussions in Sessions 3 and 4 were both conducted from the perspective of an IFG, but a different treatment to that employed in Session 2 was applied. In Session 3, instead of examining the societies of 2050 and 2020 as a cross-section of a particular era, participants worked to connect the two points in time by creating a past timeline, which gives the participants a clearer sense of the time dimension. In Session 4, to arrive at a final conclusion, each group engaged in a decision-making and consensus-building exercise, to select the three most important items from their proposed policy measures in the previous Sessions. Thus, in each of Sessions 2, 3, and 4, the groups engaged in different tasks (treatments) from the same perspective, i.e., that of an IFG.

2.3 Questionnaire analysis

2.3.1 Questionnaire

In this study, we conducted a questionnaire analysis to determine whether the participants changed their

perception and thinking over the course of the discussions. We prepared two kinds of questionnaires, Questionnaire (1) (Appendix 1), which was administered to all participants after each of the four workshop sessions, and Questionnaire (2) (Appendix 2), which was used to understand the personal attributes and disposition of the participants. The questionnaires were originally presented to participants in Japanese. Appendices 1 and 2 are translated versions prepared for this manuscript. Fig 1 describes the framework of analysis employed in this study. We first investigated how the introduction of an IFG and relevant treatment in each session influenced the perception of participants (Questionnaire (1)). Assuming that the perception is related with personal attributes and dispositions (Questionnaire (2)), we also delved into how the adoption of an IFG and associated treatment could influence the relationships. By doing so, we aim to study the effects and roles of IFG as a new social system to generate futurability.

For Questionnaire (1), we applied questionnaire form implemented by Hara et al. (2019), which consisted of 35 questions in total, under three main headings: (1) perceptions about the relationship between current and future generations; (2) perceptions and assessments relating to Suita City; and (3) cross-sections when formulating visions and policies. The questions under headings 1 and 2 were answered by rating the level of agreement with various items on a five-point scale (1 = Disagree, 2 = Somewhat disagree, 3 = No opinion, 4 = Somewhat agree, 5 = Agree), while Question 3 was answered by rating the level of importance of items on a scale of 1 to 5 (1 = Not important, 2 = Not very important, 3 = No opinion, 4 = Important 5 = Very important).

The participants were asked to answer Questionnaire (2) at home after Session 1 of the workshop. In this questionnaire, modified from Kuroda et al. (2021) and Hara et al.(2021), we asked participants to answer questions to enable us to assess their critical thinking disposition (Hirayama and Kusumi, 2004), generativity (McAdams & de St. Aubin, 1992), scientific literacy (Okamoto, 2008), social value orientation (Van Lange, et al., 2007), and their personal attributes (gender, age, occupation, family structure, no. of years living in the same residence, residence type, and income). The number of questions in the questionnaire was limited to avoid burdening the respondents. To assess critical thinking, we asked 13 questions about “awareness for logical thinking” and from the Generative Behavior Checklist we included 40 items, excluding dummy items.

Critical thinking is reflective thinking that consciously examines one’s reasoning process, focused on deciding what to believe, assert, and act upon (Ennis, 1987). It allows one to consider things from multiple perspectives and with appropriate criteria, rather than judging them subjectively. Respondents were asked to indicate their level of agreement with various statements on a 5-point scale (1 = Disagree, 2 = Somewhat disagree, 3 = No opinion, 4 = Somewhat agree, 5 = Agree).

Generativity is defined as a concern for nurturing, teaching, and guiding the next generation by generating things and outcomes that promote continuity from one generation to another (McAdams and de St. Aubin, 1992). For this study, we used the Generative Behavior Checklist (GBC) to measure generative behaviors, including creating, maintaining, and offering to others, in ways that mutually benefit subsequent and emergent commitments. Of the 50 items in the original GBC, 10 “filler items” were removed and the remaining 40 items were used in this study. Respondents were asked to how frequently they performed certain behaviors on a 3-point scale (0 = Never, 1 = Once, 2 = Twice or more).

According to Miller (1998), scientific literacy is defined as the ability to read and write about scientific and technological matters, including practical things like reading product labels and repairing cars, as well

as reading newspapers and magazines and understanding scientific vocabulary and scientific concepts well enough to understand the nature of opposing arguments. The questionnaire used in this study was developed by referring to a questionnaire used previously in the social research on the citizens' scientific literacy by the Japanese government (Okamoto, 2008).

The concept of social value orientation (SVO) classifies people's preferences regarding outcomes for themselves relative to outcomes for others, based on the assumption that individuals vary in terms of the weight that they attach to other people relative to themselves. In this study, we used Van Lange et al.'s (2007) triple-dominance measure of social values, which classifies people's preferences as being prosocial, individualistic, or competitive.

Although previous studies have analyzed how individuals' disposition, such as generativity and critical thinking, relate to the generation of "futurability" (Nakagawa et al 2019a; Hiromitsu et al 2020), in this study, we paid particular attention to the relationship between personal attributes and disposition and different forms of treatment, such as creating a timeline of the past and selecting policies after adopting the IFG approach.

2.3.2 Statistical analysis

In this study, firstly with Questionnaire (1), we conducted a one-factor analysis of variance (ANOVA; between-subjects distribution) with the work produced at each session treated as an independent variable, to investigate whether the perceptions of participants could be changed by the guidance we gave them at each workshop session. Analysis of variance is a statistical method used to examine whether the mean value of a quantitative dependent variable, such as a score or rating, varies according to the value of a qualitative independent variable (factor), such as an experimental condition. The method is used to simultaneously compare two or more factors, simultaneously.

Next, based on Questionnaire (2), we conducted a multiple regression analysis to examine whether the personal attributes and the participants' disposition impacted their weightings of values and perceptions. Multiple regression analysis is a method that is used for predicting and explaining dependent variables using multiple quantitative independent variables. Multiple regression analysis makes it possible to examine the correlations between dependent variables, by excluding the influence of other independent variables. In this study, we investigated how personal attributes and disposition (evaluated by Questionnaire (2)) influenced changes in the participants' perceptions about the items listed in Questionnaire (1), at each session. By doing so, we aim to delve into how adoption of an IFG and each treatment influenced the relationship between personal attributes and disposition and changes in the participants' perceptions.

Multiple regression analysis of all items shown in Appendix 1 was performed to examine how people's personal attributes and dispositions relate to these perceptions. All of the items in Questionnaire (1) were used as objective variables to examine how the perceptions of participants were affected by their personal attributes and dispositions. The explanatory variables were critical thinking, generativity, scientific literacy and social value orientation (SVO) as disposition, and gender, age, occupation (each occupation was used as a dummy variable), household size (no. of members), no. of years in the same residence, residence type (each type of residence was used as a dummy variable), and household income as personal attributes. The variables were selected using a stepwise method.

3. Results and discussion

3.1 Session discussion results

3.1.1 Comparison of results from Session 1 and Session 2

The results of the discussions in Session 1, from the perspective of the current generation, and the discussions at Session 2, from the perspective of an IFG, are described briefly below. The detailed contents of the discussions of each group are given in Appendix 3. As described below, there was a clear and significant difference in the quality of proposals regarding the participants' images of society (Suita City) in 2050 and the measures that should be adopted in 2020 between those generated by the discussion from the perspective of the current generation (Session 1) and those from the perspective of an IFG (Session 2).

・ "Energy A" and "Energy B"

In Session 1, Energy A envisioned Suita City in 2050 from the perspective of the current generation as a more compact city, with an environment in which women can work easily due to an increase in childcare facilities, and where people can pursue a more human-centric life that places an importance on culture and tradition as well as convenience. In this future society, everyone is aware of the seriousness of global warming, and through the availability of accurate information that has been disseminated to citizens and the ability to observe its effects, individuals are more conscious of climate change. They also see advances in "local production for local consumption" of energy with the introduction of space solar power and renewable energy. On the topic of measures to be considered in 2019, Energy A emphasized visualization and education of the effectiveness of greenhouse gas emission reductions to raise public awareness, the implementation of enjoyable events, the need for subsidies and eco-tax cuts as economic incentives, and other measures.

In its analysis of past policies in Session 2, Energy A expressed the opinion that although waste sorting was time consuming, in hindsight it was clearly a good thing. In fact, it suggested that waste separation could have been even more stringent, with provisions made to educate people who do not follow the rules.

In the second half of Session 2, Energy A discussed the state of Suita City in 2050 from the perspective of an IFG. The group depicted a society that placed greater emphasis on spiritual wellbeing, like the Scandinavian societies of 2020, in which robot and computer technology has advanced to the point that human work is limited to robot management and jobs related to guiding and inspiring people. The economy is based on bartering and exchanging "likes" and experiences rather than money. On the downside, elderly people who cannot keep up with all the changes are left behind and social disparity is widening, but the development of transportation and communication technology is facilitating greater human exchanges across national borders. Wind and solar power generation are used more and more, and it has become possible to harness energy from typhoons, earthquakes, and other natural disasters. Thus, the contents of Energy A's discussions in Session 2 were very different from those of Session 1. The measures that the group thought should be considered in 2019 from the perspective of an IFG were ambitious targets for renewable energy, the creation of a budgetary framework for the future that is not short-sighted (approx. 5% of funds) for measures to address environmental challenges to enable the public to understand them, and the need for training events and education to eliminate disparities.

Energy B's vision of Suita City in the year 2050, as imagined from the perspective of the current generation, is a society with well-developed car and accommodation sharing systems, in which the use of

excessive product packaging has been eliminated almost entirely by companies, and transportation infrastructure is based largely on small share-ride buses and ubiquitous (pick up/drop off anywhere) electric share bikes. In terms of environmental conditions, the group describes rooftop greening to counter the fierce heat of summer and advanced "local production for local consumption" of energy. As measures that should be considered in 2019, Energy B suggested educating children about sharing and recycling, and making it obligatory to install rooftop gardens and solar power generation facilities on the top floor of high-rise apartment buildings.

In its analysis of past policies, Energy B expressed the opinion that waste separation into five categories was good, but that an easy-to-understand explanation about foam tray reuse was needed. The group also suggested that a fee-based garbage disposal system might end up increasing the amount of garbage rather than reducing it.

From the perspective of an IFG, Energy B's image of Suita City in 2050 is an entirely new kind of society, as opposed to an extrapolation of the present. For example, there are fewer office buildings due to an increase in telecommuting, foods are produced indoors (e.g., synthetic food and edible insects), the space industry is flourishing, home solar power and waste incinerator/generators are the main sources of electricity, life expectancy is significantly higher, and pensions are paid from the age of 80. From the perspective of an IFG, Energy B proposed the following measures for consideration starting in 2019—creating opportunities for collaboration on energy self-sufficiency between businesses, citizens, and government; diversifying children's education; promoting renewable energy development in cooperation with universities and industry; and utilizing vacant land.

- "Recycling A" and "Recycling B"

Recycling A's vision of Suita City in 2050 from the perspective of the current generation is of a society in which people pursue health and wholesome human lifestyles, personal mobility is mainstream, recycling is a major business, and the city is energy self-sufficient and green. As measures to be considered from 2019, from the perspective of the current generation, group Recycling A proposed the creation of a system that enables consumers to earn money by separating garbage and mechanisms that help people to become more familiar with recycling, along with some other ideas.

In its analysis of past policies, Recycling A suggested that the fertilizer initiative was good, but ultimately ineffective because there was no next step. Some sort of mechanism for purchasing raw food waste and utilizing it for agriculture was necessary. On the other hand, the group considered the waste separation scheme into five categories as positive.

From the perspective of an IFG, on the other hand, Recycling A's image of Suita City in 2050 was very different to what could be expected from a direct extrapolation of current social structure and technology. According to this vision, there is 100% EV penetration and personal aerial mobility, Suita City has merged with other cities, there are far more foreign students, and it is no longer necessary to commute to a fixed workplace. On the question of environmental resources, the group sees 100% recycling of garbage, and the recovery of energy from food waste is the norm. Another feature of the vision is the occurrence of a *Nankai* Trough Mega Earthquake in 2040, as result of which Suita City in 2050 is still undergoing reconstruction. From the perspective of an IFG, Recycling A offers the following policy suggestions for 2019—policies should be implemented from an early stage, incentives should be offered for participation in initiatives, and

more and better information should be made available. The group also made numerous proposals for setting up “new mechanisms” without precedents.

Recycling B’s vision of Suita City in 2050 from the perspective of the current generation features the spread of self-driving buses and AI, and increased the cooperation between companies and universities as well as a social scenario in which “local production for local consumption” of energy is advanced and installing solar panels on new buildings is the norm. The group also anticipated more frequent natural disasters and infectious disease outbreaks. The measures it recommended for consideration from 2019, from the perspective of the current generation, included the promotion of plastic separation, disaster waste countermeasures, and measures to reduce food loss and food waste, as well as numerous measures already mentioned.

In its analysis of the past, Recycling B made the following points. It asked whether waste separation into five categories was really a good idea, it suggested that measures to tackle food waste should have been stronger, it suggested that there was a need to create mechanisms and systems related to resources management, and it suggested that it was necessary to design incentives for people and businesses who implement resources management measures.

From the perspective of an IFG, Recycling B’s image of Suita in 2050 is one in which telecommuting has become the norm and work style and lifestyle have changed radically. The group portrayed a society in which new social values are nurtured, with renewable energy accounting for around 80% of energy consumption and people finding renewed value in locality and nature. As for resources, garbage has become a valuable resource, recycling systems are well established, and the conversion of food waste to organic fertilizer is compulsory. Like Recycling A, the group envisaged that a *Nankai* Trough Mega Earthquake would occur before 2050, so it also foresaw advances in research on disaster waste disposal in the event of an earthquake. Recycling B’s suggested measures to be considered from 2019 were characterized by a broad view of the concept of resources and recycling, as well as proposals for new, unprecedented mechanisms. They included the promotion of rainwater utilization in preparation for climate change, wide-area coordination of waste disposal and disaster countermeasures, and the promotion of research on “materials” that can be recycled back to nature, in addition to waste treatment measures.

- “Cross-section A” and “Cross-section B”

Out of its discussion from the perspective of the current generation, Cross-section A tended to portray the society of 2050 as an extension of the current society in which all current issues have been resolved. This is typified, for example, by the fact that all steps on sidewalks have been eliminated, making it easier for elderly people and parents with babies to walk. Also, parks have been improved and the city is much greener. For policy recommendations, the group suggested that the city offer environmental education to citizens, reduce waste, encourage businesses to participate in environmental activities, and improve the publicity of the city’s environmental initiatives.

In its analysis of past policies, Cross-section A suggested that producers should have been approached to reduce waste, e.g., by simplifying packaging; that it would have been better to start waste separation earlier; and that making garbage bags transparent was beneficial, as it changed the attitude of citizens.

On the other hand, in its discussion from the perspective of an IFG, the group depicted the society of 2050 as highly advanced technologically. More specifically, developments in VR technology have made it

possible for adults to work from home, for children to study and learn at home, and for hospital visits to be conducted from home, leading to profound changes in work style and lifestyle. Other features of the society are lower energy consumption, because offices are no longer needed, and the ubiquity of high-performance machine translation, which makes interactivity with foreigners easy, leading to grater internationalization. These policy suggestions were similar to those the group made from the perspective of the current generation, i.e., environmental education and publicity of environmental initiatives. The group also highlighted the need for the city to build new sports grounds and for people to develop greater physical strength to withstand climate change, given that physical strength is likely to decline as technology takes over an increasing number of human activities. This point can be described as a characteristic of an IFG perspective.

From its discussions based on the perspective of the current generation, Cross-section B envisioned Suita City in 2050 as having a markedly smaller population, describing the residential areas of 2019 as being deserted like ghost towns. It also imagined that the diffusion of renewable energy would lead to much lower per-capita CO_2 emissions. Its recommended measures included promoting more contact with nature for children and raising their environmental awareness, restricting building development, implementing water quality conservation and waste reduction, and promoting preparedness for natural disasters.

In its analysis of previous policies, the group made the following comments about measures for promoting the use of food waste as fertilizer—the adoption of a subsidy system was a new idea, but there should have been a clear idea of how the fertilizer would be used. The group thought the initiative to separate domestic waste into five categories was good, because it promoted recycling.

On the other hand, in its discussion from the perspective of an IFG in 2050, the group envisaged a reduced population, just as it did from the perspective of the current generation, although it was now taking a positive view of the population decrease. The group imagined that the decline in the population would lead to the redevelopment of unnecessary buildings and the realization of livable cities. A shortage of workers would lead to the automation and unmanned operation of garbage collection and transportation. It also foresaw a rising demand for human-to-human work in fields such as welfare, which cannot be automated so easily. According to the group, the city would be much greener and full of very environmentally conscious citizens. As for measures, the group proposed environmental education in schools and workshops and seminars for the public to raise environmental consciousness. It also suggested encouraging businesses that engage in environment-friendly initiatives, imposing environmental restrictions on development, and regulating land utilization and development based on a clear vision of the future.

3.1.2 Characteristics of key policies raised by the IFGs

Tables 2 shows the “Images of Suita City in 2050” and the “three high-priority policies that should be adopted from 2020” proposed by each group from the perspective of an IFG at the end of their discussions in Session 4.

Although the proposals of the six groups share some common elements with the policies they came up with in Session 1 (from the perspective of the current generation), on the whole, the contents are fundamentally different. The proposals formulated from the perspective of an IFG are characterized by the following.

1) Proposal of new institutions and systems

One of the characteristics is the proposal of new institutions and systems that did not exist. For example, the "fee-based garbage disposal system" proposed by Recycling B is a new idea, which might present an excessively high hurdle for the current generation. This group's proposal is not an extension of the existing waste management policy; it is a new system that assumes that the revenue from fees is used to fund research on the environment and waste management measures by universities and companies.

Recycling B proposed "new rules for drones and flying cars" for the purpose of reducing the burden of maintaining roads and creating a more efficient and less wasteful environment by reducing fuel consumption. Another characteristic of the group's recommendation was the proposal of adopting new, unprecedented systems, to reduce resource and energy use and promote waste reduction.

2) Proposals from a long-term, "big picture" view

Another important feature would be holistic proposals. The Energy A raised the issue of "collaboration with neighboring municipalities", while Cross-section B proposed "collaborating with other cities and trying to establish committees". This suggests that the groups felt that instead of individual municipalities acting alone, it is necessary to promote consideration from a more comprehensive standpoint, in order to achieve more humane universal social goals.

Energy A's proposal for "building a renewable energy system that also considers disposal methods" was characterized by a view that proposals to build renewable energy systems should consider not only of the issues of the individual energy systems, but also the problems of final disposal methods and secondary issues. This is the kind of idea and perspective that is obtained by adopting the perspective of 2050 to formulate a concrete image of future challenges. Energy B's suggestion to develop "measures to address the problem of vacant land and houses" also indicates that the group considered energy issues from a comprehensive perspective, rather than as an isolated local problem.

The fact that Recycling A presented a proposal for "R&D to realize zero waste" is not so much about how to deal with generated waste (e.g., treatment, management and recycling), but rather, how to promote R&D in collaboration with universities, and other institutions. This too can be seen as the result of selecting policies from a long-term perspective rather than a short-term one.

The arguments presented in 1) and 2) above are consistent with the points identified in previous studies as being characteristic of discussions from the perspective of IFGs. For example, studies have shown that the perspective of IFGs is original, that it enables the proposal of measures that may be burdensome to the current generation, and that it facilitates decisions from a comprehensive ("big picture") perspective or shared perspective of current and IFGs (Hara et al., 2021; Nakagawa et al., 2017). However, in these previous practices of Future Design, the discussions were characterized by a high degree of freedom and a lack of administrative constraints. In this study, on the other hand, even in discussions within the framework of administrative planning, these same characteristics are present, suggesting that the adoption of the mechanism of IFGs is at least partially effective for tackling issues that require sustainability and issues that require the coordination of interests of current and future generations.

3.2 Analysis of variance (ANOVA): Perceptual changes due to treatments

Table 3 shows the results of a one-factor ANOVA (between-subjects distribution) based on data obtained from the questionnaires.

a) Items indicating significant differences between Sessions 1 and 2

In Session 2, after participants were instructed to envision the society of 2050 from the perspective of an IFG in 2050 and send a message with policy proposals to Suita City officials in 2019, scores for item **Q1-17 "In today's discussion, I thought about things from the perspective of a person living in the present day"** decreased. Conversely, scores for item **Q1-18 "In today's discussion, I thought about things from the perspective of a future generation"** increased. This means that the participants consciously abandoned the perspective of a person living today and acquired the perspective of a person living in the future, indicating that the treatment was successful.

In terms of the perceptual changes generated in participants, significant differences were observed in two items. After the participants were instructed to send a message with policy proposals to city officials in 2019, as an IFG, the level of agreement with **Q1-3 "The policies talked about in the discussion will help foster environmental awareness among Suita's citizens"** increased. In addition, responses to questions about what they prioritized in their discussion show that the participants assigned greater importance to item **Q3-7 "Reducing anxiety about what could occur in future"** than when they considered issues from the perspective of the present day.

b) Items indicating significant differences between Sessions 1 and 3

In Session 3, continuing to maintain the perspective of an IFG in 2050, the participants created a past timeline (roadmap) connecting the society of 2050 back to the society of 2020, for the purpose of re-assessing the policies that should have been considered in 2019. Once again, the level of agreement with item **Q1-17 "In today's discussion, I thought about things from the perspective of a person living in the present day"** decreased, while agreement with **Q1-18 "In today's discussion, I thought about things from the perspective of a future generation"** increased. Therefore, the treatment can be regarded as successful.

In terms of changes in perceptions, for each three items—**Q1-2 "The policies talked about in the discussion will lead to the formation of a social system that will manage Suita City's resources", Q1-3 "The policies talked about in the discussion will help foster environmental awareness among Suita's citizens",** and **Q1-4 "Failure to implement the policies talked about in the discussion will lead to a serious crisis**"—the mean score (level of agreement) was higher in Session 3 compared to Session 1. In addition, responses to questions about what they prioritized in their discussion show that the participants assigned more importance to items **Q3-5 "These measures could bring about an ideal future"** and **Q3-7 "Reducing anxiety about what could occur in future"** in Session 3 than in Session 1.

c) Items indicating significant differences between Sessions 1 and 4

In Session 4, each group was instructed to send a message to the policy planners in 2019, including the group's image of society in 2050 and three high-priority policies, as formulated from the standpoint of an IFG. Again, the level of agreement with item **Q1-17 "In today's discussion, I thought about things from the perspective of a person living in the present day"** decreased, while agreement with **Q1-18 "In**

today's discussion, I thought about things from the perspective of a future generation" increased, indicating that the treatment was successful.

Compared to Session 1, each of the following perceptions of participants were stronger in Session 4—**Q1-1 "The policies talked about in the discussion will lead to the realization of a low-carbon society in Suita City that conserves limited energy resources", Q1-2 "The policies talked about in the discussion will lead to the formation of a social system that will manage Suita City's resources", Q1-3 "The policies talked about in the discussion will help foster environmental awareness among Suita's citizens", Q1-4 "Failure to implement the policies talked about in the discussion will lead to a serious crisis", Q1-14 "The members of my group debated goals that seemed desirable for society as a whole", Q1-15 "The members of my group shared goals that seemed desirable for society as a whole",** and **Q2-8 "Suita City will be a comfortable place to live in 2050".** This session was the most focused on selecting and proposing specific policies from the perspective of the future generation of 2050, which may be why we see greater awareness of policy issues relating to energy, resource recycling, and cross-section here.

We also found that, in this discussion, the items **Q3-1 "Living an affluent lifestyle"** and **Q3-7 "Reducing anxiety about what could occur in future"** were assigned more importance in Session 4 than in Session 1.

d) Comparison of Session 1 and subsequent sessions

There was a significant difference in the responses of participants between Session 1, when they evaluated the master plan from the perspective of the present day, and the other sessions, when they examined issues and made decisions from the perspective of an IFG.

The level of agreement with item **Q1-3 "The policies talked about in the discussion will help foster environmental awareness among Suita's citizens"** was higher in each of the Sessions 2, 3, and 4 compared to Session 1, suggesting that this item is easily influenced by a future perspective. We also found that with each session, there were an increasing number of items for which the level of agreement differed from that in Session 1. In the questions about discussion perspectives, we saw that two items, **Q1-17 "In today's discussion, I thought about things from the perspective of a person living in the present day"** and **Q1-18 "In today's discussion, I thought about things from the perspective of a future generation",** were only items for which there was any observed difference in agreement between Sessions 1 and 2. However, after Session 3, differences (compared to Session 1) were observed in four and nine items, respectively. Also, in Session 4, the participants felt more strongly that **Q2-8 "Suita City will be a comfortable place to live in 2050"** compared to Session 1, indicating a change in their perception of Suita City. In the workshop, no change was observed in affection for Suita City or the intention to live in Suita City, so this was the only item in which a change in perception of Suita City was observed. Two items, **Q1-14 "The members of my group debated goals that seemed desirable for society as a whole"** and **Q1-15 "The members of my group shared goals that seemed desirable for society as a whole",** were the only ones for which a significant change in the level of agreement (compared to Session 1) was observed in Session 4. The mean score was already high, i.e., ≥4, but it increased even more in Session 4. However, we cannot exclude the possibility that this effect was due to the deepening of mutual understanding among the group members that arose from repeated discussions in the same group. We can assume that changes in

Session 4 are the result of the treatment of getting participants to make recommendations to the policy planners of 2019 from the standpoint of the IFG in 2050. Nevertheless, in future studies we will need to examine, in detail, the extent to which the influence of repeated sessions contributes to the success of treatments.

Note that no significant differences were found between any of Sessions 2, 3, and 4. This indicates that the various observed perceptual changes occur in the shift from considering things from the perspective of the present generation to considering things from the perspective of an IFG, and that the impacts on the perception changes by the treatments applied after the future perspective is acquired are smaller compared to the shifts between Session 1 (current generation) and Session 2 (future generations). In this workshop, we did not apply the treatments of Sessions 3 and 4 to discussions from the perspective of the present generation, so we cannot make a rigorous comparison. This is therefore a subject for further investigation.

3.3 Multiple regression analysis

The results of our multiple regression analysis are shown in Appendix 4. The following discussion focuses on the most important findings from the analysis. The details of each individual analysis will be discussed later, but first we will highlight the following three points as commonly observed trends and implications that are particularly important because of their commonality.

1) In Session 1, when multiple items, Q1-4, Q1-5, Q1-6, Q1-8, Q1-9, Q1-14, Q1-15, Q1-16, Q1-18 and Q3-8, were considered from the perspective of the current generation, we observed that the higher the level of critical thinking among participants, the more important these perceptual items tended to be. However, in the second and subsequent workshop sessions, when the IFG perspective was adopted, the influence of critical thinking tended to disappear (Appendix 4). Given that the average scores of these items tended to increase after Session 2 when the IFG approach was adopted, it appears that the adoption of IFG approach may strengthen these perceptions, independently of the individual characteristic of critical thinking. Further, for the item **Q1-17 "In today's discussion, I thought about things from the perspective of a person living in the present day",** those with lower critical thinking scores tended to agree with this statement in Session 1, but the effects of critical thinking disappeared after Session 2 when IFG was adopted. These results clearly indicate an effect of adopting IFG. Nakagawa et al. (2019a) showed that those with a high degree of critical thinking are likely to select future-oriented options. Our results show, for the first time, that it would be possible to increase empathy about future generations when the mechanism of IFG is introduced, regardless of the level of critical thinking. Note that the similar tendencies were observed for some items on the personal disposition of generativity and SVO.
2) In Session 2 and subsequent sessions, after IFG was introduced, analysis results suggest that the influence and effect of personal attributes can vary depending on the treatment and work contents. In other words, even when the perspective of an IFG is adopted, the influence of these personal attributes may vary depending on the type of treatment and the form of discussion for decision-making. In particular, specific features were observed in the treatment of Session 3 in which participants created past roadmaps connecting the society of 2050 back to the society of 2020. For example, the effects of personal attributes surfaced in Session 3 for items Q1-2, Q1-9, Q1-15, and Q 3-5 (see Appendix 4). However, more detailed study is required to clarify this point.

3) Analysis results suggest that detached house owners are less likely to develop stronger perceptions about items listed in the questionnaire, regardless of perspective (current or future generation). In other words, it is possible that living arrangements or residence type may affect nurturing the perceptions of empathy for future generations in some way. This seems to suggest a certain limitation in terms of fostering an awareness of these items. For example, with item Q1-4 in Sessions 2 and 3; with item Q1-5 in Sessions 1 and 4; with item Q1-6 in Sessions 2 and 3; with item Q1-18 in Sessions 2, 3, and 4; with item Q2-2 in Sessions 1 to 4; with item Q2-3 in Sessions 1, 2, and 4; with item Q2-5 in Sessions 1 and 3; with item Q3-2 in Sessions 2 and 3; with item Q3-5 in Sessions 1-3; with item Q3-6 in Session 3 and 4; with item Q3-7 in Sessions 1, 2, and 3; and with item Q 3-8 I Sessions 1, 3, and 4, we observed that individuals who live in detached houses (owners) tended not to think in accordance with the items. The number of participants in this study was limited, so to understand this tendency more clearly, it is necessary to accumulate more case studies.

The following section details the analysis results for each item (Appendix 4) and their implications.

In Session 1, when the future was examined from the perspective of the current generation, item Q1-1 was rated highly by respondents with a social value orientation (SVO) of proself and young age. However, after session 2, this tendency disappeared, however. In Sessions 2 and 3, this item was rated highly by individuals with higher levels of critical thinking and lower generativity. Item Q1-2 was rated highly by individuals who resided in the city for short time, but the tendency disappeared after Session 2. Furthermore, there was particularly strong agreement in Sessions 2 and 3 among individuals with a proself SVO. In Sessions 3 and 4, it was individuals of younger age that tended to rate this item highly. For item Q1-3, younger individuals rated this item highly in Session 1, but from Session 2 onward, the influence of age disappeared.

Each of items Q1-1, Q1-2, and Q1-3 in Session 4 tended to be rated highly by individuals who worked as regular employees. More detailed study based on more questions is needed, but this observation may indicate that there is trust in group and discussion-based decision-making, or else that the conclusion (outcome) is worth the time spent on it.

For items Q1-4, Q1-5, Q1-6, Q1-8 and Q1-9, individuals with a higher propensity for critical thinking were more likely to feel a sense of crisis, responsibility, and expectation in Session 1; however, from Session 2 onward, the influence of critical thinking was no longer observable. Since the mean ratings of these items increased from Session 2 onward, compared with Session 1, it is possible that most participants came to feel a sense of crisis, responsibility, and expectation, regardless their critical thinking level, as already discussed earlier. For item Q1-6, in Session 1, individuals with low generativity or young age tended to think that the matters discussed were the responsibility of people living in the present era, but this tendency disappeared at Session 2. Further, from Session 2 through Session 4, participants with a higher level of scientific literacy considered thing in the same way. Thus, the perception that the current generation bear some responsibility may be related to the degree of scientific literacy, independent of the type of treatment, when IFG is adopted. On the other hand, for item Q1-7, critical thinking appeared to have no effect, except for the Session 3. It seems that most participants approached the discussion from the perspective of the current generation, with a desire to solve the problem. For item Q1-8, males tended to consider that way in the Sessions 2 and 3.

We found that individuals who lived in the same residence for a long time tended to agree with item Q1-9 more strongly in the Session 1. However, this tendency disappeared from Session 2. In the Session 3, those with high levels of generativity and scientific literacy, and men, tended to agree with this item. However, this tendency was not observable in other sessions. This implies that the treatment of the Session 3 is somewhat special.

For the items relating to intergenerational inheritance, items Q1-10 and Q1-11, proself individuals tended to align more strongly with these perceptions than prosocial individuals in Session 1, but not with statistical significance. Since the tendency of proself individuals is not to consider benefits to others, we need to clarify whether they consider what they inherited from their ancestors and what they will pass on to future generations as a benefit or as a negative legacy.

Item Q1-12 was highly rated by proself individuals in Session 1, but this tendency disappeared after Session 2. In addition, the higher the scientific literacy, the more important this was considered in the present time, except in Session 2. This feature is the same as the responses of item Q 1-6. Since both of items Q 1-6 and Q 1-12 are related to the responsibility and issues of current generations, it is possible that scientific literacy is an important factor for developing relevant perception, regardless of the treatment contents. In the case of item Q1-13, the higher the participants' scientific literacy, the more important the item was considered in the future applied in Sessions 3 and 4. Interestingly, individuals who were housewives/househusbands considered this item unimportant from Session 1 through Session 4.

For item Q1-14 in Session 1, the higher the critical thinking and generativity, the more strongly individuals felt a shared recognition of goals that are desirable for society as a whole, but this effect was no longer observed from Session 2 onward. Also, for item Q1-15 in Sessions 1 and 2, the higher the participants' critical thinking, the more strongly they perceived common goals, but this effect disappeared in Session 3. For this item, it appears that the treatment of Session 3 can be considered unique because attributes such as age, gender, household size, and number of years in the same residence affected their perceptions.

With item Q1-16, we observed that in Session 1, individuals with a higher propensity for critical thinking or household income tended to find the conclusion of discussions more acceptable, but in Session 2 this effect was no longer observed for critical thinking.

With item Q1-17, individuals with a higher propensity for scientific literacy were less likely to agree with the item, but the effects disappeared after Session2. Individuals with a proself SVO tended to perceive that they considered things from the standpoint of the present time in Session 1, but this tendency disappeared from Session 2. With item Q1-18, individuals with a higher propensity for critical thinking tended to perceive that they considered things from the standpoint of future generations in Session 1, but this tendency disappeared from Session 2. In Sessions 3 and 4, individuals with a higher propensity for scientific literacy tended to agree with the item.

With item Q2-1, individuals with higher scientific literacy tended to assign greater importance to the item in all four sessions, indicating that their disposition was an important factor for the item, regardless of the standpoints adopted. With item Q2-2, we saw that in Sessions 2 and 4, the higher the scientific literacy, the greater the importance assigned to the item. In addition, participants who engaged in part-time/casual work considered that the item was not important in Sessions 1, 2, and 3.

In the case of item Q2-3, we observed that men were more likely to think in this way in Sessions 2, 3, and 4. Those who engaged in part-time/casual work considered that the item was not important in Sessions

1, 2, and 3. With item Q2-4, the higher the household income, the less affection was felt in Sessions 1 and 3. However, individuals with a proself SVO felt affection for Suita City in Sessions 1 and 3. With item Q2-5, in Session 1, we observed that the larger the household of an individual, the more affection was felt, but the higher the household income, the less affection was felt; however, these effects disappeared after Session 2.

With items Q2-6 and Q2-7 in Session 1, individuals who were not self-employed or who were family employees were more likely to want their children and grandchildren to continue living with them, and individuals who live in apartment complexes (renters) were also more likely to want their children/grandchildren to continue living with them. However, these effects disappeared after Session 2.

With item Q2-8 in session 3, which was about assessments of the city, participants with a high propensity for scientific literacy and with a proself SVO tended to agree with the idea, but these effects were not observable in other sessions, making the treatment in Session 3 special. In the case of item Q2-9, we observed that men were more likely than women to think in this way in Sessions 1, 2, and 3.

In relation to the items that were important in policymaking, with item Q3-1, we found that in Sessions 2 to 4, individuals with a proself SVO tended to think like this when discussing issues from an imaginary future perspective. With item Q3-2, this characteristic was particularly evident with the treatment of Session 2. Specifically, individuals with a low capacity for critical thinking, high generativity, high scientific literacy, or proself SVO tended to think in this way. This tendency was only observed in Session 2, which indicates that the treatment in that session affected the responses to this item in a distinctive way. Also, except in Session 2, housewives/househusbands tended not to think in this way. In the case of Q3-3, except in Session 4, self-employed and family employees tended to think like this.

In the case of Q3-4, individuals from large households (number of members) tended not to think like this in Sessions 2 and 3. In the case of Q3-5, Session 3 appears to be unique in that individuals of high generativity, high scientific literacy, and high age tended to think like this, and men were more likely than women to think in this way. In the case of Q3-6, individuals with a high propensity for scientific literacy thought like this in Sessions 2 and 3, and employees (e.g., company employees) thought like this in Sessions 2, 3, and 4 when IFG was adopted. In case of Q3-7, individuals with part-time/casual jobs tended not to think like this in Sessions 1 to 3. With item Q3-8, individuals with a higher propensity for critical thinking tended to agree with the item, but the effects disappeared after Session 2 after IFG was introduced.

4. Conclusions

In this study, we conducted a workshop in which both residents and city government officials of Suita City examined the 3rd Environmental Master Plan, a key policy document of the city. Groups of participants formulated a vision (image) of the city in 2050 and proposed policies that should be implemented in the near-term in order to realize the vision, both from the perspective of the current generation and from the perspective of an IFG in 2050. Data from group discussions and questionnaire surveys of participants revealed the following.

Firstly, data from group discussions clearly showed that the adoption of the device of IFGs significantly changes the contents of the policies proposed or supported by participants. When participants discussed issues from the perspective of an IFG, they were more likely to propose new, unprecedented institutions and systems and measures framed from a long-term and comprehensive perspective, in marked contrast

with thinking and decision-making tendencies when discussions are held from the perspective of the current generation.

Next, the results of an ANOVA clearly showed that adopting the perspective of an IFG can effect clear changes in perceptions of intergenerational problems and in assessments of Suita City, and furthermore, that applying the device of IFG to decision-making processes and discussions gives rise to significant differences in perceptions, in accordance with specific treatment and work contents. As examples, perceptions of 1) the need to eliminate uncertainties about the future, 2) a sense of crisis about the future, and 3) a shared recognition of social goals for the future were all clearly enhanced when IFG was combined with other tasks. These attitudes are extremely important for decision-making and consensus-building, and for resolving long-term issues into the future. The fact that these attitudes were strengthened suggests that the "futurability" of participants was activated.

The results of a multiple regression analysis yielded the following three notable points. First, when examining future visions and policies to be implemented from the perspective of the current generation, individuals with a high level of critical thinking (as a personal trait) tended to assign more importance to several items, including "a sense of crisis about the future", "a sense of responsibility as the current generation", and "a shared recognition of goals that are desirable for society as a whole". However, for many of the items as discussed in Section 3-3, the impact of critical thinking tended to disappear in Session 2, when the IFG perspective was introduced. These findings suggest that adopting the device of IFG can strengthen the perceptions of these items, regardless of the level of critical thinking of individuals.

Second, even in Sessions 2 to 4, even after IFG was introduced, the influence and effects of personal attributes and dispositions changed, depending on treatment and work contents. In particular, specific characteristics were observed in Session 3 when participants were dedicated to discussing past roadmaps connecting the society of 2050 back to the society of 2020. It is possible that this type of treatment enables participants to activate the perception of time framework more clearly. This finding indicates that types of treatment and work contents in decision-making could be determining factors affecting the perception of individuals, even when the device of IFG was adopted. It is important to accumulate knowledge as to what types of treatment works effectively to generate empathy for the future generations after taking the perspectives of future generations.

Third, owners of detached houses were less likely to develop stronger perception of various items in the questionnaire, regardless of whether they adopted a current generation or IFG perspective, suggesting that factors like residence type and living environment may influence the effectiveness of adopting Future Design. It is therefore necessary to examine the possibility that there are spurious correlations involving the number of years in the same residence, annual household income, relational mobility, social capital, and risk forecasting (e.g., expectation of losing assets due to a natural disaster, etc.). In apartment complexes, there are many opportunities for people to meet others in their surroundings on a regular basis, and it is quite possible that neighbors are expected to get to know each other and cooperate.

The results and implications of this study can serve as valuable information for the creation of a mechanism for supporting sustainable decision-making that considers the interests of future generations.

Topics for further research include the following. Above all, since the number of participants in these discussions was limited to 28, we need to increase the number of case studies and sample sizes, to obtain more robust results, particularly in terms of the statistical analysis.

In addition, in line with previous studies, we limited the number of questions on critical thinking and generativity, but there is still a need to examine the effects of items not tested in this study, so this is another matter for subsequent investigations. We hope to clarify all these points as we accumulate further case studies.

References

Ennis R. H (1987) A taxonomy of critical thinking dispositions and abilities. In J. Baron & R. Sternberg (Eds.), Teaching thinking skills: Theory and practice (pp. 9-26). New York: W. H. Freeman.

Hara K, Kitakaji Y, Sugino H, Yoshioka R, Takeda H, Hizen Y, Saijo T (2021) Effects of Experiencing the Role of Imaginary Future Generations in Decision-Making - a Case Study of Participatory Deliberation in a Japanese Town, ***Sustainability Science***, 16(3), 1001-1016

Hara K, Yoshioka R., Kuroda M, Kurimoto S and Saijo T (2019) Reconciling intergenerational conflicts with imaginary future generations - Evidence from a participatory deliberation practice in a municipality in Japan, ***Sustainability Science,*** 14(6), 1605-1619

Hara K (2016) Participatory future design in pursuit of sustainability, ***Design Engineering***, 51, 22–28 (in Japanese)

Hara K, Saijo T, Kurimoto S, Kishita Y, Uwasu M, Fuchigami Y (2015) Will people's perceptions and judgements change in view of future generations? Evidence from a questionnaire survey, Proceedings of EcoDesign 2015 international symposium, 105–107

Hirayama R, Kusumi T(2004) Effect of critical thinking disposition on interpretation of controversial issues: Evaluating evidence and drawing conclusions, ***Jpn. J. Educ. Psychol***. 2004, 52, 186–198 (In Japanese)

Hiromitsu T, Kitakaji Y, Hara K and Saijo T (2021) What do people say when they become "future people"? ―Positioning Imaginary Future Generations (IFGs) in general rules for good decision making, ***Sustainability***, 13(12), 6631

Höfer T and Madlener, R (2020) A participatory stakeholder process for evaluating sustainable energy transition scenarios, ***Energy Policy***, 139, 111277

IPCC (2014) Climate change 2014: mitigation of climate change. In: Edenhofer O, Pichs-Madruga R, Sokona Y, Farahani E, Kadner S, Seyboth K, Adler A, Baum I, Brunner S, Eickemeier P, Kriemann B, Savolainen J, Schlömer S, von Stechow C, Zwickel T, Minx JC (eds) Contribution of working group III to the fifth assessment report of the intergovernmental panel on climate change. Cambridge University Press, Cambridge

Kamijo Y, Komiya A, Mifune N, Saijo T (2017) Negotiating with the future: incorporating imaginary future generations into negotiations, ***Sustainability Science***, 12(3), 409–420

Kates R.W, Clark W.C, Corell R, Hall J.M, Jaeger C.C et al (2001) Sustainability science, ***Science***, 292(5517), 641–642

Kishita Y, Hara K, Uwasu M, Umeda, Y(2016) Research needs and challenges faced in supporting scenario design in sustainability science: A literature review, ***Sustainability Science***, 11, 331–347

Komiyama H, Takeuchi K (2006) Sustainability science: building a new discipline, ***Sustainability Science***, 1(1), 1–6

Kuroda M, Uwasu M, Bui X.T, Nguyen P.D, Hara K (2021) Shifting the Perception of Water Environment Problems by Introducing "Imaginary Future Generations - Evidence from participatory workshop in Ho Chi Minh City, Vietnam, ***Futures***, 126, 102671

Mander S, Bows A, Anderson K.L, Shackley S, Agnolucci P, Ekins P, Larkin A (2008) The Tyndall decarbonisation scenarios—Part I: Development of a backcasting methodology with stakeholder participation. ***Energy Policy***, 36(10), 3754–3763

McAdams D. P, de St Aubin E. D (1992) A theory of generativity and its assessment through self-report, behavioral acts, and narrative themes in autobiography, ***Journal of personality and social psychology***, 62(6), 1003

Miller J. D (1998) The measurement of civic scientific literacy, ***Public understanding of science,*** *7*(3), 203.

Nakagawa Y, Saijo T (2021) A visual narrative for taking future generations' perspectives, ***Sustainability Science,*** 16, 983–1000

Nakagawa Y, Arai R, Kotani K, Nagano M, Saijo T (2019a) Intergenerational retrospective viewpoint promotes financially sustainable attitude, ***Futures***, 114, 1–13

Nakagawa Y, Kotani K, Matsumoto M, Saijo T (2019b) Intergenerational retrospective viewpoints and individual policy preferences for future: A deliberative experiment for forest management, ***Futures***, 105, 40–53

Nakagawa Y, Hara K, Saijo T (2017) Becoming sympathetic to the needs of future generations: a phenomenological study of participation in future design workshops, Kochi University of Technology, Social Design Engineering Series, SDES-2017-4
http://www.souken.kochi-tech.ac.jp/seido/wp/SDES-2017-4.pdf.

Nikolakis W (2020) Participatory backcasting: Building pathways towards reconciliation? ***Futures***, 122, 102603

Okamoto S (2008) An analysis and consideration of public scientific literacy, ***The Journal of Science Policy and Research Management***, 22, 172–187 (in Japanese)

Pereverza K, Pasichnyi O, Kordas O (2019) Modular participatory backcasting: A unifying framework for strategic planning in the heating sector, ***Energy Policy***, 124, 123-134

Reed M.S, Kenter J.O, Bonn A, Broad K, Burt T, Fazey I, Fraser E, Hubacek K, Nainggolan D, Quinn C.H et al(2013) Participatory scenario development for environmental management: A methodological framework illustrated with experience from the UK uplands, ***Journal of Environmental Management***, 128 (15), 345–362

Robinson J, Burch S, Talwar S, O'Shea M, Walsh M (2011) Envisioning sustainability: Recent progress in the use of participatory backcasting approaches for sustainability research, ***Technological Forecasting and Social Change***,78(5), 756–768

Rockström J et al (2009) A safe operating space for humanity, ***Nature***, 461(7263), 472–475

Saijo T (2020) Future design: bequeathing sustainable natural environments and sustainable societies to future generations. ***Sustainability***, 12(16), 6467

Saijo T (2018) Future design: succeeding a sustainable nature and society to future generations, **Rev Environ Econ Policy Stud.** 11(2), 29–42 ((in Japanese))

Saijo T (ed) (2015) Fyūchā Dezain: Nana Sedai Saki o Misueta Shakai (Future design: a society looking ahead for seven generations), Keiso Shobo (in Japanese)

Uwasu M, Kishita Y, Hara K, Nomaguchi Y (2020) Citizen-participatory Scenario Design Methodology with Future Design Approach: A Case Study of Visioning for Low-Carbon Society in Suita City, Japan, ***Sustainability***, 12(11), 474

Van Lange P. A, Bekkers R, Schuyt T. N, Vugt M. V (2007) From games to giving: Social value orientation predicts donations to noble causes, ***Basic and applied social psychology***, 29(4), 375-384

van der Voorn T, Pahl-Wostl C, Quist J (2012) Combining backcasting and adaptive management for climate adaptation in coastal regions: A methodology and a South African case study, ***Futures***, 44 (4), 346–364

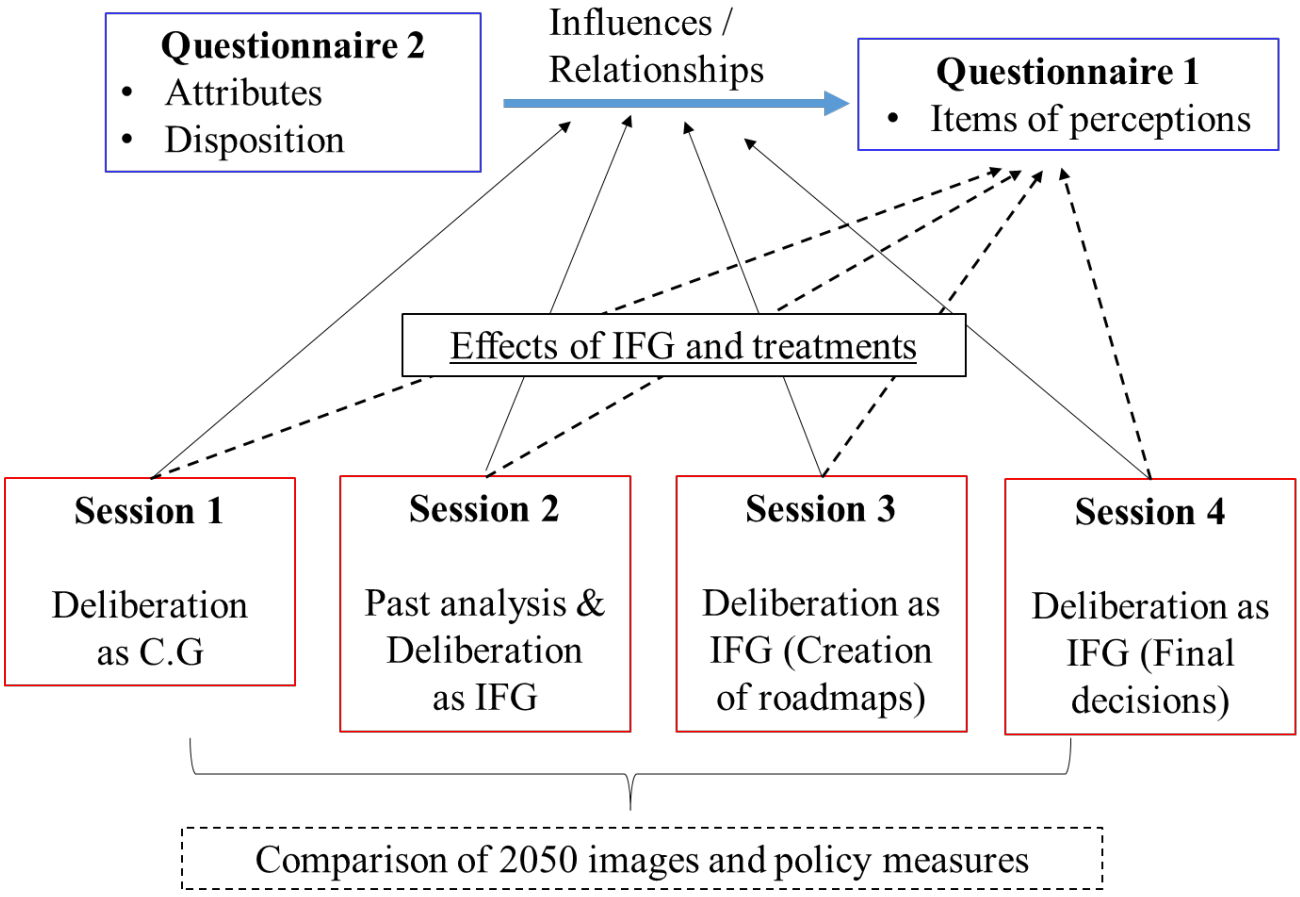

Fig 1. Framework of analyses

Table 1 Contents of each session at workshop

	Date	Content
Session 1	March 30, 2019 (Current generation perspective)	• Receive information about the city and the 3rd Environmental Master Plan • Envision the state of Suita City in 2050 from the perspective of the current generation • Evaluate and review a draft outline of the environmental master plan
Session 2	April 13 (Analysis of past policy) (IFG perspective)	• Evaluate the past waste management policies • Envision the state of Suita City in 2050 as an IFG in 2050 • Review policy ideas that should have been considered (and implemented) as environmental plans and policies in 2019
Session 3	June 23 (IFG perspective)	• From the perspective of an IFG, create a past timeline (roadmap) from 2019 to 2050 • Based on the past timeline, review the policy ideas that should have been considered (implemented) in 2019 and identify priority policies
Session 4	August 31 (IFG perspective)	• Formulate final proposals for 2019 from the standpoint of an IFG in 2050 (express vision of Suita City in 2050 and priority policies)

Table 2: Images of Suita City in 2050 and three high-priority policies that should be adopted from 2020, proposed by IFG

Description of Suita City in 2050

Energy A: Suita City, as of 2050, runs on 100% renewable energy and consumes 70% less energy. Self-driving cars declined since 2040 and have now almost disappeared. An air transportation network has been developed. Old roadways are now green belts, with abundant nature. Although life has become very convenient, there is less communication between people in the community (with people other than family members). This has become a social problem.

Energy B: In 2050, Suita City has become an environmentally friendly place to live, with no more vacant houses or lots, and abundant green spaces and places for community activities. Disaster-resistant buildings with solar panels are the norm, and the city's population continues to grow as its living environment improves. Suita City has been successful in changing the attitude of individuals and in encouraging them to create a better environment. Energy self-sufficiency is over 75%, so each household is able to supply its energy needs without difficulty.

Recycling A: In Suita City in 2050, cars fly in the sky, so there are no traffic jams. AI takes care of daily healthcare and the initial diagnosis of illnesses is handled by AI, so medical care is inexpensive. Work styles have also changed. With the support of robots, humans can focus on creative work. Human interaction has increased, but disparities have developed in the community. The style of education has also changed. People can now learn anywhere and anytime. After much effort, garbage has been reduced to zero.

Recycling B: In 2050, Suita City is a zero-waste "advanced SDGs city." Goods are transported by drones and flying cars. It is a center of human activity, but the city's greenery is decreasing and there is increasingly less interaction among people.

Cross-section A: In 2050, Suita City is the No. 1 municipality in the Kansai region for environmental satisfaction. It offers advanced transportation and self-driving vehicles. It has a high recycling rate and a high level of low-energy housing. There are more foreign residents. Thanks to AI and unmanned community buses, the city has far lower labor costs. The plastic recycling rate is high. Exporting garbage abroad is not acceptable.,(Double-paned windows, AI-based air conditioners)

Cross-section B: In 2050, Suita City is a clean, green, and comfortable city, thanks to the widespread use of EVs, the greening of walls when buildings are rebuilt, especially in the Osaka area, far fewer air conditioners are in use. As a result of environmental education programs at elementary schools and in the form of public seminars that have been systematically organized since 2019, Suita City has become a city of strong environmental initiatives that has attracted the attention of children, parents, and companies, with a growing number of jobs related to the environment. Suita City has also collaborated with other cities.

Table 2 (continued)

Three high-priority policies that should be adopted from 2020 and reasons for the proposal

Energy A

Contents (1): Building a renewable energy system that also considers disposal methods

Reasons (1): We are satisfied with the current state of 100% renewable energy, but when building a renewable energy system, it is essential to consider the final disposal method and replacement.

Contents (2): Collaboration with neighboring municipalities

Reasons (2): To achieve 100% renewable energy, for example, without wind and biomass in mountainous municipalities.

Contents (3): Create a system to nurture the "spiritual richness" that has been lost

Reasons (3): Due to the use of AI, interpersonal communication has declined, and although it is convenient, the current environment is lacking in human spirit. It is therefore necessary to increase interactions with nature and animals, and intergenerational interactions, by making the best use of enriched green spaces.

Energy B

Contents (1): Measures to improve waste reuse

Reasons (1): Because reusing waste energy in all households will not only raise public awareness, but also greatly increase energy self-sufficiency. Such measures will lead to physical reduction in the quantity of garbage generated.

Contents (2): Improve environmental education

Reasons (2): Thoroughly changing the awareness of individuals will facilitate changes in ordinances related to the conversion garbage into energy. Government and citizens can work together to promote measures, thereby creating an ideal environmental cycle.

Contents (3): Measures to address the problem of vacant land and houses

Reasons (3): This will reduce the amount of waste and garbage due to the abandonment of vacant land and housing. A steady and persistent approach by the government will eventually lead to a solution. Resolving the issue of vacant land and housing will facilitate inflows of people from other municipalities and lead to the creation of a more attractive environment.

Table 2 (continued)

Three high-priority policies that should be adopted from 2020 and reasons for the proposal

Recycling A

Contents (1): Establish clear basic policies and measures for realizing a better 2050.

Reasons (1): Above all, it is important to set goals for the future and establish a path to reach them.

Contents (2): Provide education and raise awareness about the environment.

Reasons (2): In 2019, there were many technical and institutional solutions to waste separation and recycling issues, but they could not be realized due to a lack of public awareness and knowledge. It is therefore necessary to incorporate environmental classes into school education and actively disseminate information to companies and organizations.

Contents (3): R&D to realize zero waste

Reasons (3): It is essential to partner with universities and research institutes on research to develop biodegradable plastics and automatic garbage sorting systems, and other technologies that were not available in 2019.

Recycling B

Contents (1): Fee-based garbage disposal system

Reasons (1): To reduce waste by using the revenue earned from the fee-based garbage disposal system to fund research on the environment and waste management by universities and companies. Achieving recycling.

Contents (2): Education and awareness of the SDGs

Reasons (2): To deepen understanding of fee-based garbage disposal system, etc.

Contents (3): New rules for drones and flying cars

Reasons (3): To reduce the burden of road maintenance and achieve an efficient, low-waste environment through fuel reduction, etc.

Table 2 (continued)

Three high-priority policies that should be adopted from 2020 and reasons for the proposal

Cross-section A

Contents (1): Land improvement

Reasons (1): Roads, living environment (drainage, utility poles)

Contents (2): Exchange (locations)

Reasons (2): Distribute and share information on social networking sites. Create more children's playgrounds and places for people to interact.

Contents (3): Recycling

Reasons (3): Increase the number of sorting categories ⇒ Separate plastics, etc. Charge for garbage bags

Cross-section B

Contents (1): Designing the environment together with citizens

Reasons (1): By providing environmental education to young generations and exchanging opinions with citizens who are interested in the environment, generate a synergistic effect to raise environmental awareness and create policies in conjunction with citizens.

Contents (2): Collaborating with other cities and trying to establish committees

Reasons (2): To enable access to information from other cities and to enable the implementation of a wide range of measures.

Contents (3): Create institutions related to the environment

Reasons (3): To accelerate environmental improvements, involve companies, and increase the scale of projects. Also, guidelines are necessary for real-world implementation

Table 3 Results of a one-factor ANOVA

	Sessions	1st Session		2nd Session		3rd Session		4th Session			
	Questionnaire Items	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**F**	**sig.**
Q1-1	The policies talked about in the discussion will lead to the realization of a low-carbon society in Suita City that conserves limited energy resources.	3.71	0.76	4.11	0.75	4.00	0.41	4.39	0.58	5.82	**
Q1-2	The policies talked about in the discussion will lead to the formation of a social system that will manage Suita City's resources.	3.93	0.47	4.22	0.70	4.33	0.64	4.43	0.59	3.80	*
Q1-3	The policies talked about in the discussion will help foster environmental awareness among Suita's citizens.	3.82	0.90	4.37	0.63	4.58	0.58	4.39	0.72	6.25	***
Q1-4	Failure to implement the policies talked about in the discussion will lead to a serious crisis.	3.39	0.99	3.81	0.92	4.13	0.74	4.13	0.87	5.60	**
Q1-5	The matters discussed here must not be left to future generations.	4.39	0.79	4.44	0.58	4.46	0.66	4.57	0.59	0.28	n.s.
Q1-6	The matters discussed here are the responsibility of people living in the present era.	4.39	0.96	4.44	0.70	4.63	0.58	4.35	0.71	0.28	n.s.
Q1-7	The matters discussed here are issues that cannot be solved solely by people living in the present era.	3.39	1.26	3.37	1.39	3.25	1.36	3.87	1.01	0.97	n.s.
Q1-8	The solution to matters discussed here is something	4.25	0.65	4.26	0.76	4.17	0.96	4.43	0.59	1.12	n.s.

	expected of a future era.										
Q1-9	What was concluded in this discussion is something that future generations would also hope for.	3.89	1.03	4.07	0.73	4.29	0.95	4.35	0.71	1.72	n.s.
Q1-10	That which we enjoy today is a legacy inherited from our ancestors.	4.14	0.80	4.33	0.83	4.29	0.95	4.52	0.59	1.18	n.s.
Q-1-11	That which we enjoy today must be passed down to future generations.	4.00	0.98	4.33	0.73	4.42	0.93	4.35	0.83	1.76	n.s.
Q1-12	The themes talked about in the discussion are important issues of the present.	4.57	0.63	4.56	0.58	4.58	0.93	4.74	0.54	0.36	n.s.
Q1-13	The themes talked about in the discussion are important issues for the future.	4.61	0.63	4.52	0.64	4.36	0.91	4.70	0.56	1.61	n.s.
Q1-14	The members of my group debated goals that seemed desirable for society as a whole.	4.14	0.71	4.44	0.58	4.40	0.71	4.78	0.42	5.17	**
Q1-15	The members of my group shared goals that seemed desirable for society as a whole.	4.00	0.82	4.19	0.62	4.36	0.76	4.57	0.51	4.25	**
Q1-16	The conclusions reached in the discussion are acceptable.	4.04	0.84	4.15	0.66	4.32	0.75	4.35	0.57	1.40	n.s.
Q1-17	In today's discussion, I thought about things from the perspective of a person living in the present day.	4.07	0.66	2.78	1.25	3.20	1.29	2.57	1.38	10.60	***
Q1-18	In today's discussion, I thought about things from the perspective of a future generation.	3.39	1.17	4.37	0.56	4.36	0.76	4.35	0.78	9.61	***
Q2-1	The realization of a low-carbon society that conserves limited energy resources is an important	4.56	0.70	4.48	0.64	4.64	0.57	4.74	0.54	2.27	†

	issue for Suita City.										
Q2-2	The formation of a social system that will manage its resources is an important issue for Suita City.	4.56	0.70	4.74	0.53	4.68	0.56	4.83	0.39	1.84	n.s.
Q2-3	The implementation of environmentally friendly practices by citizens is an important issue for Suita City.	4.56	0.70	4.59	0.50	4.72	0.46	4.78	0.42	1.78	n.s.
Q2-4	I feel emotionally attached to Suita City.	4.30	0.87	4.37	0.88	4.48	0.71	4.41	0.96	0.84	n.s.
Q2-5	I want my children and grandchildren to feel an emotional attachment to Suita City.	4.22	0.89	4.26	0.90	4.36	0.81	4.30	0.97	0.12	n.s.
Q2-6	I want to continue to live in Suita City.	4.26	0.86	4.26	1.02	4.32	0.85	4.36	0.85	0.53	n.s.
Q2-7	I want my children and grandchildren to continue living in Suita City.	3.63	1.04	3.78	0.97	3.96	0.93	4.04	0.98	1.60	n.s.
Q2-8	Suita City will be a comfortable place to live in 2050.	3.48	0.70	3.74	0.86	3.96	0.73	4.26	0.92	5.09	**
Q2-9	Feeling a sense of one's own individual importance will also be important for people in the Year 2050.	3.93	0.92	4.11	0.75	4.14	0.78	4.26	0.92	1.07	n.s.
Q3-1	Living an affluent lifestyle	3.08	1.16	3.30	1.17	3.38	1.21	3.65	0.98	2.89	*
Q3-2	Living a healthy lifestyle	4.65	0.49	4.78	0.42	4.79	0.41	4.87	0.34	2.03	n.s.
Q3-3	Living a cultured lifestyle	4.38	0.57	4.56	0.58	4.50	0.51	4.39	0.66	1.61	n.s.
Q3-4	These measures are feasible	4.04	0.96	3.96	0.81	4.38	0.49	4.09	0.73	1.39	n.s.
Q3-5	These measures could bring about an ideal future	4.08	0.74	4.22	0.70	4.54	0.59	4.39	0.66	3.92	*
Q3-6	Suita City is sustainable	4.21	0.93	4.30	0.67	4.38	0.82	4.35	0.88	0.29	n.s.
Q3-7	Reducing anxiety about what could occur in future	4.12	1.07	4.56	0.58	4.50	0.66	4.57	0.84	4.47	**
Q3-8	Leaving room for people in the future to be able to make	4.27	0.92	4.11	0.75	4.25	0.74	4.26	0.86	0.29	n.s.

choices for themselves	

Note. *** p<.001, **p<.01, *p<.05, †p<.10

Note: All p values in this table are two-tailed.

M: mean value; *SD*: standard deviation