Environ Syst Decis (2016) 36:421–437
DOI 10.1007/s10669-016-9613-6

Clarifying relationships between participatory approaches, issues, processes, and results, through crosscutting case analysis in Japan's environmental, energy, and food policy areas

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Published online: 4 November 2016

Abstract Participatory public engagement approaches such as Consensus Conferences, Deliberative Polling®, and Planning Cells have been used to try and resolve environmental disputes in Japan; however, the strengths and weaknesses of these approaches have not been analyzed adequately or comprehensively. This paper evaluates practical applications of each of the above participatory approaches and conducts a crosscutting analysis of these applications to evaluate how effectively each approach provides scientific information to participants and to consider how the quality of deliberations that occur during these processes affect their outputs. Based on existing classification of participatory processes, and methodology for public involvement in US environmental decision-making, this study compares and contrasts the processes and outcomes of 25 participatory planning case studies in Japan. After compiling a case inventory of participatory approaches, the features of one approach are documented using qualitative analysis, and the aspects of four other approaches are confirmed using crosscutting analysis. In so doing, the likely strengths and weaknesses of each approach are suggested as follows. When discussions require an understanding of scientific knowledge, the Consensus Conference tends to be more suitable than the DP approach. If the consensus of participants is expected, the Consensus Conference is also thought to be suitable. But through a DP process or Simplified Planning Cells approach, we can know the quantitative portion of each opinion through results of ballots. In sum, new participatory approach that incorporates strengths of the Consensus Conference and the Simplified Planning Cells into Local Environmental Planning is needed. Thus, the quality of consensus building could be improved.

Keywords Participatory approaches · Case inventory · Deliberative Polling · Consensus Conference · Planning Cells · Environmental policy

1 Introduction

Water, energy, and food are essential resources for our human life. Our research aims to explore whether participatory approaches offer possible solutions for resolving conflicts in the context of water–energy–food policy in local communities. This paper focuses on a participatory approach that has been applied to three policy areas, such as water, energy, or food (agricultural) issues in Japan.

Participatory approaches such as Consensus Conferences, Deliberative Polling® (DP), and Planning Cells have been used with the objective of resolving various environmental disputes; however, in Japan, the strengths and weaknesses of these processes have not been analyzed adequately or comprehensively. Participatory approaches are sometimes referred to using different descriptors, such as stakeholder engagement or consensus building. For instance, in the Organization for Economic Cooperation and Development (OECD) context, stakeholder engagement is defined as *the process by which any person or group who has an interest or stake in a water-related topic is involved in the related activities and decision-making and implementation processes* (Akhmouch and Clavreul 2016). Consensus building

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is also *a process of seeking unanimous agreement* (Susskind, McKearnan and Thomas-Larmer 1999). In this article, our scope of study includes both process and output or outcome. This purpose is to study relationships between the processes inherent in participatory approaches and outputs or outcomes of these processes.

Key aspects of each type of participatory approach are analyzed. These aspects include their application, government involvement, provision of scientific information to participants, and relationships between the quality of the deliberations and outputs. The results of this analysis are then used to design and implement participatory approaches for use in local communities. These approaches are intended to realize the co-design and co-production of science and society in the near future.

Three research questions were answered during our analysis of the participatory approach: first, which approaches were applied to which types of issues? Second, what were the major outputs of the different participatory processes, and was there a relationship between the methods selected and the outputs or results achieved? Finally, how were scientific facts (expert knowledge) and local knowledge dealt with under each approach? To answer these questions, we conducted a literature survey of journal articles and official documents in Japan to develop an inventory of the cases in which participatory approaches have been used to resolve various environmental differences.

2 Developing an inventory of participatory approaches

2.1 Research framework and methodology

Dienel (2009) developed the Planning Cell (*Planungszelle*) methodology for using deliberation to develop solutions to planning or policy problems. To evaluate various participatory approaches, Dienel proposed four major criteria for use in evaluating a participatory system: information acceptance, general weaknesses, the capacity for increasing participation, and providing learning opportunities. Information acceptance includes having knowledgeable individuals concur that the information is correct, ensuring that specified stakeholders' concerns are accurately portrayed and that stakeholders are motivated to participate in the continuous process. General weaknesses relate to the possibilities that special interests and self-interested organizations are allowed to dominate the process and that all social classes are not equally represented. Providing learning opportunities includes identifying self-interests, having the capacity to consider general long-term interests, having confidence in the process, and an understanding of the methods necessary for citizen engagement.

Dienel applied these four criteria to very general institutions and systems, such as those related to public administration, assemblies, political parties, citizen polls, advisory committees, citizen movements, and advocacy planning. He pointed out that his concepts are relatively broader than the concepts on which general participatory studies are based. These four criteria seem to be suitable for evaluating some institutional arenas and governance systems, but this is not true in all cases.

More practical criteria were proposed by Fishkin (2009), who developed a participatory approach called Deliberative Polling. According to the distinctions he made, there are two types of public opinion—raw and refined. Refined opinion can be thought of as an opinion that has been tested in competing arguments and information that has been conscientiously offered by others who hold contrasting views. Raw opinion has not been subjected to such a process. In our database, refined opinions are analyzed in deliberations that consider appropriate scientific facts. In other words, we use his distinction as a benchmark for identifying a specific approach and scoping criterion.

Table 1 summarizes the key components of Fishkin's participatory approaches. They are comprised of two types of public opinion and four methods of selection: self-selection, nonrandom samples, random samples, and everyone. Row A summarizes the methods of selection used to collect raw opinions; Row B summarizes methods of selection based on public opinions that have been refined through a process of deliberation based on scientific facts.

After identifying the approach, we use Beierle and Cayford's (2002) conceptual model to analyze various features of each participatory approach included in our inventory. Beierle's work was based on over 200 cases of environmental decision-making in the USA after the 1960s. His framework consists of three major components—context, process, and results—and uses qualitative evaluation criteria such as high, medium, and low for many variables in each case. Consistent with Beierle's model, our inventory has three major components: context, process, and results. Some variables have been modified to meet our research objective and to answer our three research questions as shown in Table 2. In the table, C means context variable, P means process variable, and R means results variable.

2.2 Method for creating an inventory of participatory approaches

In developing the inventory, we briefly described the cases' contexts, processes, and results. Three criteria to select the case studies were used. First, only public, official reports, or academic books and articles that included case studies for Japan and contained enough descriptive material for our analyses were included in our inventory. Second, in each

Table 1 Fishkin's classification of participatory approaches. Adapted from Fishkin (2009)

Public opinion	Method of selection			
	1. Self-selection	2. Nonrandom sample	3. Random sample	4. "Everyone"
A) Raw, without deliberation or scientific facts	1A SLOPs	2A Some polls	3A Most polls	4A Referendum democracy
B) Refined, with deliberation and scientific facts	1B Discussion groups	2B Citizen juries	3B Deliberative polls	4B "Deliberation day"

SLOP self-selected listener opinion poll

Table 2 List of variables included in case inventory

C-1. Policy area
C-2. Existing conflict or disputes among public
C-3. Lead agency's level of involvement[a]
P-1. Selection way of participants[a]
P-2. Type of output[a]
P-3. How to provide scientific information
P-4. Quality of deliberation[a]
R-1. How the output was treated
R-2. Resolving conflicts or disputes among competing interest
R-3. Building trust in institutions[a]
R-4. Informing the public and their learning

[a] Those variables are based on Beierle and Cayford's work (2002)

case, the approach or set of approaches taken had to be identified. Lastly, only cases that addressed a water, energy (including climate change), or food (agricultural) issue were collected. In total, 25 cases were comprehensively analyzed.

Regarding the specific approaches taken, the following four participatory methods were identified and included in our inventory.

1. Deliberative Polling®: This is a form of consultation in which a group of randomly selected citizens complete a public opinion survey on a policy, before participating in a discussion forum on this subject, where they deliberate their various opinions and clarify them, after which they complete another public opinion survey on the topic, and attitudes on the first survey are compared to those on the second survey to note changes in their attitudes (Inohara 2011) (Fig. 1).
2. Consensus Conference: In this type of public enquiry, a group of citizens is charged with the task of assessing a socially controversial science and technology topic. The general aims of this form of public engagement are to improve decision-making about topics related to science and technology, by expanding access to expert opinions and perspectives beyond those normally available, with the objective of increasing public understanding of science and technology through informed public debate, and fostering civic engagement to enhance democratic processes (Guston 1999) (Fig. 2).
3. Simplified Planning Cells (Citizen Deliberation): This forum consists of the random sampling of lay citizens for the purpose of discussing and fostering solutions for local public problems (Shinoto 2009) (Fig. 3).
4. Local Environmental Planning Process: In this process, self-selected citizens participate in a Local Environmental Planning process (such as a water, energy, or food policy issue) with local public officers, academic experts, and territorial group leaders. The process begins with an agenda-setting stage and culminates with a proposal for, or a decision regarding, a Local Environmental Plan or Ordinance. This process is very different from the above three approaches in terms of purposes, and this process may contain one or some of the above three approaches. The relationship between this process and the other approach is shown in Fig. 4.

2.3 Procedure for analyzing a participatory approach

After compiling a case inventory of participatory approaches, an analysis of the variables was conducted as follows: first, the general tendency of one approach was confirmed by qualitative analysis; second, relationships between variables were investigated using qualitative correspondence analysis; and third, conclusions were extracted through integrating above two analysis results.

3 Data obtained from cases using a participatory approach

3.1 Case descriptions

In 25 cases we analyzed, six were DPs, five used Consensus Conferences, five used Simplified Planning Cells, and nine were Local Environmental Planning efforts. Table 3 summarizes the profiles of these cases by listing

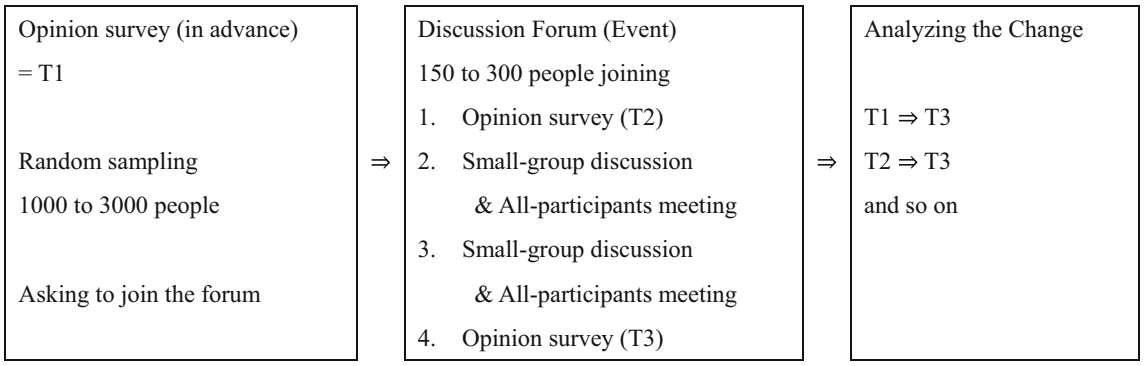


Fig. 1 A summary of steps followed for conducting deliberative polling in Japan

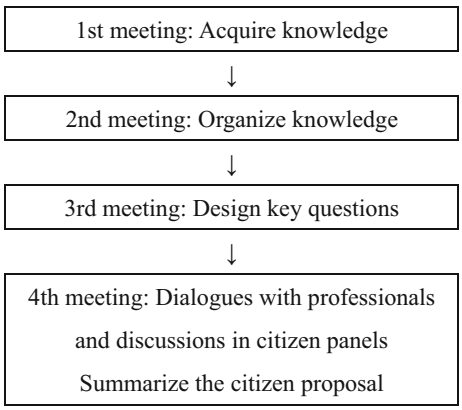


Fig. 2 A summary of the process followed for conducting Consensus Conference in Japan. Adapted from Morioka (2007)

their titles, the methods applied, issues targeted, the scope of the administrative levels and agencies involved, and the length of time required. We also provide additional information such as population sizes and locations.

3.2 Characterization of cases

3.2.1 Context of the cases

Appendix 1 shows variables regarding the context.

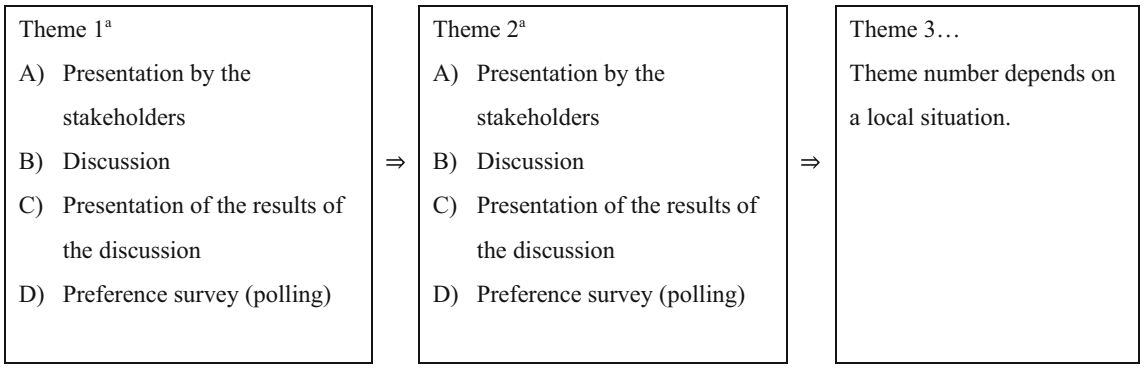
Five of the six DP cases dealt with climate change issues, and though they were intended to contribute to international negotiations or national policy processes (Yagi 2010; Baba and Kosugi 2013), the main purpose of the one bovine spongiform encephalopathy (BSE) DP was gathering information for research purposes (Sugiyama 2012). Of six DP cases, three were held at the national level, and one of these was funded and managed by the national government (Executive committee for Deliberative Polling on energy and environmental choice 2012).

While all the four GMO Consensus Conferences were intended to contribute to a national policy process (Society for Techno-innovation of Agriculture, Forestry and Fisheries 2001, 2002), the main purpose of the river improvement Consensus Conference was to reflect the opinions of the local citizens who lived along the river (Kobayashi 2007). Three of five Consensus Conference cases were led by a national government agency, and the other two cases were at the prefectural level. One of them dealt with regulations (Mikami 2007; Watanabe 2007), and the second case focused on river improvement issues. According to our literature survey, the responsible agency and local officer that attended these two cases led a very positive Consensus Conference.

Three of the five Simplified Planning Cell cases dealt with local environmental actions, such as reducing households' energy consumption (Hitachi-ota Junior Chambers of Commerce 2011) and reducing the volume of household garbage being produced (Hidume 2009). The aim of another case was to draft new rules on the use of river frontage (Komae Junior Chambers of Commerce 2009) and gather citizens' opinions for city planning purposes (Odawara city 2016).

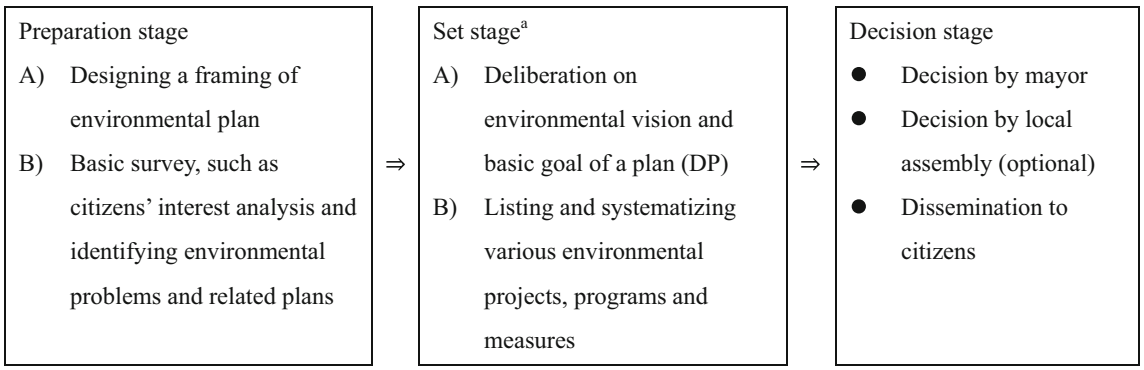
Reflecting the character of Local Environmental Planning processes, various themes were discussed throughout the process. In many cases, small groups or thematic sessions were organized around key words, such as nature, living, and city planning, as shown in Table 3. An interesting example of Local Environmental Planning is Numazu City—located in the central part of Japan near Mt. Fuji in Shizuoka prefecture, with about 200,000 citizens—which adopted an approach using random sampling (Muramatsu 2011).

In many cases, it is difficult to assess whether there were conflicts or disputes among citizens, stakeholders, and public administrators prior to starting the participatory process. However, we can confirm the national level of controversy with regard to nuclear power dependence and the cultivation of GMOs. Serious confrontations erupted around public nuisance problems between local citizen groups and previous administrative actions in some areas



[a]Themes 1 and 2 are usually different but sometimes the same

Fig. 3 A summary of steps for conducting simplified planning cells in Japan



[a]In some cases, DP approach is adopted at the set stage

Fig. 4 A summary of stages for making local environmental plan in Japan

(Takahashi 2000). These confrontations did not seem to affect the participatory process directly.

3.2.2 Processes of the cases

Appendix 2 shows variables with regard to processes.

By definition, participants for DP are selected by random sampling. The smallest group had 57 people which was conducted in Kawasaki City and dealt with a national energy and environmental innovation strategy. The largest number of participants in a DP case, 286, dealt with this same issue from a national perspective (Executive committee for Deliberative Polling on energy and environmental choice 2012). DP outputs were separated into three types: according to the results of scenario preferences (two cases), those that gathered only academic information (two cases), and policy reports, which were based on global common guidelines provided by the World Wide Views Committee (two cases). In the first case, participants' scenario preferences were usually indicated as representing a proportion of the participants polled, so this type did not seek consensus.

On the basis of their level of interest in the issue, participants self-selected their participation in four of the five Consensus Conferences. The management team only selected participants for one conference that was held in Shizuoka prefecture (Kobayashi 2007). The outputs of a Consensus Conference are typically expected to be a citizen proposal drafted through discussions by the participants. In that sense, achieving consensus among the participants is always the goal to some extent. However, in some cases, such as the Consensus Conference on the GMO issue in 2000, the final report was based on two different opinions (Society for Techno-innovation of Agriculture, Forestry and Fisheries 2001).

Participants of Simplified Planning Cells were also selected by random sampling. The case in Hitachi-ota City had 11 participants, while the largest Simplified Planning Cell was held in Odawara City, dealt with a citywide plan, and had 174 participants. Outputs were categorized into two major types, on the basis of the results of simple ballots (three cases), and citizen proposals (two cases). Furthermore, all three cases based on ballots included brief citizen proposals.

Table 3 Profile of analyzed cases, by method and period

Case no.	Title	Method	Issue (s)	Level and agency	Period
1	Deliberative Polls On Global Warming	Deliberative Polling	Energy: global warming	Local, greater Tokyo metropolitan	About 1 year (2005)
2	WorldWide Views on Global Warming	Deliberative Polling	Energy: global warming	National, world wide views in Japan	Late 2007–Nov. 2009
3	Deliberative Polls on BSE Problem	Deliberative Polling	Food: BSE	Local, Hokkaido University	Oct. 2009–Nov. 2011
4	Innovative Strategy for Energy and the Environment (local)	Deliberative Polling	Energy: nuclear power and climate change	Local level, non-government	Jan–Aug. 2012
5	Innovative Strategy for Energy and the Environment (national)	Deliberative Polling	Energy: nuclear power and climate change	National level, by government funding	Mar–Aug. 2012
6	World Wide Views on Climate and Energy	Deliberative Polling	Energy: global warming	National, world wide views in Japan	Jun–Dec. 2015
7	Consensus Conference to Think about GMOs	Consensus Conference	Food: GMOs	National level, by government funding	Nov. 1999–Nov. 2000
8	Citizen Conference to Think about GMOs (Sendai)	Consensus Conference	Food: GMOs	National level, by government funding (Sendai City, as producer area)	Jul. 2001–Mar. 2002
9	Citizen Conference to Think about GMOs (Yokohama)	Consensus Conference	Food: GMOs	National level, by government funding (Yokohama City, as consumer area)	Jul. 2001–Mar. 2002
10	Consensus Conference on the Anma River Improvement	Consensus Conference	Environment: river improvement	Local, Shizuoka Prefecture	2001–Apr. 2002
11	Consensus Conference on Cultivation of GMOs	Consensus Conference	Food: GMOs	Local, Hokkaido Prefecture	Jun. 2006–Feb. 2007
12	Earth and Garbage. Let's Think for Children!	Simplified Planning Cell	Environment: Reducing household garbage	Local, Shizuoka City	Unknown-Oct. 2007
13	You Are The Star, City Planning of Hitachi-Ota	Simplified Planning Cell	Energy saving and environment	Local, Hitachi-Ota City	May 2008–Nov. 2011
14	Odawara TRY Forum	Simplified Planning Cell	City planning and environment	Local, Odawara City	2008–Aug. 2009
15	City Discussion for Problem-Solving and Effective Use of Tama Riverfront Area	Simplified Planning Cell	Environment: how to use big riverfront area	Local, Komae City, partly funded by city government	May–Oct. 2009
16	Utsunomiya Citizen Discussion Forum	Simplified Planning Cell	Energy saving	Local, Utsunomiya City	Jul. 2012–Jan. 2013
17	Toyonaka City Environmental Basic Plan and Toyonaka Agenda 21	Local Environmental Planning	Environmental living, nature,	Local, Toyonaka City	May 1996–Mar. 1999
18	Date City Environmental Basic Ordinance	Local Environmental Planning	Environmental right and management	Local, Date City	Jul. 1997–Mar. 1999
19	Hino City Environmental Basic Plan	Local Environmental Planning	Water, nature, air, recycle and living	Local, Hino City	Oct. 1997–Nov. 1998
20	Shiki City Environmental Basic Plan	Local Environmental Planning	Nature, living and global environment	Local, Shiki City	Nov. 1997–Feb. 1999
21	Ichikawa City Environmental Basic Plan	Local Environmental Planning	Resource circulation, nature and global environment	Local, Ichikawa City	Feb. 1999–Sep. 1999
22	Nisshin City Environmental Basic Plan	Local Environmental Planning	Water, green, city planning, lifestyle, community, playing and learning	Local, Nisshin City	Aug. 2001–Feb. 2004
23	Fukuchiyama City Environmental Basic Plan	Local Environmental Planning	Nature, living and city planning	Local, Fukuchiyama City	Jan. 2002–Oct. 2003
24	Yasu City Environmental Basic Plan	Local Environmental Planning	Nature, city living and resource circulation	Local, Yasu City	Sep. 2005–Mar. 2007
25	Numazu City Environmental Basic Plan	Local Environmental Planning	Tourism, low-carbon city and local production for local consumption	Local, Numazu City	Jul. 2009–Nov. 2010

BSE Bovine spongiform encephalopathy, *GMOs* genetically modified organisms

Participants in the Local Environmental Planning process were basically self-selected. The number of participants depended on the size of the city's population and limits placed on the number of participants. In nine analyzed cases, the smallest one, held in Yasu City, had eight participants (Miyanaga 2008). The largest group, in Hino City in Tokyo, had over 100 participants (Takahashi 2000). Most cases had around 20 participants. Expected outputs of Local Environmental Planning processes include a draft plan, an ordinance draft, a proposed plan, and a citizen proposal. In the sense that participants' consensus is required, this process is similar to a Consensus Conference.

In most DP cases, written and/or video materials were prepared by professional committees and provided to participants before commencing deliberations. The program of deliberation consisted of four to six sessions dealing with multiple issues, and in some cases, third-party evaluations that were fair and objective in the quality of their deliberations were published.

In contrast, it was rare to provide information prior to Consensus Conferences. Professional panels conveyed most of the scientific information, and administrative responses were given to key questions posed by members of the citizen panel. When using these methods, limiting the time allotted for answering questions was problematic. So, when the time available for answering questions was short, relative to the number of professionals available to answer them, participants might evaluate the process negatively and comment that the answers provided and the extent of the discussions were not adequate.

Oral or slide presentations by professionals, local officers, and related stakeholders were used to provide information for participants during Simplified Planning Cell processes. With regard to the quality of deliberations, the time available for discussion varied from a half day to nine days.

Regarding Local Environmental Planning processes, drafting a Local Environmental Plan would be the most important task for a city's environmental sections during the process. So they made rules to discuss or cooperate and arranged to coordinate an internal city office and planning schedule. Thus, we can conclude that citizen participation is well regarded in the city office.

3.2.3 Data about Results

Appendix 3 summarizes variables related to results of participative process. A three-stage evaluation is used for this analysis. Regarding evaluation criteria, high means full, medium means not full, but almost, and low means not, or almost not, for each variable in Appendix 3.

Low evaluations were given to DPs that were held only to collect academic information or because there was a lack of outputs. We also evaluated one case in which the global policy decision taken was different from that recommended through a participatory approach. Concerning the case that had small groups of about five people, and a lack of sufficient facilitators, it would be difficult to conclude that there was adequate discussion of the qualitative or quantitative meaning of the issue.

Expected outputs of Consensus Conferences are that citizen proposals can be drafted following the deliberation. We have to consider how these proposals are dealt with after they are published, to estimate how they actually affect the decision-making process. In the five Consensus Conference cases analyzed, all proposals, once published, were sent to the appropriate administrative agencies. The effects, however, were different at the local and national levels. For example, after the Consensus Conferences at the local level, such as in Hokkaido and Shizuoka prefectures, drastic changes that would result in adopting new flood measures in the Anma River and not deregulating the cultivation of GMOs emerged from the conference discussions. Through these conference processes, local administrative agencies received additional information that embedded citizens' emotional responses, which could not have been acquired by questionnaire surveys. On the other hand, while proposals from three Consensus Conferences were sent to appropriate sections of Japan's Ministry of Agriculture, Forestry, and Fisheries, their direct actions only reflected the research-funded themes of the organization that managed the three conferences (Otsuka 2003).

Almost all outputs of Simplified Planning Cells were the results of ballots for multiple proposals by participants following group discussions, so we observed how the results were reflected in the decision-making process. In the five cases analyzed, two cases were classified as a medium level and two cases as a high level. Among them, we evaluated two cases with drastic policy changes as a high level, such as Komae City in Tokyo, which has about eighty thousand citizens, where a new ordinance banned barbecues on the Tama River frontage, and Shizuoka City which banned new plastic bags and set a new pricing policy.

The outputs of Local Environmental Planning processes are draft environmental plans or citizen proposals for environmental ordinances or basic plans. Our evaluation of the increasing quality of decision-making differs from a medium to a high level. These results mean that adopting participatory approaches for planning processes leads to a more familiar plan or ordinance than would otherwise be provided by the usual administrative documents drafted for local citizens. In Deliberative Polling cases, disputes or confrontations between stakeholders were discussed or explained, but deliberations during DP did not extend to

problem solving, because the participants were not selected from the core of stakeholders. This means that confrontational structures were essentially retained, even after DP.

Regarding trust in institutions, appropriate data were not produced in three cases. Only in one case, for which the theme was the BSE issue, was explicit evidence found that indicated greater trust in national and local governments after DP than before. The impacts of Consensus Conferences for solving confrontations or increasing trust in institutions differ at national and local levels. At the national level, the series of conferences led to mutual understanding of GMOs by supporters and objective parties, but the confrontation still remains. On the other hand, reconstructing relationships between related agencies and integrating new measures was reported at local levels, such as in Hokkaido and Shizuoka prefectures.

The themes of five Simplified Planning Cells did not deal with sensitive issues, so we cannot find evidence that conflicts were resolved with this method. The only exception was the decision in Komae City to ban barbecues in the Tama riverfront area, after consensus building occurred among local citizens who were worried about the negative effects of barbecues (noise, smoke, garbage) and barbecue users. There were not enough data to evaluate outcomes regarding trust in institutions, so no comprehensive evaluation was conducted.

Themes related to the Local Environmental Planning process did not deal with sensitive issues, so we cannot confirm that conflicts were resolved through these processes. When we found a sentence that showed some conflicts had been resolved, we evaluated the case at a medium level. In contrast, if a better example of trust building was found due to planning processes that extended over a relatively long time, they were evaluated at a high level.

Of the six cases, after the local DP on an Innovative Strategy for Energy and the Environment, the proportion of the participants that replied, "I chose one scenario with much confidence" increased from 42 to 68 %. Furthermore, we found in the other cases in which professional knowledge and information were provided to participants, when they completed the follow-up survey they believed their knowledge had increased.

In the five Consensus Conference cases, the Anma River improvement conference local citizens became more innovative, even though that case was not, according to a strict definition, a Consensus Conference. There were not only cases in which interest in administrative mechanisms increased, but there were also cases in which enough information was not provided. We can say that problems regarding the provision of information and education using this method still remain.

3.3 Features of each participatory approaches

This section evaluates the relative effectiveness of the four different participatory approaches from viewpoints of output type of participants' discussion, relationship between results of the discussion and actual policy changes, and mutual understanding between participants and various stakeholders and summarizes findings regarding the crosscutting analysis used for this study.

3.3.1 Deliberative polling

A feature of the outputs produced by DP is thought to be a change in awareness or a policy report that supports a proposed change. DP is not a consensus-building approach. An important aspect of DP was that this approach had been used for Japan's Innovative Strategy for Energy and the Environment in 2012—the first DP case to be officially incorporated into a national policy process. The government at that time—the Democratic Party—decided to try to reduce the production of nuclear power to zero by the 2030s, based on the results of the national DP. However, after December 2012, a new government—mainly led by the Liberal Democratic Party—took office, and the Democratic Party's decision was reversed. In the medium or long term then, decision-making at the national level does not seem to have been affected by citizen deliberations.

Regarding relationships that develop when providing information and building capacity, in most DP cases, because professional committees had prepared written and/or video materials that were provided to participants prior to the discussion, our evaluations of capacity building range from a medium to a high level. On the other hand, during the discussions, if participants paid attention to understanding the professional information, new options were not suggested, and no additional information was raised.

3.3.2 Consensus Conferences

The citizen proposals that were the outputs of Consensus Conferences were sent to the appropriate sections or agencies. We considered the outcomes of those citizen proposals. At local levels, two policy changes were identified, for example, new effective measures had been adopted and the deregulation of GMOs cultivation had been stopped. We concluded, however, that at the national level it seemed to be difficult to directly affect policy changes that exceeded agencies' mandates.

Regarding relationships between providing information and building capacity, though materials were not provided in advance, and in most cases professional panels answered

key questions summarized by citizen panels in a limited period of time, the evaluations of participants were generally high. The common feature of two cases at the local level was the opportunity to incorporate citizens' emotional responses and experiences, and this knowledge could not have been acquired by documentary surveys of citizen proposals and policy changes. We conclude that citizen proposals are useful and provide additional information for administrative agencies.

3.3.3 Simplified planning cells

All the cases using Simplified Planning Cells were held at city levels. Odawara City intended to officially reflect the results of these deliberations in the city's basic plan. However, from the viewpoint of their impacts on decision-making, new ordinances to ban barbecues along the river frontage in Komae City and change the pricing structure for plastic bags in Shizuoka City are more influential. One of the reasons they could influence new ordinances in Komae City was the continuous deliberation.

Regarding relationships between providing information and capacity building, in the two cases in Hitachi-ota City and Utsunomiya City, the only lectures given were by city officers and a few professionals. On the other hand, in Komae City and Odawara City the information provided by city officers was supplemented by that from users and broader stakeholders.

3.3.4 Local environmental planning

Citizen participation in Local Environmental Planning processes is very different from their participation in the other approaches analyzed, because it incorporates some methodologies and means that suggest the continuous participation of citizens in local government's policy implementation processes. Thus, the outcomes of these processes can be evaluated both by indicators related to processes and results, and by quantitative environmental indices and citizens' degrees of satisfaction with their environmental conditions.

3.3.5 Results of the crosscutting analysis

Table 4 summarizes the major features of the four participatory approaches in terms of issues, sampling, numbers of participants, means of providing information for participants, and outputs from the processes. We found that each method was applied to some themes. So, after central issues were identified, possible participatory approaches could be extracted as shown in Table 4. For example, if we would like to discuss local environmental actions, the Simplified Planning Cells method is the preferred choice. If the discussion were thought to refer to science-related issues, a Consensus Conference would be the preferred choice also.

In situations where the self-selection process would be problematic in terms of fairness or representativeness, random sampling, such as that used in Deliberative Polling and Simplified Planning Cells, is preferred. Care must be taken to ensure that random sampling methods will not extend to requiring the consensus of participants, but only that the ballot results. Therefore, if a decision maker would like to get agreement from most of the participants or achieve consensus on a citizen proposal, he or she should opt for the Consensus Conference method or Local Environmental Planning.

Setting geographical scale at the vertical axis and living/science knowledge at the horizontal axis, relative strengths are shown in Fig. 5.

Table 4 Features of participatory approaches by method

Method	Dealt themes, issues	Level	Sampling way	Participating number	Way to provide information	Outputs
Deliberative Polling	Climate change and energy	City—national	Random	Around 100	Paper and/or video	Ballot result and policy report
Consensus Conference	GMOs	Prefecture—(national)	Self-selection	<20	Questions and answers	Citizen proposal
Simplified Planning Cells	Local and living action	City	Random	<100	Presentation by professionals and stakeholders	Brief ballot result
Local Environmental Planning process	Local environmental plan and ordinance	City	Self-selection, sometime random	<100	Series lectures and internal study meetings	Draft plan, plan proposal, draft ordinance

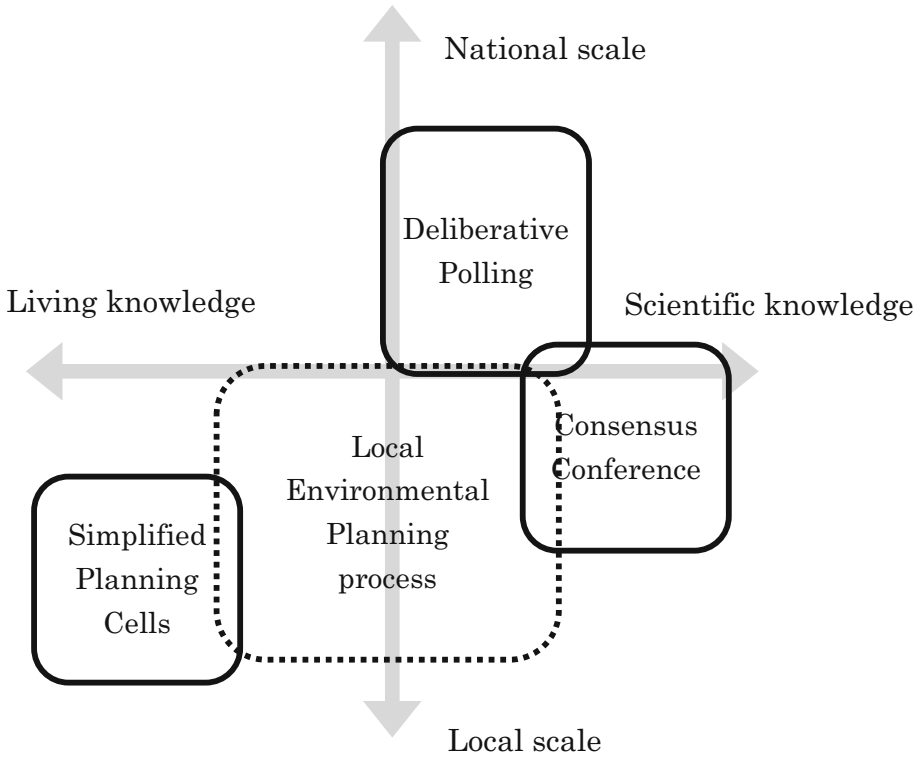


Fig. 5 Strengths map of four participatory methods

4 Conclusions

This section summarizes our conclusions regarding the three research questions posed earlier. First, regarding linkages between approaches and issues, the DP method has achieved actual results for issues related to climate change and energy. The Consensus Conference tends to be suitable for discussions that require an understanding of scientific knowledge, such as for issues related to GMOs. Second, outputs from participatory processes consist of two major types. One is the consensus of self-selected participants, such as citizen proposals developed using a Consensus Conference approach. The other type is the result of surveying participants or analyzing policy reports that discuss the results. Finally, regarding the question of how to deal with scientific facts and local knowledge, during DP discussions, new options or additional information was not raised if participants paid attention to understanding difficult scientific facts. The common finding of two Consensus Conferences was that incorporating citizens' emotional responses—which could not have been collected using documentary surveys—into citizen proposals and policy changes was useful and provided additional information for the responsible administrative agencies.

Considering strengths of each method shown in Fig. 5, the Simplified Planning Cells and the Consensus Conference methods are useful at local level. And new participatory approach that incorporates strengths of the two methods into Local Environmental Planning is needed. Thus, the quality of consensus building at local level can be improved. And at national level, the DP and the Consensus Conference methods are suitable, and new methods which combine quantitative aspects of the DP with qualitative aspects of the Consensus Conference should be created.

Adopting mixed approaches that we proposed above may require more human and financial resources than ever. To avoid overinvestment, we should think appropriate number and depth of each consensus-building process. For instance, national and local governments can merge some stages which require same scientific knowledge to incorporate essence of the Consensus Conference. This situation can be occurred when Local Environmental Plan and Agricultural Plan are in process of making. Total expenditure of local government would decrease if it integrates some of planning stages across several policy processes.

Our main further research will focus on relationships between improving quality of participants' decision-making including new information or new proposals and building capacity and the effects of educational efforts. We will examine these outcomes more fully in future research.

Acknowledgments This research was financially supported by the R-08 Project, entitled "Human-Environmental Security in Asia–Pacific Ring of Fire: Water-Energy-Food Nexus" of the Research Institute for Humanity and Nature (RIHN), Kyoto, Japan.

Appendix 1

See Table 5.

Table 5 Brief description of obtained data about the context

Case no.	Title	C-1. Policy area	C-2. Conflict or disputes among public	C-3. Lead agency's level of involvement
1	Deliberative Polls on Global Warming	Energy: GHG emissions and environmental actions	No explicit conflict	Unknown
2	Worldwide Views on Global Warming	Energy: GHG emissions and economic development	No explicit conflict	Strong focus on linkage with policy makers
3	Deliberative Polls on BSE Problem	Food: food security	No explicit conflict	No agency
4	Innovative Strategy for Energy and the Environment (local)	Energy: GHG emissions and nuclear power	Potential conflict between nuclear zero scenario and others	No agency
5	Innovative Strategy for Energy and the Environment (national)	Energy: GHG emissions and nuclear power	Potential conflict between nuclear zero scenario and others	Very much involved in the political situation
6	Worldwide Views on Climate and Energy	Energy: GHG and energy	No explicit conflict	Strong focus on linkages with policy makers
7	Consensus Conference to Think GMO	Food: food security	80 % of applicants feel uneasy with no information	Incorporated body regulated by the ministry managed the whole process and administration of the conference
8	Citizen Conference to Think GMO (Sendai)	Food: food security	Unknown	Incorporated body regulated by the ministry managed the whole process and administration of the conference
9	Citizen Conference to Think GMO (Yokohama)	Food: food security	Unknown	Incorporated body regulated by the ministry managed the whole process and administration of the conference
10	Consensus Conference on the Anma River Improvement	Water environment	No explicit conflict	Very involved, including hamamatsu city office
11	Consensus Conference on Cultivation of GMOs in Hokkaido	Food: food security	Confrontation between anti-GMO groups and pro-GMO groups	Very involved
12	Earth and garbage. let's think for children!	Environment	Unknown	No agency
13	You are the Star, City Planning of Hitachi-ota	Energy: energy saving	No explicit conflict	Involved very well
14	Odawara TRY Forum	Environment: city planning	No explicit conflict	Involved very well
15	City Discussion for Problem Solving and Effective Use of Tama River Front Area	Water environment (how to use big riverfront area)	Various opinions and too many stakeholders	Involved very well
16	Utsunomiya Citizen Discussion Forum	Energy: energy saving	No explicit conflict	Random sampling and information sharing by city officer
17	Toyonaka City Environmental Basic Plan and Toyonaka Agenda 21	Environment: living, nature,	No explicit conflict	Strong leadership by city office secretary staff leader
18	Date City Environmental Basic Ordinance	Environment: including environmental right and management	In the 1970 s, there was a big conflict regarding the Date power generation plant construction	Some proposals for making environmental ordinances and plans were denied and changed for the first time
19	Hino City Environmental Basic Plan	Environment: water, nature, air, recycle and living	Regarding city planning, there was a little conflict between citizens and the city	Continuous collaboration between citizens and city officers

Table 5 continued

Case no.	Title	C-1. Policy area	C-2. Conflict or disputes among public	C-3. Lead agency's level of involvement
20	Shiki City Environmental Basic Plan	Environment: nature, living and global environment	Regarding city planning, there was a little conflict between citizens and the city	The environmental section was on the side of citizens in the city office internal coordination process
21	Ichikawa City Environmental Basic Plan	Environment: resource circulation, nature and global environment	Some citizen groups are objecting to reclaiming the tokyo bay	Participating citizens and city officers demonstrated a high capacity to plan policy
22	Nisshin City Environmental Basic Plan	Environment: water, green, city planning, lifestyle, community, playing and learning	Conflict among citizen groups for different activity areas	Strong leadership of city office secretary staff leader
23	Fukuchiyama City Environmental Basic Plan	Environment: nature, living and city planning	Unknown	Focus on coordinating
24	Yasu City Environmental Basic Plan	Environment: nature, city living and resource circulation	Unknown	City officers also joined in the discussion
25	Numazu City Environmental Basic Plan	Environment: tourism, low-carbon city and local production for local consumption	Unknown	Unknown

BSE Bovine spongiform encephalopathy, *GMO* genetically modified organism, *GHG* Greenhouse gas

Appendix 2

See Table 6.

Table 6 Brief description of obtained data about processes

Case no.	Title	P-1. Selection of participants	P-2. Type of output	P-3. How to provide scientific information	P-4. Quality of deliberation
1	Deliberative Polls on Global Warming	Around 15,000 Internet-based monitors → 110 participated	Information gathering	Providing basic information and environmental action effects at workshops	Lack of facilitators in small-group (5 people) discussions
2	Worldwide Views on Global Warming	Worldwide guideline set; in Japan 100 non-specialists participated	Policy report	Materials from the IPCC report and international consulting issues	Four sessions for different themes in groups of 5–8 people
3	Deliberative Polls on BSE Problem	Randomly selected questionnaire (Postal) 3000 people → 151 participated	Information gathering	Information brochure and summary video provided by implementation committee (9 experts)	They got to know each other's various opinions
4	Innovative Strategy for Energy and the Environment (local)	Randomly selected questionnaire (Postal) 670 people → 57 participated	Result of scenario preference	Materials prepared by expert committee (5 experts)	Broader discussion than the above DP
5	Innovative Strategy for Energy and the Environment (national)	Random digit dialing 6849 people → 286 participated	Result of scenario preferences	1. To construct information database 2. Public hearing 3. Materials for deliberation	Fair and smooth deliberation

Table 6 continued

Case no.	Title	P-1. Selection of participants	P-2. Type of output	P-3. How to provide scientific information	P-4. Quality of deliberation
6	Worldwide Views on Climate and Energy	Worldwide guideline set; in japan, 100 non-specialists participated	Policy report	Materials from the IPCC report and international consulting issues	Six sessions for different themes for groups of around 7 people
7	Consensus Conference to Think GMO	Selection from public, self-proposed (479 → 18)	No consensus made citizen proposal including both arguments	Specialists' answers to key questions prepared by citizen panel	Few participants claim that deliberation or providing information were insufficient due to time limitation
8	Citizen Conference to Think GMO (Sendai)	Selection from public, self-proposed (51 → 16)	Citizen proposal	Specialists' answers to interim report prepared by citizen panel	Active facilitator compared to the Yokohama case
9	Citizen Conference to Think GMO (Yokohama)	Selection from public, self-proposed (83 → 15)	Citizen proposal	Specialists' answers to interim report prepared by citizen panel	Unknown
10	Consensus Conference on the Anma River Improvement	Individual offer during field surveys and hearing surveys	Proposal of Anma River improvement vision	Public agency's response to the citizen panel	Current state survey and specialist hearing survey ware conducted in parallel
11	Consensus Conference on Cultivation of GMOs in Hokkaido	Debate group and observation group selected from the public (15)	Statement sent to prefecture government, related to local ordinance change	Basic knowledge provided by specialists including journalist and producer in Hokkaido	Preparation for key questions and answers to key questions; concerning attitude to GMOs, there were severe conflicts among participants
12	Earth and Garbage. let's Think for Children!	Random sampling 4000 people → 23 participated	Citizen declaration	Unknown	Unknown
13	You are the Star, City Planning of Hitachi-ota	Random sampling 1000 people → 11 participated	Result of simple ballots and brief proposal	Two experts made materials and presentation	Short time but participants evaluated it positively (90 %)
14	Odawara TRY Forum	Random sampling 3000 people → 174 participated	Result of simple ballots and brief proposal	Information from various stakeholders not only the city but also NGOs	Nine days' deliberation
15	City Discussion for Problem Solving and Effective Use of Tama River Frontage	Random sampling 1500 people → 47 participated (Final day, 35)	Citizen proposal sent to the mayor Set local ordinance to ban barbecue	Information from various stakeholders not only the city but also users	Four days' deliberation
16	Utsunomiya Citizen Discussion Forum	Random sampling 1500 people → 80 wanted but 40 participated	Result of simple ballots and brief proposal	Information from the city officer	Short time
17	Toyonaka City Environmental Basic Plan And Toyonaka Agenda 21	Around 150 groups and businesses	Local Agenda 21	About 1 year, internal study meetings	Very often and deep
18	Date City Environmental Basic Ordinance	20 self-proposed and 3 additional offered members	Citizen proposal for environmental ordinance and environmental plan	Lecture by professionals	Very often and deep

Table 6 continued

Case no.	Title	P-1. Selection of participants	P-2. Type of output	P-3. How to provide scientific information	P-4. Quality of deliberation
19	Hino City Environmental Basic Plan	109 self-proposed participants	Draft of environmental plan of the city	Hearing to professionals and site visiting	Very often and deep
20	Shiki City Environmental Basic Plan	24 self-proposed and 4 additional members from business sector	Draft of environmental plan of the city	Internal meeting	Ten times, but participants could propose additional issues before they gathered
21	Ichikawa City Environmental Basic Plan	Self-proposed 70 → 15 selected by the city office	Citizen proposal for environmental plan	Voluntary study meetings of small groups	Very often and deep
22	Nisshin City Environmental Basic Plan	Around 50 self-proposed and around 50 city officers	Environmental plan of the city and environmental ordinance	Internal meeting	From medium stage, discussion was managed and recorded by participants themselves
23	Fukuchiyama City Environmental Basic Plan	19 self-proposed, 12 representatives from citizen groups and businesses	Citizen proposal and environmental plan of the city	Studying other examples	From medium stage, discussion was managed by participants themselves
24	Yasu City Environmental Basic Plan	Self-proposed (8), selected by community organization (18) and business (4)	Environmental plan of the city including visions and concrete projects	Internal meeting	Rule set on format of each concrete project and partnership between city and citizen
25	Numazu City Environmental Basic Plan	Random sampling 1000 people → 41 participated (Final, 39)	Future vision and important value of the city	Two days with information provided	During deliberation, motivation to participate doubled

BSE Bovine spongiform encephalopathy, *GMO* genetically modified organism, *GHG* Greenhouse gas

Appendix 3

See Table 7.

Table 7 Brief description of obtained data about results

Case no.	Title	R-1. How the output was treated	R-2. Resolving conflict or disputes among competing interests	R-3. Building trust in institutions	R-4. Informing the public and their learning
1	Deliberative Polls on Global Warming	Low	Low	Unknown	Medium
2	Worldwide Views on Global Warming	Low: almost 90 % support that agreement at COP15 is needed and support the 2 °C target.	Low	Unknown	Medium
3	Deliberative Polls on BSE Problem	Low: only academic purpose. no policy proposal	Low	Medium: trust in the national and local government regarding the issue increased slightly	Medium

Table 7 continued

Case no.	Title	R-1. How the output was treated	R-2. Resolving conflict or disputes among competing interests	R-3. Building trust in institutions	R-4. Informing the public and their learning
4	Innovative Strategy for Energy and the Environment (local)	Medium: through deliberation, zero atomic power scenario in 2030: 49 % → 53 % slightly increasing	Low	Low	High: respondents who support "I chose one scenario with much confidence" increased from 42 to 68 %
5	Innovative Strategy for Energy and the Environment (national)	Medium: through deliberation, zero atomic power scenario in 2030: 33 % → 47 % increasing	Low	Low: trust in governmental information was decreasing	Medium: increased knowledge such as ratio of nuclear power and GHG goals
6	Worldwide Views on Climate and Energy	Medium	Low	Unknown	Medium
7	Consensus Conference to Think GMO	Medium: new research theme started	Low	Unknown	Medium: deepening knowledge and understanding
8	Citizen Conference to Think GMO (Sendai)	Medium: new research theme started	Medium: mutual understanding between supporters and opposition party	Unknown	Medium: deepening knowledge and understanding
9	Citizen Conference to Think GMO (Yokohama)	Medium: new research theme started	Medium: mutual understanding between supporters and opposition party	Unknown	Medium: deepening knowledge and understanding
10	Consensus Conference on the Anma River Improvement	Medium: new and effective measures adopted	High: integration of related administrative agencies	Medium: role of institution redefined	High: drastic change of local citizen awareness
11	Consensus Conference on Cultivation of GMOs in Hokkaido	High: no deregulation	Medium: reconstructing relationship between related agencies	Unknown	Medium
12	Earth and Garbage. Let's Think for Children!	High: banning and pricing plastic bag-use based on the citizen declaration	Low: no explicit conflict	Unknown	Unknown
13	You are the Star, City Planning of Hitachi-ota	Medium: eco event and eco calendar	Low: no explicit conflict	Medium: interest for administration increasing	Medium
14	Odawara Try Forum	Medium: reflecting for city comprehensive plan	Low: no explicit conflict	Unknown	Unknown
15	City Discussion for Problem Solving and Effective Use of Tama River Frontage	High: set ordinance to ban barbecues in the river frontage	Medium	Low	High: listing stakeholders including related administrative agencies and their concerns
16	Utsunomiya Citizen Discussion Forum	Low	Low: no explicit conflict	Unknown	Low: very brief information provided
17	Toyonaka city Environmental Basic Plan and Toyonaka Agenda 21	High: the agenda was made by local citizen	Medium	Medium	High: school visit by members of a working group

Table 7 continued

Case no.	Title	R-1. How the output was treated	R-2. Resolving conflict or disputes among competing interests	R-3. Building trust in institutions	R-4. Informing the public and their learning
18	Date City Environmental Basic Ordinance	Medium	Medium	High	Medium
19	Hino City Environmental Basic Plan	High: final plan incorporates almost all contents of the citizen proposal	Medium	High	Medium
20	Shiki City Environmental Basic Plan	Medium	Low	Medium	Low
21	Ichikawa City Environmental Basic Plan	High: many projects based on the citizen proposal	Low	Medium	High
22	Nisshin City Environmental Basic Plan	High: most leading projects were based on the citizen proposal	Low	Medium	Medium
23	Fukuchiyama City Environmental Basic Plan	High: all leading projects were based on the citizen proposal	Medium: some leading projects have been implemented successfully	Unknown	Medium: other good examples
24	Yasu City Environmental Basic Plan	High: all leading projects were based on the citizen proposal	Low	Medium	Medium
25	Numazu City Environmental Basic Plan	Medium	Low	Unknown	Medium

BSE Bovine spongiform encephalopathy, *GMO* genetically modified organism, *GHG* Greenhouse gas

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