Trial of Tools to Evaluate Adaptive Processes in Environmental Activities

11

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Abstract

Environmental problems are "wicked problems" with multiple interacting causes; they cannot simply be solved by eliminating a single factor. To solve wicked problems when they occur, perspectives and responses to the problem must spread, allowing various people to detect the problem early and respond appropriately. A creative learning process is also required when responding to the problem. One way to create such a learning process is to evaluate an activity process that promotes mutual learning among diverse people. This chapter introduces two evaluation tools we have developed. The first is a social assessment tool for environmental activities which shares environmental activity processes. The other is a visualization tool for environmental activities which promotes mutual learning by encouraging dialogue between people involved in environmental activities. The social assessment tool incorporates self-assessment into the environmental activity process, which could lead to the immediate discovery and sharing of a problem, collaboration among different people, and finding the optimal way forward. The visualization tool promotes dialogue, focusing on "listening" to and "speaking" the reasons for people's opinions. This helps people become conscious of their own perceptions, learn about others' perspectives, deeply examine concepts and values, and cooperatively define their meanings. Both tools aim to create intellectual resources that lead to solutions by respecting diversity in opinions on the problem.

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11.1 Introduction

Environmental problems are "wicked problems." Because they are caused by multiple interacting factors, they cannot simply be solved by removing a single cause. One example of a wicked environmental problem is the degradation of biodiversity caused by the underuse of natural resources. The *Satoyama* environment, which involves hot spots of biodiversity in Japan, is a secondary natural environment that has been maintained and managed through human use. However, agricultural fields and forests that make up *Satoyama* began to be abandoned and left unmanaged because of lifestyle changes in mountainous areas, the declining economic value of natural resources produced in *Satoyama*, and the issue of a declining and aging population. As a result, the unique flora and fauna adapted to *Satoyama* are changing.

The cause of such biodiversity loss would be relatively easy to identify if it were only related to certain developmental activities. The search for solutions would then be possible, although not necessarily simple. However, if the degradation of *Satoyama* is related to the loss of economic activities in such environments and the decline of the rural communities that have been instrumental in their management, then we must face "wicked problems" that involve socioeconomic issues and consider possible solutions for the revitalization of the *Satoyama* economy as well as rural communities. The problem of *Satoyama* is not just a matter of preserving ecosystems. The important question is how to find clues to revitalize the relationship between people and nature, and how to formulate policies and activities accordingly.[1]

The conservation of the secondary natural environment would be made possible by the search for solutions to wicked problems. The main question explored in this chapter is what approaches are necessary for solving such wicked environmental problems. We examine this question based on a case study of the tools we developed for assessing environmental activities.

11.2 From Adaptive Management to Adaptive Process

It is important for solutions to environmental problems to be based on scientific data and theory. However, no matter how much progress is made, science has limited knowledge and cannot always provide a clear answer to every question. This results in "scientific uncertainty." One reason environmental issues are difficult to solve is that element reductionism, a scientific approach to problem recognition that is often thought of as logical, must rely on science for solutions despite its limited ability to

account for interactions, multidimensional meanings, and changes over time (Sato and Hiroishi 2018: 33).

In contrast, adaptive management, which manages the natural environment by trial and error based on feedback from ecological monitoring, has been developed based on the scientific method: investigating as much as possible, planning for maintenance and restoration, executing the plans, verifying results, and correcting course accordingly. This approach assumes that some things cannot be understood based on element-reductionist science. However, it is not enough to make plans based on scientific knowledge and manage them adaptively. This is because solving environmental problems should be regarded as "social work." It is necessary to consider who the actors will be and what kind of relationship with nature will be preserved and regenerated through their activities. Furthermore, natural uncertainty is only one part of the problem (Miyauchi 2013: 17). Actors do not include only researchers, government officials, and people with a particular interest in environmental issues, they span various fields. Consequently, conflicting interests and opinions may arise between the actors. However, people's values are pluralistic. Not only are the actors diverse, they are also changeable. Even their visions may change. Naturally, society is also uncertain.

We deal with nature through uncertain and complex societies. Given the uncertainty and variability of both science and society, it is desirable to create a flexible process in which diverse people—such as researchers, government officials, and the public—collaborate and adapt their methods, systems, and goals depending on the situation. Let us describe this as an "adaptive process" (Miyauchi 2017). In an adaptive process, we shift from the scientific approach of element-reductionist problem solving to a dynamic, comprehensive approach (Sato and Hiroishi 2018: 7). Emphasis is placed on building the ability to respond to issues through repeated dialogue between people who may have different opinions (Kuwako 2016). This is essential to manage both the decision making of actors involved in environmental work and the natural environment itself.

Thus, solving a wicked problem does not mean eliminating it. It means creating a process by which perspectives and methods of addressing the problem are shared widely, allowing various people to detect the problem early and respond appropriately should it arise (Sato and Hiroishi 2018: 37). To do this, it is necessary to utilize people's differences in perspective, scope, specialty, and available resources. Diverse actors must recognize each other's differences and build a relationship in which they share what they can and cannot recognize alone (Sato and Hiroishi 2018: 49).

However, how can we create a process to leverage actors' differences?

11.3 The "Evaluation" Perspective

11.3.1 Emergent and Creative Consensus Building

People have different opinions about environmental issues. As human beings are social and communicate with each other, it is common for conflicts to emerge from differences of opinions (Kuwako 2016: 1). Consensus building is the process of generating the state of consent, integrating various perspectives based on the assumption that people generally possess different opinions (Kuwako 2016: 2). Consensus building can be understood as a "process of creating a solution" (Kuwako 2016: 13) in which diverse people recognize each other's differences and build relationships that allow them to identify and do things that they could not do on their own. In other words, consensus building is essential to generating outcomes without ignoring people's differences.

However, the creativity of such outcomes changes depending on how we design the consensus building processes. To clarify this point, let us compare two types of consensus building: "deductive consensus building" and "emergent and creative consensus building" (Toyoda 2017: 37). We will explain the difference of these approaches using the case of reintroducing the nearly extinct bird, *Nipponia nippon* (the Japanese crested ibis), to the natural environment. This project has been underway in Sado Island, Niigata Prefecture with the initiative of the Ministry of the Environment. Under the global mission of protecting endangered species, habitat conservation for the crested ibis has advanced through the collaboration of the government and the public in maintaining and restoring the wetland environment in paddy fields and *Satoyama*. However, due to serious depopulation in rural areas, the conservation of such environments has become quite difficult. In deductive consensus building, necessary measures are searched for in order to complete the important mission of preserving the species; this process starts from the assumption that conserving the crested ibis is important and aims to generate consensus for particular conservation measures. Deductive consensus building forms an agreement based on a clear vision, such as returning the crested ibis to the wild. Opinions are extracted and issues are discussed according to the theme of "co-existence with the crested ibis." The theme controls the shared opinions. However, deductive consensus building presupposes a common understanding among participants—in this example, that symbiosis with the crested ibis is important. If residents' main concerns relate to their living circumstances instead—such as the decline of public services, including education and welfare, due to population decline and depletion of the local economy—inconsistencies or even conflict may arise in settling issues (Tomita 2014). Thus, there are limits to the deductive consensus building approach in the face of various values and thoughts.

Another approach—emergent and creative consensus building—identifies or establishes a connection to the crested ibis while also unraveling the issues that concern local residents. For example, non-farmers, women, and children who had little contact with the crested ibis may be re-evaluated as people with opinions. In our work, we created a space in which to listen to these voices and form a new consensus

from the diverse regional opinions. For example, a women-only workshop discussed the necessity of measures for elderly people living alone, suggested encouraging elderly people to participate in crested ibis birdwatching, and debated whether the crested ibis could be used to improve welfare. This debate resulted in an effort to investigate information on crested ibis sightings by elderly individuals. The idea behind emergent and creative consensus building is to initiate discussions based on people's diverse interests, using the opinions to form the theme.

Shifting from a deductive approach to an emergent and creative approach will change people's perception of the issues. For example, the deductive approach focuses on symbiosis with the crested ibis and considers that the problems arise from the declining birthrate and aging population. This opens the possibility for the counterargument that countermeasures against population decline are more important than symbiosis with the crested ibis. In contrast, the emergent and creative approach discusses the various problems arising from population decline in local living. For example, discussions may involve real-world concerns such as the impact of school consolidation on the community and elderly individuals' purpose. In this way, opinions on population decline are diversified, perspectives about symbiosis with living creatures are diversified by considering population decline, and the potential for action is created (Toyoda 2017).

Dialogue among people with various opinions in emergent and creative consensus building can be recognized as a "mutual learning" process that diverse people participate in. In other words, ideas emerge because diverse people learn from each other.

11.3.2 Evaluation as Mutual Learning

One effective method to promote mutual learning among various people is evaluating the activity process. Visually assessing the activity process to determine what effects are being produced and what are not, as well as what achievements are made and what are not, makes individuals and businesses more likely to modify their activities and learn how to proceed. In this way, evaluation produces learning, which enables the discovery and confirmation of various values. An evaluation framework that leads to learning will also rebuild trust among those with opinions to share (Miyauchi 2017). The evaluation we describe here is a "self-evaluation," in which we evaluate our own activities while adding others.

Below, we explain two assessment tools we have created and experimented. Tool A was first developed with the aim of elucidating and evaluating the process of environmental activities from the social viewpoint (Kikuchi et al. 2017). Tool B was developed based on the review of Tool A and designed with the aim of facilitating dialogue among actors for self-evaluation. Through the experimental workshops to implement these tools, we conclude that Tool B is promising as a practical method for self-evaluation of environmental activities.

11.4 Tool A: Social Assessment Tool for Environmental Activities

11.4.1 Tool Development Process

Thus far, evaluation of environmental activities has generally been limited to the natural science methods of concrete regeneration techniques and natural monitoring. However, environmental activities are comprehensive efforts with various effects on local communities. Therefore, the social process by which environmental activities create nature-related activities and increased value of living in an area must also be evaluated. Our social assessment tool for environmental activities targets this social process.[2] The tool uses ten items to evaluate environmental activities from a social perspective. The items were extracted by researchers involved in tool development from their practical experiences in environ*mental conservation and natural restoration.

The first aspect we consider important in social evaluation is recognizing the issues. Because issues are not corrected and change depending on the situation, recognizing what the specific problem is must be a repeated process.

Second, it is important to create a physical place for communication between the various people and networks involved in environmental activities. Accordingly, "actors," "platforms," and "networks" were included in the evaluation of activities.

Knowledge and technology are also essential aspects of environmental activities. Environmental activities require knowledge and skills, such as ecology and environmental engineering. At the same time, social technology[3] that converts the scientific knowledge of the field into practical local knowledge is crucial. It is important to determine whether external academic knowledge can be utilized in the region or if it remains extraneous and inaccessible.

Evaluating environmental activities should consider both the pleasure and fulfillment felt by those who participate and appraisals from outside the region. In many cases, evaluations from outside a region have motivated rediscovery of the region's richness.

Decision-making within the region is indispensable to promoting environmental activities. Engagement in activities differs depending on whether decisions are being made locally or remotely.

Finally, specific actions relate to environmental activities. Some actions directly intervene in nature, while others form networks. Regardless, the actual actions of the people involved drive the overall environmental activities.

Based on the above considerations, social evaluation indices for environmental activities were summarized in ten items. By setting the social evaluation index on the vertical axis of a graph and time on the horizontal axis, changes in the index and their respective relationships can be expressed. This may lead people to visualize the process of environmental activities and consider directions in which to proceed. Figure 11.1 shows a social evaluation sheet used for a workshop.

	Evaluation item	Evaluation item content	Specific content
Problem		The process of collectively identifying an issue	
People	People involved	Entities engaged in environmental activities	
	Human connections	Status of connection with others	
	Gathering place	A predominantly spatial area where diverse people exchange information and services	
	Decision-making mechanisms	Mechanisms for determining a goal and selecting a specific means from among all those available	
Technology and behavior	Know-how for nature restoration	Technology that converts environmental activities into social objects	
	Specific actions	Specific actions related to environmental activities	
	Nature restoration technique	Technology that intervenes naturally	
Knowledge and evaluation	Knowledge	Content and method of recognizing/understanding an event	
	Evaluation	Positive feedbacks from outside; people's feelings of fulfillment	

Fig. 11.1 Social assessment sheet

We employed this evaluation tool on a trial basis at several environmental activity sites in Japan. Through this implementation, we examined and sought to improve the tool's effectiveness.

11.4.2 Natural Restoration of Nakaumi

One of the authors, Kikuchi, tested the social assessment tool at the site of the Nakaumi Nature Restoration Project in 2015. Nakaumi is a brackish lake, the fifth largest lake in Japan, located on the border of Shimane and Tottori Prefectures. Until around 1960, it was a beautiful lake with clear water, beaches, abundant macroalgae, and various types of fish and shellfish, including blood clams. Beginning in 1963, the government-run Nakaumi Reclamation Project (hereafter "Reclamation Project") was tasked with resolving post-war food shortages and expanding land area. A quarter of the lake, approximately 2500 hectares, was reclaimed to create advanced agricultural land suitable for modern farming (Shibuya 2012: 42–43). However, because of public and resident action and critical public opinion of large-scale public works, the project was cancelled in 2002 (Shibuya 2012: 14–15; Asano 2009).

Despite the project's cancellation, Nakaumi's ecosystem was severely damaged by the nearly 40 years of extensive public works. The relationship between the people and the lake was also changed. Regenerating the deteriorated environment and ecosystem posed a significant challenge. However, the Nakaumi area's natural environment was preserved and, in November 2005, Nakaumi and Lake Shinji were designated as Ramsar Convention registered wetlands. In March 2006, in

cooperation with administrative agencies, local residents and researchers from the local Shimane University gathered to establish the Nature Restoration Center and begin restoring Nakaumi. The Nature Restoration Center was approved as an NPO in April 2007. In June 2007, several NPOs, governments, and universities launched the Nakaumi Nature Restoration Council (hereafter the "Council") based on the Act on the Promotion of Nature Restoration, and there has since been movements to organize individual restoration projects.

Fierce conflicts have arisen in Nakaumi over land reclamation projects. People involved in environmental protection activities have called for a break in project promotion. However, the same people were instrumental in creating a desirable environment, realizing the commercialization of various proposals. Rather than opposing administrative policies, a movement has been actively re-creating ties with Nakaumi (Asano 2009: 253).

The aim of Nakaumi's natural restoration, which pursues the theme of "Revived, Rich, Fun, and Beautiful Nakaumi," is to restore the lake's rich beauty, environment, and ecosystem and rebuild the natural environment and resource circulation of the former Nakaumi. Specific activities include using Hi-Beads to backfill numerous depressions created by the Reclamation Project that have significantly affected Nakaumi's water quality.[4] Other activities include providing environmental education on Nakaumi through experience-based activities in elementary schools and reusing macroalgae. (Macroalgae remaining as an unused resource is collected to reduce nutrients that cause water pollution in lakes and processed into fertilizers for agricultural products.)

11.4.3 Social Evaluation of Natural Restoration in Nakaumi

A social evaluation workshop on natural restoration in Nakaumi was held in October 2015. Ten individuals participated: the director and secretary-general of the Nature Restoration Center, a Council chairperson, a Ministry of the Environment representative, two staff members from Shimane Prefecture, two staff members from Tottori Prefecture, and two Chugoku Electric Power Company employees involved in backfilling depressions as a social contribution.

Every two years, from FY2007 to FY2014, the stakeholders were asked about the activities. Specifically, they were asked what was done and when, who participated, and what results were obtained. We organized the stories that emerged and recorded them on the assessment sheet. This eight-year history of the activities ultimately lasted 3 h. Figure 11.2 shows an evaluation sheet summarizing the workshop results.

The sheet shown in Fig. 11.2 illustrates data between FY2007 and FY2008, activities mainly involved holding study sessions and formulating the overall concept of natural restoration. At that time, the activities were initiated and led by researchers, showing the attractiveness of the activity as a research field. Shimane University researchers and their networks played a central role. Little external evaluation was conducted.

	Items	2007–2008	2009–2010	2011–2012	2013–2014
Problem		Attractive as a research field	Depression and water quality issues; Establishing connections with residents	"Sea for swimming" → Creating a vision to involve residents; Objective → A comprehensive perspective	Independence/sustainability of activities; Encouraging empathy → Symbolize blood clams and promote community participation
People	People involved	Researchers at Shimane University	Fishery cooperative, Yonago National College of Technology	Nakao san, Mr. Kumagai (Yonago National College of Technology)	Companies, governments, NPOs, residents
	Human connections	Shimane University Network; Residents' meetings Business sphere	Government agreement Networking with companies/NPOs	Primary schools Exchange with Yonago	Networking with companies
	Gathering place	Shiragata salon	Nakaumi Conference (2010)	Eco shop estranged from Yonago	
	Decision-making mechanisms				
Technology and behavior	Expertise in nature restoration	Study group Council established; Formulation of the overall concept	Strengthening the secretariat system (2009); Focus on environmental learning; Building trust and cooperation; Online call for ideas and implementers	Secretariat operation (indirect expenses); Procuring grants; Environmental learning in elementary schools	Certified NPO (2013); Ending reliance on grants; Employment of specialists (accountants, labor consultants, etc.)
	Specific actions	Surveys and study sessions; Activity trial and error	Backfilling depressions; Conservation and restoration of common eelgrass	Backfilling depressions; Biodiversity conservation and environmental activities; Sundowner concert	Organizational strengthening
	Nature restoration technique		Hi-Beads , Chugoku Electric Power Company		
Knowledge and evaluation	Knowledge	Water quality and ecosystem	Preservation and regeneration of common eelgrass	Integration with city planning	1
	Evaluation	Minimal external evaluation; Active transmission	Accumulated social achievements; Government recognition; Biodiversity Action Award	National recognition; Resonate Award	Social evaluation and responsibility; UN Decade on Biodiversity Japan Committee Cooperation Project (Sep. 2013)

Fig. 11.2 Nakaumi nature restoration sheet

In FY2009–2010, depressions and water quality were identified as problematic through research progress. Backfilling the depressions became a specific activity, and Chugoku Electric Power Company provided technology and materials called Hi-Beads as part of its social contribution. A common eelgrass conservation and regeneration project was also started. Using the sheet to reflect on activities visibly conveyed the progress of cooperation with the government and formation of networks with companies and NPOs. As these networks expanded, strengthening the secretariat system became challenging. The government also became aware of the activities and provided external evaluations such as granting the project a Biodiversity Action Award.

In FY2011–2012, backfilling of depressions continued and other activities were added, such as biodiversity conservation projects and concerts for the general public. Using the sheet, we confirmed that stakeholders began re-examining the purpose of natural restoration as external evaluation increased, although the activity did not expand greatly in the area. Researchers specializing in urban planning participated to consider the relationship with the land area in addition to the lake, and the vision of a "sea for swimming" was established to gain residents' empathy. At this point, the activity gained nationwide recognition.

In FY2013–2014, the Nature Restoration Center gained greater social reputation and increased responsibilities through certification as an authorized NPO. It aimed for a self-sustaining organizational operation without reliance on government subsidies. The sheet visualized that networks with companies were strengthened at

this time, emphasizing the promotion of public participation to create empathy by symbolizing the once-abundant resource of blood clams.

As the participants collaborated to create the assessment sheet, they visualized the changes in problems, people, technology and behavior, and knowledge and evaluation that occurred over the history of the activities and their relevance. Ultimately, the activity theme changed from researcher-led water quality issues to public participation. In particular, interest shifted from the lake alone to linking with shorelines and hinterlands, symbolizing the delicious seafood of Nakaumi, and eliciting empathy from the public. This indicates that Nakaumi, which fell out of public familiarity because of the reclamation work, is once again becoming more familiar. Additionally, with theme changes, the activity's challenges shifted to building networks with various stakeholders and strengthening organizational management. No major change in the technology for natural restoration, primarily technology for backfilling depressions, occurred. Because the lake activity is highly specialized, it is difficult for the public to feel connected to it. Although the major theme of the activity is shifting toward public participation, such participation is currently lacking. Thus, creating public participation activities was clearly identified as a future direction. The next challenge is to modify the organization to function as a hub for networks of various actors and create multifaceted activities. The decision column was left blank. Although blank space is also important data, no efforts were made to fill it. However, awareness of the system's limitations, which could fulfill social responsibilities and create multifaceted activities, has increased.

What was the significance of using the assessment sheet for the participants of the workshop? To clarify this, Kikuchi interviewed the workshop participants in May 2016. The investigation confirmed some effects. First was the "awareness effect." The purpose of the project's natural regeneration is to rebuild the relationship between Nakaumi and the people who were disenfranchised by the Reclamation Project. Without widespread empathy, cooperation with diverse people cannot progress, and the relationship between people and Nakaumi cannot be restored; because researchers initiated Nakaumi's natural restoration, the work would become simply a "research" activity. Researchers accustomed to element-reductionist thinking are not adept at coordinating between various people and tend to take a narrow perspective. However, the natural restoration is not only for research. The workshop participants were not fully aware of the scope, but knew that the restoration activity was expanding.

Second, using the assessment sheet shifted the participants' perspective on the research and allowed them to discover the significance of contact with different viewpoints. Reflection on the activities regarding social evaluation indices clarified that it was important to accumulate new activities, such as shore-based activities and gaining empathy through food. Thus far, issues were managed from a research perspective, but the participants came to realize that people, technology, behavior, knowledge, and evaluation were connected. Through the workshop, participants reframed their view of natural restoration as a social activity affecting local communities. There is a gap between this perspective and that of natural science research, however. Thus, it is necessary to shift the research perspective to meet that

of citizens and promote natural and regional regeneration in an integrated and flexible way.

Third, comparison built confidence. It is difficult for individuals alone to verbalize changes in their activities or view the entirety remotely. Dialogue with other workshop participants enables a bird's-eye perspective and allows individuals to more clearly see what needs to be done. Even Kikuchi, who specializes in environmental sociology, reported becoming more confident in promoting the natural restoration of Nakaumi as a social activity because of the workshop. Thus, individuals self-evaluate activities and projects through exchanges with the other participants. Applying the social assessment tool allowed the users to confirm their awareness of the challenges and potential of their activities.

11.4.4 Achievements and Issues

Mutual learning by evaluation is one method for promoting environmental activities through a flexible process that leverages the advantage of different perspectives, specialties, scopes, and resources. The social evaluation tool we developed can also incorporate self-assessment into the process of environmental activities. This helps users discover and share problems in the field, work with different people, and identify how to proceed. The social assessment tool is significant in its ability to handle environmental activities (Miyauchi 2017).

However, some of the tool's shortcomings were identified. First, it is costly. The workshop was lengthy, and the results could not be summarized on the same day. Because it is difficult for the tool to show its results immediately, the effect of promoting communication remains questionable. Second, implementing the tool is currently challenging without a workshop coordinator. It cannot be used without guidance from a specialist. To make the tool more versatile, it will be necessary to create an operation support manual.

By reviewing Tool A's function, we recognized that it would be necessary to create a simpler tool that is more user-friendly. Tool B was developed based on the experiences of implementing Tool A.

11.5 Tool B: Infographic Tool for Activating Dialog Among Environmental Actors

11.5.1 Tool Development Process

Based on the social assessment tool's limitations, we developed a visualization tool for environmental activities. The social evaluation tool introduced in Sect. 11.4 evaluates activities based on sharing of the activity process. The infographic tool introduced in this section evaluates activities by promoting dialogue between participants.

   Kikuchi identified the need for a tool to regularly evaluate activities and initially proposed a simple activity checklist to the Council.[5] In December 2016, a workshop of Council stakeholders was held, self-evaluation items were selected from among the activities, and a checklist of 50 items was constructed. Items were classified into six groups: participation, process management, people and networks, technology and behavior, knowledge and assessment, and financing and management.

   Users select an answer of "yes," "no," or "I don't know" for each of the 50 items, such as "Do you explain the principle of your activities to local stakeholders?" and "Are the goals of your activities established through participation by various stakeholders?" Results from the checklist revealed that even among those involved in the same activity, answers differed widely. For example, in response to the questions above, some Council members answered "yes" and others answered "no" despite performing the same activity. The activities' core members tended to rate items more critically, whereas peripheral supporting members tended to provide ratings that are more positive. This "assessment gap" could be an important factor in reviewing one's own activities. For example, when asked, "Are the goals of your activities established through participation by various stakeholders?", some respondents answered "yes," and others answered "no." This may indicate differences in how people interpret the terms, "various stakeholders" or "participation." In other words, even when people take part in the same activities, they may see things differently. However, is this not natural when people with different perspectives collaborate? Clarifying this difference in perception and deepening debate may promote development and revitalization of the meaning of environmental activities. Thus, the checklist could be used not only for evaluation but also as a tool for communication between active members, able to help a diverse group of people recognize each other's differences and support the construction of relationships that allow people to share and recognize aspects of an issue they could not identify as individuals.[6]

11.5.2 Using the Tool

The questions on the checklist proposed by the Council were reviewed and reorganized. As shown in Fig. 11.3, the worksheet contains 50 simple questions with ambiguous expressions that can be interpreted in various ways (such as "various stakeholders" and "participation" in the previously mentioned items). We opted to retain this ambiguity because it may cause a gap in answers that can activate discussion. For example, the checklist includes the following questions:

   1-1: Do you explain the principles of your activities to local stakeholders?
   2-1: Do you ensure diversity among experts?
   2-5: Do local residents actively participate in the activities?
   2-7: Is the number of participants in the activity increasing?
   3-8: Do you involve multiple stakeholders?
   4-5: Do you discuss the blessings of nature?
   5-5: Do you make decisions through discussion?

1-1	Do you explain the principle of your activities to local stakeholders?	(Yes / No / I don't know)
1-2	Are the goals of your activities established through participation by various stakeholders?	
1-3	Are your activities linked to community revitalization?	
1-4	Do you discuss issue awareness within your organization?	

People and networks

2-1	Do you ensure diversity among experts ?
2-2	Does the government actively participate in the activities ?
2-3	Do companies actively participate in the activities?
2-4	Do NPOs actively participate in the activities?
2-5	Do local residents actively participate in the activities?
2-6	Are stakeholders (fishers , farmers, etc.) actively involved in the activities ?
2-7	Is the number of participants in the activity increasing?
2-8	Do you promote activities through cooperation with related parties?
2-9	Do you actively promote exchange outside the region?
2-10	Are the generations well-balanced in the activities ?
2-11	Is the gender of actors well-balanced?
2-12	Is there a certain place where stakeholders gather?

Technology and behavior

3-1	Are participants able to use the technology to carry out environmental activities?
3-2	Do you conduct technical trial and error in your activities?
3-3	Do you make proposals to the national or local government?
3-4	Do you make proposals to companies?

3-5	Do you make proposals to people involved in manufacturing?
3-6	Do you offer environmental education opportunities to elementary, middle, and high school students?
3-7	Are jobs created by your environmental activities?
3-8	Do you involve multiple stakeholders?
3-9	Do you actively disseminate information?

Knowledge and assessment

4-1	Do you use scientific knowledge?
4-2	Do you use traditional knowledge (e.g., fisherman's wisdom)?
4-3	Do you try to combine scientific knowledge with conventional knowledge?
4-4	Do you incorporate external assessment into your activities?
4-5	Do you talk about the blessings of nature?
4-6	Do you regularly conduct environmental monitoring?
4-7	Do you implement environmental monitoring with citizen participation?
4-8	Are the results of monitoring fed back into the activity?
4-9	Do you try to disseminate your activities?
4-10	Do you hold study sessions or observation sessions?

Financing and management

5-1	Do you get financial support from the government?
5-2	Do you have external funding?
5-3	Have you implemented external assessment in your organization's operations?
5-4	Do you collect donations or gifts?
5-5	Do you make decisions through discussion ?

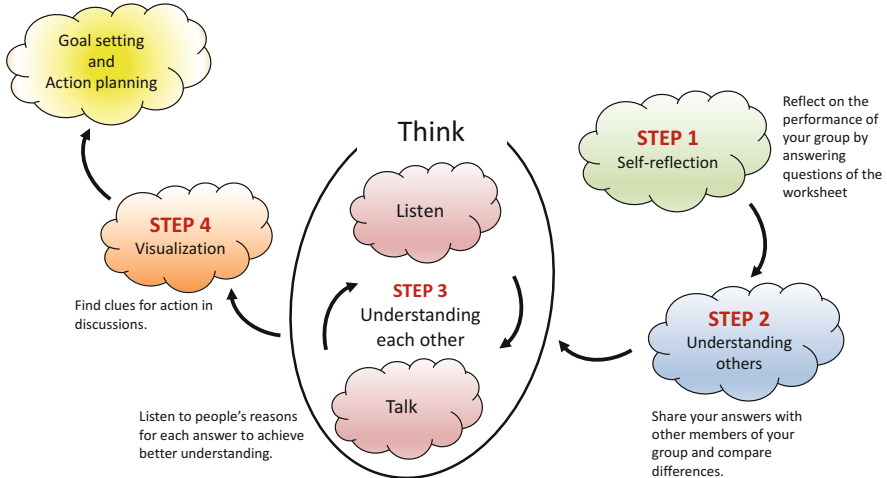**Fig. 11.3** Visualization worksheet for environmental activities

Fig. 11.4 Four-step infographic tool to promote dialog among environmental actors

Implementation of the tool proceeds in four steps (Fig. 11.4). In Step 1, respondents are asked to answer "yes," "no," or "I don't know" to the 50 questions. The process of answering "yes" or "no" to simple but ambiguous questions can cause uncertainty. Based on that uncertainty, respondents each sort out their opinion and the reasoning behind it. Thus, a question that can be interpreted differently can trigger deeper thinking. For example, when answering the question, "Do you ensure diversity among experts?", conceptual questions that are rarely asked may arise, such as "Who is an expert?" or "What is diversity?" The importance of the question is that it is simple but ambiguous enough to enable various interpretations, which leads to organizing one's own opinions and reasoning. Actually answering "yes" or "no" is not as crucial. Thus, Step 1 is considered the process of "self-reflection."

In Step 2, all answer data are input into Excel and displayed on a projector screen. Comparing the answers reveals that some questions have similar answer tendencies, whereas others receive vastly different evaluations. It also provides a rough grasp of others' tendencies, provoking questions such as "Why does that person have a different answer from me?" or "Why does that person have the same answer as I do?" Thus, Step 2 is considered the process of "understanding others."

In Step 3, based on the projected results, the coordinator selects questions to discuss, both with different and matching answer tendencies. Each participant explains the reason for their "yes" or "no" answer, and the dialogue proceeds from there. As participants already took time to reflect on their opinions in Step 1, the reasons for their answer should be easy to articulate. This should also make it easier for those who are not actively vocal at workshops to participate. The reasons for people's differing opinions become clear as the discussion progresses. It is crucial that participants both listen and speak. Further, those who initially answered "yes" may change their opinion to "no" because of the discussion, or vice versa. This is a

mutual learning effect. Thus, Step 3 is considered the process of "understanding each other."

In Step 4, the discussion promotes visualization of participants' activities, allowing them to find areas of agreement and clues for future action. Thus, Step 4 is considered the process of "visualization."

11.5.3 Workshop with the Actors of Restoring the Kamoko Estuary on Sado Island

From January 2017 to the end of December 2019, 12 workshops using the infographic tool were held. The following briefly summarizes the results of a workshop conducted in May 2018 with an NPO called KAMOKEN (*Kamoko Suikei Saisei Kenkyūsho*: Research Community for Restoring the Watershed of Kamoko). KAMOKEN was inspired by fishermen engaged in oyster farming on the brackish Lake Kamo in Sado Island, Niigata Prefecture. It was established as a citizen laboratory on July 11, 2008, to consider the regeneration of the Lake Kamo estuary—which is experiencing eutrophication due to sheet pile revetment and drainage inflow improvements during the high economic growth period—in collaboration with industry, government, and academia.

Six people involved in the laboratory's activities participated in the workshop, including both key members, such as the president and directors, and some members who had recently begun participating. The workshop lasted about two hours and included six of the 50 questions in the discussion. Two questions are presented below to provide an example of the resulting discussions (Fig. 11.5).

Question 2–7: Is the number of participants in the activity increasing?

This question appears to refer to objective facts. However, answers were split. We asked each person for the reasoning behind the answer and received the following responses.

Actor D: There were more than 70 participants in reed boat making. I feel that the number is increasing compared to before.

Actor B: I answered no [because] participation by the key actors, fishermen, is difficult to increase.

Actor A: You say there were 70 participants, but how do you get to 300 or more? Do we not have to think about that?

	Question item	Actor A	Actor B	Actor C	Actor D	Actor E	Actor F
1-4	Do you discuss issue awareness within your organization?	No	Yes	Yes	Yes	No	Yes
2-7	Is the number of participants in the activity increasing?	No	No	Yes	Yes	No	Yes
2-8	Do you promote activities through cooperation with related parties?	No	I don't know	Yes	Yes	Yes	Yes
4-6	Do you regularly conduct environmental monitoring?	I don't know	Yes	I don't know	Yes	No	No
4-9	Do you try to disseminate your activities?	No	No	Yes	Yes	I don't know	Yes
5-5	Do you make decisions through discussion?	Yes	Yes	Yes	Yes	Yes	Yes

Fig. 11.5 Research community for restring the watershed of Kamoko (implemented May 7, 2018)

Actor E: I also answered no [because] the number of core members who are involved in planning has not increased.

Actor F: Even if you are unaware of it, the number of people participating in the resource cycle of Lake Kamo is steadily increasing.

Actor B: It may be true that the number of children playing at Lake Kamo has increased.

Actor A: [However,] they do not continuously [increase]. They stop at temporary involvement.

Actor C: I have been trying to create a playground for children. [Has this not just begun]?

It became clear that interpretation differed based on the word "participants," and participants made discoveries based on each other's remarks. Their "yes" or "no" answers were unimportant compared to asking the reason for their opinion. This is because "giving a certain opinion is different from giving a reason for that opinion" (Kuwako 2016: 74). The point of the exercise is to mutually understand the reasoning, interests, and concerns behind others' opinions. Promoting dialogue led the group to collaboratively define the concept of "participants" in the context of their specificity.

Question 5-5: Do you make decisions based on discussion?

All six participants answered "yes" to this question. However, sharing the results raised objections from the participants. One member felt that he discussed decisions in detail, but another thought he was making top-down decisions. Participants asked what exactly an agreement made through discussion is. Does it refer to providing information? Thus, the meaning of "discussion" was again called into question.

11.5.4 Effects and Issues

In some of the 12 workshops conducted thus far, we included a questionnaire for participants on the tool's effectiveness. Questionnaire questions and responses are shown in Figs. 11.6–11.9. The results identified effects related to communication, discovery of new ideas, and review of one's own philosophy and goals.

In the open-ended response column, opinions related to the communication effect included "I was able to learn from other people through this workshop," "It was a

Question 1	Did you share your thoughts and ideas with other members?
Question 2	Did you get to know what other members were thinking?
Question 3	Did you notice anything new?
Question 4	Did it cause you to rethink your philosophy and goals?
Question 5	Have you come to recognize issues regarding your organization/activity?
Question 6	Have you identified new possibilities for your activities?
Question 7	Do you think these discussion opportunities are needed regularly?

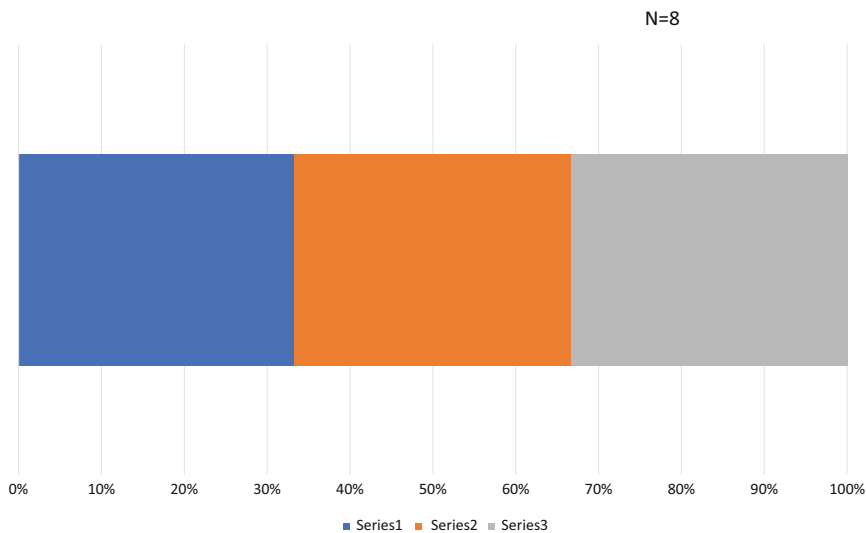**Fig. 11.6** Participant survey

N=8

Fig. 11.7 Kami Sarobetsu Nature Restoration Council (January 24, 2019)

good opportunity to share issues with each other," and "I felt it was a very good tool and good a workshop to get to know others' thoughts." In contrast, the effect on identifying new activities was somewhat small, with open-ended responses such as, "I don't know exactly what happened. I think it is a good workshop, but we must go a step further and discuss as a group what we should do in the future." Furthermore, all respondents indicated that it would be better to conduct regular workshops, which could serve as a monitoring tool for activities.

Based on the results of the implementation and questionnaire survey, the following effects of the infographic tool for environmental activities were identified. First, it allowed people to visualize differences in others' awareness and perception of the same situation. Because people interpret issues based on their own life experiences and position, different perspectives on the same problem are common. It is often unclear whether they even see the same problem (Kuwako 2016: 14). Even when engaged in the same activities or occupation, people's perceptions differ. By allowing participants to listen to and share the reasons behind their opinions, this tool creates the opportunity to visualize that outwardly matching opinions may be based on different reasoning, or that outwardly opposing opinions may be based on the same reasoning. Second, the tool naturally encourages dialogue that helps participants identify the reasons for differences in opinion and understand others' perspectives. This generates acceptance of diverse opinions and promotes mutual communication. Third, users of the tool can delve deeply into the issues related to their activities as their understanding of the concepts and values expand. For example, discussions lead to collaborative definition of terms such as "participation," "region," "active," "related parties," and "diversity of experts," deepening participants' mutual understanding.
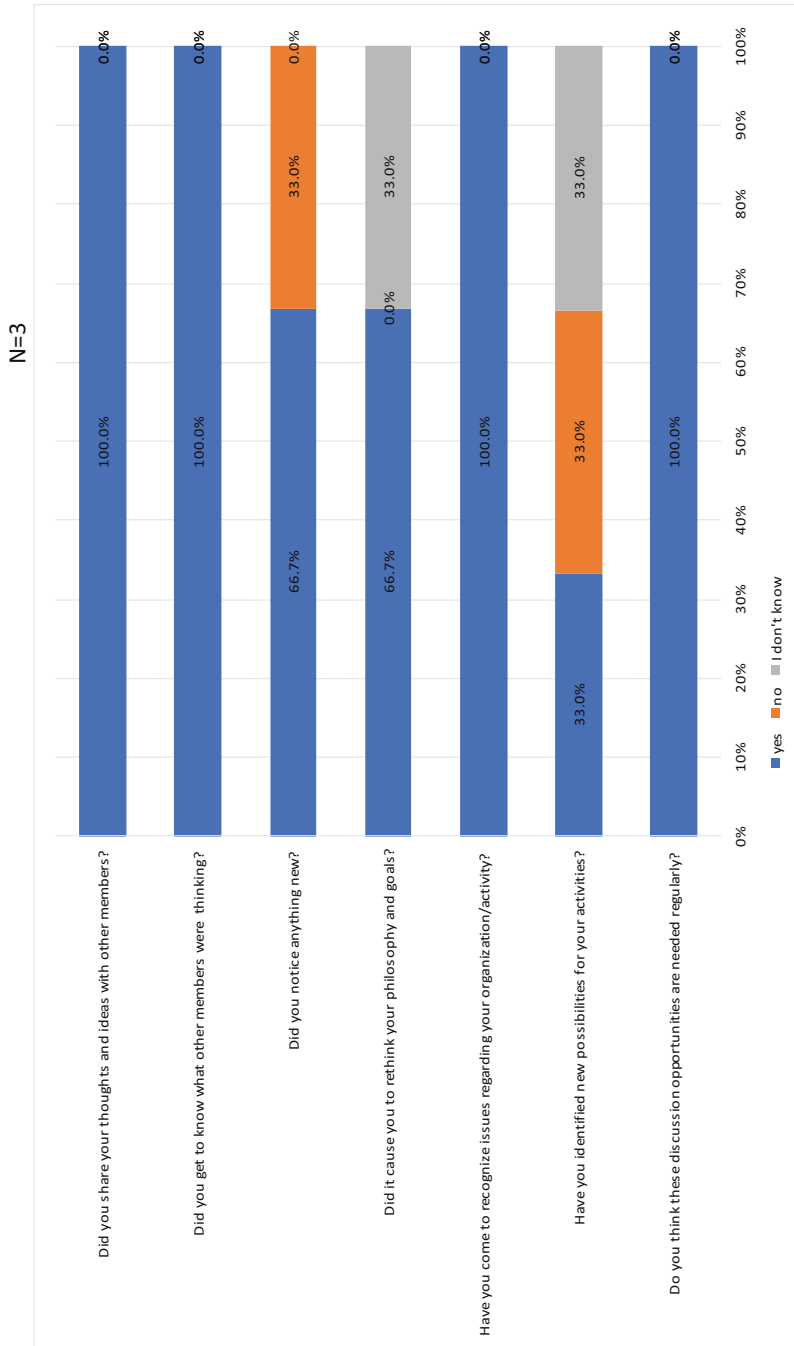
Fig. 11.8 Fushinogawa Tidal Flats Nature Restoration Council (February 7, 2019)
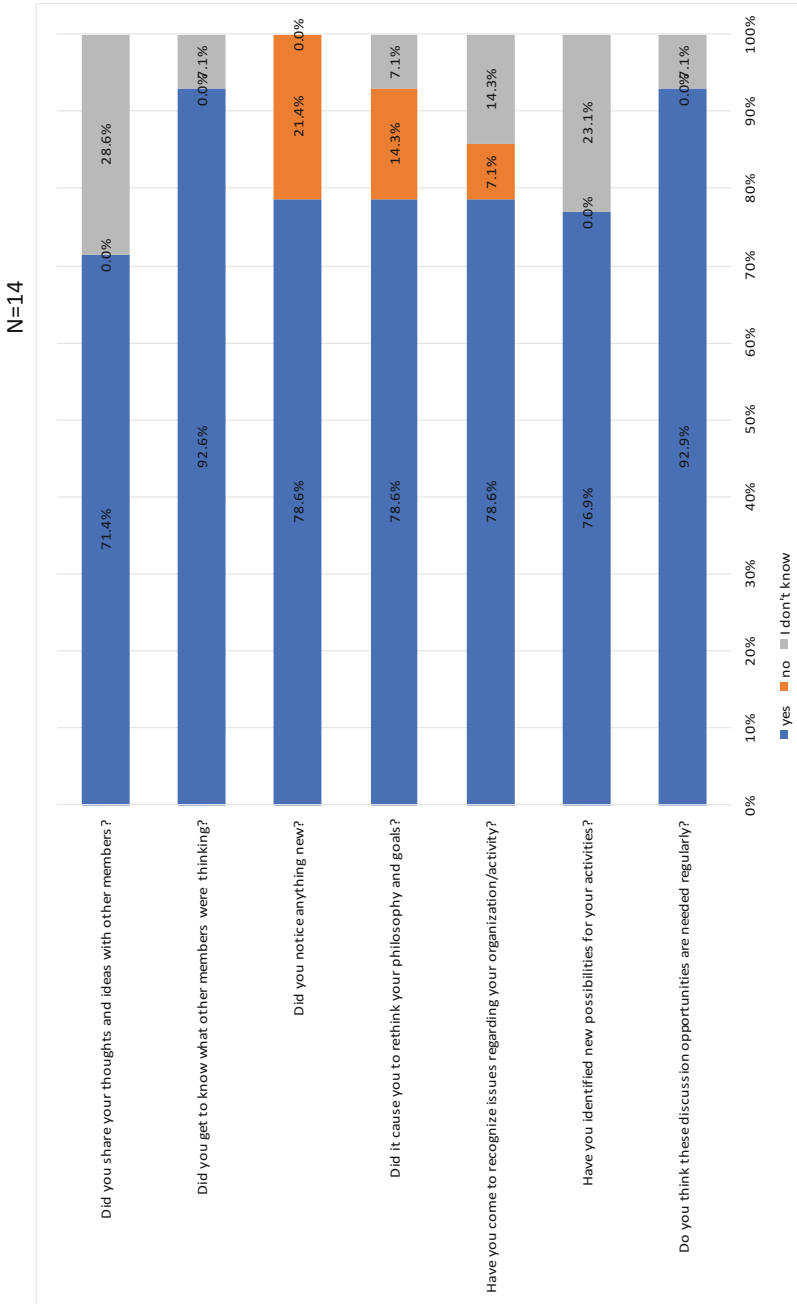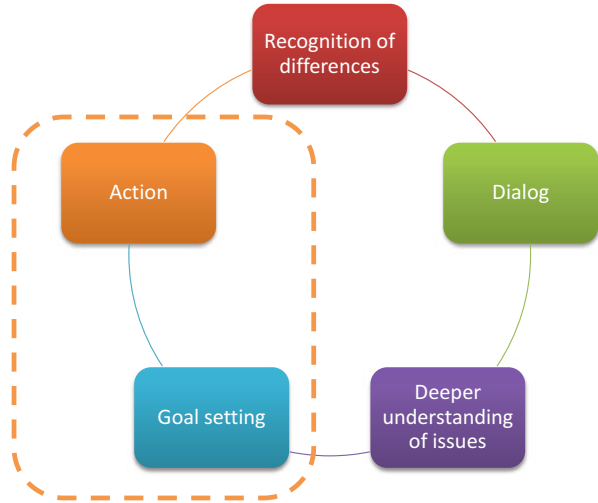
Fig. 11.9 Stork Symbiosis Promotion Liaison Council in Echizen City (March 30, 2019)

Fig. 11.10 Adaptive
process loop: respecting
differences of opinion

Although the tool was expected to encourage consideration and visualization of future activities, effects on these aspects were not pronounced. It may be more effective to combine this tool with another tool geared for visualization and action.

The adaptive process loop established by the tool is shown in Fig. 11.10. Within the loop, issue recognition is deepened through dialogue, which is sparked by recognition of differences in opinion that are made clear by action. Subsequent actions then differ depending on how the activity process is assessed. A dialogue process in which different perspectives can be shared and recognized is vital, and this tool is effective in promoting that dialogue.

11.6   Conclusion

Solving wicked problems involves building people's ability to respond. To this end, it is important to drive a "process of accepting diverse opinions, exploring the values underlying each opinion, sharing that information, and creating solutions" (Kuwako 2016: 13). Different perspectives, scopes, specialties, and resources can be leveraged as an advantage. Emergent and creative consensus building helps construct relationships that can properly utilize these differences. Evaluation is one method for implementing this mutual learning process. Accordingly, in this chapter, we introduced some results from workshops using a social evaluation tool and a visualization tool we are developing for environmental activities.

The social assessment tool for environmental activities incorporates self-assessment into the environmental activity process; we predicted that this could produce immediate discovery and sharing of issues, collaboration with others, and identification of direction for future action. However, the tool is difficult for people to implement independently.

The infographic tool for environmental activities, which promotes a dialogue process through "listening" to and "speaking" the reasons for individual opinions, effectively helped participants understand their own perspectives, learn about others' perspectives, delve deeply into concepts and values, and define their meanings collaboratively. However, this tool alone did not lead to visualization for future action.

It is necessary to consider wicked problems from multiple angles. This means respecting a diversity of views on the issue. Naturally, diverse opinions have the potential to cause conflict, but they are also important intellectual resources that can lead to better responsiveness and solutions (Kuwako 2016: 6). The two tools discussed in this chapter aim to build emergent and creative consensus that integrate diverse perspectives as an intellectual resource.

Notes

1. This question setting is related to the research history of the two authors. Kikuchi participated as an environmental sociologist in a project to return an endangered species of stork to the wild around Toyooka, Hyogo Prefecture. Although the main goal is to increase the number of storks, the project also conducts some regional revitalization activities related to secondary nature involving paddy fields and *Satoyama*, which serve as a stork habitat. Refer to Kikuchi (2018) for details. Toyoda is working on the regeneration of brackish lakes from an environmental philosophy perspective, while operating Sado Island's Lake Kamo Water System Nature Restoration Laboratory.
2. Other members involved in the tool's development since 2011 include the following: Mami Shikita, who has been building a model of the activity process while studying the regeneration of Kyōtango in Kyoto Prefecture and Kiritappu Wetland in Hokkaido; and Mayuko Shimizu, who specializes in environmental policy and has been conducting research on the regeneration of polluted areas and renewal of areas centered on coral reefs around Ishigaki Island. We utilized our differences in perspective, specialties, scopes, and resources.
3. In a broad sense, social technology is intended to solve social problems and manage society smoothly. This refers not only to engineering technology but also to social systems, including legal and economic systems, education system, and social norms (Horii 2012: 1).
4. Hi-Beads are functional materials for environmental restoration made by adding a small amount of cement and water to coal ash. Their effectiveness in improving the habitat of living organisms has been previously demonstrated (Saito et al. 2014).
5. Kikuchi first referred to the Philippine Marine Protected Area (MPA) management effectiveness evaluation system. This system aims not to determine good and bad MPAs, but to encourage mutual learning to improve MPAs with reference to other districts. Other benefits of the system beyond mutual learning are its adaptive management ability and capacity to report on activities in a way that is comparable to other regions. The system consists of 48 question items.
6. This tool was developed in collaboration with relevant members of the Nakaumi Nature Restoration Council. It is also the result of joint research with Yushu Tashiro of Sasayama City Hall, Toshihisa Asano of Hiroshima University, Mayuko Shimizu of Ryukoku University, and Mami Shikita of Hokuriku Advanced Institute of Science and Technology.

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