## Chapter 6 Sustainable Community Co-development Through Collaboration of Science and Society: Comparison of Success and Failure Cases on Tsushima Island



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**Abstract** This chapter examines how science can co-produce with local communities and what kind of roles it can play for local revitalization in one of the border islands of Japan, Tsushima (Nagasaki Prefecture). Currently, depopulation, declining birthrate, and aging population are accelerating in local regions all over Japan, and the management and survival of local communities is becoming "unsustainable." Therefore, it has become a major issue on how to build a sustainable local community around Japan, and various efforts have already been made everywhere. Under these circumstances, the case of Tsushima is a practical case study of transdisciplinary research to develop a sustainable local community. This is also one of the Future Earth research which is based on the "co-design, co-production, and co-delivery between science and society." This chapter will introduce two cases in Tsushima islands, and then, from the perspective of TD research, emphasize the importance of the role of coordinator, social sensitivity to local needs and realities, priority, problem framing, and scale setting.

Keywords Tsushima · Social capital · Coordinator · Personality · Social sensitivity

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## 1 Introduction

In this chapter, we examine how science (scientists, scientific knowledge, universities, and other research institutes) can co-produce with local communities (local society) and what kind of roles it can play for local revitalization in one of the Japan border islands, Tsushima (Nagasaki Prefecture). Currently, depopulation, declining birthrate, and aging population are accelerating in local regions all over Japan, and the management and survival of local communities is becoming "unsustainable." Therefore, it has become a major issue on how to build a sustainable local community around Japan, and various efforts have already been made everywhere.

Under these circumstances, the case of Tsushima, which is introduced in this chapter, is a practical case study of transdisciplinary research (hereinafter, TD) to develop a sustainable local community. This is also one of the Future Earth research which is based on the "co-design, co-production, and co-delivery between science and society," conducted by the interdisciplinary research team from the Institute of Decision Science for a Sustainable Society, Kyushu University (IDS3). In other words, this is one of the TD case studies from a local perspective, which tries to answer the theme of this part of "how can we co-design, co-produce, and co-deliver with local society toward a sustainable local community?"

Specifically, this chapter will introduce two cases in Tsushima islands: (1) project which aims to find and resolve local issues with local high school students and (2) project to revitalize local communities by regenerating abandoned farmland. The aim of the former project is that local children will grow as local leaders in the future in a local community that is struggling with population decline, by trying to discover local resources (including resources of the natural environment as well as the distinctive history, culture, stories, places, and people in the region) and raising awareness of local residents. And, the aim of the latter is that local residents are reusing abandoned farmlands in consideration of biodiversity, to commercialize high-value-added crops and develop experiential tourism.

In these two projects, the focus is on whether it is possible to achieve "co-design/ co-production/ co-delivery" between science and local societies, and what kind of implication does "co-design/co-production/co-delivery" have in the planning and implementation of the project. Then, from the perspective of TD research, the importance of social capital (face-to-face relationship), the role of coordinator, social sensitivity to local needs and realities, priority, problem framing, scale setting will be emphasized.

#### 2 Definition of Local Society and Local Community

First of all, we want to make a simple definition of the concept of "local society" and "local community" used in this article. The meaning of these words is likely to differ greatly by country or scholars. The word "local" is very ambiguous (Herod 2011).

The general Japanese word corresponding to "local" is "Chiiki," but the meaning or content is similarly diverse (Tonooka 2004). This term may be used in the meaning of a "prefecture" or "municipality," or a smaller area where dozens of people live within relatively small blocks enclosed by several roads or rivers. In addition, other concepts similar to "local" in English include "region," "rural," "municipality," "province," "area," "village," "settlement," "town," "city," "field," "zone," "district," and "block." Although the definition of these concepts has been discussed in each discipline such as political science, geography, sociology, cultural anthropology, and urban planning (Sakamoto 1966; Mitsuhashi 2007), the difference is not clearly defined or understood. It is not the purpose of this chapter to closely follow these discussions on the definition of "local" (Yohannan et al. 2014; Hooghe and Marks 2016). However, for the moment, it is necessary to define the concepts of "local society" and "local community" in this chapter, because comparisons with other local cases are meaningless if the geographical scale, spatial range, scope of the targeted local people, and limits of jurisdiction are not clear and do differ from case to case (Ihara 1983).

The "local society" used in this chapter refers to all types of societies that are established at a lower level than the national level. It may mean an area of local government such as prefecture or municipality in Japanese administrative division, or an area of smaller unit, scale, community, or neighborhood. Therefore, it is to be regarded in the broad sense of the word without limitation as far as it is located within the national territorial jurisdiction. In connection with such a geographical scope, the term "local people," "locals," and "local resources" are used without limiting the scope.

On the other hand, the term "local community" is used in the sense of more restrictive, limited scope. It is usually regarded as a smaller unit than the municipality that Japanese people often imagine in the word "Chiiki" (local). In addition, it should also be a "community" where some material is shared by a group of people. Specifically, it is a communal unit that is composed of several or thousands of households with a certain geographical range. Because there is a variation in the scale, it is called "town" when the number of members is large, or is called "village" or "settlement" when it is small. When the geographical area is relatively broad, it is sometimes referred to as "district." However, the common feature is that a certain level of resident's self-governance or autonomy exists. Of course, there is a possibility that all residents share something even on the prefecture or municipal level. However, in Japan where the scope and scale of municipality is too large in the world, the resident's autonomy at the level of daily life is usually implemented in a smaller scale than municipality. Such a smaller scale is called a "local community" in this chapter, and it is likely to be referred to as "rural community" in other cases.

The above definition is likely to be criticized from various disciplines, but is to be set up just only for convenience to clarify the range of this chapter in accordance with the purpose of this part. It must be emphasized repeatedly that our case of "co-design/co-production/co-delivery" especially focuses on the "local community" that is a unit smaller than municipality and has something shared by a group of people as self-governance.

Finally, we would like to briefly explain why local community in such a small scale should be focused on. First, municipality which is often imagined in the word "Chiiki" (local) by Japanese people has a very large geographical range or population size, and has a wide variety of culture, history, industry, lifestyle, and interests. Therefore, it is very difficult to think of municipality as a single unit or a bundle of community. In other words, Japanese municipality on a large scale will always have difficulty in promoting the collaborative "co-design/co-production/co-delivery" with various stakeholders living in the society that is demanded in Future Earth research.

Hence, in order to achieve "co-design/co-production/co-delivery" within a local society, it is necessary to "scale down" to a small "local community" level where local people can share something in a substantial form.

Second, as mentioned earlier, the municipalities in Japan are losing their financial and governance capabilities for tackling the problem of declining population and birthrate. As a result, it is becoming difficult for municipalities to provide an adequate quality of public services to all areas of jurisdiction, or to solve the problems in the entire region. Under the circumstances, some of new approaches in local governance have already started. For example, an entire area of municipality is subdivided into small areas of tens to thousands of households. Then, local people in such a small unit establish a "resident's organization" ("resident's self-governance unit"), while municipalities provide financial and human support. The "resident's organization" is administered and managed by local people themselves, and also responsible for providing a part of the public service such as water supply, childcare service, and local event on behalf of the municipal organization. Unnan City in Shimane Prefecture is the pioneer region where 30 resident's organizations in the city are actively engaged in the operation of public service. On the other hand, on the nationwide scale in Japan, more than 3000 resident's organizations were already established, and it is usually called "self-governance organization of small scale and multi-function" with much attention.

It can be pointed out that, in recent years, local autonomy or self-governance in a smaller scale of community is demanded more and more in Japan, as public governance and problem solving at the national or municipality level have become unsustainable gradually. In light of the viewpoint of this chapter, this trend indicates that, in order to "co-design/co-produce" a sustainable local society, it is necessary to consider at the level or scale of smaller "local community" rather than the municipality level.

## 3 Tsushima Island

We would like to briefly introduce the outline of the subject of case studies presented in this chapter and the current situation in Tsushima island in Nagasaki Prefecture.

Tsushima island is a border island located at the north westernmost end of Japan. It is the tenth largest island in Japan, and the current population is about 30,000 people. About 90% of the area is covered with forest and mountain, and because



# Significant Decrease of Population & Households

Source: Tsushima City, 2nd Comprehensive City Planning (2016)

Fig. 6.1 Change in population and households in Tsushima Island

there is little land suitable for cultivation, people's lives have been managed by the exchange and trade with Korean peninsula which is 49.5 km away from the island since ancient times. Moreover, because it is a border remote island, the island as a whole functioned in the past as a military fortress, and development such as construction of the road has been restrained for many years. Therefore, Tsushima was one of the most "undeveloped" regions in Japan, as the folklore scholar Tsuneichi Miyamoto said in 1960 that "the Middle Ages still remain in Tsushima" (Miyamoto 1984). Since the modern era, fishery has become a key industry, but with the decline in fishery resources in recent years, the population has already fallen down to less than the half of the 1960s (Fig. 6.1).

In line with the population decline, one of the most serious problems is the declining birthrate and aging population. The average of total special fertility rate in Tsushima City from 2008 to 2012 is 2.18, and this is the fifth highest in all municipalities in Japan. However, the total number of children continues to decrease every year due to the population decline of the parent generation, and in recent years, elementary and junior high schools have been forced to close. A lot of children go out of the island after graduating high school for getting a job or going on to a university, and most of them do not return to the islands afterward. On the other hand, the aging rate, which shows the percentage of people of 65 years or over in the total population, is 33.9% in Tsushima City in 2015 (Fig. 6.2). This rate is said to be the same as that of the entire country of Japan after 20 years. In addition, there are



Fig. 6.2 Population aging rate in Tsushima (Source: Tsushima City, 2nd Comprehensive City Planning, 2016)

some areas in the island where the aging rate has already exceeded 60%. It indicated that the number of local people who can accept the responsibility for supporting a senior citizen in the island has been extremely declining.

As an approach to this problem, Tsushima City has been working on the project "collaboration between university and local society" (Tsushima City 2020) since 2014. This is the national project in Japan from 2012 in which university students and teachers work with local people together to promote "activities that contribute to the revitalization of local communities and the development of local human resources" (Japan Ministry of Internal Affairs and Communication 2012). Tsushima City has been attracting attention as one of the pilot model cases. More than 500 university students and graduate students visit Tsushima from all over the country every year, and they collaborate with local people in various fields of natural science, social science, and humanities. Many of them are continually tackled and there are also successful cases that have a positive effect on the region, but there is also the challenge that this kind of collaborative approach is not necessarily being implemented in all areas and problems in the island.

On the other hand, so many Korean tourists have visited from Busan on the opposite bank of the strait to Tsushima island. Since the opening of the international sea route between Tsushima and Busan in 1999, the number of tourists from



Fig. 6.3 Increasing number of foreigners entering Tsushima

Korea has increased every year, and in 2018, the number of foreign immigrants has exceeded 400,000 (Fig. 6.3). Most of them are Koreans and have reached about thirteen times the population of Tsushima City. The tourism consumption by Korean tourists has increased by 2.4 times in the last 5 years, and the two port cities in Tsushima where regular vessels arrive are undergoing remarkable development in recent years. However, it is said that the recipient of the profit is limited to a part of tourist companies and construction contractors doing business activities around the port city, and the feeling of doing good business in tourism is hardly felt in other areas with small population size. On the other hand, the tourism service and tourist attractions is demanded firmly. Nevertheless, regarding the promotion of tourism, efforts made by local residents themselves as well as cooperative joint projects through the aforementioned municipality project of "collaboration between university and local society" have been rarely observed.

Based on the current situation in Tsushima, our team was aware of the following issues: (1) Is it possible to take an interdisciplinary approach of "co-design/co-production" for improving the sustainability of the local areas that have not been tackled in the past, based on the framework of the municipality project of "collaboration between university and local society"? (2) Is it possible to "co-produce" a sustainable community in cooperation with local residents or universities, by organizing both university students and Korean tourists as not guests (objects) but players (subjects) for supporting local communities? (3) Is it possible to make an

opportunity for children who were born and bred in the island and then go out of the island, to return to the island in the future and play an active part as a supporter of the community without relying too much on the power of "Yosomono" (people coming from outside)? (4) What conditions or requirements will be necessary for tackling the abovementioned issues at the level of the local community which is a smaller unit than municipality?

## 4 Project "Looking for Island Treasures" by Local High School Students

The first case is an attempt to "co-produce" a sustainable local community with local people and local high school students by rediscovering local resources. One of the purposes of the project is that the local high school students are expected to learn afresh about the local community where they live in, try to find the local resources, and to resolve the problems in local community by "co-designing/co-producing" with local residents and university students. Second, they are also expected to have a feeling of attachment or a sense of mission to their home island by knowing well the local community and finally become the supporter of the community after returning to the island in the future. Third, local people are expected to take a look at the hard struggle by local high school students and have an awareness of the social issues and their own role or responsibility to contribute to the establishment of the sustainable local community. In this project, for the purposes mentioned above, it must be examined what kind of function science or university can perform in such a "co-design/co-production," and on what conditions or requirements local community and university can "co-design/co-produce" a sustainable local society.

## 4.1 Background of the Project Starting

In the winter of 2015, we were talking with the president of the local construction company, the head of the Commerce and Industry Association, and municipal officials (Tsushima City officials) in Kamitsushima town located in the northernmost part of Tsushima. This was the first time to talk together with the counterpart of the industry, local government, and academia on the future of Kamitsushima town, although we had connected with various parties in this area through the educational program in the university or the fieldwork research on borders.

One of the municipal officials in the meeting was Mr. K who was working in Tsushima City as a temporary staff. He came to Tsushima from Tokyo with a 3-year term as a new supporter of the local community, by the fiscal backup of the Japan Ministry of Internal Affairs and commissioned by Tsushima City. He was an excellent talent who penetrated deeply into and understood the realities of the

local community by using his delicate standing position of "half-inhabitant" and "semi-outsider." He also played an important role in connecting local islanders with "outsiders," or "guests" coming from outside the island such as university researchers.

In Kamitsushima, the municipality so far had been taking various initiatives aiming at the revitalization of the local community, and it did not go quite well. A good idea had not occurred to the local people, and it was expected to have good wisdom from outside. While the number of Korean tourists increases every year, the improvement of tourism service, attraction, and hospitality remained to be discussed for many years. Moreover, the shopping street which is the symbol of the community was deserted without traffic, and the decline of the community had progressed in the visible form. The sense of urgency that we had to respond as soon as possible was shared by all concerned.

Then, Mr. K raised the topic of Kamitsushima high school which is one of three high schools in Tsushima City. The number of students in this high school has decreased rapidly as the area declines, and it is now facing a crisis of "closing down." The existence of the school is vital for the survival of the local community, and the close-down of the high school will have an adverse effect on the local community. Mr. K proposed to launch a special educational program in order to overcome the close-down crisis. His proposal is that students are expected to learn something interesting in the field outside the classroom altogether with local people, municipality, and university students coming from outside.

Then, we hit on a plan that the local high school student will learn the realities or problems in the local community by interviewing various local residents while walking in the shopping street. In addition, the plan expected them to try to resolve the problem in the community and then make a presentation of an idea for revitalizing the local community toward local businessmen. The president of the local construction company and the head of the Commerce and Industry Association agreed to this proposal, hoping that the young high school students would consider the idea of revitalizing the area while wishing for the continuation of a local high school, a source of vitality in the local area. We also agreed that it would be an interesting initiative to stimulate the local people by involving local high schools.

What we had to consider for starting the project was who will plan, organize, and implement such an extracurricular class. Even if the municipality or businessmen are familiar with the actual situation of the area, they do not have know-how and enough time to teach high school students. On the other hand, high school teachers have professional skills of teaching in classroom, but in fact they do not have much contact with the area outside the school, and it is difficult to say that they understand fully the situation and the problem of the local area. Most teachers are actually "strangers" to the local area, and not "local people" because the teacher of the prefectural high school has the practice of repeatedly transferring to another high school in Nagasaki every few years.

Then, we thought that the researchers and graduate students of the university can accept the work of teaching the realities of the local area to the local high school student. We are certainly "strangers" coming from outside of the island, but we are slightly familiar with local people in Kamitsushima because we had been engaged with the education practice there many times. We researchers have some experience and knowledge about resolving local problems and have enough know-how to teach students. On the other hand, the graduate students who have participated in the educational practice in various regions have the experience of finding and solving problems in local areas. In addition, it was preferable, from the viewpoint of the educational effect on graduate students, that the graduate students themselves carried out the joint fieldwork for finding and solving problems with the high school students who were comparatively close in age to them.

Therefore, we can summarize the roles and interests of each of the stakeholders as follows. First, the university including researchers and graduate students is responsible for planning the education programs of local high school students and actual classroom management of the joint fieldwork. In doing so, the graduate students have the advantage of being facilitators and deepening their involvement in resolving local problems, which will promote a study on community for graduate students. Next, the high school will be able to show the appeal to avoid the close-down crisis by implementing a unique, distinctive education program. In addition, the local businessmen and Commerce and Industry Association will give advice on the selection of interviewed persons and arrange a presentation meeting directed at local people scheduled at the end of the year. By obtaining ideas from a fresh viewpoint of the local high school students, they will be able to propose a project that will stop the decline of the area. Finally, the municipality will coordinate the entire stakeholders, standing between the high school, the university, the business operators, and the Commerce and Industry Association. By undertaking such a coordination work, it can produce a satisfactory result on the municipal project "collaboration between university and local society" and another project "collaboration between high school and university" which are also progressing nationwide in recent years.

The first challenge was whether the high school, the most important stakeholder, would accept this project. At this point, high school officials did not participate in the process of the planning discussion. Therefore, it would be a complete surprise for the high school side. At first, we thought that Mr. K and our university researchers would submit the petition to the high school. However, the president of the local construction company who was a co-planner of the project suddenly visited the high school and persuaded the principal to accept the project. It was also a complete surprise for us that the project was decided to start in such a way.

Then, we university team would be in charge of the extracurricular class for the 26 high school students. They would find attractions and problem in the area, try to solve the problem, and finally make a presentation to local people. The project is named "Looking for Island Treasures" project for the purpose of exploring the challenges and possibilities of the local community while rediscovering the attractions of the island.

It is true that the high school side wished to have a distinctive educational program to avoid the close-down crisis, but it is presumed that the most influential driving force for reaching that decision is the specific interpersonal relationship between the president of the local construction company and the principal of the high school. In other words, we have to emphasize that research and education ability and scientific knowledge of our university have not had a big influence on the start of the project.

#### 4.2 Trial Experiment in the First Year

Since the project has started suddenly, we did not necessarily share a clear understanding or image of a goal setting, a definite division of roles, and a feasible outcome from the beginning among all the stakeholders. Rather, it proceeded through trial and error approach, while we "try for the time being, and then re-examine or revise if there occurs a problem." The reason is that such an approach of repeated trial and error (the so-called adaptive governance) is suitable according to circumstances of the community and the change of the interests of each stakeholder (Folke et al. 2005; Brunner et al. 2005).

In 2016, which was the first year, all the stakeholders felt in the dark about the project. Even our university group, who were supposed to lead the fieldwork and group work of high school students, had to go through the confusion occasionally because it was the first experience of the "co-design/co-production" project. The involvement of our university group in the management of the class was limited because we were afraid of confusing the high school teachers. Due to the circumstances of the university group, it was not possible to get enough students to participate in the class, so the members of university students in charge of each high school student group changed every time. As a result, the mutual trust relationship between high school students and our university group was not able to develop well. It was also the first time for high school teachers to get students out of school and to interview local people, so it was a very confusing experience. It was supposed that there were a lot of high school teachers who were attending the joint fieldwork and group work with the question "what is the meaning of such a hard extracurricular activity?"

Still, the students who were divided into five groups continued the interview investigation in their own ways. They investigated the attractiveness and problems about the local food culture, natural resources, history, the annual "border marathon" events, and hosting Korean visitors in the community. Finally, they showed the results of the group investigation at a town meeting where local residents and business operators participated (Picture 6.1).

It actually has become a great stimulus for the people of the community, as the participants of 20 local residents and business owners asked sharp questions about the students' presentations. In the questionnaire survey toward the high school students after the presentation, there were several positive comments such as "It was pleasant," "It was stimulated," and "it was good to know a lot about the local community where I lived." In addition, the high school teacher also seemed to have obtained a feeling of satisfaction and accomplishment.



Picture 6.1 Presentation of the students group investigation at a town meeting

On the other hand, in the opinion of students and teachers, there were many comments indicating that they wanted our university group to be involved more actively in their work. "We want them to go to the fieldwork with us every time," "we wished the same university group member to take charge of each group every time by communicating with each other," and "we want to have a more friendly chat with university group members." A lot of comments asked for the enhancement of communication and trust between high school and university. In fact, we university group members were not able to carry out the work with a well-organized plan. Therefore, they indicated dissatisfaction and regret that the project was not able to achieve complete presentation and practice of the solution, even if they were able to point out the problem in the local community. In addition, we also received many expectations and requests for the intellectual resources of the university. "We wanted them to show a model of interview to us", "we want them to teach us more and more about how to make a good questionnaire survey," "we want them to give more guidance and advice of presentation by PowerPoint," and so on.

As described above, even if there is plenty of scope for improvement, the results of trial experiments in the first year gave a positive impression to each stakeholder. We also received a nice request from the high school side that "we want you to continue this project not only this time but also next year." On the other hand, a variety of problems were also highlighted. Therefore, it was the key to the project success to overcome and improve these problems next year.

#### 4.3 Development Phase in Second Year

In response to the reflection of the first year, the second year of the 2017 project focused on communication between stakeholders and started in a way that greatly strengthened the commitment of university members.

Mr. K, who has been a key coordinator among the stakeholders, left the island with the termination of his term, and a successor Mr. S was to play a similar role as a new temporary municipal official. Therefore, it is important to carry out the succession of tasks from Mr. K to Mr. S, and to conduct a thorough meeting between stakeholders in order to aim for further development while taking into account the circumstances to the point. In the first year, the project was started without sufficient planning, but the second year began with a meeting from four months before the start of the class, and a total of 20 meetings were held between the stakeholders throughout the year (Picture 6.2). In addition, the role sharing between stakeholders has become clear through the previous year trial. It was agreed that the university members would be more actively involved in the planning and management of educational programs (Fig. 6.4). In addition, it seems that the high school teacher tried to get involved in this project more proactively, as a result of a thorough meeting beforehand and continuously exchanging opinions about the aim and contents of the project many times. As described later, the accumulation of such



Picture 6.2 Continuous meetings among stakeholders



Fig. 6.4 Interest and role of each stakeholder in the project

in-depth meetings and face-to-face communication led to the success of the project by building a strong trust relationship between stakeholders.

The number of students in the second year has increased by 36. On the other hand, it has greatly increased the attendance and participation frequency of the university members to ensure sufficient communication and trust with all students. The organizing staff was 10 members composed of university teachers and graduate students, approximately twice as many as the previous year. Although the frequency of our participation was about five times in the previous year, the second year was approximately 15 times. We supported not only extracurricular fieldwork, but also the facilitation of group work for setting up and analyzing tasks in the classroom (Picture 6.3), and the preparations for their presentation in a meeting with local residents. In addition, prior to the full-fledged start of the class, preparative lectures and group works were carried out twice beforehand (Picture 6.4). By giving high school students sufficient preparation time, students were able to set up their own problems without being swayed by instructions from high school teachers and university members. As a result, the friendship between the university and the high school students was significantly improved, and the students' willingness to participate in the project was clearly increased.

With the involvement of our university members in almost every class and fieldwork, the quality of the surveys by high school students has risen significantly. One of the groups discussed a concrete proposal about the strategy to increase jobs in local society based on the result of the interview investigation (Picture 6.5). There



Picture 6.3 Facilitating a student group work by a university group member



Picture 6.4 Preparative lecture by a university graduate student



Picture 6.5 Interview research with local people and businessmen

was a group who carefully examined a sensitive problem of whether the local community in Tsushima island ought to receive Korean tourists or not, and finally tried themselves to guide Korean tourists in the street. In addition, another group conducted a questionnaire survey both to Korean tourists and to Japanese tourists, and came up with a concrete proposal to improve tourism hospitality by receiving more than 500 answers from tourists. The findings of the latter group won the best prize at a poster session of the academic research event sponsored by Tsushima City at a later date. We also tried to maintain a good relationship with local residents by exchanging frequent greetings with the local businessmen and people who supported the high school students' interviews and questionnaires survey.

The second year of project activity was also widely featured in the local newspaper, and it became well known to local residents (Picture 6.6). In addition to having the opportunity to talk about the project in the high school cultural festival, we also held the same presentation event for local residents as the previous year, and high school students fruitfully exchanged views with about 20 local people. This project has become more and more popular among local residents, and high schools students and teachers have been able to fully realize the impact of the project on the local society.

The results of the questionnaire survey to high school students after the end of the class showed that the high school students changed their minds about the local society. As shown in Fig. 6.5, the students commented that "I was able to think



**Reported in local newspapers** 

Picture 6.6 Reported in local newspapers

Fig. 6.5 Comments from high school students after the project

- · I was able to think deeply about Tsushima.
- · I have noticed the attractiveness of the community.
- I was surprised to know that population will decrease dramatically in Tsushima.
- · I want to participate more frequently in local events.
- I want to come back to Tsushima after university graduation.
- · I came to think of what I can contribute to Tsushima.
- I have to make me responsible for the Future of Tsushima.
- I want to become a local community leader in the future.
- I found this island is so attractive to outsiders and foreign tourists.
- I have never thought about Tsushima much deeper before.

deeply about Tsushima," and "I have noticed the attractiveness of the community" in the same way as in the previous fiscal year. Moreover, there were positive comments such as "I want to participate in local events more and more," "I want to return back to Tsushima in the future," "I came to think about what I could do for Tsushima," and "I want to become a local leader in the community in the future." This shows that they did not only capture the attractiveness and problems of their island from an

## Change of Mind in high school students <u>"Do you want to make positive efforts to contribute to</u> <u>local community building?"</u>



- I want to participate in the local politics in a positive manner.
- I want to do local volunteer activity when I have a chance.
- I want to have a job here and contribute to our local community in the future.

Fig. 6.6 Change of mind in high school students before and after the project

objective point of view, but also seemed to have the intention to be deeply involved in the future of the island or community. These comments also show that this project may actually contribute to the purpose that local children will have a sense of attachment to the local community where they were born and raised, and a sense of responsibility to become a local community leader after returning to the island in the future" as expected from the project designing phase.

This conclusion was also backed up by a questionnaire to the high school students that shows how the student's consciousness changed before and after the project. Figure 6.6 shows the result of the question to all 36 students, "Do you want to make positive efforts to contribute to local community building?" They self-evaluated in five grades for four indicators before and after the project. The result shows that their willingness to contribute to the community is greatly increased after the project than before.

## 4.4 Examining from the Perspective of "Co-design/ Co-production/Co-delivery"

Based on the achievements and results of the "Looking for Island Treasure" project conducted over 2 years, what can be said from the perspective of "co-design/co-

production/co-delivery" in Future Earth studies and TD research? Finally, we will summarize from our own six perspectives.

First, the geographical, societal scale, and scope of the project were appropriate for the purpose. Although the target area should be the whole town of Kamitsushima with about 3800 people given the range of a school district where students attend the school, but the 26 students who participated in the project actually performed fieldwork at the Hitakatsu area, a central part of Kamitsushima town, where about 800 people in 400 households lived in. The quality of the project and the impact on a community seem to have been secured by limiting the geographical scale to the small local community of 800 people, instead of expanding to the large scale of the entire Tsushima City or Kamitsushima town. In this sense, scaling of geographical and human ranges was appropriate in light of one of the TD indicators ("scaling") shown in this part. It was also important to limit stakeholders to high school, university, commerce associations, local businesses, and municipality in order to carry out projects on such a small scale. There were many other individuals and organizations in the community, and it was not impossible to get them involved with the project for the purpose of it. However, it was likely that the uncertainty of the interest adjustment would increase, and the achievement of the goal would be difficult if we involved in the project other local individuals, organizations, and larger administrative bodies such as prefecture, central government, and international organizations (even if it is actually impossible). All individuals and organizations involved in collaborative work would usually have and wish to achieve their own intentions and interests. In that sense, it can be said that the "stakeholding" which is the selection of the interested party according to "scaling" was also appropriate.

The second is the success of building trust relationships between stakeholders. In the first year, sufficient planning and staffing were difficult and impossible, but in the second year, a sufficient good relationship was established between the stakeholders by conducting continuous elaborate meetings and emphasizing communication with high school students. As a result, consensus was formed between stakeholders almost perfectly about the policy, aim, and content of the project, and finally the "co-design" was successfully achieved. This means the fulfillment of "social capital" as a building of trust between stakeholders (TD indicators shown in this part), but in more detail the following can be said. First is that the agreement on the "framing" (TD indicators shown in this part) of changing minds of the local populace while educating the local high school student as future supporters of the local community has been successfully achieved. Second, the consensus on "priority" (TD indicator shown in this part) has been achieved in that each stakeholder's interests and intentions are mutually harmonized complementarily. On the other side, "transition process" (TD indicators shown in this part) to reconcile conflicts and gaps between stakeholders was not generated. These points seem to be a major factor for going further to the "co-production" without stopping at the "co-design" stage.

Third, Mr. K and Mr. S, who were temporary municipal officials, successsfully played a major role as coordinator for the entire project. Because they were in a position to stay in Tsushima only for the term of three years, they could have a "halfway" standpoint, so to speak, neither a complete outsider nor a

complete resident. However, on the contrary, their halfway position enabled them to pay fair attention to each stakeholder while taking the distance moderately with all stakeholders ("sensitivity" and "fairness" as TD indicators shown in this part), and build the trust relation with each other. In the case of TD research, there are cases where scientists and university members are working as coordinators. However, since Mr. K and Mr. S played the role of coordinator in this project, we university members were able to be released from a neutral role of the coordinator ("independent/ neutral" as TD indicators shown in this part). This enabled our university members to act independently as one of the active stakeholders rather than the entire coordinator. In summary, it can be said that the role of coordinator should not necessarily be taken on by scientists or university. In other words, other subject actors might be suitable for coordinator in order to achieve a successful co-design and co-production.

Fourth, the credibility of the university's scientific knowledge and research technology might have influenced the success of the project. Although whether or not the methodology of interviews and questionnaires can be said to be "scientific" in a strict sense seems to be debatable, expectations from high school teachers and students for these methods were so large at the end of the first year. In fact, it is also true that in the second year, the quality of research has been improved owing to these techniques provided by our university members. On the other hand, "citizenship education" that has its origin in the UK (Crick 2000), which raises the consciousness of political participation of citizens and people, has been attracting attention in the discipline of political science. If we can regard this project as one of such "citizenship education" (Tokunaga and Akiho 2018), we can also see that in this project a method of "citizenship education" has been accepted as a scientific and technical tool. This shows the possibility of "usefulness of science" in TD research (TD indicator shown in this part), and such method can be applied to other locals and cases. In this sense, this project can also be regarded as a case that indicates the potential of "co-delivery." On the other hand, the usefulness of scientific knowledge and reliance on it were based on a strong relationship between stakeholders and the hard work of Mr. K and Mr. S as coordinators. Therefore, merely adopting such method would not necessarily have been able to lead to the success of this project.

Fifth, it is about the factor of "personality" (TD indicator shown in this part) that depends on the standpoint and ability of a particular stakeholder. In particular, this project was highly dependent on the temporary municipal officials Mr. K and Mr. S, but, on the other hand, the adverse effects of the substitution of a coordinator from Mr. K to Mr. S were mitigated by the relationship of trust and communication among other stakeholders. Therefore, it can be said that the influence of personality was able to be overcome by other such factors.

Finally, the sixth is about time setting. This chapter introduced the process of the project until the end of the second year, but from that time it is likely to take a long time for the results of the project to appear in a tangible way. It is not yet clear whether the high school students who actually performed fieldwork will return to the island in the future and become a local leader of the community. In addition, this project was also taken up by the local media, and became known to a certain extent

in Tsushima island, but it has not yet come to the next stage where the external social evaluation ("legitimacy" as a TD indicator shown in this part) has been obtained apart from the internal evaluation among the relevant stakeholders. In that sense, it will take much longer to confirm the final success of this project. On the other hand, the financial support of JST for Future Earth research is in only five years, including two years of feasibility study and further three years as a full research period. Here, we would like to emphasize that there is a significant gap between the amount of time it actually takes to get results in the field site and that of time that can be supported as a Future Earth TD research. Strictly speaking, it is virtually impossible for science and universities to "co-design/co-produce" a successful result with society in a short period of five years. Therefore, from the beginning of the project, we have been preparing for achieving the phase of "self-propelled" by local stakeholders alone to continue this project, on the premise that we university would "withdraw" from the project as a stakeholder after the three years full-scale research period has passed. For that purpose, we prompted the high school teachers to understand completely the significance of this project, and continue the project as an annual educational program. In addition, the know-how of fieldwork research, facilitation, and presentation should be accumulated by the high school, and taken over among teachers who transfer from and to the high school. This project should also be a regular local event supported by the local Chamber of Commerce, businessmen, and municipality. If it will be taken over well, it is possible to be arranged and organized only by the local stakeholders continuously even after the university leaves. In fact, it is expected to be carried out only by local stakeholders from 2019. Whether this project will continue in the future is not yet known, but given the limited role that scientists and universities can play in the local society in a limited period of time, we university are required to start the process of "co-design/ co-production" while keeping in mind a future image of phase "self-propelled" by local stakeholders.

## 5 Project "Reconversion of Abandoned Farmland" in Consideration of Biodiversity

The second case is a project aimed at rebuilding a sustainable local community by reconverting an abandoned farmland straggling all over the island of Tsushima. As mentioned above, Tsushima has accelerated the population and birthrate decline in recent years, and the population of the elderly is increasing and simultaneously the number of young people is decreasing in local communities. As a supporter and manpower of agriculture becomes insufficient, agriculture that has been managed until then in local communities is becoming "unsustainable." As a result, agricultural farmland is abandoned as it is, and "abandoned farmland" which is left uncultivated is now increasing rapidly. There is no objective statistical data, but according to Tsushima City, the percentage of abandoned farmland in the entire cultivatable land

area is more than 50%. This phenomenon is seen in the whole country of Japan in recent years (Japan Ministry of Agriculture, Forestry and Fisheries 2017), but it is especially remarkable in Tsushima island. And with the decline in population, birthrate, and agricultural industry, the transformation of a local community toward "marginal settlements" (Yamashita 2012) is further accelerating. Therefore, we thought of the plan to restore such abandoned land to a richly cultivated land with high biodiversity, and to raise value-added crops which conserve rare organisms, while mobilizing inbound tourists such as Korean and university students coming from outside the island as the manpower for agricultural work. We also expected that it is to give vitality to a local community by securing a high profit.

In doing so, it must be questioned what kind of role does science and university play, and on what conditions are science and university able to "co-design/co-produce" with the local community?

### 5.1 Background of the Project Planning

The project was born from the idea of our researchers' group in IDS3. We have originally been interested in the unique natural environment of Tsushima and the problem of the community degradation. As we have visited Tsushima many times and drove around the island, we were very surprised to see too much abandoned farmland. At that time, a project idea has suddenly occurred to us to restore abandoned farmland in order to promote the community revitalization. What should be noted here is that the project plan has not been studied based on local needs and data obtained from local interviews, but has actually been started from a pure idea of our scientists and researchers.

The contents of the plan are as follows (Fig. 6.7). It is difficult to simply restore abandoned land to the original farmland. Of course, it takes a lot of effort and labor, but the most important point is that the crops produced on farmland restored in the conventional form are low in profitability and are "not worth the candle." This is a common problem that farmers working all over the country are facing. Therefore, we thought of changing such an abandoned land to a high-biodiversity farmland. It was expected that the reconversion of abandoned farmland into eco-friendly farmland enables to produce highly value-added crops with high price, because the survival of rare animals may be ensured in such an ecological farmland.

A rare animal, the Tsushima Leopard Cat inhabits in Tsushima (Picture 6.7). It is the cat that does not live in Japan except in Tsushima, and is designated as a "Natural Monument of Japan," and listed as "Critically Endangered Species (IA)" in the Red Data Book edited by the Ministry of Environment of Japan. It is a subspecies of the Bengal cat which has originally crossed from the Korean peninsula, and is a unique animal living only in Tsushima island in Japan. Its scarcity and appearance enjoys huge nationwide popularity.

The number and range of the Tsushima leopard cat are recently decreasing in the island. It is said that one of the major causes is a decrease in cultivated land. The

## "Reconversion of abandoned farmland" Project



Fig. 6.7 Outline of the "reconversion of abandoned farmland" project

Tsushima leopard cat usually feeds on rats and aquatic insects which live in the cultivated land such as rice fields. However, as the cultivated land disappears, such food for the Tsushima leopard cat is decreasing. Therefore, by transforming an abandoned land into a high-biodiversity ecosystem environment and making it a habitat and feeding area for the Tsushima Leopard Cat, it is possible to contribute to the preservation of the Tsushima leopard cat. And, the crops made on such a high-biodiversity farmland are added value and regarded as "crops to preserve the Tsushima leopard cat." They are to be sold at a high price, and it may become a source of income for a local community. This could make a community even more lively. In addition, if such a reconversion project is successfully implemented in Tsushima island, it may lead to a new job creation, and put the brakes on the trend of "marginal settlements" in local communities in Japan.

The scientific and practical knowledge of the university on natural regeneration is useful for the creation of high-biodiversity farmland. Scientists in our group will conduct scientific examination into the applicability of natural regeneration technology and the effect of re-cultivation of land.

On the other hand, the manpower for agriculture in Tsushima, which decreased with aging trend and declining birthrate, might be partly provided by a lot of Japanese university students who come to Tsushima for research and educational purposes in the municipal framework of "collaboration between university and local



Picture 6.7 Tsushima Leopard Cat

society," and also Korean tourists coming to Tsushima. We thought of providing Korean tourists with the experience of farmwork in a highly biodiversity ecosystem as green tourism. Each different tourist might be engaged in separate farmworks as green tourism during their stays only for a few days. This was also conceived from the results of our hearing survey on Korean travel agencies. According to one of the travel agencies, the tourism attraction in Tsushima is scarce, and it is still confusing where to take Korean tourists in Tsushima. Then, we thought that the experience of such green tourism might be accepted as one of the sightseeing menu for the Korean tourist who tends to be attracted by rich nature that does not exist in Korea.

### 5.2 Project Start

In the starting phase of this project, there was no specific prospect of local community in the island as an object of investigation. Moreover, it is necessary to find a candidate site which must meet various geographical requirements: it has to be near the place where (1) it seems to be the habitat of the Tsushima leopard cat, (2) sufficient water can be supplied because we originally assumed the cultivation of rice (however, rice was finally rejected and we changed to buckwheat later because rice production will take a great deal of time to care for cultivation and farmland), (3) there is a local community which agrees to provide an abandoned land for joint cultivation, (4) Korean visitor can easily access to. For this reason, we have traveled many times from 2014 and went around the entire island to explore the surrounding environment and ecosystem while investigating a candidate site (Picture 6.8). In addition, we talked to the residents of the area where environmental conditions seemed to be appropriate, and tried to negotiate with them on whether we could ask them to take charge of actual farmwork to a certain extent (Picture 6.9). We have looked for a candidate site for two years, but were not able to find out a suitable research site. Our research group was actually puzzled as to what we should do.

Meanwhile, the temporary municipal official Mr. K, who was playing an important role in the early stages of the project "Looking for Island Treasures" mentioned earlier, suddenly introduced us to a village in late 2016. Because residents of village A in the northern part of Tsushima were cultivating sweet potato for revitalizing the local community, he proposed that our research group might be able to start the project by collaborating with village A. The village A of about 60 households had a sense of crisis in the declining population and birthrate and voluntarily tried to start a

**Picture 6.8** Investigating a candidate site (2014)





Picture 6.9 Negotiation with local residents on the operation of farmwork (2015)

local community business by cultivating sweet potato. The motivation of the residents in the village A was very high, and Mr. K had a good relationship with them, so we thought that it might be possible to start the project if we could ask Mr. K to take on the responsibility of acting as coordinator.

In addition, we received an invitation from Mr. K to explain the outline of the project in the village meeting to be held several weeks later. As we were actually at a loss how to find a research field, there was no reason for refusing the invitation. After observing a field where the residents of village A were actually making sweet potato (Picture 6.10), in February 2017 we explained the project in front of the leader and other 10 members of village A (Picture 6.11). We received various opinions and comments there. For example, "Is it ok for you to make sweet potato rather than rice?" "I think buckwheat cultivation will be better considering the troublesome work of care," "how much manpower is necessary for the project implementation?" "It is necessary to cooperate with a farm corporation for selling the farm products with added value. What do you think about that plan?" All of these comments and questions were very important, but we honestly told them that we did not have any clear answer and that we would rather want to "co-design" the project together with them and continue to think ahead. We generally got a positive reaction, not a negative or critical opinion, and finally they told us that it was possible to offer a farmland for the project. On the other hand, the deadline for applying for the subsidy in Tsushima City was approaching in May 2017, and there was not much time left before the end of the research period in IDS3. Therefore, after discussing with the members of the village A, we decided to start the project there as early as possible, especially within three months or less.



Picture 6.10 A new candidate site for the project (2016)



Picture 6.11 Presentation on the project to members of the village (2017)

## 5.3 Project Development

It seemed that the project would start smoothly, but two major changes occurred here. First, the village leader was replaced at the turn of the fiscal year. The former leader was active and cooperative in our project, but the new leader was rather negative about the project. We tried to persuade the new leader several times, but there was no change in his cautious stance, and frustration began to show in our communication with him. After that, he proposed to change the course of action about our project in the community meeting where all households in the village participated in. The main member of the village used to make a positive comment before, but most of the residents who participated in the meeting agreed on a negative policy proposed by the new leader. Frankly speaking, this was an unexpected happening for us. The cause of such a change was not certain, but it seemed that the human relations and the power of the new leader in the village probably influenced their decision.

Second, as mentioned earlier in the description of the "Looking for Island Treasures" project, the Tsushima City's temporary staff Mr. K left the island due to the expiration of his term. The succeeding new staff, Mr. S who took over the mission of Mr. K in the "Looking for Island Treasures" project, were not yet in a good relationship with the residents of the village and not able to cooperate well in this project, because it has not been long since he came to the island. Owing to the fact that Mr. K who had played the role of the great coordinator and connected village A with our university group was gone, the mediator and the connecting post were lost. The impact of the absence of a coordinator was greater than expected. Until then, we could not say that we had been able to build a robust one-to-one relationship of trust with the village A. Finally, it became much difficult for us to reconcile our opinions with village A.

Both our research group and the members of the village were being beset by doubts and fears with each other and we began to think that it would be difficult to start the project. However, a chance of turning the tables in our favor was suddenly given from village A. In the end of April 2017, we were asked to explain once again the contents and prospects of the project to all the residents of village A in the community meeting.

The deadline for the project to start was approaching and we were impatient, but one of us decided to visit there and explained our project carefully. However, most of the reactions from the resident were negative. Figure 6.8 is an extract of the comments received from the resident at that time.

The details and implication of each comment will be described later, but we can simply conclude that it was not possible to fill the gap of the idea with the residents of village A. As mentioned in the last comment from the residents, there was an opinion that they wanted to spend more time talking about the project because they were still not able to understand and discuss each other sufficiently. At the end of the meeting, our university group and village A formally concluded that we would continue the discussion. But our group had no time left. The deadline to start the project is approaching in May 2017, taking into consideration a necessary period of time for developing and selling high-value-added products by cultivating some crops and for verifying the effect on the local community revitalization. Therefore, we discussed carefully and ultimately decided to give up the start of this project.

- I cannot understand why we should bear physical and monetary burden.
- > We are all very busy, and cannot cooperate in any farm work.
- How long will Kyushu University go on contributing to our village?
- > How much money will Kyushu University provide for us?
- Agricultural damage caused by wild animal such as deer and boar is much more critical for us than biodiversity, conservation of Tsushima Leopard Cat. Can you cooperate in the extermination of harmful wild animals?
- We suspect that Kyushu University will make use of our village for scientific research on the conservation of Tsushima Leopard Cat.
- We need much more time for talking with each other. This project plan is complete surprise for us. We cannot still understand your explanation.

Fig. 6.8 Comments from village residents at the presentation meeting

## 5.4 Lesson Learned from the Project "Reconversion of Abandoned Farmland"

This project ultimately ended in "failure," but what can be learned from the perspective of Future Earth research, and "co-design/co-production/co-delivery" in TD research? We will summarize from our own seven points of view in short.

First, it is necessary to build a strong trust relationship with the local community for scientists and universities to "co-design/co-produce" with it on an equal status. For that purpose, a lot of time and labor for confidence building is essential. In fact, the project had difficulty in finding an appropriate research site at the stage of feasibility study, and began negotiations with village A for the first time in the stage where there was not enough time left. However, due to the lack of time, we rushed ahead and tried to start the project without being able to communicate adequately with the residents of village A and building a trust relationship. As a result, as shown in Fig. 6.8, the residents showed their refusal to devote money and labor and had the misunderstanding that our university group tried to make use of village A for another purpose such as scientific research on the preservation of Tsushima leopard cat. This shows the failure in building "social capital" as the TD indicator shown in this part. In other words, "co-design/co-production" does not succeed without bringing about a relationship of trust with the local community, even if scientific researchers or universities have enough scientific knowledge and technics for contributing to the sustainability of a local community. We also had difficulty in "time setting" (TD indicator shown in this part) in that it was not allowed to have enough time to build trust relationships with the local community.

On the other hand, second, in the co-design phase of this project, the voice of both trust and doubt was not heard among residents of the village about scientific knowledge on biodiversity and technology for improving productivity which our university group could offer to them. The fact that the project was to be based on scientific knowledge and technology did not seem to have a direct influence on the

judgment of the resident. Of course, in fact, the residents of the local community do not have the ability to judge the validity of scientific knowledge. Moreover, there is a possibility that the resident's understanding and reliance on the scientific knowledge and technology were not enough and that might have been a chief cause for a negative reaction by the residents. However, as a result, it is true that the residents valued building the trust relation, agreeing on the purpose and direction of the project with our university group rather than questioning the validity of the scientific knowledge. Therefore, it can be said that the validity and usefulness of scientific knowledge are not sufficient conditions even if it is a necessary condition, for the successful achievement of "co-design/co-production" with the local community. On the other hand, one of our group members thinks that the primary cause of failure in the project is that we did not show a fully satisfactory scientific basis and data to the local community, rather than a failure in building a human trust relationship with each other. However, the problem is that, in case of failure in the collaborative work. it is so difficult to examine why we failed by, for example, talking with the other stakeholders after the event. As a sensitive human relationship between our group member and the residents of the village or among residents of the community may matter, it is difficult to do an ex post interview survey with the stakeholders.

Third point is that a neutral "coordinator" (TD indicator shown in this part) was indispensable. The withdrawal of the municipal temporary official staff Mr. K from the project had a great influence, and we lost the mechanism which coordinated the disagreement of the opinion between our university group and village A. If scientists or university members cannot play the role of a neutral coordinator, it would be a prerequisite for some other entity to play such a role.

Fourth, the "personality" of the stakeholders (TD indicator shown in this part) had a significant impact on the project because the atmosphere of the residents changed greatly by the alternation of the leader of village A. This is not something that can be controlled by ourselves, and we cannot expect what kind of person becomes the head of the village, so it can be said that it is a problem which depends on luck. However, such a personal human nature as a standpoint, character, and bias of a particular stakeholder usually influences the project at any time. Supposing that factor, it should be noted that the influence by the personality of the specific stakeholder might have been somewhat eased if it was possible to have enough trust relations with other stakeholders of residents in the village.

Fifth, there was a critical problem in the way that our university group unilaterally designed a project, created the plan, and proposed it to the local community and asked for consent and cooperation. Undoubtedly, we had a stance that we wanted to discuss with the member of the community the details of the project, the specific goals, and the process on how to proceed. However, the blueprint for the entire project was produced only by our university group. We did not fully understand the needs of the community by doing a detailed hearing investigation of the resident in village A, even if there was not enough time left for "co-designing" at the early stage of the project planning while we were suddenly introduced to the village A by Mr. K. In this sense, it must be said that we failed to meet the requirement of "sensitivity" to the local community as a TD indicator shown in this part.

Sixth, there was a huge gap in the "framing" and "priority" between the residents of village A and our university group. We thought that, for the revitalization of the local community, it was necessary to make the farm products which made high profits by reconverting abandoned farmland and making use of external manpower. However, as shown in Fig. 6.8, the residents of village A thought that the problem of abandoning farmland and unsustainable local community was caused by damages of increasing harmful wildlife such as deer and boar. In a word, they assigned high priority to the resolution and reduction of such a harmful wildlife damage rather than the reconversion of abandoned farmland. Unless the harmful wildlife damage problem is resolved, the surrounding mountain and field will be left to run wild and there will be no rat which Tsushima leopard cat usually feeds on.

Seventh, the gap in "framing" and "priority" also leads to the gap in the perception of "scaling" and "stakeholding" between our university and village A at the same time. Harmful wildlife damage caused by drastically increasing deer and boar is extending through the whole area of the island. Because animals move freely in disregard of human boundaries (borders) such as settlements and communities, it is not a problem that can be managed only within a particular village. Rather, it is a problem that must be managed in a larger area by involving the entire scope of the Tsushima City or at least a neighboring local community. In this sense, we can say that there was a gap in the perception of "scaling" of the problem between our university and the residents of the village. There are various different types of scale, for example, local community scale such as village A, local area scale including surrounding local communities around Tsushima City, and even larger scale such as prefectures and Japan nationwide with similar problems. So, it is understood that it should have been taken as a problem of a "layered scale." Also, as the perception of "scaling" is different, of course, the scope of stakeholders corresponding to each scaling also changes. In other words, it could be said that we consequently failed to decide the appropriate "stakeholding".

On the other hand, even if these gaps are recognized, adjusting and correcting over time may eventually eliminate the gap. It might be usual that there occurs a "gap" in various respects between scientists and the people who live in the local community in TD research. What is important there is we should establish a process of coordinating such gaps, and if this process succeeds, it will lead to a strong trust relationship. However, in the case of this project, unfortunately it was not possible to secure sufficient time for "transition process" (TD indicator shown in this part) which adjusts such various "gaps."

Finally, as we mentioned repeatedly, the research term of three or five years in Future Earth research is too short for successfully achieving the "co-design/coproduction" of a sustainable local society with a local community and further to verify the effect. In particular, unlike "Looking for Island Treasures" project, if geographical and natural environmental requirements are imposed on the selection of research sites, it will take a considerable amount of time to pre-examine the candidate sites. Then, the various social activities (understanding the needs and priority of the community by hearing investigation, setting an appropriate scaling and stakeholding, and establishing a trust relationship with the local community) which are necessary after the investigation and decision of the research site will obviously be constrained in time.

### 6 Conclusion

It is difficult to make an assertive conclusion to the question "how can we achieve the "co-design/co-produce/co-delivery" between science and (local) society toward a sustainable local community?" shown at the beginning of this chapter only from the examination of these two cases in Tsushima island. Society is inherently diverse, complex, and dynamic (Miyauchi 2018). Therefore, it may be impossible to provide a "manual" or "recipe" for promoting the "co-design/co-production/co-delivery" between science and society.

However, when comparing the two cases in this chapter from the perspective of the hypothetical TD indicators presented in this part, there are some important points in common.

One is that it is important to develop social "sensitivity" and build "social capital" or trust relationship with a local community. In other words, "co-design/co-production/co-delivery" will not be approved only by the validity of the scientific knowledge and technology. Second, the presence of a neutral coordinator is a prerequisite. If scientists or university cannot play that role, some other stakeholders should take it. Third, a consensus of opinion on scaling, stakeholding, framing, and priority with a local community must be reached through sufficient pre-investigation and continuous face-to-face communication. If these "gaps" occur, the process of coordinating the gap will always be necessary. Finally, the fourth is to properly perform the "time setting" required for "co-design/co-production." If the "co-design/co-production" process ends halfway when time expires, social responsibility or "accountability" (TD indicator shown in this part) of scientists and university to society will always occur. Then, unless we make ourselves responsible and accountable for that failure, the trust in science in the society will be lost more and more.

The "co-design/co-production/co-delivery" between science and society would not be achieved only if scientists and university install scientific knowledge on the social field. If we are collaborating with any kind of society or community with various interests, effortful social activities that have nothing to do with scientific research will be very important. In this sense, the efforts to pursue science–society collaboration ("co-design/co-production/co-delivery") will absolutely require scientists and university not only to have academic research skills, but also to have human and social ability to talk, communicate, and discuss face-to-face with a society.

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