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Conceptualizing of Disaster Recovery Landscape: Policy-making process to build a Resilient Society

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Abstract

Purpose

We face expansive and complex natural disaster crises. Managing these crises and protecting the livelihoods of communities requires all actors to work together to ensure an enabling environment for Building Back Better (BBB) after disasters. The Resilient Society, provided by the Hokkaido University School of Public Policy in 2022, designed a Disaster Recovery Landscape (DRL) in its education curriculum. DRL is a policy-making support project comprising five projects to be initiated in Broad-Based Regional Communities (BBRCs) that have not experienced disasters. This study derives a methodology for creating a BBB in BBRCs.

Approach & Method

- 1) The DRL proposal in Hokkaido Kita-Shiribeshi (HKS) is highlighted as a case study to depict its logic model and project design. The DRL was designed using the institutions of disaster management policy and feedback data from fieldwork, interviews, and workshops.
- 2) Conceptualize a DRL's social services by analyzing the hybridity's governance and management and discussing its implications. The methodology is reconstructed by tracking and verifying the progress of the project and providing feedback on the evaluation.

Result

DRL is a social project implementing the Advance Recovery Community Development Plan (ARCP) to maximize social capital in hybrid areas. It embodies the BBB approach of the Sendai Framework, which was adopted by UNDRR in 2015. The HKS's BBB concept, found in the logic model formulation, includes the following: 1) residents are aware of the code of conduct in the disaster and evacuate safely, 2) municipalities and residents prepare and share the ARCP, Community Development Plan (CDP) and, 3) all stakeholders collaborate regularly to incubate social capital for activation during disasters.

It has four hybridity characteristics: 1) The complex procedural conflicts between sectors that emerge when joining are overcome in the multi- and cross-sectoral mission-realizing process. 2) In the process of constructing a disaster prevention system for unaffected BBRCs (meso-level), it is aggregated by the municipality's ARCP (micro-level) and financial and human resources procured from the national support system (macro-level). 3) DRL progresses a value-creation approach linked to social capital cultivation and mediation and provides public and economic value. 4) The Digital mandala matrix and Disaster Prevention Evacuation System visualize and share social interactions, potentially building public consensus. The institutional integration phase of ARCPs and existing town development plans requires coordination and meshing of formulated policies with new ones.

This case study illustrates the relevance of treating existing regulations as reformable for all sectors, creating an ecosystem that governs and manages the policy-making process in response to complex emergent phenomena.

Findings

Disaster Reconstruction comes from the safe evacuation of all residents and their active participation in drafting the CDP following disasters. DRL creates a collaborative policy-making process to meet these needs in the educational curriculum. Thus, DRLs offer a practical model for all communities seeking to rebuild their post-disaster regional management systems. The Japanese approach to institutionalizing disaster management is an excellent form of hybrid governance and management, as presented in hybridity research.

Keywords

Disaster Recovery Landscape, Resilient society, Sendai framework, Social capital

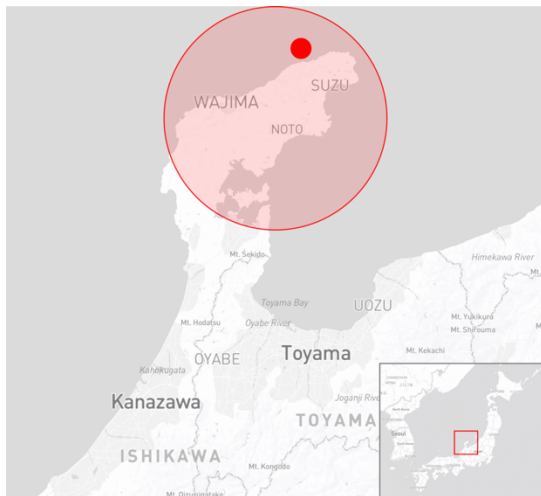
1 Introduction

Disasters affecting social infrastructure, such as climate change and complex natural disasters, occur frequently worldwide. Japan's risk of facing complex, broader-area disasters in regions that have not experienced disasters is increasing [1]. We must develop a methodology to manage these crises and "build a resilient society" that can protect the livelihood of local communities, both in the event of disasters and in regular times, with participants from all sectors. In other words, an approach that "governs and manages" the phenomenon of hybridity is required. The Resilient Society Program, a temporary course offered at Hokkaido University's Graduate School of Public Policy in 2022, aims to train students to explore methodologies for building resilient societies that can quickly recover from the multiple and increasingly devastating disasters that are occurring around the world, by combining public policy and industrial creation. In this curriculum, Disaster Recovery Landscape (DRL) content was created to design a post-disaster recovery approach for the HKS region, one of the areas that has not experienced any disasters so far.

In this research, to derive a methodology for creating a "process for designing a better world after disaster recovery in a broader region that has not suffered any disasters so far," Chapter 1 provides a background, and Chapter 2 describes the logic model and project design of the DRL proposal in the Hokkaido Kita-Shiribeshi (HKS) region. Chapter 3 conceptualizes DRL's social enterprise through the "governing and managing hybrids" analytical framework of hybridity research. Chapter 4 contains a discussion.

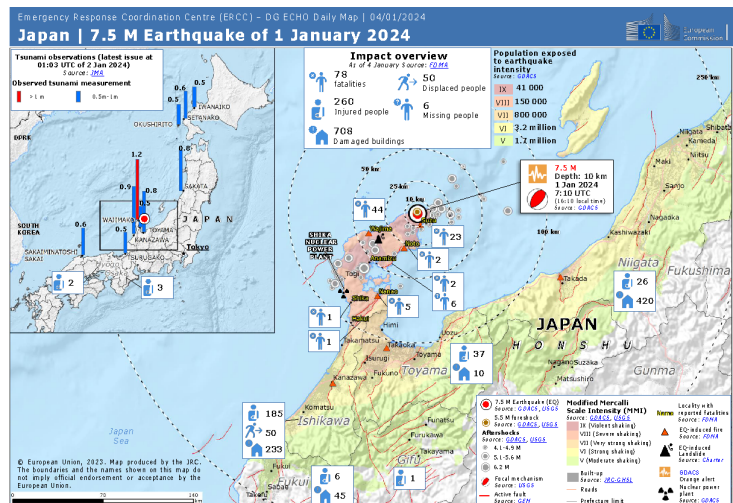
1-1 Noto Peninsula Earthquake

On January 1, 2024, a magnitude 7.5 earthquake struck 7 km northwest Suzu on the Noto Peninsula in Ishikawa Prefecture, Japan (Fig 1). The earthquake and accompanying tsunami caused extensive damage to the Noto Peninsula, particularly Wajima, Suzu, and Anamizu (Fig 2). Ishikawa reported 240 fatalities and 12 missing, while nearly 1,300 were injured across multiple prefectures, making it the deadliest earthquake in Japan since the 2016 Kumamoto Earthquake. The Japan Meteorological Agency (JMA) officially named this earthquake the 2024 Noto Peninsula Earthquake (JMA 2024).



source: <https://www.jrc.or.jp/english/relief/2024NotoPeninsulaEarthquake.html>

Fig 1: Noto Peninsula Earthquake Location



source: <https://ercportal.jrc.ec.europa.eu/ECHO-Products/Maps#/maps/4737>

Fig 2: Noto Peninsula Earthquake Impact

A review after the earthquake revealed that Ishikawa Prefecture's disaster preparedness plan needed to be revised to handle the event. It was found that the plan had not been significantly updated since 1997 and only made provisions for a magnitude 7.0 earthquake that would be localized in scope and classified as a low-level disaster with only three deaths, 120 destroyed buildings, and 2,781 evacuees [2].

In Hokkaido, the tsunami from the 2024 Noto earthquake struck the neighboring towns of Setana near the Kita-Shiribeshi region, which faces the Sea of Japan. The region encompasses Yoichi Town, Niki Town, Furubira Town, Shakotan Town, and Akaigawa Village (Fig 3). Yoichi Town, bordering Otaru City, lies within a 60-minute drive from Sapporo City, connected by a highway network. If a significant earthquake and tsunami occur directly in this region in the future, a large area will be flooded mainly by major rivers. Because the city center and administrative functions, urban areas, and main infrastructure are included in the inundated area [3], it is necessary to design a regional evacuation plan.

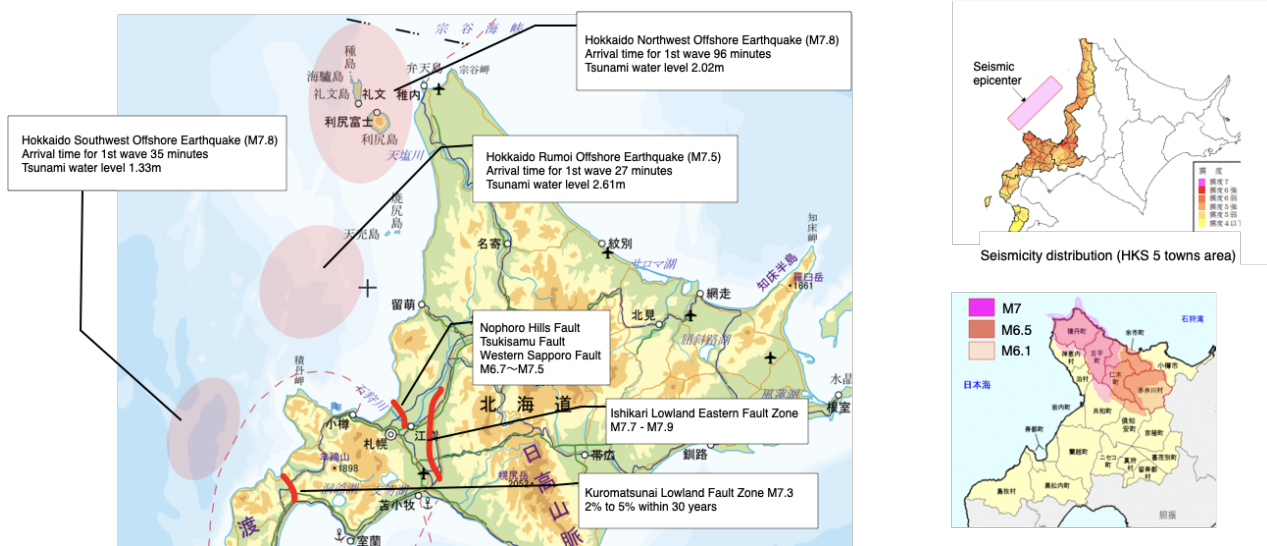


Fig 3: Hokkaido Kita-Shiribeshi disaster risk (Katoh et al. 2022)

1-2 Hokkaido Kita-Shiribeshi region's disaster risk

Hokkaido has numerous active faults and has historically been subjected to significant periodic earthquakes when severe disasters occurred in road-bordered regions. The Hokkaido Kita-Shiribeshi (HKS) Region encompasses Yoichi Town, Niki Town, Furubira Town, Shakotan Town, and Akaigawa Village. The aging rate in these towns where approximately 26,000 people and 14,000 households live, is 40%, higher than the national average. Most of Yoichi's 17,446 residents and 9,109 households live in residential areas along major river basins. The only major roads leading to Sapporo and Otaru are National Route 5 and National Route 229.

According to Yoichi's maximum damage scenario "Rumoi Offshore Earthquake (intensity 7)," an earthquake of intensity 4 in Shakotan and Furubira, intensity 6 in Yoichi, and intensity 6 in Shakotan, and a tsunami with an approximate height of 3 meters expected to arrive within 30 minutes would cause approximately 5,400 evacuees in the entire HKS region. Even if the Disaster Relief Law is applied, it will take 48 hours for national and regional governments' relief supplies to arrive. Municipalities alone cannot rescue and aid all victims by themselves (Katoh et al. 2022).

Katoh and Yoneda's research group at Hokkaido University developed Disaster Prevention Evacuation System (DPES) to solve these problems, assist local governments, and induce disaster prevention policy innovation (Katoh & Yoneda 2023). Disaster prevention policy innovation refers to the construction of a disaster prevention system that updates and improves existing systems to solve institutional issues related to disaster response before disaster occurs.

1-3 Approach & Method

To begin with, hybridity refers to the interaction between the public, private, and civil society spheres through ownership forms, institutional logic, funding bases, and various forms of social and institutional controls. Hybridity study methodology can be divided into three approaches. 1) Analyzing institutional domains and fields at the boundaries of public policy, private sector efforts, and citizen activities. 2) Describing the specific experience of a hybrid organization, having a track record, adapting to social contexts and multiple layers, and working across institutions. 3) Comparing the institutional contexts and characteristics of hybrid organizations in different countries. This research, along with the principle, provides new insights into identifying the features of Japanese practices in the context of Hybridity studies.

We have two approaches. 1) The DRL proposal in HKS was highlighted as a case study to depict its logic model and project design. The DRL was designed using the institutions of disaster management policy and feedback data from fieldwork, interviews, and workshops. 2) Conceptualize a DRL's social services by analyzing the hybridity's governance and management and discussing its implications. The methodology is reconstructed by tracking and verifying the progress of the project and providing feedback on the evaluation.

2 Case Study

2-1 Hokkaido Kita-Shiribeshi Disaster prevention evacuation system (DPES)

Hokkaido Kita-Shiribeshi DPES (HKS DPES) is a policy package for building a disaster prevention system in the HKS region. It has a catalytic function to create a collaborative relationship between universities and governments by being used to verify existing evacuation plans and to develop new evacuation plans.

The DPES has three phases, as described below. The first phase is for all stakeholders to share disaster risks (DPES 1.0), the second phase is for all stakeholders to share solutions to avoid damage (DPES 2.0), and the third phase is for all stakeholders to build the desired disaster reduction system (DPES 3.0).

2-1-1 HKS DPES.1.0: Sharing Disaster Risks in a Broader region

To reduce risk, a visualization of the tsunami damage faced by the five HKS towns revealed that urban areas along the main roads and in the estuary basin could be inundated in this region. Sakae-cho on National Route 5 (where National Route 5 comes closest to the coast) faces inundation in about 25 minutes (Fig 4), and the areas near Irifune-cho, Kurokawa-cho 1-chome, 2-chome, and 3-chome on National Route 229 will be inundated in about 29 minutes (Fig 5). The main train line of the HKS area would be cut off, making it impossible to evacuate from the area to other areas until the area is restored, and logistics by land, including the supply of relief supplies, would be disrupted. A tsunami would travel up the Yoichi River, inundating the coastal area in approximately 20 minutes and the inland area in approximately 40 minutes (Fig 6). When the population density is taken into account based on census data (the average number of inhabitants per household is 2.17), the number of affected residents is approximately 1400, or 7.8% of the town's entire population. The tsunami damage in Yoichi is more severe in the Yoichi River Basin than in the coastal area. There is a risk that victims will be removed from the transportation network and left behind in the assumed inundation area, HKS DPES 1.0 (Katoh and Yoneda 2023).



Fig 4: National Highway 5 Inundation



Fig 5: Tsunami Inundation in Central District



Fig 6: Tsunami Damage to Buildings

2-1-2 HKS DPES.2.0: Sharing solution approaches for the Broader region

Since all parties involved in the project need to understand the challenges and goals, the Bell Data Corporation has held four workshops (the first on March 2, 2022, and the second on July 20, 2022). The online tool utilized here, the Digital Mandala Matrix (DMM), is suitable for finding broad-based and long-term solutions and deriving action plans, as it has a five-level scope and allows for thinking about multiple themes, moving through the past, present, and future, and sharing them with the group (Katoh et al. 2022). At the same time, the gap in recognition of the current situation among the participants when faced with forecasted results that were difficult to resolve was highlighted.

The action plans of the participants expressed in the workshop can be categorized into action plans of local governments (six cases), action plans of companies (four cases), action plans of students (17 cases), and others (four cases), according to the participants' attributes, and each action plan is a component of the action map. The proposed action plans of local governments include (1) holding meetings of those in charge, (2) formulating a broader-area disaster prevention plan, and (3) developing a new disaster prevention plan. To this end, there is a strong need to attempt to share issues by meeting with the persons in charge of the HKS broader-area disaster prevention collaboration. Next, the action plans of companies were clearly stated as the Virtual Inventory Scheme (Katoh et al. 2022), which the Bell Data Corporation and Satsudora Holdings are promoting. The scheme is a system whereby private companies store disaster prevention stockpiles, with the local government bearing the cost of such stockpiles, operating them through its normal merchandising business, and providing supplies in the event of a disaster. If this system were to be operated, municipalities would be able to reduce the work involved in storing and inventorying disaster prevention stockpiles as well as eliminate

disposal losses. Finally, the students' action plans were divided into four types. Type 1 is a public policy approach (4 examples), Type 2 is a plan to solve problems through technology and business (3 examples), and Type 3 is a plan to collect information and "act from a place of awareness: awareness approach" (10 examples). Of these, "Development of QGIS contents and provision to government and residents (HKS DPES Project)," which belongs to Type 1, and "Design of a HKS evacuation center for vulnerable people (HKS Evacuation Center Design Project)," which belongs to Type 2, could be connected to action plans by local governments and companies (Katoh et al. 2022).

The third workshop on November 9, 2022, was part of the Resilient Society Program. It provided visualized contents of the HKS DPES 1.0 for broader-area tsunami damage to explain to partners and explained and proposed "PA1 HKS Disaster Prevention Evacuation System (DPES)" and "PB1 Evacuation Center Design." Because the HKS Region can be affected by heavy rainfall and river flooding, we also provided contents visualization of flood risks due to river flooding. We conducted work on drawing a broader-area evacuation system, which revealed that such a plan was not yet in place for a projected simultaneous flooding occurrence in the five main river basins.

The content for visualizing flood scenarios with river flooding as the incident consists of (1) content that visualizes flood damage in each of the five towns, and (2) map content that combines flood damage in the five towns into a single map. Project stakeholders can view these two contents simultaneously to share damage forecasts across a broader region (Katoh and Yoneda 2023). The contents of the report are as follows:

Visualization of flood damage in a Broader region

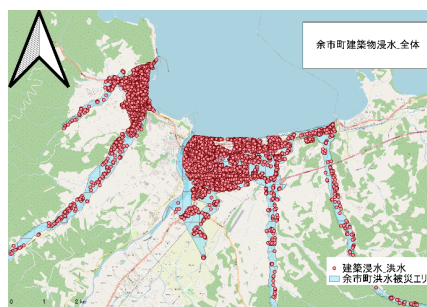
Using geographic information tools, we visualized the risk of flood inundation in five HKS towns and villages based on the assumption of publicly available information by the Hokkaido Government (assumed maximum magnitude of 1 in 1,000 years). The data used were Census 2020, Economic Census 2016, National Land Numerical Data, Fundamental Geospatial Data, Ministry of Agriculture, Forestry, and Fisheries Brush Polygons, and hazard maps for each town and village. Using these data, each town/village was divided by mesh, and the inundation rate was calculated for the projected damage to buildings, farmland, population, and business establishments in the five towns by proportionally dividing the area by the inundation mesh/existing mesh (Table 1). The damage to each town or village is shown below.

Table 1: Flood Damage in HKS region (Katoh and Yoneda 2023)

Municipality	Building	Farm	Population	Office
Yoichi	8787 (65.54%)	300.5827ha (71.28%)	11859 (69.43%)	76%
Niki	871 (41.98%)	411.4366ha (24.75%)	1882 (59.44%)	59%
Furubira	898 (39.8%)	46.0771ha (76.7%)	870 (31.68%)	30%
Shakotan	194 (13.2%)	48.5501ha (7%)	360 (19.64%)	13%
Akaigawa	372 (39.59%)	193.5973ha (20.61%)	470 (40.13%)	35%

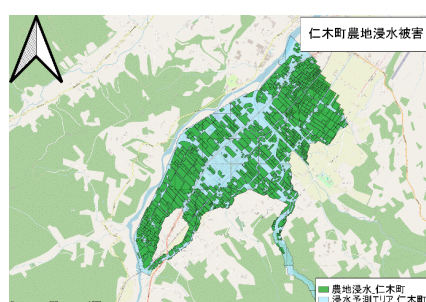
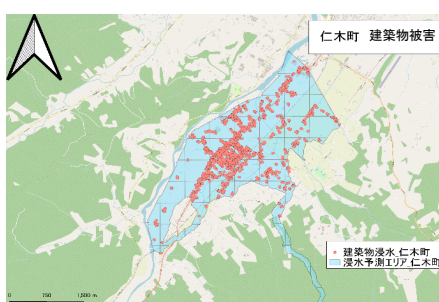
Yoichi Town

The flood risks in Yoichi Town are shown in Figs 7-a, 7-b, and 7-c). In the event of the Yoichi River flooding at its maximum expected size, National Routes 5 and 229, the main arteries in the HKS area, and the Japan Railways Hakodate Main Line are at risk of flooding. The population living in the inundation area was 11859 (69.43%), and 8787 (65.54%) of the buildings were inundated. Farmland damage occurred at 300.5827h (71.28%). Approximately 76% of business establishments were located in inundated areas. In addition, as the center of the HKS Region, the disaster risk in terms of population and economy is the greatest among the five towns.



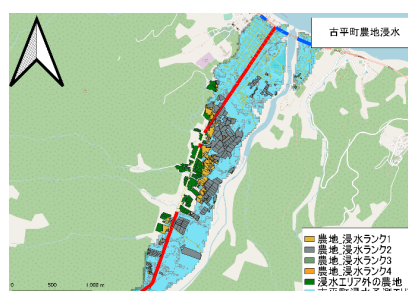
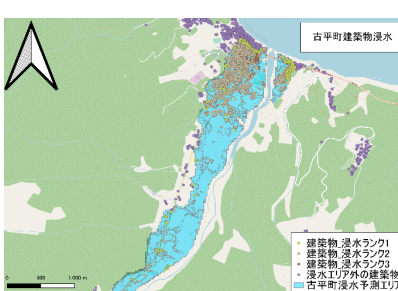
Niki Town

The flood risks in Niki Town are shown in Figs 8-a, 8-b, and 8-c. If the Yoichi River overflows, National Route 5 and the JR Hakodate Main Line will be inundated, and central Niki Town will be flooded. 871 buildings (41.98%) and 411.4366 ha (24.75%) of farmland were inundated. 1,882 (59.44%) residents and 59% of business establishments were located within the inundation area.



Furubira Town

The flood risks in Furubira Town are shown in Figs 9-a, 9-b, and 9-c. If the Furubira River floods to its maximum expected size, National Highway 229, which runs through the coastal area and the roads that cross the town, is at risk of inundation. 870 residents (31.69%) lived in the inundated area. 898 buildings (39.8%), 46.0771 ha (76.7%) of farmland, and approximately 30% of business establishments were flooded.



Shakotan Town

The flood risks in Shakotan Town are shown in Figs 10-a, 10-b, and 10-c. The assumption used in this study is that the Shakotan and Bikuni Rivers flood at the maximum assumed magnitude. National Highway 229 and roads that connect towns from east to west were at risk of flooding. The town's total of 194 buildings were in the flooded area, accounting for 13.2% of the town. 48.5501 ha of farmland was located in the flooded area, which is approximately 7% of the total agricultural land in the town. Of the population of Shakotan Town, 360 lived in flooded areas, which is 19.64% of the town's total population. Similarly, approximately 13% of all business establishments were flooded.



Fig: 10-a Shakotan Flood Damage - Roads

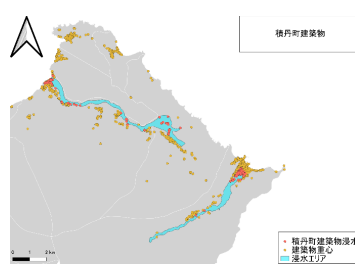


Fig: 10-b Shakotan Flood Damage - Buildings

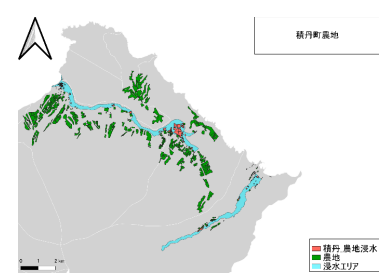


Fig: 10-c Shakotan Flood Damage - Farmland

Akaigawa Village

The flood risks in Akaigawa Village are shown in Figs 11-a, 11-b, and 11-c. If the Yoichi River floods at its maximum expected size, National Route 393, leading to Otaru, and the roads in the center of the village are at risk of flooding. 372 buildings in the town were located in flooded areas, representing 39.59% of the town's total. 193.5973 ha of farmland were located in the inundated areas. That represents 20.61% of the total area of the town. Of the population of Akaigawa Village, 470 (40.13%) lived within the flooded area. Similarly, approximately 35% of all business establishments are located in this predicted area.



Fig 11-a: Akaigawa Flood Damage - Roads

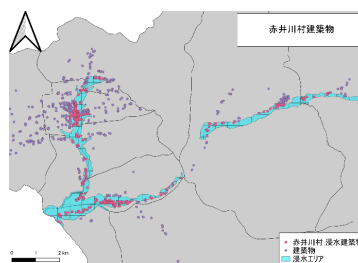


Fig 11-b: Akaigawa Flood Damage - Buildings

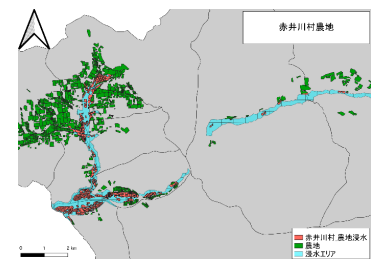


Fig 11-c: Akaigawa Flood Damage - Farmland

Based on the above data, if Yoichi is affected by a disaster, there could be a decline in administrative functions and dysfunction of the medical system. The damage would be even greater if all five municipalities were affected simultaneously. Therefore, it is necessary to have a coordinated system to receive support from the national government and other towns promptly.

2-1-3 HKS DPES.3.0: Sharing the process of building a DPES for the Broader region

The 4th HKS Regional Disaster Prevention Collaboration Project Workshop, Designing the HKS Code of Conduct, was held on February 10, 2023. Here, the "HKS DPES" developed by the Disaster Prevention Unit was used to visualize combined flood damage in the five HKS towns and the village. Broader-area flood risks were reproduced on the map, while colored flags were posted with the necessary systems and items for evacuation. Finally, this work allowed related companies to share disaster risks in the broader region simultaneously. The bottleneck, which has been an issue since the first workshop, namely, the inability to recognize the damage caused by multiple disasters and the fragmentation of disaster prevention administrative structures and information, was overcome.

The content representing the broader-area flood damage in the HKS Region (Regional DPES) also served as a prerequisite for discussing subsequent themes. In the work leading to the "Desirable Disaster Prevention Approach for the HKS Region," it was discussed that the HKS Region surrounding the Yoichi River (Yoichi Town, Niki Town, and Akaigawa Village) and the two towns surrounding the Mikuni River and Shakotan River (Shakotan Town and Furubira Town) cannot be divided into individual municipalities in terms of river mechanisms. The Disaster Prevention Unit explained that "even if there are policies and legislation at the national level, the organization that conducts operations is the municipality," so there are hints in the concept of a "local government unit" that appears in the United Nations Conference on Disaster Reduction.

The point where a "unit of local government to establish a disaster prevention system" is formed is the starting place for establishing a disaster prevention system for a broader region. A similar example was introduced: a disaster prevention drill conducted since 2009 through a broader-area collaboration of municipalities in the Kushiro River Basin in eastern Hokkaido. Applying this concept to the HKS Region

would consider evacuation plans for the residents of this entire area by capturing the evacuation operation area in the frame of "river basin municipalities cooperation." Furthermore, in the work to imagine "better reconstruction of HKS Region," the Ministry of Land, Infrastructure, Transport and Tourism's Council for Social Infrastructure Development report, "Water-related Disaster Countermeasures in Light of Climate Change Conversion to Sustainable Basin Flood Control to be Conducted by All Stakeholders throughout the Basin" was introduced and cross-cutting efforts that look over the entire basin (KDCD 2009). The importance of disaster prevention policies that coexist with the multifunctionality of rivers was discussed. In addition, we have developed a mutual image of Building Back Better of HKS, which can be shared by the five municipalities and is beneficial both in regular times and in times of disaster (CSID of MLIT 2020).

2-2 Process and Characteristics of the Logic Model for Disaster Recovery Landscapes

A logic model (P.H. Rossi et al. 2003) was developed during the DRL drafting phase. The central concepts of this project are the resilient society, learned in the Resilient Society Program at university, and as a realization approach [4], the Sendai Framework (UNDRR 2005, 2015) [5][6]. The Sendai Framework defined seven global targets and four actions. The DRL for the HKS region is a scenario that describes the process of Building Back Better (BBB) in the HKS region by implementing the four actions of the Sendai Framework (Fig 12).

The process for developing the logic model is as follows. In the first phase of the work, "impact," the long-term outcome, is defined as the seven priorities of the Sendai Framework. In the second phase of the work, the "inputs" and "activities" of the five projects and the "outputs" of each project to the region were defined. In the third phase of the work, we defined "mid-term outcomes" to realize the "impact" as "implementation of the four actions of the Sendai Framework in the region." We derived the concept of "recovery, reconstruction, and better recovery" through these actions. Finally, "short-term outcomes" were defined so that "impact" is consistent from "input" to "impact" (Kato and Misumi 2023).

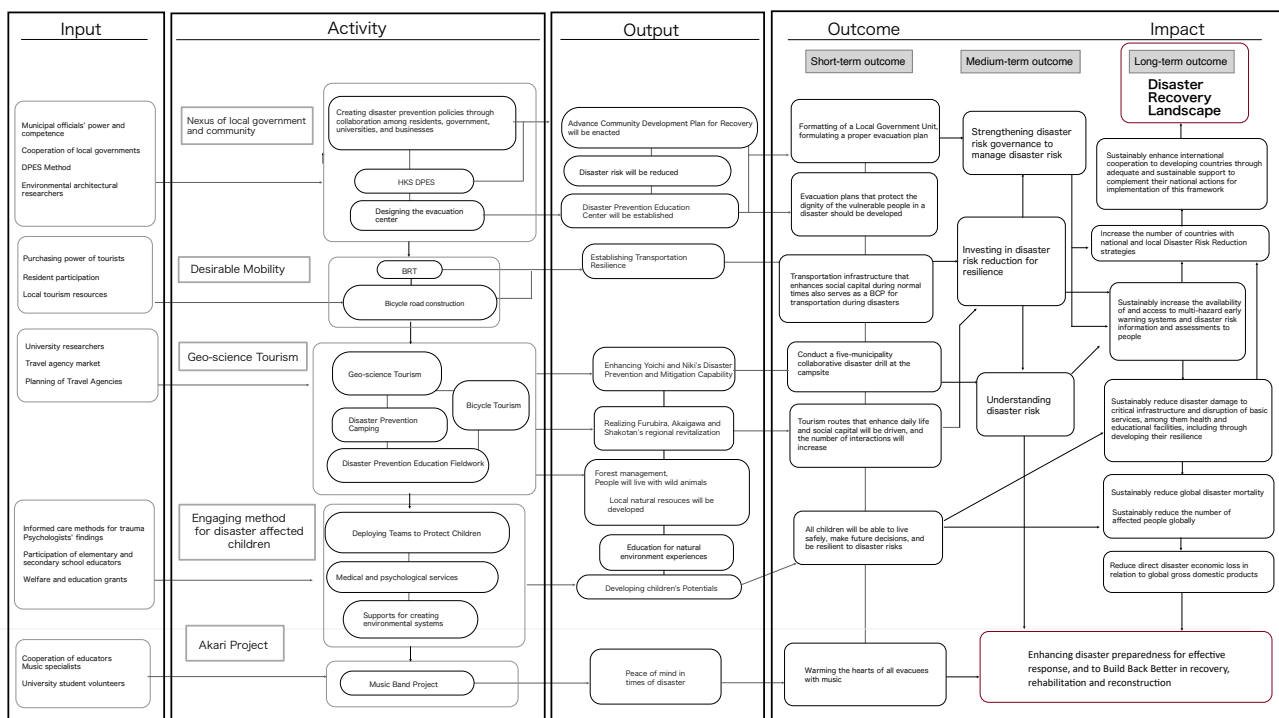


Fig 12: Logic Model of DRL (Source: Kato et al. 2023)

The five projects are Building a Policy Formation Process Project, Desirable Mobility Transportation Project, Geo-science Tourism to learn about disasters, Engaging Method for Disaster Affected Children, and Help people heal from the crisis. These five projects will be sequentially and concurrently initiated to embody the Build Back Better philosophy. In essence, ARCP will be implemented, facilitating the launch of the desirable mobility in response to policy outcomes. Leveraging this mobility, geoscience tourism will be cultivated. Additionally, the "Engaging Method for disaster affected children" will provide emotional support to children, during disasters through activities aimed at nurturing their well-being. The five projects are implemented in tandem, many participating stakeholders become involved, human connections increase, and the resources needed to overcome disasters are gathered. These resources correspond to social capital [7]. Social capital

includes the norms, information, and trust that social networks possess, and is a driving force in recovery from catastrophic disasters (Daniel P. Aldrich 2012). Because social capital works during disasters and normal times, we designed the functions of social capital that are fostered during normal times and work during disasters in the logic model.

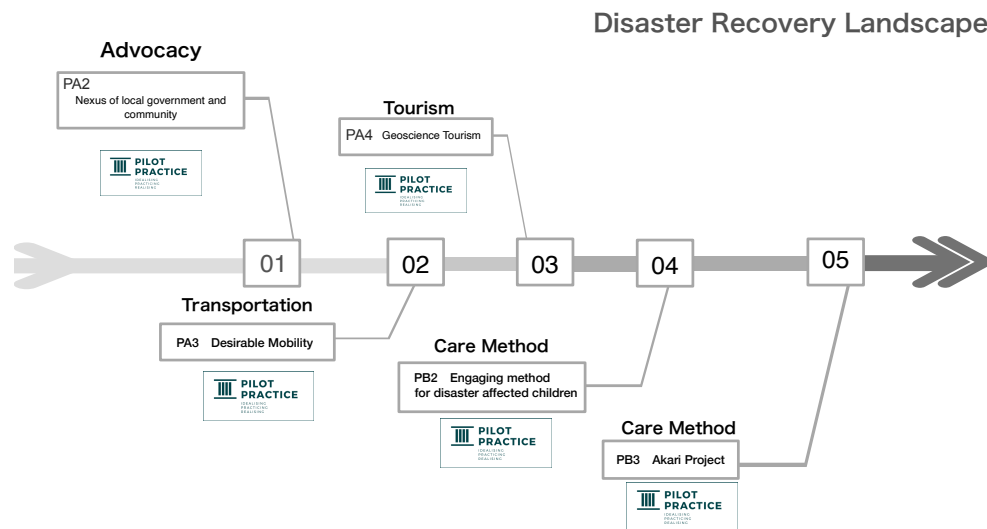


Fig: 13: DRL Components (Source: Author)

At the DRL Proposal Presentation, a mixed team of students and companies advocated the Resilience Project, a policy-making approach for building a resilient society consisting of five projects (Fig 13) [8]. If the method is implemented in the community, 1) residents will be aware of the code of conduct in the event of a disaster and will evacuate safely [9], 2) the Advance Recovery Community Development Plan (ARCP, Plan B) will be formulated, and 3) a community development plan will be conducted to foster social capital that can be activated during a disaster. In other words, BBB in the HKS region means practicing community development and organizing for recovery in advance. This policy-making process will prepare each municipality's disaster prevention and mitigation policies while considering broader-area cooperation [10][11] (Katoh et al. 2023).

The characteristics of the DRL are explained using the example of the BBB in HKS: Drawing an approach to recovery and reconstruction.

2-3 Proposal

Proposal : Drawing the BBB's approach to recovery and reconstruction

We proposed to HKS to develop the Advance Recovery Community Development Plan (ARCP) with the participation of local residents as a way to ensure the nexus between local communities and local government. The term "landscape" was chosen because it means all the visible features of an area of countryside or land and Fig 14 was created to visualize, at a glance, like a landscape, the approach to disaster recovery that we are aiming for in the HKS. Since it is impossible to fit all the elements on a single sheet of paper, the proposed projects and related elements are plotted and their relationships are indicated by arrows. It was named "Disaster Recovery Landscape (DRL)".

The theme of this landscape is "Realization of BBB (Build Back Better) Driven by Local Community". The elements in the dark blue or with dark blue frame boxes and the dark blue arrows are the essential elements of this theme, creating the value of DRL. They indicate that the participation or involvement of the people living in disaster-risk areas is essential to the realization of the BBB. The light blue area is the area led by the administration. The upper light blue area is the elements of the central government and the arrows leading to it show the feedback from the BBB's experience on them for improving governmental policies and systems. The bottom light blue area is the local government area, in which plans related to mainly disaster prevention, reduction and recovery are listed and they are expected to be developed by the local government. The pink area indicates civil society or community. Here, activities during normal times that contribute to the formation of social capital are plotted.

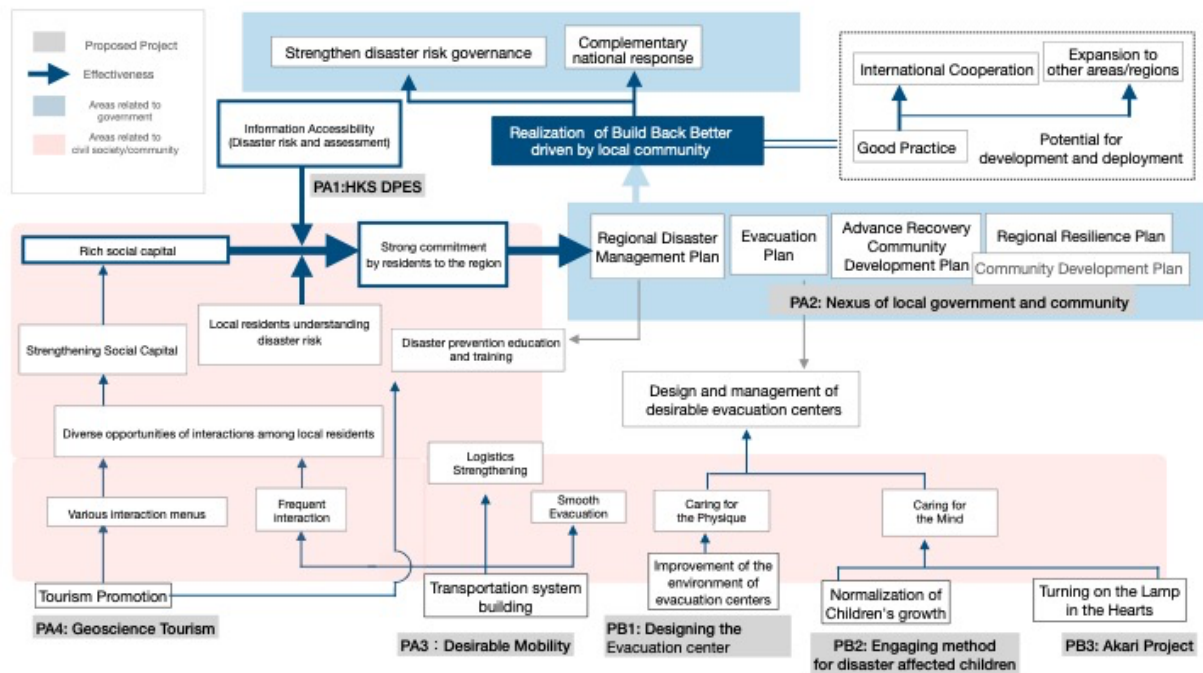


Fig 14: Disaster Recovery Landscape for HKS (Kato et al. 2023)

In the DRL with the HKS in mind, five new projects and two previously proposed projects (PA1: HKS DPES, PB1: shelter design), can be seen in pink area, but different projects can arise when a DRL developed in other municipalities (or federations of municipalities), depending on their local context. However, the following four points related to communities and the need to ensure the nexus between local communities and local government are universal elements to realize the BBB in any DRL.

- Activities fostering rich social capital are involved
- Guaranteed access to information on disaster risk and risk assessment
- People living in the area with understanding of disaster risks (residents' commitment to the community)
- Involvement of locals in the formation of local government policies/prevent measures

The key to smooth progress in disaster recovery lies in the recovery plan. We must prevent a situation in which reconstruction cannot be started because it takes time to reach consensus on a reconstruction plan, or a situation in which evacuees hesitate to return to their reborn home town, because they feel like a stranger, even though necessary infrastructures have been built according to the plan. The development of ARCP with the participation of residents that we proposed is one solution to avoid these two situations. DRL emphasizes carefully designing the planning process so that local residents take the initiative in developing the ARCP, rather than the outcome of completing it. The local government designs the process and encourages residents to participate.

The Japanese government has published "Guidelines for the Examination of Preliminary Reconstruction Town Development Plans," which require local governments to establish a system for examining reconstruction plans and to create a grand design of what the town should look like after the disaster. A total of 62% of municipalities have set goals and are conducting some activities, such as establishing a system, confirming procedures, conducting drills, and analyzing primary data (MLIT 2018). However, we believe that how properly the recovery plan functions, which is formulated in accordance with the guideline, depends on whether or not the residents take ownership of the plan. Based on this thought, we have presented a process for fostering residents' ownership as a planning methodology.

Generally, each local government in Japan has a comprehensive development plan for a period of five to ten years, and a land use plan and district plan that is consistent with the comprehensive development plan. First, we decided such an existing town development plan is called Plan A. Then, we defined Plan B, the town that the residents envision created without being constrained by the status quo. Plan B is an attempt to look at the predicament of losing everything due to the disaster in a positive light, as an opportunity to build a town from scratch. The local government will ask residents to formulate a Plan B with their own free ideas, after which

the both sides will proceed with a series of dialogues to fill the gap between Plan A and Plan B. While Plan A is an existing, official plan, the compromise created in the gap between Plan A and Plan B becomes ARCP (Fig15-a).

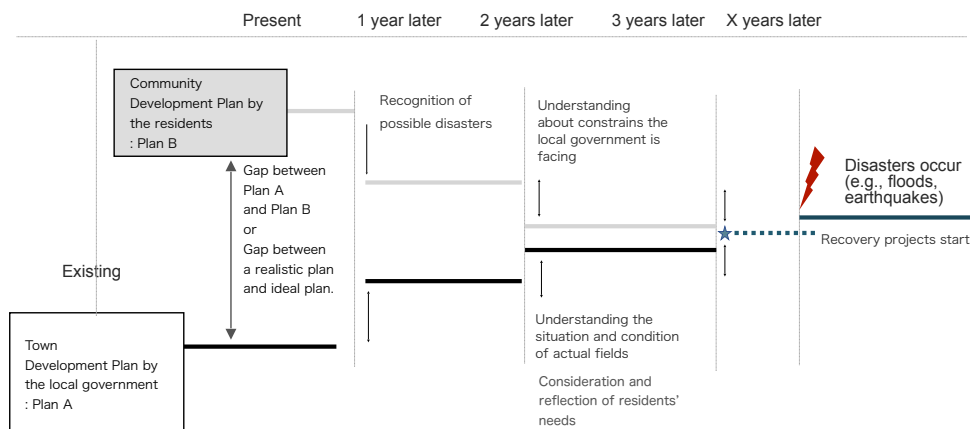


Fig 15-a: Image of dialogue process (Source: Author)

Most of the municipalities provide opportunities for residents to participate, to varying degrees, in the development of plans. However, the ARCP differs from a typical community development plan with resident participation in three critical aspects:

- 1) At the stage of asking residents to participate in the formulation of the ARCP, the local government needs to provide them with enough information about possible disasters and risks. This would trigger residents to ask themselves whether they are prepared to accept the risks of disasters and continue to live in the area.
- 2) Naturally, there is a large gap between Plan A and Plan B at the starting point. In order to fill this gap, the local government must explain to the residents about the issues they will have to consider, for example, legal restrictions and lack of resources. Residents will gain a better understanding of administrative activities and may change their attitude to their plan in the face of reality.
- 3) Through dialogues with residents, the local government can accurately grasp the needs of the residents' side. Furthermore, the addition of perspectives different from those of the government could create the possibility of solving problems through unconventional ideas.

Even after Plan A and B merge into one plan, there may be transfers in and out of the area and generational changes on the part of residents. In addition, the plan will need to be revised in response to changes in the surrounding environment and potential risks. Thus, the dialogues between the local government and residents, changing participants, will continue forever through the joint work of updating it (Fig 15-b).

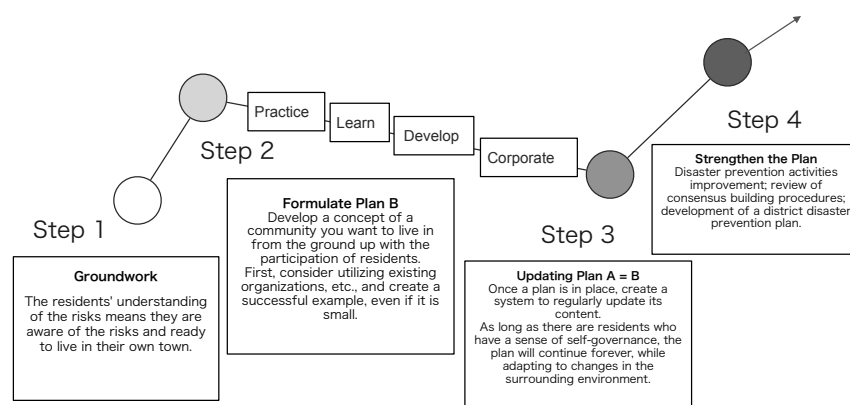


Fig 15-b: Integration process of Plan A and Plan B (Source: Author)

It is assumed that it will not be easy in practice to reach an agreement through a series of dialogues. Since it is important for a new initiative to first establish a successful example, we suggested to HKS that the trial be conducted in an administrative district with a particularly active community.

The development of an ARCP with broad participation of residents will also provide an opportunity for them to raise their awareness of disaster prevention. They will become aware that issues that cannot be solved locally will require cooperation with surrounding communities and municipalities. If they can clarify and detail the needs for regional cooperation, they will be able to prevent cooperation from ending up as a mere rhetorical exercise.

In terms of the practice of the development, we also suggested that the local government should share with neighboring municipalities the progress and learn from their efforts to involve residents. Unless neighboring municipalities can confirm that the relationship is mutually win-win, it will be difficult to institutionalize broader collaboration. We believe that exchanges among local governments will contribute to forming the foundation for institutionalization of workable broader collaboration.

3 Analysis

Looking at Disaster Recovery Landscape (DRL) through the analytical frame of 'governing and managing hybridity.' DRL, in which multi-sectoral actors work together, is an example of a hybrid model in Japan (Katoh 2020). Here, the characteristics of DRL are conceptualized through the Governance and Management of Hybrid Organizations analytical framework.

Hybrids, hybrid governance, and hybridity appear in various forms in contemporary society. Hybrid organizations are forms of governance between the public and private sectors, where hybrid forms of ownership, institutional logic, and competing value-creating mechanisms sometimes contradict, but promote important social objectives through the collaboration of their respective sector actors (J. Vakkuri and Johanson, J. 2021).

Examples of hybrid organizations include those that use business principles to complement or replace professional healthcare and higher education roles. As seen in Chapter 2, ARCP, to maximize social capital, attempts to overcome the institutional differences that divide each sector and put them into practice. It can, therefore, be seen as a form of hybridity that "does good by doing good" (J. Vakkuri and Johanson, J. 2021). The hybrid analytical framework comprises four segments (IRSPM Governing & managing hybridity 2023). DRLs are analyzed from these four segments: entangling procedures, aggregation of institutions, combining value creation, and aggregation of social interaction.

3-1 Entangling Procedures: Segment 1.

To unite people from different sectors in one project and manage the events that emerge in people and organizations, the triggered social actions must be visualized, shared, and brought together in a project system. The first step is to overcome the differences in institutional procedures specific to each sector.

In the HKS project, the mission of the DRL ('Practice of Advance Reconstruction Community Development to Maximize Social Capital') was derived by integrating the vision of the future of the HKS region expressed on the DMM, and the problems and solution approaches of the region shared by the HKS-DPES. It would be possible to overcome the differences between the various systems in the long term if the government, enterprises, and universities worked together to achieve future missions. The blueprint is as follows:

To realize the mission derived from collaboration, it is essential to have a perspective on the four areas emphasized in public management: 1) community perspective, 2) regional financial perspective, 3) disaster operations perspective, and 4) learning and growth perspective (Fig 16). This mission is achieved through the realization of perspectives (1), (2), and (3). For perspectives (1), (2), and (3), the learning and growth perspective of residents (4) is a necessary condition.

The residents of the HKS region can learn from each other about disaster prevention and reduction, acquire a code of conduct to protect their lives, and put it into practice in the event of a disaster. Intellectual property can be compiled and provided from the residents' participatory community development methods as policy content for the reconstruction of vulnerable areas and to take on global issues. The residents' accumulated experiences and growth provide resources for future perspectives in various fields and strengthen the community's social capital.

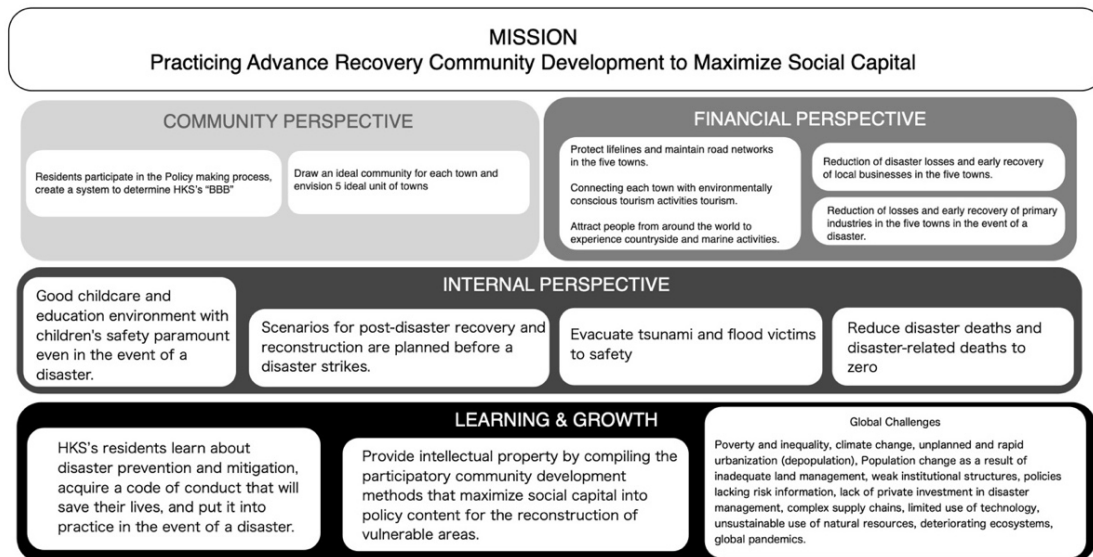


Fig 16: ARCP Perspectives (Kato and Misumi 2023)

In DRLs, the first segment of hybridity, Entangling Procedures, is realized in the process where the goals of projects in different sectors are defined and put into practice to achieve shared missions. Individual procedures are untangled and aligned with policies implemented in the existing town development plan by weaving them back into the activities of the residents.

3-2 Aggregation of Institutions : Segment 2

Aggregation of institutions of the local community (micro-level), the broader region (meso-level), and the state and the world (macro-level) is the second segment of hybridity. In the interviews conducted in the Resilient Society Progeam, some participants said that disaster-related laws and institutions at the national level and the disaster operations of local governments need to mesh better in times of disaster.

The recovery and reconstruction approach proposed by the DRL includes three approaches to community development: 1) fostering good social capital, 2) combining disaster operations with routine operations, and 3) planning to turn disasters into opportunities. After each municipality has drawn up its ARCP based on the three concepts, it forms a broader-area cooperation scheme to address issues a single municipality cannot solve alone.

In other words, the local community forms the consensus process between the administration and residents, resources to achieve the mission are procured from the national system, and domestic and international broader-area disaster management cooperation arrangements are made.

The second segment constituting hybridity, "aggregation of institutions," can be achieved by integrating institutions that exist in three dimensions (micro, meso, and macro) through the use of national institutions in a broader-area cooperation scheme that incorporates the creation of ARCP in individual municipalities to conceive a broader-area disaster prevention system.

3-3 Combining value creation: Segment 3

In the HKS project, three stages of the policy-making process of regional disaster risk reduction can be found: the first stage (HKS DPES 1.0), in which the disaster risks of the broader-area region are shared; the second stage (HKS DPES 2.0) in which the solution approaches of the broader-area region are shared; and the third stage (HKS DPES 3.0), in which the DPES building process of the broader-area region is shared (Kato and Yoneda 2023).

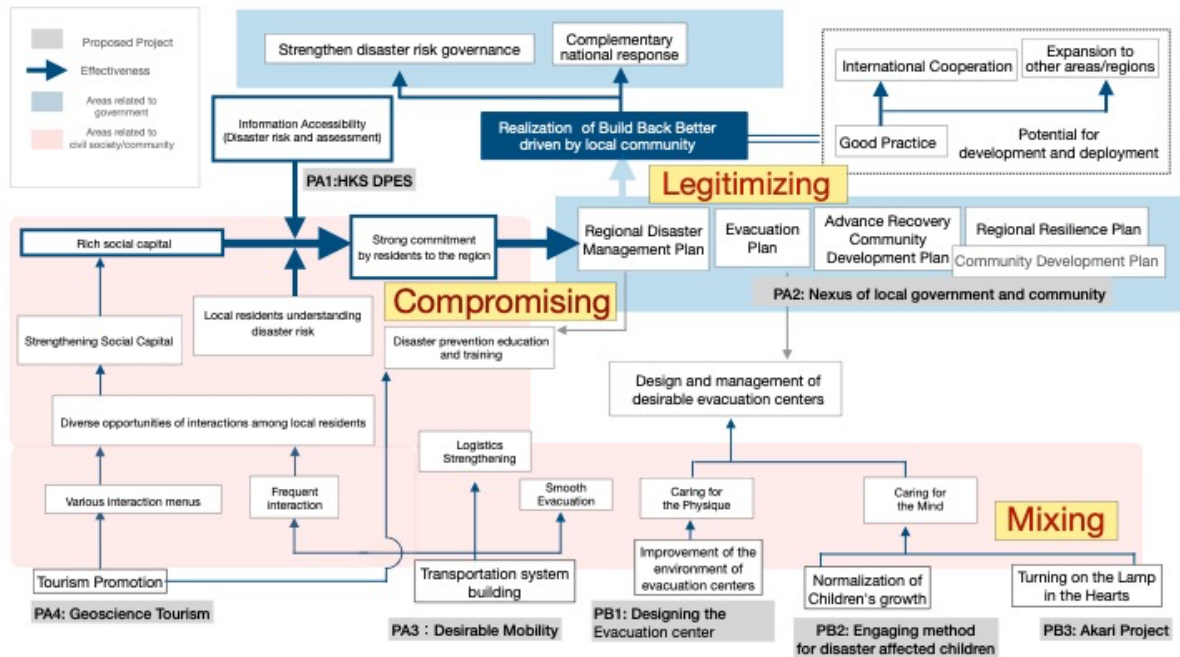


Fig 17-a: DRL Value Creation Approach (Source: Author)

Segment 3 of hybridity, Combining value creation, is formed in the DRL to foster a social capital environment. In other words, the phenomenon of mixing value-creating approaches appears to create social capital. Next, in the process of people and organizations being active in an environment where social capital (social relationships and trust) is fostered and participating in policy-making, the phenomenon of the value-creating approach's coordination and compromise emerges. The legitimizing phenomenon of the value creation approach appears in the process where policies and measures in line with the will of the residents are outputted (implemented) from the policy-making process, and people make use of them (e.g., implementation of individual evacuation plans → evacuation of residents during a disaster) (Fig 17-a, 17-b).

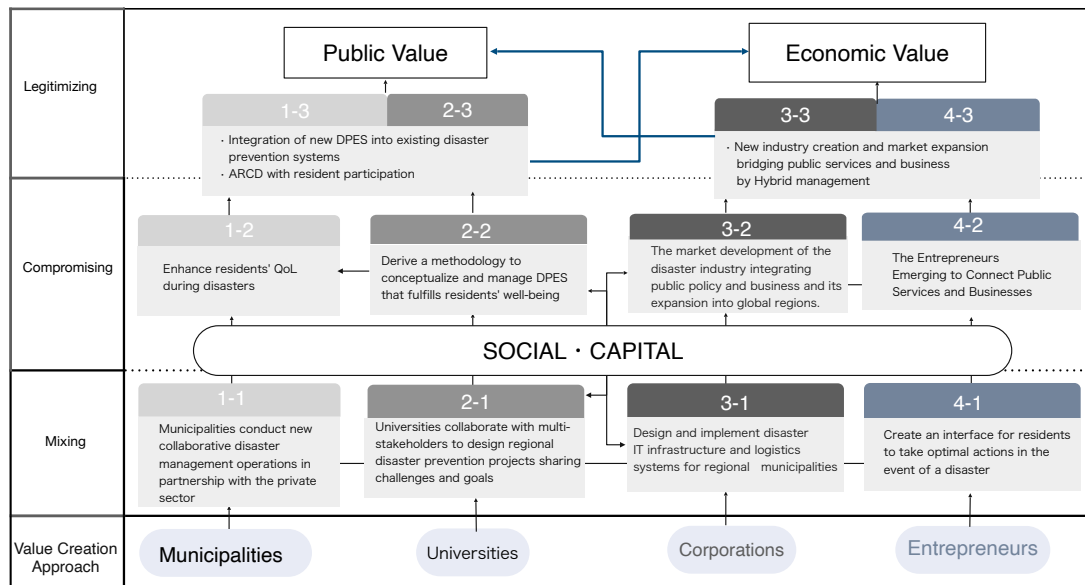


Fig 17-b: DRL Value Creation Process (Source: Katoh and Misumi 2023)

3-4 Aggregation of Social Interaction: Segment 4

The broad-based disaster risk management policy-making process is when stakeholders from different sectors come to a common understanding. An essential part of this process is developing a consensus-building approach to meet the conception of many stakeholders.

In the DRL, the use of the DMM enabled a series of processes to be experienced: setting the agenda for a project comprising participants from other sectors, visualizing the challenges and solution approaches, generating and sharing action plans for each actor, and integrating a vision for the future. Second, using the HKS DPES enabled us to fill the perception gap that had been an obstacle to the project and conduct activities to find appropriate evacuation routes and centers in the broader-area evacuation plan. These tools will facilitate communication in future workshops with more stakeholders.

Therefore, it can be said that the third segment of hybridity, Aggregation of social interaction, is ensured in the DRL by visualizing the policy-making process through the use of DMM and the sharing of the disaster management system through the use of the HKS DPES. The environment fostered in this manner is a requirement for the establishment of legitimization in the value creation approach.

3-5 Conceptualising Disaster Recovery Landscapes (DRL)

DRL in the HKS region is a social project that attempts to implement ARCP to maximize social capital. This project had four characteristics (Fig 18). First, cross-sectoral and mission-creating approaches can overcome the complex procedural conflicts between sectors that emerge when attempting to collaborate. Second, constructing a disaster prevention system for a broader region unaffected by a disaster involves the municipality's ARCP, which is the minor component (micro-level). At the same time, insufficient financial and human resources are procured from the national (macro-level) receiving system and consolidated in the evacuation system for a broader region (meso-level). Third, DRL follows a three-stage value-creation approach (mixing, compromising, and legitimizing) linked to fostering social capital. In other words, it describes a scenario in which social capital is enhanced and mediated to provide public and economic value. Fourth, the social effects caused are visualized and shared by two tools (DMM and HKS DPES), which have the potential to build public consensus.

Entangling procedures	The cross-sectoral approach to mission creation overcomes the complexities of inter-sectoral procedures that emerge when collaborating in a multi-sectoral manner.
Aggregation of institutions	Building a regional disaster prevention system on a broad regional basis, with the municipal ARCP as the smallest component (micro-level), while procuring insufficient financial and human resources from the national receiving system (macro-level), and consolidating them into a broad regional evacuation system (meso-level).
Combining value creation	DRL traces a three-step value creation approach (mixing, compromising, and legitimizing) linked to the process of fostering social capital.
Aggregation of social interaction	Visualization of the social effects caused by the disaster with two tools (DMM and HKS DPES), and sharing of disaster risks and solution approaches, with the potential function of building consensus among the constituents of the five towns.

Fig 18: DRL Four Characteristics (Source: Author)

In this paper, we conceptualize the policy-making process for building a DRL that promotes resilient society within the HKS region, an example of Japanese-style hybridity, using analytical framework of governing and managing hybrid organizations. The methodology developed here will undergo reconstruction through the ongoing tracking, verification, and feedingback of the project progress and evaluation results.

4 Findings

The essence of DRL's approach to Advance Recovery Community Development Plan is a policy-making approach that builds a specific recovery process in the event of a disaster, a process that integrates ordinary Town Development Plan with Advance Recovery Community Development Plan. The process is designed to facilitate dialogue between the government and the residents, so that the two parties reach an agreement that is acceptable to both, by understanding the other's position, making efforts to compromise, and generating innovative ideas.

When a disaster strikes, there will be forces at work to revert to the existing regulations, but if the needs of the residents have been heard, the government may create one that is more suited to the will of the community. If the town development plan is based on an ARCP developed with the participation of the residents, they will have ownership in the proceeding DRL project. The ARCP functions as a reformable system that is integrated

into the policy-making process, resulting in social capital stored in the community being inherited for future residents.

Disaster recovery will be accomplished through the safe evacuation of all residents in the event of a disaster and their active participation in community building starting immediately afterward, as well as by formulating an ARCP for the affected area.

If there is a shortage of places to evacuate in a single municipality, authorities must secure them from a broader and more widespread area. Residents need to be trained to acquire a code of conduct that can be activated in a disaster and one which is rooted in their schools and communities. After a broad regional partnership scheme has been formed, companies and universities must cooperate in its operation and ensure that all inhabitants in the neighborhood consent and participate in the action.

DRL, which has designed an educational program for a collaborative policy-making process that meets these needs, has the potential to be a valuable practical model for broad-based communities, both in Japan and internationally that are trying to build new regional management systems in the aftermath of disasters. The Japanese Disaster Prevention and Evacuation System Building Approach also articulates a form of good hybridity governance and management, which could be a proposition for hybridity research.

Notes

[1] Global risks

The massive global risks affecting infrastructure, whether in the form of climate change, the COVID-19 pandemic, or cyberattacks launched by state and non-state actors, demand greater resilience during crises and stable periods. The cost of inaction can be enormous regarding life, money, and social disruption. For example, between 1998 and 2017, climate-related natural catastrophes cost disaster-hit countries an estimated \$2.2 trillion, according to research commissioned by the UNDRR. Moreover, dealing with COVID-19 has proven far more challenging in a place like the US, which has less than three hospital beds per 1,000 people, than in South Korea, which has more than 12 beds per 1,000 people. Cyberattacks on critical infrastructure, including power grids in Ukraine and the SWIFT global payments system, have been devastating. Infrastructure that shuts down an emergency or does not adapt to new realities can inhibit disaster response, undermine social cohesion, and stifle economic growth. Maintaining infrastructure not built to accommodate the changing world can be prohibitive. Building new infrastructure with sustainability and resiliency in mind, retrofitting, and applying new operating models to existing infrastructure can result in wide-ranging benefits. In a 2019 report, the World Bank estimated that low- and middle-income countries could reap \$4.2 trillion in net economic benefits by investing in more resilient infrastructure - with \$4 in benefit for each \$1 invested. These benefits can be obtained by avoiding costly repairs and minimizing disruptions to the daily lives of millions of people. "Room for the River," spearheaded by the Dutch government and implemented in several countries worldwide, including the Philippines, is one example of a related initiative. It reimagines water management infrastructure in a way that enables natural landscape features to act as "natural water sponges" and lessens the damage of flooding, which is now expected to increase in severity due to the worsening effects of climate change. Ultimately, building infrastructure that can withstand massive shocks will be important in developing more sustainable and inclusive economies as the world recovers from COVID-19.

<https://intelligence.weforum.org/topics/a1Gb0000000LiPXEa0/key-issues/a1G0X000006OEflUAG> (2024.1.27.)

[2] Noto Peninsula Earthquake

Japan is situated at the juncture of the Pacific, Philippine Sea, Okhotsk, and Amurian Plates, which are convergent boundaries. This geographical location has resulted in a high incidence of seismic activity, including major earthquakes and tsunamis such as those that occurred in 1833, 1940, 1964, 1983, and 1993. One of the most catastrophic tsunamis in the Sea of Japan occurred in 1741, and recent studies have identified a 94.2 km-long southeast-dipping fault consisting of two segments as a potential source of an earthquake measuring 7.6 on the Richter scale. Additionally, the northeastern tip of the Noto Peninsula has experienced a series of earthquakes over the past three years, with the largest one, measuring 6.3 on the Richter scale, occurring in May 2023. This earthquake was the strongest to hit the peninsula since records began in 1885.

The 2024 earthquake occurred in the Noto region on New Year's Day, a holiday when many individuals were at home and businesses were closed. This triggered Japan's first major tsunami warning since the 2011 Tohoku earthquake, and a tsunami of 6.58 meters was recorded along the coast of the Sea of Japan. The evacuation orders affected 62,000 people, and the quicker arrival of the tsunami than expected resulted in people not evacuating in time. In Ishikawa Prefecture, 240 deaths have been reported, with 15 individuals losing their lives due to injuries or illnesses. Most deaths, over 80 percent, were caused by the collapse of homes. More than 1,181 individuals were injured, and as of February, 12 individuals remained missing. The National Police Agency's autopsy findings

revealed that 92 victims were crushed to death, 49 died from suffocation or respiratory failure, 32 died from hypothermia, and three died from burns. The majority of fatalities (> 70 percent) were elderly individuals. In Ishikawa Prefecture alone, 49,429 buildings were damaged or destroyed, and the Japanese government estimated the total cost of damage in Ishikawa, Toyama, and Niigata to be ¥2.6 trillion. These costs are primarily attributed to damaged homes, roads, ports, and other infrastructure, with Ishikawa Prefecture accounting for ¥0.9 and ¥1.3 trillion (MLIT 2024).

The Japan Society of Civil Engineers reported on the Chairman's Special Investigation Team on the 2024 Noto Peninsula Earthquake as follows: 1) four special features, 2) findings for controlling secondary damage and speeding up recovery and reconstruction, and 3) findings on the state of restoration and reconstruction (JSCE 2024).

Four Special Features

- The Noto Peninsula Earthquake was the second in a series of earthquakes that registered seven on the Japanese seismic intensity scale, simultaneously causing a complex of disasters, including damage to buildings and structures from seismic tremors, damage from landslides and liquefaction, flooding damage from tsunamis, and damage from fires.
- As a result, roads and lifelines leading to villages in mountainous areas were cut off in areas with little flat land at the tip of the peninsula and many villages were isolated.
- The main roads that should be the main route for emergency restoration and recovery efforts were severely damaged, making it challenging to take initial action to support the affected areas, as emergency restoration took time.
- There are concerns that creating a forum to promote regional restoration and recovery visions and plans will become an issue, partly because of the decline in population following secondary evacuation and other disasters.

Findings for controlling secondary damage and speeding up recovery and reconstruction

- Although aftershock activity is decreasing, there is still the possibility of its occurrence, including interlocking earthquakes. Therefore, it was necessary to confirm the main points of the responses. It is also necessary to pay attention to secondary disasters that may occur during the flooding season, such as blockage of river channels.
- For early restoration and livelihood support, it is necessary to maximize the use of limited traffic capacity, proceed with restoration while maintaining the livelihood of disaster victims, alleviate traffic congestion through traffic management, such as appropriate traffic restrictions, hasten the restoration of trunk roads, and improve access to them as soon as possible.

Findings on the state of restoration and reconstruction

- Regarding the restoration of roads, water, and sewage systems, it is necessary to reinforce vulnerable areas and ensure redundancy to prevent extensive damage in the future. In particular, the introduction of decentralized and self-sufficient (off-grid) infrastructure should be considered for water and sewage systems.
- As the Noto Peninsula recovers and rebuilds, it is necessary to consider the construction of arterial traffic routes to improve and reinforce the alignment of the longitudinal arterial road leading to Wajima City, and the lateral axis leading to Suzu City and other cities.
- Promote safe and secure urban development, including consideration of housing options that consider the risk of combined disasters, such as earthquakes, tsunamis, landslides, and liquefaction. Promoting various types of community development in urban areas and settlements is necessary, according to livelihoods and individual circumstances.
- In the process of recovery and reconstruction, it is necessary to restore and improve infrastructure and revitalize the region by taking advantage of the regional resources of the Noto Peninsula (nature, landscape, climate, agriculture, forestry, fisheries, tourism, history, and culture) to restore the local culture and strengthen local economic activities.

[3] Infrastructure

Infrastructure refers to "physical systems and corresponding institutional arrangements designed and built to exist, mediate, and provide services to support economic growth, health, quality of life, and safety among people, their communities, and the wider environment (Chester, 2019; (Dawson et al. 2018)). Emerging economies in the Asia-Pacific region are rapidly increasing their investments in physical infrastructure and infrastructure-related systems. Cities, where most of the region's population (especially people with low incomes) live, are vulnerable to natural disasters and the impacts of climate change. Instead of leaving an aging infrastructure in place to exacerbate risks, risks must be mitigated for future infrastructure and services. New infrastructure resilient to disasters and climate change must be developed with accelerated investment to maintain essential services and prevent loss of human life and livelihoods. Disaster-resilient infrastructure is more than simply "maintaining a hard infrastructure. It is founded

on both interconnected and independent systems and the efforts of the people who operate them and support the infrastructure. Ultimately, it is critically important to maintain an aging infrastructure and improve it through the efforts of the people.

Asia-Pacific Ministerial Conference on DRR 2022

https://www.youtube.com/watch?v=HI_OHoxj9as

[4] Resilience is defined in the IPCC Sixth Assessment Report as follows:

The capacity of interconnected social, economic, and ecological systems to cope with a hazardous event, trend, or disturbance, responding to or reorganizing in ways that maintain their essential function, identity, and structure. Resilience is a positive attribute that maintains capacity for adaptation, learning, and transformation (Arctic Council 2016).

[5] Sendai Framework for Disaster Reduction

Build Back Better is a concept defined in the Sendai Framework for Disaster Reduction adopted at the Third United Nations World Conference on Disaster Reduction in 2015. That can be summarized into the following three main components.

(1) Building more disaster-resilient communities during the recovery phase after a disaster in preparation for the next disaster (Cabinet Office, 2015).

(2) Preventing and reducing exposure and vulnerability to hazards; enhancing preparedness for response and recovery; and strengthening resilience to significantly reduce disaster risks and losses of lives, livelihoods, the health of individuals, businesses, communities, and national economic, physical, social, cultural, and environmental assets to strengthen resilience by enhancing preparedness for emergency response and recovery.

(3) Prevent new and reduce existing disaster risks through integrated and inclusive economic, hard and soft, legal, social, health, cultural, educational, environmental, technological, political, and institutional means. Building back better is a concept defined in the Sendai Framework for Disaster Reduction, adopted at the Third United Nations World Conference on Disaster Reduction in 2015. That can be summarized into the following three main components.

[6] International disaster reduction strategies were discussed at the World Conference on Disaster Risk Reduction (WCDRR)

The secretariat is the United Nations Disaster Reduction Agency (UNDRR). The 44th United Nations General Assembly, held in 1989, adopted the International Decade for Disaster Reduction (IDDR) from 1990 to 1999. The first UN World Conference on Disaster Reduction was held in Yokohama in 1994 and adopted the "International Strategy for Disaster Reduction." The second UN World Conference on Disaster Reduction was held in Kobe, Hyogo Prefecture, in 2005, where the "Hyogo Framework for Action" and other guidelines for disaster reduction measures for 2005-2015 were formulated. The third United Nations World Conference on Disaster Reduction was held in Sendai, Miyagi Prefecture in 2015, and the Sendai Framework for Disaster Reduction, which includes targets for reducing the mortality rate and number of victims of disasters, was formulated.

UNDRR <https://www.undrr.org>

[7] Social capital

Social capital (i.e., social networks and human relationships) drives recovery from catastrophic damage. The application of social capital to disaster recovery and rapid recovery can be realized through the norms, information, and trust of a well-developed social network. Daniel P. Aldrich's research on four major disasters demonstrated that local self-help and external interventions create social capital. His research team offers policy tools to increase resilience and reduce future disaster damage (Daniel. Aldrich 2015).

[8] The UNDP package of crisis

The UNDP package of crisis response projects includes (1) emergency livelihood support through community infrastructure and debris/garbage removal; (2) emergency livelihood support through emergency employment, restoration of economic activities, and cash transfer-based assistance; (3) assistance in restoring central government functions; and (4) national recovery planning and coordination support and other complex projects.

The UNDP deploys experts in business products with special processes, tools, and skills to national- and regional-level agencies to accelerate project progress and implementation, build partnerships with target countries, and conduct budget preparation, advocacy, and communications for rapid crisis response. The UNDP provides a country office and the target countries with systematic support. Their programs are tailored to each context, as each crisis is different.

[9] Business Continuity Management

In developing durability to ensure business sustainability, it is beneficial to learn the Business Continuity Plan (BCP) and Business Continuity Management (BCM) approach to prepare for natural disasters, biohazards, etc. By developing a BCP for uninterrupted business operations during a sudden disaster, a company can avoid business interruption (vulnerability) as much as possible and recover from damage as quickly as possible when a disaster strikes. In addition, by learning about BCM, which is positioned as a strategic management activity to secure budgets and resources to realize the BCP, the durability of the business can be further enhanced.

ISO 22313 Social Security stipulates that warning of a disaster is adequate for early recovery (Gradual Disruption). For ongoing operations, "crisis warnings" can cause temporary disruptions; however, recovery will occur gradually. By repeatedly experiencing the cycle of crisis warning and recovery from stagnation during normal times, one can recover from a crisis more quickly than without such preparations when a crisis occurs. Prescribing and training in advance of projects and activities to recover quickly from a crisis in the event of a disaster means embedding a warning function into daily activities. Community resilience will be enhanced if many businesses have a disaster action code and engage in normal economic activities (Katoh 2021).

[10] A case study of broader-area collaborative disaster prevention

Kushiro River Comprehensive Flood Fighting Exercise and Broader-area Collaborative Disaster Prevention Drill, which was conducted for the first time in Hokkaido in FY 2009. River and port operators collaborated on a broader-area basis to prepare for earthquakes and tsunamis. It was organized by 13 municipalities (Shibecha Town, Kushiro City, Nemuro City, Kushiro Town, Atsugishi Town, Hamanaka Town, Teshikaga Town, Tsurui Village, Shiranuka Town, Betsukai Town, Nakashibetsu Town, Shibetsu Town, and Rausu Town), Hokkaido, and the Hokkaido Development Bureau. The drills included flood control method drills, resident evacuation drills and support for those in need, residential flood prevention drills, TEC-FORCE drills, emergency meal preparation drills, disaster response joint headquarters meetings, disaster victim rescue drills, rescue drills for fallen vehicles, navigation channel opening drills, road opening drills, temporary bridge installation drills, evacuation drills including disaster situation assessment drills, flooding road closures drills, drills to search and rescue drifters, drills to patrol ports, drills to open navigation channels, and drills to transport emergency relief supplies.

[11] Flood Control by All Parties

The Council for Social Infrastructure Development of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), in its report "Flood Control Measures in Light of Climate Change - A Shift to Sustainable Basin-wide Flood Control by All Parties" published in 2020, calls for "comprehensive and multi-layered measures combining responses to hazards, exposure, and vulnerability from a basin-wide perspective" (basin flood control). The report calls for a basin-wide, cross-sectional approach (basin flood control) as follows:

Rivers sometimes cause large-scale flooding and threaten human survival and economic activities, however in normal times, they also provide a rich natural environment and bring comfort and relaxation to local communities. In addition, local cultures and climates are deeply connected to rivers, and floods often shape the topography of a region. Therefore, it is necessary to help more residents in the basin understand the various aspects of rivers and improve their awareness of flood control (CSID of MLIT 2020, p.53).

The concept of "green infrastructure" should be adopted to promote sustainable and attractive land, cities, and regions by utilizing the diverse functions of the natural environment while promoting watershed flood control. The conservation and restoration of water retention and absorption functions in watersheds and the utilization and conservation of rice paddies and farmland, including abandoned land, function effectively to preserve and create habitats, growth, and reproductive environments for living creatures, and at the same time, are effective flood control measures. Multifaceted factors other than disaster prevention functions, such as revitalizing the local economy and creating livelihoods, should also be considered and combined with flood control measures to create sustainable communities (CSID of MLIT 2020, p.57).

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