Realization of earthquake disaster crisis management and a society with safe and secure transportation

1. Background and goals

The Great East Japan Earthquake was an unprecedented disaster that shook the foundation of Japanese society, which was previously expected to be safe and secure. IATSS was formed with the goal of contributing to the realization of a society with ideal transportation, and in the many years since its establishment, has performed interdisciplinary and international research studies toward that end. In the face of the disaster, however, the question has arisen as to how the association can contribute to the reconstruction of the affected areas and the creation of new regional communities.

As a result of discussion, IATSS recognized that it was particularly important for a society to have the three qualities: compactness/connectedness, redundancy and resilience. Taking these as keywords, we have collected proposals from five viewpoints: construction of resilient regional communities, promoting information management and awareness, the creation of new local industries, transportation systems with coexistence functions, and the legislation of liability rules and laws.

We hope that these proposals will contribute to the future recovery and reconstruction in disaster-affected areas, and that widespread development of the introduced measures will contribute to creating a society with safer and more secure transportation. Below we introduce several examples of the proposals described above.

2. Research content

2-1. Constructing a resilient society through smart choices

(1) Network-type compact cities

A network-type compact city is one in which the various attractive features of the city are consolidated (compacted) into multiple hubs, which are connected (networked) by various modes of transportation. Such a city has various functional units such as commercial centers, manufacturing centers, and tourism sites, which are intensively developed within a certain range and connected by various modes of transportation such as walking, bicycling, public transportation, and automobiles.

Compactness does not simply refer to the overall city as being in one place, but rather indicates the efficient aggregation of various attractive city features within suitable locations. It refers to aggregating

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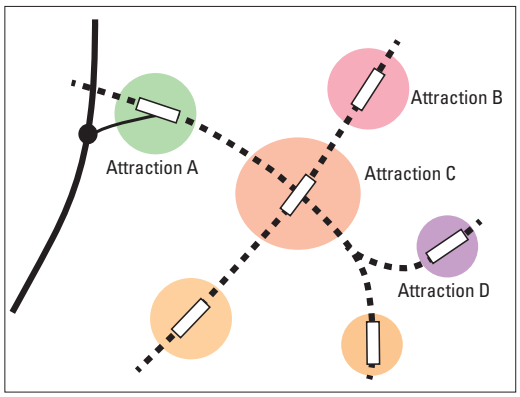

Figure 1. Network-type compact city

limited resources to enhance the attractiveness of sites, and interconnecting these attractive sites via various modes of transportation. Compactly connecting such aggregated sites (giving them compactness/connectedness) leads to ensuring mutual complementarity (redundancy) even if part of the city is affected by disaster, and flexibly performing recovery activities in other areas increases the resilience of the city as a whole.

City compactness is generally a result of repeated relocation of individual sites, and requires many years. In disaster reconstruction, on the other hand, there is a possibility of rapid recovery and consolidation. Rebuilding a disaster-affected city a model city for local governments throughout the country can provide an inspiration for overcoming the damage and tragedy of natural disasters.

(2) Multilayered transportation networks

Reconstruction following an earthquake disaster presents the opportunity for reconstructing the hierarchy of transportation systems in heavily damaged cities. High-speed traffic channels in particular should be preferentially secured to allow transport and delivery of both goods in normal situations and disaster-related goods in emergencies. Another necessity is the development of public transportation networks to better accommodate a super-aging society. The key to sustainable use of public transportation will be the development of transportation systems that can be stably utilized, as well as high-intensity utilization of the land surrounding train stations and bus stops.

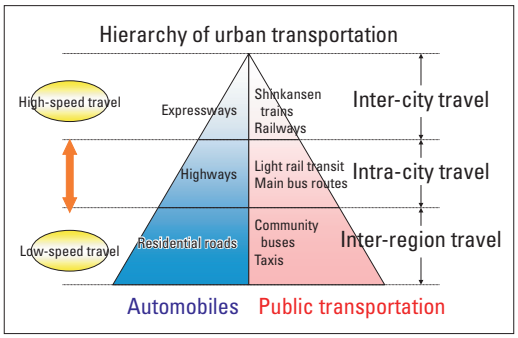

Figure 2. Image of hierarchy of urban transportation

In this way, appropriate division of roles between automobile and public transportation can ensure redundancy of transportation functions. Establishing sufficiently wide evacuation routes will allow smooth evacuations from low-lying areas to high ground, further improving post-disaster resilience.

From a variety of viewpoints, such as supporting disaster victims' ability to travel to school and work, and allowing transport of recovery-related goods, there is also a need for improving transportation networks between adjacent cities. Interconnecting cities over ranges sufficiently wide to include disaster-affected areas will improve redundancy of the region as a whole, as well as its resilience to natural disasters.

2-2. Creating a new commons for supporting local industry

Key industries in disaster-affected areas include agriculture, forestry and fisheries. In the case of the

Great East Japan Earthquake, these industries in particular were severely affected by the tsunami and nuclear power plant accident. Even before the earthquake, the affected area was experiencing stagnation of these industries due to reduced population and an aging labor force. What is needed in this area is a new business model for redevelopment, one that takes advantage of the fine mosaic structure of land and water usage that is characteristic of Japan.

Developing such a business model and tying it to regional redevelopment will require developing new systems for cooperative resource management involving companies, nonprofit organizations, and city residents. We propose such a model, which we call the "new commons." Unlike the traditional concept of a commons—a place maintained for the common good—it is necessary to foster the concept of a commons that allows participation by a variety of stakeholders.

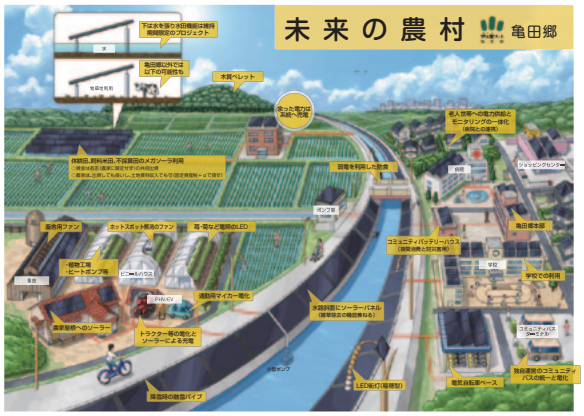

Figure 3. Image of rural area of the future
Source: Energy Sustainability Forum
(The University of Tokyo IR3S, Showa Shell Sekiyu K.K.)

Along with redevelopment of agriculture, forestry and fisheries as economically advantageous, high value-added industries, the promotion of ecotourism and environmental education will be needed to gain outlooks on regional revitalization. There are increased expectations being placed on renewable energy such as solar, wind, and biomass as a consequence of the nuclear power plant accident, but the creation of new regional industries through introduction of concepts such as co-harvesting (reconciling renewable energy production with biological production) will likely be vital toward realizing renewable energy in rural areas. This will require introducing systems for co-management of natural resources into regional communities with consideration of regional circumstances, and building sustainable societies that are in harmony with nature.

2-3. Construction of a transportation system for coexistence of functions between ordinary and emergency times (Evaluation of quality of life as evacuees with consideration of traffic quality)

We propose a method for evaluating whether evacuees living in shelters or temporary housing during reconstruction maintain a certain quality of life (QOL), incorporating into the appraisal consideration of quality-of-trip (QOT).

Traditional traffic evaluations consider quantitative values such as degree of congestion, length of traffic jams, and point-to-point travel times. We believe the problem of system evaluations of transport quality is better addressed through appraisal of QOT. Even when living in emergency shelters, there are daily errands that people must attend to. The ease with which individuals can move to such destinations should therefore be considered an important evaluation criterion. When individually considering movement objectives such as commuting to work or school, shopping, or personal errands, in addition to

distance traveled and ease of selecting methods of transportation, it is also important to consider factors such as the steepness of hills and anxiety during night-time travel. There are also other important evaluation metrics that should be finely tuned for individual areas, such as accessibility to friends and family, and accessibility to a community's important cultural sites on special days for public rituals.

The quality of transportation is an important part of quality of life. A proper understanding of this is a necessary part of efforts toward improving quality of life.

3. Conclusions and future outlook

Problems related to transportation have been a central theme in earthquake disaster reconstruction. However, we have attempted to go beyond this, considering a more comprehensive understanding of recovery and reconstruction that presents proposals and cases from a multifaceted point of view.

This paper introduced several examples of proposals from viewpoints based on three keywords, namely, "compactness/connectedness," "redundancy," and "resilience." All of the proposals are collected in "Aiming toward recovery and reconstruction of resilient regional communities: Five proposals and fifteen cases." We hope any interested readers will refer to this collection of proposals.

At the IATSS we have provided these proposals to the world through making recommendations to related local governments, academia, and international symposiums. We hope that such attempts have contributed to further IATSS-related earthquake disaster recovery efforts and to international society. These are important endeavors, and we look forward to further developments through IATSS projects.