International Cooperation for Disaster Recovery and Reconstruction to Developing Countries: Learning from Japan's Experience

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The Japan International Cooperation Agency (JICA) implemented the Study of Reconstruction Process from Large-Scale Disasters in 2013, organized a reconstruction process from seven mega-disasters in Japan and proposed 45 actions in accordance with the framework of four periods and the six steps. Using this framework the paper analyzed the JICA cooperation results for disaster recovery and reconstruction to have some implications for future cooperation. It was suggested that the measures were insufficient in the process of reconstruction due to lack of a system, expertise and urban planning. After discussion of the land re-adjustment projects, disaster education and preparation in advance based on a review of the present situation of the Reconstruction Project of the Imperial Capital , this paper proposed that JICA supported projects related to resonstruction in disaster prone regions before disasters strike as regular urban development projects. Finally the paper indicated that a mega-disaster was considered as a right time to solve urban problems including disaster prevention as well as traffic, housing and the environment.

Key Words : *international cooperation, disaster recovery and reconstruction, mega-disasters in Japan, the Reconstruction Project of the Imperial Capital, urban problem solving*

1. INTRODUCTION

The Great East Japan Earthquake (GEJE) of magnitude 9.0 occured on March 11, 2011 and the gigantic earthquake and tsunami struck the north east region of Japan. The toll of dead and missing was close to 20,000. The government technical committee (2011)[1)] proposed countermeasures to mitigate the tsunami damage consisting of efficient evacuation, resilient communities and disaster awareness. The Government of Japan (2011)[2)] prepared the Basic Guidelines for Reconstruction including building disaster resistant and resilient regions, restoration of life in communities, and revival of local economic activities.

The World Bank (2012)[3)] reviewed the experience of the GEJE, delivered a set of 32 knowledge notes grouped into six thematic clusters and concluded that the management of risks from natural disasters should be mainstreamed into all aspects of development planning in all sectors of the economy. Sakamoto, M. *et al*, (2007)[4)] analyzed the disaster vulnerability in the recovery and reconstruction process based on the field survey at Banda Aceh, Indonesia where the most severly affected from the 2004 Sumatra Earthquake, showed that the most part of cooperation focused on recovery process and proposed increased assistance to reconstruction process.

Carter, M. R. and Castillo, M. (2005)[5)] explored the efficacy of informal mechanisms of mutual aid and insurance in rural communities in Honduras devastaed by Hurricane Mitch in 1998. The chief findings were: 1) there was notable variation in the degree of alturism and trust in the communities, 2) higher levels of altruism promoted more rapid recovery from the shock of Hurricane Mitch, and 3) mutual insurance mechanisms invigorated by norms work only for a small subset of the households.

The Tokyo Metropolitan Government (TMG) prepared TMG Eartquake Disaster Recovery and Restruction Manual in March 2003 to present a new framework for community collaborative recovery, which showed the recovery and restruction process

of city, houses, industry and livelihood. The TMG updated Disaster Prevention Measures in March 2012 and explained the measure to promote disaster-resistant city to deal with wood housing areas (28 zones, about 7,000ha), which are likely to have a disaster. The progress is difficult and takes a time due to complex rights relationship[6].

Kanai, M. and Katada, T. (2013)[7] analyzed evacuation behaviors of tsunami victims in Kamaishi City in the case of the GEJE. Most of them didn't evacuate immediately after the earthquake occurence. On the other hand all elementary and middle school pupils evacuated from tsunami except five pupils who were absent from school. The survival rate of pupils was 99.8 %[8]. Katada, T. and Kanai, M. (2008)[9] reported that tsunami experience was fading in Kamaishi City even though costal towns repeatedly affected by tsunami occurences. Through the tsunami disaster education at elementary school children got knowledge and wisdom about tsunami evacuation. The disaster education at school had a high effect on evacuation in Kamaishi City at the time of the GEJE.

JICA prepared the Guidelines for Disaster Reduction in 2007[10],which showed three strategy goals: building disaster-resilient societies; emergency response; and recovery and reconstruction. This paper reviewed Japan's experience and the JICA cooperation results for disaster recovery and restruction and aimed to have some implications for future cooperation to developing countries.

2. METHODS

First, the lessons learned and actions proposed to the JICA from past mega-disasters, especially from the GEJE, were organized by utilizing the Study of Reconstruction Processes from Large-Scale Disaster (SRPLD) (2013)[11]. Second, some cases of JICA cooperation for disaster recovery and reconstruction were reviewed according to the same framework of the SRPLD. Third, the present situation of the Reconstruction Projects of the Imperial Capital (RPICs) was reviewed. Because more than 80 years have passed since the RPICs were developed and lessons learned and related researches are available. The current situation of the RPICs would give some valuable input to the international cooperation. Then, the paper discussed some implications for future cooperation learning from Japan's experience.

3. RESULTS

(1) Lessons learned from mega-disasters in Japan

According to the basic process of recovery and restruction (Fig.1) proposed by TMG Eartquake Disaster Recovery and Restruction Manual, the 24 lessons and 45 proposals for JICA actions were presented in Table 1. This table results from the SRPLD.

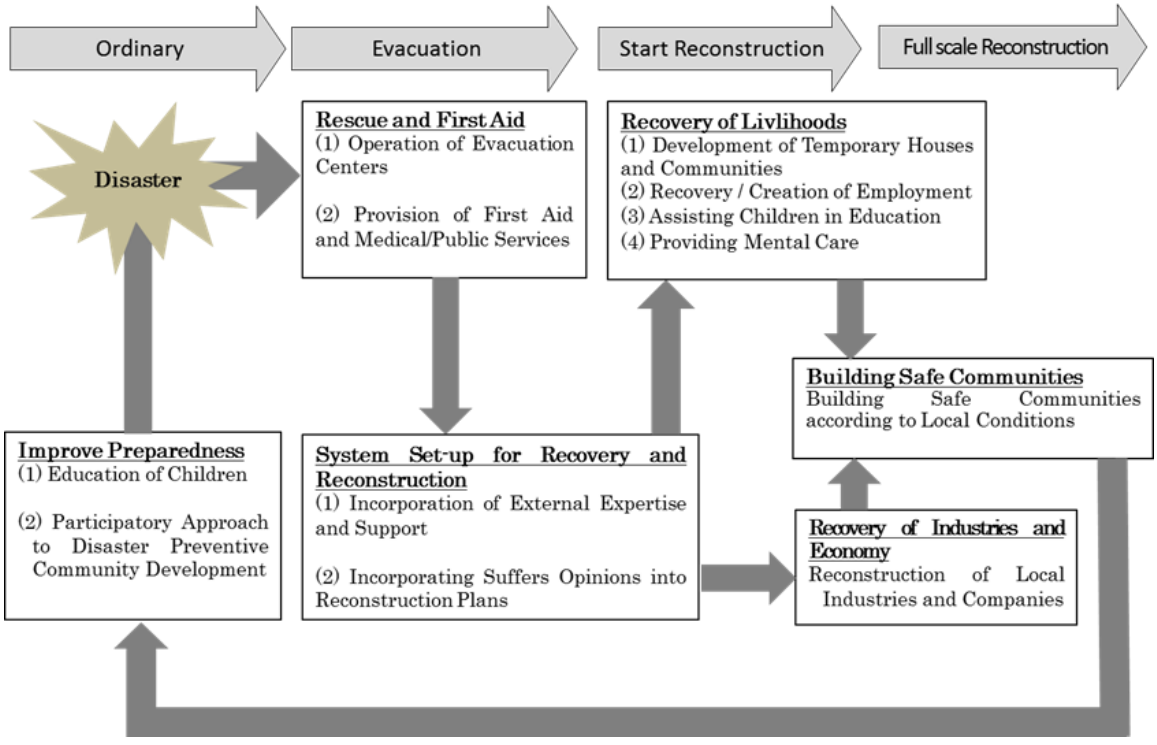

Fig.1 Basic Process of Recovery and Reconstruction[11]

Table 1 Lessons learned from Mega-Disasters and JICA actions proposed

Lessons	JICA actions (proposals)
1. Rescue and first aid	
(1) Operation of evacuation centers	○Support for evacuation center operation guidelines ○Evacuation center assessments and proposals for improvements
(2) Provision of first aid and medical services	○Support for establishing an emergency medical care system ○Risk assessment of medical facility locations
(3) Suitable delivery of aid supplies	○Confirm inflows of aid supplies from overseas ○Understanding of the possibility of receiving aid supplies not only from countries but also from local governments and NGOs
(4) Rapid provision of information	○Support for strengthening the ability to send and receive information in countries and regions affected by a disaster
(5) Waste and sewage treatment	◎Study and assistance for suitable treatment in the area
(6) Local energy and water	○Supply equipment for using renewable energy sources ○Use of well-water, etc. while building an infrastructure
2. System set-up for recovery and reconstruction	
(1) Assistance needs assessment	◎Reconstruction needs assessment upon completion of the rescue and first aid step
(2) Build a centralized reconstruction framework	◎Support for a reconstruction control tower
(3) Assistance for victims from external parties	○Collect information about major local NGOs ○Work with experienced NGOs from the initial stage ◎Support for specialists to establish an assistance organization
(4) Prepare a reconstruction plan incorporating the opinions of victims	○Support for reconstructionplan preparation by local governments ○Proposal based on the "people initiative principle" ○Ensure the participation of diversified actors in the plan process ○Support for a reconstruction plan with NGOs
3. Recovery of livelihoods	
(1) Development of temporary houses	○Proposals for temporary housing communities ○Proposals of maintaining the original cumminities
(2) Recovery of employment	◎Job creation support focused on women
(3) Physical and mental support for livelihood recovery of victims	○Support for rebuilding livelihoods and proposals and supports ○Assistance for NGOs,etc. to care for residents of temporary houses ○Understanding of Japanese NGOs and building a network ○Support for recovery policies based on regional characteristics
(4) Support for education	○Assistance for NGOs to support for education for children
(5) Provision of safe housing site and environment for self-recovery	○Support for housing complex plans to enable self recovery ○Support for organizing victims to reach a consensus ○Support for building public housing (for example, quake resistance and base isolation construction technologies)
4. Building safe communities	
(1) Building safe communities according to local conditions	○Master plans and programs and for implementing priority projects ○Fullness of workshop for disaster prevention communities through field trips and exchanges of people
(2) Comprehensive tsunami countermeasures	○Proposal and implementation for tsunami measures ◎Offer proposals for public facilities that have functions as evacuation centers
5. Recovery of industries and economy	
(1) Rebuild small and medium-sized enterprises	○Projects for the reconstruction of local companies ○Exchanges among local governments
(2) Recovery of local industries	○Support for local industries with disaster-stricken countries ○Support for industrial recovery with environmental education
6. Improvement of preparedness	
(1) Education of children about disaster prevention	◎Promote disaster prevention education at schools
(2) Disaster prevention communities	◎Capacity development of people for disaster resilience
(3) Mitigation of mega-disaster	◎Collection and assessment of disaster risk information ○Restructure disaster prevention training in Japan
(4) Disaster experience for the next generation	○Support for producing archives ○Proposals of methods for preserving disaster experiences
(5) Promotion of local authority collaboration	○Coordinate collaboration

Note: ◎: Priority actions

The process consisted of six steps, which are: 1) rescue and first aid, 2) system set-up for recovery and reconstruction, 3) recovery of livelihoods, 4) building safe communities, 5) recovery of industries and economy, and 6) improvement of preparedness. Lessons and actions were discussed within the JICA, and the detailed procedures, methods and actual exapmles also were compiled for practical use of JICA staff.

(2) JICA projects for Recovery and Restruction

Examples of JICA projects for disaster recovery and reconstruction were given in Table 2. There was a pattern of cooperation, which was that recovery and reconstruction plan was prepared first to make concrete the process of recovery and reconstruction, then loan and technical cooperation projects were followed. JICA actions were arranged according to six steps of the reconstruction process (Table 3).

Table 2 Examples of JICA Projects for Disaster Recovery and Reconstruction

Project Name	Period
Indonesia	
1. The Study on the Urgent Rehabilitation and Reconstruction Support Program for Aceh Province and Affected Areas in North Sumatra (D)	2005.3~2005.9
2. The Development of Appropriate Technology for Multi-Story Residential Building (T)	2005.7~2007.6
3. The Project on Self-Sustainable Community Enpowerment Network Formulation in Nanggroe Ache Darussalam Province (T)	2007.3~2009.3
4. Aceh Reconstruction Project (L)	2007~2015
5. Project on Capacity Development for National Center of Indonesia Tsunami Early Warning System (T)	2007.8~2009.5
Sri Lanka	
1. Recovery, Rehabilitation and Development Project for Tsunami Affected Area of Northern and Eastern Region (D)	2005.3~2007.3
2. Tsunami Affected Area Recovery and Take off Project (L)	2005.6~
3. Comprehensive Study on Disaster Management (D)	2006.10~2009.3
Thai	
1.Project on Capacity Development in Disaster Management (T)	2006.8~2008.8
Bangladesh	
1. Cyclone Disaster Resilient Community Development Project (GT)	2009.2~2012.3
2. Project for Capacity Development on Natural Disaster Technique of Construction and Retrofitting for Public Buildings (T)	2011.3~2015.3
Turkey	
1. Disaster Mitigation Project (T)	2005.8~2008.3
2. School-based Disaster Education Project (T)	2011.1~2014.1
Haiti	
1. The Urgent Rehabilitation and Reconstruction Support Project (T)	2010.5~2011.11
2. The Project for Improvement of Urban Roads and Drainage for Reconstruction of Leogane City (G)	2010.12~2012.3
Maldives	
1. Tsunami Reconstruction Project (L)	2006.7~
Pakistan	
1. The Urgent Development Study on Rehabilitation and Reconstruction in Muzaffarabad City (D)	2005.12~2007.8
2. Urgent Earthquake Disaster Reconstruction Project (L)	2006.1~

Note: T: Technical Cooperation Project, L: ODA Loan, G: Grant Aid, D: Development Study, GT: Grassroots Technical Cooperation

Source: JICA website

Table 3 JICA Actions

1. Rescue and first aid
Japan Disaster Relief (JDR) Team (I, M, S, T1・2, P, H)
2. System set-up for recovery and reconstruction
Support for Rehabilitation, Reconstruction Agency for Ache and Nias (I)
3. Recovery of livelihoods
Support for Temporary Communities (T2)
Community Enpowerment Plan, Skill Training, Cash for Work (I, S, M)
Village Planning (I), Public Participation Approach (I, S, M)
Recovery of Infrastructure (Roads, Water, Debris Removal, School, Hospitals, etc.) (I, S, P, M)
4. Building safe communities
Proposal of Zoning of Urban Area (I, S, P, H)
Warning System and Disaster Prevention Facilities (I, M)
Proposal of New Infrastructure (Roads, Parks, Resettlement Sites,etc.) (I, S, P, M)
5. Recovery of industries and economy
Support for Agriculture and Fishery (S)
6. Improvement of preparedness
Disaster Education at School (I, P, M)
Workshop to Promote Resilient Communities (P)
Hazard Assessment (I, P)
Interchange of Munincipalites (I)

Note: I:Indonesia, M:Moldives, S: Sri Lanka, T1:Thai, T2: Turkey, P:Pakistan, H:Haiti

Source: JICA website

JICA has past results at each step, but as Sakamoto, M. *et al*, (2007)[4] pointed out the support for reconstruction process was not regarded as sufficient compared with the recovery process. In case of Aceh city in Indonesia, JICA proposed zoning but houses were constructed again in the area damaged by the tsunami. The writer also heard in Aceh in September 2011 that the warning system was installed and the tsunami escape buildings were constructed but the majority of people didn't escape at the time of the earthquake in May 2010 and some escape buidlings were not maintained properly.

The main reasons of a poor performance in reconstruction would be: 1) high-pressure livelihood recovery; 2) enormous fund requirements; 3) lack of a system, expertise and planning; 4) difficult consensus building with local residents about exchange of rights; and 5) fading disaster experience with time. Next the Reconstruction Project of the Imperial Capital in Japan was examined as a successful case.

(3) The Reconstruction Project of the Imperial Capital (RPIC) from 1924 to 1930

The Great Kanto Earthquake (GKE) of magnitud 7.9 struck the Kanto region on 1 September, 1923. The toll of dead and missing was more than 100,000 and the cause of death was fire, collapsed building, landslide disaster, tsunami, etc. The amount of loss was estimated at four to seven times of the then national budget[12]. The Imperial Capital Reconstruction Department drafted the reconstruction plan of the imperial capital (1.3 billion yen budget scale) on 27 October, 1923. The budget was reduced by the government to 0.57 billion yen and the Diet approved the further reduced budget on 19 December. The Reconstruction Department of the Ministry of Interior was established on 25 February, 1924. Projects started and completed by March 1930 (Table 4).

The RPIC wiped out dense populated downtown areas and developed city areas with a network of roads, parks, water supply and drainage system. The parks offered functions of not only health, recreation and the environment but fire belt and evacuation space. The 52 small parks were designed to locate next to elementary schools and aimed to become disaster prevention shelter bases at communities.

Table 4 Main Projects of the RPIC

1. Land Readjustment
66 blocks, more than 3000 ha (about 80% of burnt area)
Relocation of about 200,000 houses
2. Road Improvement
Main roads (more than 22 meters wide): 53 routes, 114 km
Secondary roads (more than 11 meters wide): 124 routes, 139 km
Land readjustment streets: 605 km
Road ratio was improved from 11.6% to 27% in land readjustment area.
North-South Road: Showa Road (33 to 44 meters wide)
East-West Road: Yasukuni Road (15 to 36 meters wide)
3. Improvement of Park and Elementary Schools
3 big parks (Sumida: 19 ha, Hamacho: 4.7 ha, Kinshi: 5.6 ha)
52 small parks next to reconstruction elementary schools
117 reconstruction elementary schools (reinforced concrete building and fire-resisting construction)
4. Bridge Construction
142 bridges by the National Government
313 bridges by the Tokyo City Government
5. Hospitals and Social Work Institutions
5 hospitals, 13 employment offices, 4 day-care centers, 10 public dining rooms, 2 public baths, 2 central wholesale markets (Tsukiji and Kanda)

Source: Cabinet Office [12] and Reconstruction Agency [13]

The scale of RPIC was reduced from the first draft plan but implemented the long-awaited urban reform of Tokyo to a considerable degree, which retained very large infrastructure into modern era. The main part of the urban infrastructure in Tokyo was developed by the RPIC and supported the present civil life and economic activities in the capital of Japan.

Ito, K. *et al*, (2010)[14] examined the current state of streets constructed by the RPIC and confirmed that the road network remained as it was at the time of the RPIC. The Showa Road (North- South, 33 to 44 meters wide) and the Yasukuni Road (East-West, 15 to 36 meters wide) are main routes in Tokyo at the present time (Fig 2). Ishiyama, C. *et al*, (2001)[15] made clear the transitional process and present utilization of small parks and elementary schools constructed by the RPIC. 49 of 52 parks were existent as of April 2001. A set of school and park was an important asset inherited in a community for more than 70 years and a synergistic effect of park and school is expected. The Kuramae school and park, one set of 52 schools and parks, acts as disaster evacuation area at a community even today (Fig.3).

The Expert Panel of Cabinet Office (2009)[12] learned lessons from the experience from the reconstruction process of the GKE. The reconstruction achieved a safe city through the process, relieved the victims from misery without any major disruptions and promoted a movement of new science and culture. The necessary conditions are: 1) preparation of urban planning theories and systems; 2) mutual assistance system in a community; 3) relatively stable economic bases; and 4) leadership of the government and building consensus of communities. The problems are victim gap and urban sprawl. Some implications for future cooperation are discussed from the past disaster lessons in the next section.

Fig.2 Showa and Yasukuni Roads

Fig.3 Kuramae School and Park

4. DISCUSSION

(1) Land Readjustment Projects

The land readjustment projects (LRPs) were implemented to improve infrastructure at the time of RPIC, which played a very important role for the present disaster prevention and urban improvement in Tokyo. No improvement of infrastructure means no disaster prevention nor disaster reconstruction[12]. JICA has supported for LRPs to Thai, Malaysia, Indonesia, Colombia, etc[16] as urban development projects. The JICA LRPs should strengthen a linkage with reconstruction process. One reason of that the reconstruction process was not regarded as important, may be that damaged countries had no system and expertise of LRPs.

The consensus building is not easy and takes a time due to complex rights relationship but the LRPs have advantages. The communities can maintain with the LRPs after a disaster, which would recover more rapidly from damages using the social network[5]. The LRPs rise the land value in Tokyo. The RPIC implemented the LRPs at a part of Mukojima area, which has a mixed land readjustment and no readjustment zone. The land price of readjustment was 250 to 340 thousand yen per square meter and one of no readjustment was 210 to 240 thousand yen in 2013 (Fig.4)[17]. Taito City in Tokyo improved the disaster prevention plaza in 2005 using the LRP. The plaza has a deep well, manhole emergency toilets and ovens. The road was widened to enable emergency vehicle pass (Fig 5)[18]. This LRP is small scale but is a good example in normal times.

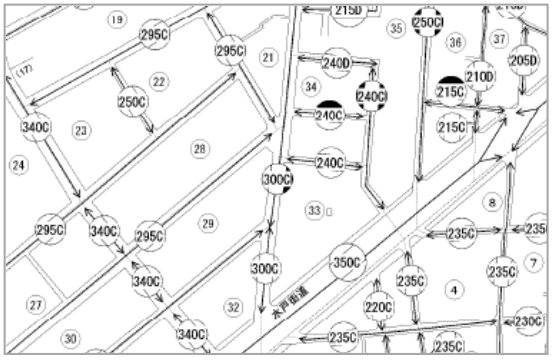

Fig.4 Land Assessments at Mukojima area

Fig. 5 Disaster Prevention Plaza and Deep Well against Disaster

(2) Disaster Education

Takafuji, Y. (2011)[19] examined a role of foklore to transmit disaster memory, which encouraged residents in Sumueulue Island of Indonesia to evacuate when earthquakes occured. Majority of residents in Simeulue island evacuated on hill at the time of the Sumatra Earthquake in 2004 and the number of the dead was only seven. The folklore of Smong, which means tsunami, has been handed down there. The tsunami memory is inherited. On the other hand the number of the dead in Nias island was 685, where no disaster memory was inherited through folklore or disaster education.

Yamaguchi, Y (1943)[20] reported that the damages at the time of Showa Sanriku Tsunami in 1933 were various among villages whether old villagers who had memory of tsunami at the time of Meiji Sanriku Tsunami in 1896 resided or not. One village where old villagers resided, was alert to the dangers of tsunami in the night when the earthquake occured and villagers evacuated on hills when the tsunami came at the time around 3 a.m.

Kanai, M. and Katada, T. (2011)[21] reviewed the evacuation at the time of Chile Earthquake Tsunami in 2010. The tsunami warning was issued on February 28, 2010 but only few residents have evacuated and the Tokyo Marathon was not canceled. One reason not to evacuate would be an effect of boy who cried wolf. The past repeated missed warnings reduced the credibility of warning system.

Even if anti-disaster facilities including warning system, sea wall and evacuation tower were installed, victims would not decrease without evacuation behavior. The disaster education at school in Kamaishi city gave us a valuable lesson. Teachers taught pupils three principles to survive from tsunami, which are: 1) not to be constrained by the assumption; 2) to do your best; and 3) to evacuate carelessly[8]. The pupils took lead in evacuating on their judgement. Their behavior promoted evacuation of neighbors.

The schools and parks developed by the RPIC could be good examples of the succession of disaster memory, disaster drills and practice of mutual assistance in communities. The communities have the infrastructure as disaster prevention shelter bases and need to dig up disaster memory of the GKE and inherit it through education so that people take evacuation actions. Japan has the experience of disaster education. The Fire of Rice Sheaves, the evacuation story at the time of the Ansei Earthquake Tsunami in 1854, was included in an elementary school textbook from 1937 to 1947 in Japan[22].

The JICA has assisted the disaster education at school (Table 3) and needs to use Japan's experience and improve the disaster education through a verification of the effects, which should be required by examining the evacuation behaviors when a natural disaster strikes.

(3) Preparations in Advance

The TMG prepared the first urban master plan in May 1921 including infrastructure improvement of roads, parks, schools, sewers, etc. The Tokyo Institute for Municipal Research[23] was established in February 1922, which was a neutral and independent research institute to advise and support the municipal governnance of Tokyo. The progress of urbanization required a legal system for urban planning and the Urban Planning Law was established in April 1919.

When the GKE occured on 1st September 1923, the TMG had the master plan, the law and expertise of urban planning by good fortune. The TMG prepared the RPIC in a short time following the master plan prepared in 1921. When JICA supported developing countries for disaster reconstruction, many of them didn't have a plan, a system or any expertise. Without them there would be a limit to full-scale reconstruction. JICA needs support to solve their difficulties. One measurement is to link urban planning cooperation with reconstruction cooperation. JICA could support for urban planning, system building of LRPs and capacity building in advance through the regular urban planning cooperation.

5. CONCLUSIONS

The paper discussed the LRPs, disaster education and preparation in advance as important countermeasures against reconstruction process. But many developing countires are assumed to have difficulties to implement these actions due to lack of a system, expertise and urban planning. At the present the JICA starts support for disaster reconstruction to developing countries after disaster occurs.

The paper proposes support the reconstruction related projects including the LRPs, disaster education and urban planning in normal times in disaster prone regions before disasters strike. The JICA has already supported them with the existing scheme of urban development[24] but the linkage should be strengthed between the disaster reconstruction and urban development. The disaster reconstruction projects must be useful in normal times too because developing countries would be difficult to bear the cost of facilities to utilize only in case of emergency.

Finally a mega-disaster would be considered as a

right time for a city to solve urban problems including disaster prevention as well as a traffic, housing and the environment and improve urban structure. Tokyo is a good example to reconstruct from the disaster and to retain very large infrastructure into modern era.

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(Received April 25, 2014)