評価調査結果要約表（英文）

<table>
<tr><td colspan="3">I. Outline of the Project</td></tr>
<tr><td colspan="2">Country: Republic of India</td><td>Project title: Project for Information Network for Natural Disaster Mitigation and Recovery</td></tr>
<tr><td colspan="2">Issue/Sector: Information and communication technology, Disaster management</td><td>Cooperation scheme: Technical cooperation</td></tr>
<tr><td colspan="2">Division in charge: JICA</td><td>Total cost: 478 million Yen</td></tr>
<tr><td rowspan="2">Period of Cooperation</td><td rowspan="2">R/D: 17 March 2010
Duration: July 2010 to June 2015 (5 years)</td><td>Implementation: Indian Institute of Technology, Hyderabad (IITH), other three Institutes of Technology, Indian Meteorological Department (IMD), and National Geophysical Research Institute, Hyderabad (NGRI)</td></tr>
<tr><td>Supporting Organization in Japan: None</td></tr>
<tr><td colspan="3">Related Cooperation: None</td></tr>
<tr><td colspan="3">1-1 Background of the Project
The Japan Science and Technology Agency (JST), the Japan International Cooperation Agency (JICA) and the Government of India have agreed to co-operate in implementing the Project for “Information Network for Natural Disaster Mitigation and Recovery in India”(hereinafter referred to as “the Project” or “the DISANET Project”). The director of IIT Hyderabad bears overall responsibility for the Project and is the chairperson of the Joint Coordinating Committee (JCC).
In order to carry out the Project successfully, four (4) different groups as follows, each with a defined set of the tasks, was identified which involve participation of multiple Indian and Japanese universities and agencies.

Group 1: Earthquake Disaster Risk Mitigation
Group 2: Weather Monitoring Platform
Group 3: Sustainable Communication Infrastructure
Group 4: ICT Platform and Resource Development for Emergency and Disaster Mitigation

Through the detailed planning and discussion in July and August, 2009, the Government of India and the Government of Japan agreed outline and components of the Project under the framework of JICA-JST Science and Technology Research Partnership Program (SATREPS). Record of Discussions (R/D) was signed by both sides on 17 March 2010, and the Project started with the formal inauguration by the Governor of Erstwhile Andhra Pradesh in July 2010. In November 2014, mostly a half year before the end of the Project, the Terminal Evaluation Team was delegated to India by JICA.

1-2 Project Overview
(1) Overall Goal
To strengthen research collaboration between India and Japan in the field of natural disaster prevention and information communication technology and to advance scientific knowledge and technology for resolving global issues such as natural disasters.</td></tr>
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(2) Project Purpose

1) To establish infrastructure for continuous data collection on earthquake and weather with global information network by applying it to India and Japan as example cases and to develop technical bases for rescue and support for restoration and for disaster recovery support.
2) To develop rapidly deployable, robust communications system that can be deployed during / after a natural disaster to provide voice, data, and video connectivity for emergency communications and relief work.

(3) Outputs

Output 1: Earthquake Disaster Risk Mitigation: Seismic Hazard Assessment through Sensor Networks and Vulnerability Studies
Output 2: Weather Monitoring Platform: Development of Weather Sensors and Analysis Platform
Output 3: Sustainable Communication Infrastructure: Emergency and Post-Disaster Communication System, Emergency Data Processing
Output 4: ICT Platform and Resource Development for Emergency and Disaster Mitigation: Development of Information Sharing Platform and Resources, Development of Advanced Disaster Management System

(4) Inputs

Japanese side:

Short term expert: 20 persons in total Equipment: 22.5 million JPY
Long term expert: 1 person (from November 2012 to present)
Local cost: 81 million JPY
Trainees received: 65 times of research activities and workshops in Japan

Indian side:

Counterpart: 51 persons
Local Cost: 5.7 million INR for installation works and others, and energy, cleaning, etc.
Land and Facilities: Offices, meeting rooms and others

II. Evaluation Team

Members of Evaluation Team	Leader: Hiroshi TAKEUCHI, Director, Team 1, Transportation and ICT Group, Infrastructure and Peacebuilding Department, JICA Evaluation planning: Jotaro TATEYAMA, Deputy Director, Team 1, Transportation and ICT Group, Infrastructure and Peacebuilding Department, JICA Research Evaluation: Yoshimori HONKURA, Professor emeritus, Tokyo Institute of Technology; Program Officer, Research Partnership for Sustainable Development Group, JST Research Evaluation: Katsuhiko MASUDA, Senior Staff, Research Partnership for Sustainable Development Group, JST Evaluation Analysis: Toyomitsu TERAO, Fisheries Engineering Co., Ltd	
Period of Evaluation	17 November 2014 to 4 December 2014	Type of Evaluation: Terminal evaluation

III. Results of Evaluation

3-1 Summary of Evaluation Results

(1) Relevance: high

The 12th Five Year Plan (2012–2017) prioritizes disaster management (Section 10.69) "to utilise our science and technology in disaster risk and warning communities well in advance to save life and property". Effective communication systems are also given priority and "have to be set up in all the levels to ensure timely and accurate dissemination of warning signals to vulnerable communities". In addition, in its "National Disaster Management Information and Communication System" (February 2012), NDMA directed requirements of ICT network during various phases of disaster; i.e., phase of mitigation, preparedness, response, and recovery. Main objective of the DISANET Project is to develop application of the advanced ICT on utilization of disaster relevant information, and hence can contribute to execute these national policies.

Furthermore, the Project is positioned to support IITH in the field of "Digital Communication", one of the five academic areas for cooperation planned in the IITH-Japan Collaboration Program (October 2008). For purpose of the support, the Project aimed at research and development of disaster management through utilization of ICT. Broader subjects of research were selected and researcher groups were organized from both IITH and other institutes. As a result, a variety of practical outcomes was produced. And a research interaction base was established between IITH and other institutes involved. This approach was appropriate for supporting IITH in scientific and academic development of ICT field.

(2) Effectiveness: high

The project purpose was achieved. All the Outputs contributed to the achievement of the project purpose respectively. Among others, research subjects were broadly adopted and researcher groups were organized from many institutes. As a result, in addition to progress of R&D of ICT in IITH, research infrastructures and outcomes have been developed in field of seismology and meteorology in some of other institutes. Through development of data network with cloud computing, cases of the advanced ICT utilization could alo be demonstrated not only to IITH but to other institutes involved.

The activities concerning earthquake disaster prevention and mitigation have recently come to cover assessment on strong ground motions in the target area. Utilization of the assessment for disaster management will possibly need further data acquisition. It should be noted, however, that the research has reached at such a practical stage within rather limited time. Provision of estimated scale of earthquake hazard to Group 4 from Group 1 implies opening of collaboration between these two groups. Emergence of such possibility of the collaboration increased an extent of the effectiveness of the Project.

(3) Efficiency: moderate

Through these five years, collaboration between the Indian researchers and the Japanese researchers has been extensively promoted. Equipment newly introduced by the Japanese side became available for studies without significant delay except AWS. Trip to the counterpart country by Indian and Japanese research groups were made mostly as scheduled. With regard to the project resource, the inputs were done as planned.

Deployment of AWS was delayed for the following reason. Procurement of AWS prerequired reservation of land with permission letters from landowners. Staff facilitating deployment of AWS was delayed. Thus,

the delay of the staffs caused the delay of deployment of AWS.

(4) Impacts: high

One of features of the Project is found in a process of building the disaster management information platform. The process is collaboration of the researchers of different discipline. Such collaboration produced a prototype of the disaster management information platform that provides all necessary information at different stages from disaster mitigation to recovery. Further interactions among the researchers participated, as well as continued development of the prototype by incorporating actual needs of the government officials in charge of disaster management, will promote its adoption as the system comes to more meet the society in India.

(5) Sustainability: high

Policy aspect: As shown in the 12th Five Year Plan (2012–2017) and "National Disaster Management Information and Communication System" (February 2012), application of the ICT for the disaster management is prioritized in the national policies in India. The policies for ICT and disaster management are expected to be continued in the future.

Institutional aspect: The research institutes that are expected to continue the activities of DISANET include varied institutes; namely, IITK, NGRI and IIITH for seismology and building health, IMD and IITH for AWS data network, IITM for emergency communication infrastructure, and IITH for disaster information platform. All these institutes are permanent organizations and engaged in provision of governmental or public service. These institutions started their effort to secure budgets to maintain equipment and to continue research after the end of the Project.

Technical aspect: The Project has opened a place for collaboration studies on the ICT application among IITH and other related institutes of India and Japan. It is expected that the researchers involved will continue scientific and academic interactions in this field.

3-2 Factors that promoted materialization of effects

(1) Outreach activities

In 2012 to 2014, Group 1 held an outreach symposium in the City of Chandigarh, and performed outreach activities such as workshops and exercises at schools in neighboring areas. In July 2014, the demonstration focused mainly on the outcomes from Group 3 (Communication Infrastructure) was held at Chennai. In the following week, the demonstration for all four groups was held at Hyderabad, and participated by central and municipal government, police and railway companies assigned to disaster management. These illustrate outreach activities conducted by the Project. In addition, the Project made a presentation on the outline and achievement of the Project to NDMA in January 2014. This is a great step for a nationwide dissemination of the disaster management information system developed by the Project.

(2) Expansion of the Indian research groups

In view of a long term, DISANET is positioned to support one of the five academic areas that were identified to implement "IITH-Japan Collaboration Program" (October 2008). In a course to implement the DISANET Project, research collaboration network between IITH and other institutes such as IIITH, IITK, IITM, IMD, NGRI in the field of seismology, weather monitoring or disaster management information system has been established. Expansion of the research targets has strengthened the effectiveness of the Project.

(3) Collaboration among the research groups

It was recommended in the Mid-term Review that the cooperation among groups should be accelerated. Now, the sensor data network has been established, and the data are collected in the unified format to the platform of G4. G2 developed vibration sensor material according to the request of G1. Furthermore, groups jointly hold workshops or other outreach activities. Such collaboration among the research groups has also strengthened the effectiveness of the Project.

3-3 Factors that impeded materialization of effects

(1) Delay in data acquisition of AWS network

The Mid-term Review indicated delay in developing technical specifications and followed deployment works for Vaisala-type AWS. Afterwards, the deployment was accelerated and completed of the 18 sites, and the micro-scale weather observation in Hyderabad started. However, data acquisition is still insufficient and it will be needed to accumulate the weather data further more for analysing the city-scale weather phenomenon.

3-4 Conclusion

The studies of the DISANET Project for seismology and building health have reached the assessment of earthquake hazards at the target area in Indo-Gangetic Plain. The city-wide weather monitoring at Hyderabad has also been successfully able to observe behaviour of local heavy rain. The communication infrastructure and information platform to obtain and disseminate selected disaster information has been developed for use of the societies in India. For continuing the data acquisition even after the Project, the Indian research groups have already paid due regard to efforts for securing funds available to operate and maintain the observation instruments. Considering these developments in the last five years, the Evaluation Team concludes that it is pertinent that the Project be terminated as planned.

3-5 Recommendations

3-5-1 Actions toward the end of the Project

(1) In the course of developing a prototype of AWS network with dense granularity, the Group 2 researchers explored several types of AWS deployment designs. At several places, installation of Vaisala-type AWS is still experimental. For instance, several boxes are exposed outdoor without countermeasures against water and dust. At the time of implementation, they need to be installed properly with counter measure against water and dust.

3-5-2 Actions after the end of the Project

(1) Realizing effectiveness of densely deployed AWS for city-wide disaster forecast, IMD Hyderabad is going to examine compatibility of data attained from Vaisala-type AWS with those from WMO-standard AWS. Once the compatibility is confirmed, it is recommended that both IMD Hyderabad and IITH report and advertise Vaisala-type AWS on its effectiveness to related authorities in order to enhance capacity of weather observation for disaster mitigation.

(2) It is difficult to climb the towers of WMO-standard AWS for a maintenance purpose. At the time of maintenance of equipment attached to towers such as anemometers, it is recommended to set up scaffolding so that workers can safely do maintenance work.

3-6 Lessons learnt

(1) In the Project, Group 3 conducted a workshop to advertise outcome of its research activities, which caused inquiry from participants. Group 2 demonstrated data collected from densely deployed Vaisala-type AWS, which facilitated IMD officials to understand effectiveness of deployment with dense granularity. Even if certain technology is still under development, its demonstration to those who are expected to implement can facilitate its application.

(2) Each sensor network is designed to be equipped with common data format and communication protocol so that data obtained from different sensor network can be integrated into the portal site developed by Group 4. At a meeting at Ministry of Telecommunication, ministerial officials expressed their interest in incorporating AWS network developed by Group 2 to Smart City planned in Hyderabad. In other words, AWS network has become common platform for application in relevant field. When there is a new Project introducing a new IT system, it is advised to design and build a system making use of as much standardized specification and format so that data obtained can be utilized organically.