Internal Ex-Post Evaluation for Technical Cooperation Project

conducted by Iran Office: October, 2019

| Country Name | **[Phase 1] Establishment of Emergency Response Plan for the First 72 Hours after an Earthquake** |
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| Islamic Republic of Iran | **[Phase 2] Capacity Building for Earthquake Risk Reduction and Disaster Management in Tehran** |

**I. Project Outline**

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| Background | The capital city of Tehran is located in one of the world's most active seismic belts and has sustained repeated substantial damages due to high magnitude earthquake activities. JICA conducted two development studies, namely, "The Study on Seismic Micro-zoning of the Greater Tehran Area in the Islamic Republic of Iran" (1998-2000) and "The Comprehensive Master Plan Study on Urban Seismic Disaster Prevention and Management for the Greater Tehran Area in the Islamic Republic of Iran" (2002-2004) (hereafter "the development study project in 2002-2004") that developed the "Tehran Disaster Management Master Plan (TDMMP)." Based on the study results, the Tehran Municipality developed an emergency response plan titled "Tehran Comprehensive Emergency Management Plan (TCEMP)" in 2003.<br>Phase 1 of this project was implemented to build the capacity of Tehran Disaster Mitigation and Management Organization (TDMMO) to implement the TCEMP, and the Outputs including a quick damage and loss estimation (QD&LE) system were produced. However, while the Tehran Municipality needed to establish a structure for taking initial action based on the information from the QD&LE system, it still lacked know-hows on such as of road management in an emergency situation and awareness of the community of civil participation in community disaster management. |
| Objectives of the Project | **[Phase 1]**<br>Through improving the emergency response command system, developing and operating the QD&LE system and improving the emergency evacuation plan and capacity, the project aimed to improve the emergency response plan and capacity for the priority activities for the first 72 hours after an earthquake in Tehran, thereby improving the 72-hour emergency response capacity in Tehran as a whole.<br>1. Overall Goal: Capacity for emergency response for the first 72 hours after an earthquake in Tehran is continually improved.<br>2. Project Purpose: The emergency response plan and capacity for the priority activities for the first 72 hours after an earthquake in Tehran are improved.<br><br>**[Phase 2]**<br>Through improving TDMMO's capabilities in the three areas, namely, road management, community-based disaster management and early warning against earthquake disaster, the project aimed to improve Tehran Municipality's preparedness for response against earthquake disaster in these three areas, thereby improving the municipality's integrated preparedness for earthquake disaster.<br>1. Overall Goal: Integrated preparedness for response of Tehran Municipality against earthquake disaster is improved.<br>2. Project Purpose: In the three areas of road disaster management, community disaster management and early warning, preparedness for response against earthquake disaster of Tehran Municipality is improved. |
| Activities of the Project | 1. Project Site:<br>**[Phase 1] [Phase 2]** Tehran Municipality<br>2. Main Activities:<br>**[Phase 1]** Stage 1 (preparation period) - survey and preparation of the contents of Stage 2. Stage 2 (implementation period) - planning for and pilot operation of the Emergency Response Command Center (ERCC); design, training, and operation of QD&LE system; development and training of the evacuation system; preparation of related guidelines; etc.<br>**[Phase 2]** Upgrading the emergency road networks (ERN) and prepare related plans/instruction; upgrading the existing master plan on public training and awareness for the earthquake disaster management including the short-term action plans; preparing the concept, operation plan, etc. for the disaster management museum; improving the earthquake early warning system (EEWS) including the QD&LE system; drills; workshops/seminars; etc.<br>3. Inputs (to carry out above activities)<br>**[Phase 1]**<br>Japanese Side<br>1) Experts: 18 persons<br>2) Trainees received: 25 persons<br>3) Equipment: Seismometers, server, PCs, printers, etc.<br>4) Local cost<br>Iranian Side<br>1) Staff allocated: 47 persons<br>2) Project office and facilities<br>3) Installation of the seismometers<br>4) Local cost including hiring of local agents<br>**[Phase 2]**<br>Japanese Side<br>1) Experts: 16 persons<br>2) Trainees received: 26 persons<br>3) Equipment: GIS software, printers, GPS receivers, accerometer, etc.<br>Iranian Side<br>1) Staff allocated: 12 persons<br>2) Project Office<br>3) Local cost |

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| | 4) Local cost | | |
| Project Period | **[Phase 1]**<br>November 2006 – March 2010<br>(Extended period: April 2009 – March 2010)<br>**[Phase 2]**<br>April 2012 – October 2015<br>(Extended period: March 2015 – October 2015) | Project Cost | **[Phase 1]**<br>(ex-ante) 320 million yen, (actual) 345 million yen<br><br>**[Phase 2]**<br>(ex-ante) 370 million yen, (actual) 445 million yen |
| Implementing Agency | **[Phase 1] [Phase 2]** Tehran Disaster Mitigation and Management Organization (TDMMO) | | |
| Cooperation Agency in Japan | **[Phase 1] [Phase 2]** Oriental Consultants Co., Ltd., OYO International Corporation | | |

**II. Result of the Evaluation**

< Special Perspectives Considered in the Ex-Post Evaluation >

- We evaluated the two phases together in the following way: for Relevance, evidence was confirmed for each phase, based on which the two phases were evaluated as combined; for Effectiveness/Impact, the status of achievement of the project objectives were judged for each phase, based on which the two phases were evaluated as combined; for Efficiency, each phase was evaluated, based on which the two phases were evaluated as combined; for Sustainability, the two phases were evaluated as combined.

1 Relevance

<Consistency with the Development Policy of Iran at the Time of Ex-Ante Evaluation and Project Completion>

**[Phase 1] [Phase 2]** Both Phase 1 and Phase 2 projects were consistent with the TCEMP mentioned in "Background" above throughout the ex-ante evaluation and project implementation period. Also, the "Fifth Iranian Five-year Development Plan" (2011-2015) addressed the prevention and mitigation, including earthquakes.

<Consistency with the Development Needs of Iran at the Time of Ex-Ante Evaluation and Project Completion >

**[Phase 1] [Phase 2]** After the occurrence of a large-scale earthquake of magnitude 6.3 in Bam City on December 2003, the necessity of improving the emergency response system immediately after an earthquake was strongly recognized. Capacity development for the implementation of the TCEMP was needed, as mentioned in "Background" above, and such needs continued throughout both phases. At the time of completion of the Phase 2 project, the TDMMO was still playing the central role in planning for disaster management and risk reduction.

<Consistency with Japan's ODA Policy at the Time of Ex-Ante Evaluation>

**[Phase 1]** In the economic cooperation policy dialogue in 1999, Iran and Japan agreed to make the following priority areas: 1) expansion of agricultural production, 2) vocational training, 3) support for market economy transition, 4) improvement of environmental conservation and public health, and 5) water supply.[1] In its country assistance policy in 2004, JICA included urban safety (disaster prevention) as a sub-issue of the cooperation in the area of the environment.

**[Phase 2]** One of the priority areas of Japan's assistance for Iran as of the fiscal year 2011 was "disaster prevention (earthquake disaster prevention)".[2]

<Evaluation Result>

**[Both phases]** In light of the above, the relevance of Phase 1 and Phase 2 projects as combined is high.

2 Effectiveness/Impact

<Status of Achievement of the Project Purpose at the time of Project Completion>

**[Phase 1]** The Project Purpose of improving the emergency response plan and capacity for priority activities was achieved by the time of project completion. The project developed and updated the QD&LE system, which was put into operation at the TDMMO's Tehran Disaster Management Headquarters (TDMH) (Indicator 1) and used in drills for the operation of the emergency response command system (Indicator 2). The emergency evacuation system practiced in the two pilot districts were institutionalized in these districts (Indicator 3).

**[Phase 2]** The Project Purpose of improving the TDMMO's capabilities in three areas was achieved by the time of project completion. Regarding road management, the ERN-related plans were formulated and shared with related organizations (Indicator 1). Regarding community-based disaster management, short-term action plans were formulated and implemented (Indicator 2). As for early warning against earthquake disaster, the project installed four earthquake early warning (EEW) stations installed and confirmed good communication between each of them and the TDMMO (Indicator 3).

<Continuation Status of Project Effects at the time of Ex-post Evaluation>

**[Phase 1]** The project effects have continued to the time of ex-post evaluation. The QD&LE system is fully operational online, and two drills are conducted every year using the QD&LE software. Emergency evacuation maps are available to citizens in all of the 22 districts in Tehran Municipality.

**[Phase 2]** The project effects have partially continued to the time of ex-post evaluation. Regarding road management, the status of ERN-related plans formulated by the project is mixed, i.e., some plans such as the seismograph installation plan have been completed during the project period, some such as the seismic-resistant plan of ERN has been approved and executed to date, and some such as annexes to transportation of Tehran Emergency Response Plan including the operation and maintenance (O&M) plan of ERN are still

[1] ODA Country Data Book (2006)
[2] ODA Country Data Book (2012)

under TDMMO's approval process. Regarding community-based disaster management, training for schools (students, parents, principals, teachers and staffs), firefighters, volunteers, citizen of Tehran, public companies including electricity, water, sewerage and gas company, Mayors and managers of districts and areas municipalities of Tehran (22 districts and 134 areas) were conducted.

The disaster management museum that was planned under the project did not materialize due to lack of budget. As for the early warning, while the EEW stations installed are still in operation, one of them sometimes has communication failures due to troubles with radio equipment. The TDMMO has a plan to establish a backup communication system (for example, 4G) to increase system stability. Also, TDMMO has a plan to increase EEW seismic stations in around Tehran and, in the 1st development phase, bought 22 seismographs in 2019.

<Status of Achievement for Overall Goal at the time of Ex-post Evaluation>

**[Phase 1]** The Overall Goal of improving the emergency response capacity in Tehran has been achieved by the time of ex-post evaluation. Among the priority areas mandated for the TDMMO, the emergency response planning framework for other areas than those supported by this project has been drafted and is in under the process of reviewing and approval (Indicator 1). The ERCC (piloted under this project) is operational in recent disaster occurrence (Indicator 2). All neighborhoods (mahalehs) have evacuation maps that are available for all citizens (Indicator 3). QD&LE system is updated and maintained by TDMMO (Indicator 4).

**[Phase 2]** The Overall Goal of improving Tehran Municipality's integrated preparedness for earthquake disaster has been partially achieved by the time of ex-post evaluation. Revision of the Comprehensive Master Plan on Urban Seismic Disaster Prevention and Management for the Greater Tehran area (prepared under the development study project in 2002-2004 and known as the TDMMP), expectedly incorporating the results of this project, has not taken place yet (Indicator 1), although most of the priority actions to be incorporated in the revised master plan have been implemented as mentioned above (Indicator 2).

<Other Impacts at the time of Ex-post Evaluation>

**[Both phases]** No negative impacts of the project in both phases have been observed. Other positive impacts than already mentioned include the following. (1) Both phases contributed to the development of seismology in Iran. By the cooperation between the Building and Housing Research Center and the TDMMO, the development of seismographs for the QD&LE system has been followed up. Also, cooperation between the TDMMO and Tehran Province Gas Company for installing additional seismographs for the QD&LE system and the gas shutdown system has been followed up. The results of such cooperation have increased seismic data and system accuracy. (2) The results of both phases are a good sample to extend to other cities and also national policymakers: a plan has been sent to the provinces of the country to be implemented as a model based on the risks of each province. TDMMO has been awarded the 1st prize of the 4th Tehran Golden Adobe Global Award on 31st of October, 2019 for two projects, Earthquake Early Warning System and Emergency Roads Network, that were joint projects between TDMMO and JICA. It represents the effective output of past cooperation between TDMMO and JICA. Also, the Emergency Roads Network Project won in Urban Innovation Project in 2019.

<Evaluation Result>

**[Both phases]** Therefore, the effectiveness/impact of Phase 1 and Phase 2 projects as combined is high.

**[Phase 1]** Achievement of Project Purpose and Overall Goal

| Aim | Indicators | Results |
|---|---|---|
| (Project Purpose)<br>The emergency response plan and capacity for the priority activities for the first 72 hours after an earthquake in Tehran are improved. | Indicator 1: QD&LE system is incorporated into the overall framework of emergency response command system. | Status of the Achievement: achieved (continued)<br>(Project Completion)<br>The newly developed QD&LE system was put into operation at the TDMH.<br>(Ex-post Evaluation)<br>The system is fully operational online. |
| | Indicator 2: Drills for operation of emergency response command system are implemented utilizing improved version of QD&LE software at least once by the end of the project. | Status of the Achievement: achieved (continued)<br>(Project Completion)<br>Revisions of the QD&LE software have been repeatedly done. A drill for the operation of the emergency response command system was conducted in November 2009 utilizing the 3rd version of the software.<br>(Ex-post Evaluation)<br>Two drills per year are conducted every year from 2011 to 2018 using the QD&LE software. The TDMMO has planned and started to implement the updating of the software by contract with Khaje Nasir University (to which the Phase 1 project commissioned the development of the QD&LE system). |
| | Indicator 3: Emergency evacuation system is institutionalized at least in two pilot districts. | Status of the Achievement: achieved (continued)<br>(Project Completion)<br>The two pilot districts where the project conducted evacuation drills had already positioned the practiced system as the districts' evacuation system.<br>(Ex-post Evaluation)<br>Emergency evacuation maps of all neighborhoods are published and are available to the citizens in all of the 22 districts in Tehran Municipality. |
| (Overall Goal)<br>Capacity for emergency response for the first 72 hours after an earthquake in Tehran is continually improved. | Indicator 1: Emergency response planning framework for other priority areas mandated for TDMMO is prepared. | (Ex-post Evaluation) achieved<br>There are 14 Technical Working Groups in the TDMMO with the same titles of those exist at the national level in the Ministry of Interior (MOI). For each of them, the emergency response planning framework has been drafted and is under the process for review and approval. Among them, this project supported the emergency response planning framework for damage estimation (QD&LE), evacuation, and the ERCC (the |

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| | | Phase 2 project additionally supported telecommunication, traffic, and community activities). |
| | Indicator 2: Emergency Response Command Center (ERCC) is made fully functional by TDMMO. | (Ex-post Evaluation) achieved<br>The ERCC has been functional in the Malard Earthquake in 2016 and the recent flood in 2018. |
| | Indicator 3: Evacuation maps are prepared and distributed to the residents for at least another five (5) mahalehs. | (Ex-post Evaluation) achieved<br>Prepared and distributed to all mahalehs. |
| | Indicator 4: QD&LE system is updated and maintained by TDMMO. | (Ex-post Evaluation) achieved<br>The soil is updated. Updating the building, population, and fragility curves are in the process. The QD&LE scenario outputs are used to conduct drills. |

Source: Terminal Evaluation Report; Interview with and data provided by the TDMMO; Site visit

**[Phase 2]** Achievement of Project Purpose and Overall Goal

<table>
<tr><th>Aim</th><th>Indicators</th><th>Results</th></tr>
<tr><td rowspan="3">(Project Purpose)<br>In the three areas of road disaster management, community disaster management and early warning, preparedness for response against earthquake disaster of Tehran Municipality is improved.</td><td>Indicator 1: Plans formulated in the project are shared with related organizations in the existing technical committees.</td><td>Status of the Achievement: achieved (continued)<br>(Project Completion)<br>The plans (see the table below) were formulated involving, as the emergency traffic and transportation committee members, related organizations including relevant Deputies of Tehran Municipality, relevant departments in districts, traffic police and lifeline companies.<br>(Ex-post Evaluation)
<table>
<tr><th></th><th>Approved in</th><th>Situation at the time of ex-post evaluation</th></tr>
<tr><td>The seismic-resistant plan of ERN</td><td>2015</td><td>TDMH is executing the plan.</td></tr>
<tr><td>Annexes to transportation of Tehran Emergency Response Plan (including the operation and maintenance plan of ERN)</td><td>2017</td><td>Based on the evacuation map project established, 30 pilot points and 30 sites were selected with collaboration with Traffic Deputy of Tehran Municipality and under operation currently.</td></tr>
<tr><td>Draft Instructions for design and construction of structures, lifelines and buildings adjacent to ERN</td><td>Each executive agencies and ministries approving individually.</td><td>TDMH presented all criteria (building, lifeline) to relevant stakeholders. All the stakeholders are utilizing accordingly.</td></tr>
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<tr><td>Indicator 2: Short term action plans (from 2 to 3 years) in the improved master plan on public training and awareness for the earthquake disaster management are achieved.<br><br>(Note) We interpreted the term “achieved” as “implemented” considering the project period.</td><td>Status of the Achievement: achieved (continued)<br>(Project Completion)<br>The one-year action plans were implemented. Detailed planning and budgeting took place for the 2 to 3-year action plans.<br>(Ex-post Evaluation)<br>Implementation of the short-term action plans include the followings.<br>1.Schools all over the country including officials and staff.<br>2.Firefighting Organizations of Tehran and other cities throughout the country.<br>3.Volunteer citizens and firefighters in Tehran city<br>4.Citizens of Tehran, depending on the demand and capacity of each neighborhood. Training is being conducted in public places and buildings such as parks, mosques, etc.<br>5.Disaster management authorities of Tehran province and other cities throughout the country.<br>6.Disaster management authorities of lifeline companies of Tehran province and other cities throughout the country, such as electricity co. Water and sewerage co. Gas co. etc.<br>7.Mayors and managers of districts and areas municipalities of Tehran (22 districts and 134 areas)</td></tr>
<tr><td>Indicator 3: Communication systems of early warning are functioned.</td><td>Status of the Achievement: achieved (continued)<br>(Project Completion)<br>The communication network between the four EEW stations installed by the project and TDMMO was established and tested with good results (e.g., the packet loss ratio being 0% at best (TDMMO and EEW-2) and 0.00462% at the worst (TDMMO and EEW-1).<br>(Ex-post Evaluation)<br>The four EEW stations are in operation, but radio communication sometimes fails at one of them. And TDMMO has planned to upgrade the communication system.</td></tr>
<tr><td>(Overall Goal)<br>Integrated preparedness for response of Tehran Municipality against earthquake disaster is improved.</td><td>Indicator 1: Comprehensive Master Plan on Urban Seismic Disaster Prevention and Management for the Greater Tehran area is revised based on the outputs of the project.</td><td>(Ex-post Evaluation) not achieved<br>It has not been revised yet. Revision is planned during the upcoming JICA technical cooperation Project with JICA, which is to be implemented once an agreement between the two governments is concluded.</td></tr>
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| | Indicator 2: Priority actions following the master plan are implemented. | (Ex-post Evaluation) achieved<br>Most of the priority actions of the existing master plan (TDMMP) have been taken or followed up. These are to be incorporated in the revised master plan. |

Source: Project Completion Report; Interview with and data provided by the TDMMO; Site visit

3 Efficiency

**[Phase 1]** Both project cost and project period exceeded the plan (ratio against the plan: 108% and 137%, respectively). The period of Stage 2 (implementation period) was extended as a result of discussion during Stage 1 (preparation period). Therefore, the efficiency of the project is fair.

**[Phase 2]** Both project cost and project period exceeded the plan (ratio against the plan: 120% and 123%, respectively). The project period was extended due to a delay in procurement of equipment as the project had to change the model and specification of some equipment in response to the tightened international sanctions on Iran. Therefore, the efficiency of the project is fair.

**[Both phases]** The efficiency of Phase 1 and Phase 2 projects as combined is fair.

4 Sustainability

<Policy Aspect>

**[Both phases]** The "Sixth Five-year Development Plan of the Islamic Republic of Iran" (2018-2022) sets out the obligation of national government organizations, municipalities, and other stakeholders to take measures for earthquake risk reduction.

<Institutional Aspect>

**[Both phases]** The interview with them at the time of ex-post evaluation found that the TDMMO has a strong organizational structure. Besides, the TDMMO maintains a cooperative relationship with other organizations including Khaje-Nasir University (to which the Phase 1 project commissioned the development of the QD&LE system) and the Tehran Seismographic Network. Howver TDMMO is hoping to have more staff members involved for the task, although the decision is in the Municipality's hand and the TDMMO cannot increase the human resources.

Organizations related to the tasks in the areas supported by the Phase 1 and Phase 2 projects

| Tasks | Name of responsible organization/unit | No. of staff allocated |
|---|---|---|
| (i) Early warning / QD&LE | TDMMO | 3 |
| (ii) Evacuation | TDMMO and 22 municipality districts | 2 (TDMMO) |
| (iii) Telecommunication | TDMMO, Iran communication regulatory, Tehran municipality information and communication organization | 4 (TDMMO) |
| (iv) Traffic (ERN) | TDMMO, TDMH, police, Traffic deputy | 2 (TDMMO) |
| (v) Community activities/ education | Fire Fighting Organization & Emergency Medical Services | 400 |
| (vi) ERCC (command center) | TDMMO and 22 municipality districts | 18 |
| (vii) Disaster Management Museum | TDMMO, District 22 | 3 (TDMMO) |

Source: TDMMO

<Technical Aspect>

**[Both phases]** We have interviewed four staff members from the TDMMO and found that they had full knowledge and ability to maintain the training and the QD&LE system. Although there is no institutional training at the TDMMO, all of the counterpart personnel of the projects still work at the TDMMO, and most of the master trainers developed under the projects are still available. Also, TDMMO's advisors are helping TDMMO staff receive technical training. The EEW stations are generally well maintained by TDMMO staff. Some spare parts are unavailable due to the current circumstances; however TDMMO is finding ways to get their necessary parts.

<Financial Aspect>

**[Both phases]** The TDMMO receive its budget (USD10,000 in 2016, USD10,000 in 2017 and USD20,000 in 2018) from Tehran Municipality. According to the TDMMO, the amount of the budget is not enough, and thus it requests more budget to the municipality, but the amount they receive is not enough due to limitations of the municipal budget.

<Evaluation Result>

**[Both phases]** In light of the above, some problems have been observed in terms of the institutional and financial aspects of the implementing agency. Therefore, the sustainability of the effectiveness through Phase 1 and Phase 2 project as combined is fair.

5 Summary of the Evaluation

Both Phase 1 and the Phase 2 projects achieved the respective Project Purposes (improved capabilities of the TDMMO in emergency response and earthquake disaster risk reduction in Tehran) by the time of project completion. The effects of the Phase 1 project such as the QD&LE system and emergency evacuation system have continued or further expanded to the time of ex-post evaluation, which has led to the achievement of the Overall Goal (improvement of TDMMO's emergency response). Regarding the Phase 2 project, the effects have been partially continued with some weaknesses in community-based disaster management activities while other activities such as road management and early warning have continued or further expanded. The Overall Goal has been partially achieved mainly due to the delayed revision of the 2004 master plan.

Regarding the sustainability for both phases, some problems were observed in the institutional and financial aspects mainly due to lack of personnel and budget, while the relevant policy and the technical capacity are well secured. As for the efficiency, both project cost and project period exceeded the plan in both Phase 1 and the Phase 2 projects.

Considering all of the above points, this project (Phase 1 and Phase 2 as combined) is evaluated to be satisfactory.

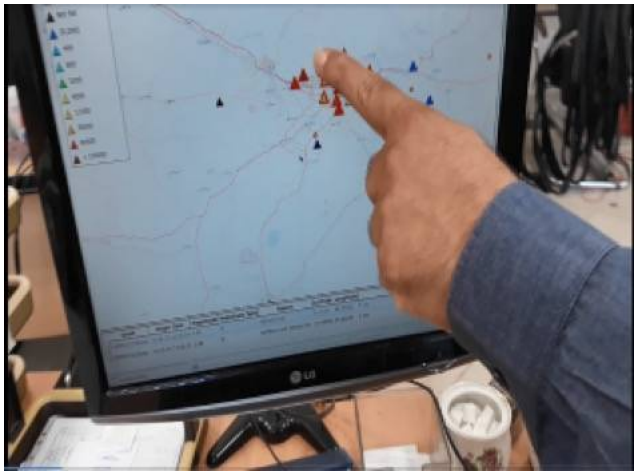
### III. Recommendations & Lessons Learned

Recommendations for Implementing Agency:

- In 2021, the TDMMO is recommended to ask the Tehran Municipality to secure more budget and human resources.

Lessons Learned for JICA:

- If a project plan to establish any buildings, centers, or museums and expects it to be established by the implementing agency after project completion, JICA should consider conducting feasibility study at the time of starting of the project particularly if implementing agency could secure necessary funding.
- Regarding the expert team, the capacity, knowledge, specialty, and ability are depending on the consultant company. TDMMO suggested to compose of consultant teams considering necessary expertises.



QD&LE System are under operation at TDMMO

Accelerometers were all under operational and maintained properly by TDMMO

Accelerometer's room (locked and supervised by TDMMO)

Accelerometer's room (Inside)



Samples of ERN traffic signs