TO CR of JICA MYANMAR OFFICE

PROJECT MONITORING SHEET

Project Title: Development of a Comprehensive Disaster Resilience System and Collaboration Platform in Myanmar
Version of the Sheet: Ver.8（Term: April, 2019 - September, 2019）

Name: DG of MoHE
Title: Project Director
Name: Kimiro Meguro
Title: Principle Investigator
Submission Date: 9 March 2020

I. Summary

1 Progress

1-1 Progress of Inputs

(1) Input by Japanese side

a) Dispatch of experts
Total number of dispatch of experts is 34 during this monitoring term. Details are as shown in Table 1. (Note: student members and researchers travelled with another budget are not included in this list)

Table 1. List of dispatched researchers

Name		#	Period (From / To)		Purpose
Disaster Management Group (5 total)					
	Kimiro Meguro (L)	1	2019/07/16	2019/07/21	Meeting (YTU), 3rd Preparation meeting for Consortium, Student Seminar
		2	2019/09/25	2019/10/02	Meeting (YTU), Student Seminar, JST workshop
	Muneyoshi Numada (SL)	1	2019/5/12	2019/5/16	Implementation of GAD training for Lanmadaw, Latha and Pabedan
		2	2019/08/05	2019/08/09	Implementation of GAD training for Kyauktada and Botahtaung Township
		3	2019/09/29	2019/10/02	Meeting (YTU)
Water-related Disaster Group (8 total)					
	Akiyuki Kawasaki (L)	1	2019/05/26	2019/05/28	Meeting (YTU, HydroInformatics Center)
		2	2019/06/12	2019/06/18	Field (Bago), Meeting (YTU, GAD), Implementation of Join Workshop
		3	2019/07/07	2019/07/10	Technical meeting on satellite rainfall product (GSMaP) and Probablic Rainfall Density Evaluation, High-level meeting on Data Integration for Flood Risk Reduction
	B.Seemanta Sharma	1	2019/04/01	2019/04/11	Field (Bago), Meeting (YTU)
		2	2019/07/06	2019/07/10	Technical meeting on satellite rainfall product (GSMaP) and Probablic Rainfall Density Evaluation, High-level meeting on Data Integration for Flood Risk Reduction
		3	2019/09/25	2019/10/02	Meeting (YTU),Student Seminar, JST workshop
	Daisuke Komori	1	2019/07/06	2019/07/09	Technical meeting on satellite rainfall product (GSMaP) and Probablic Rainfall Density Evaluation, High-level meeting on Data Integration for Flood Risk Reduction
	A. Ralph Allen (SL)	1	2019/04/01	2019/04/11	Field (Bago), Meeting (YTU)
Infrastructure Group (5 total)					
	Koji Matsumoto (SL)	1	2019/07/24	2019/07/27	Meeting (YTU), Investigating of bridge (Twantay)
		2	2019./09/29	2019/10/02	Meeting (MoC)

	Jiradilok Punyawut	1	2019/05/13	2019/05/17	Making Casting of concrete test specimens
		2	2019/07/24	2019/07/27	Meeting (YTU), Investigating of bridge (Twantay)
		3	2019/09/25	2019/09/29	JST workshop
RS/GIS Group (4 total)					
	W.Takeuchi (L)	1	2019/06/10	2019/06/15	Lecture (YTU)
		2	2019/06/25	2019/06/28	Lecture (YTU), Principle and application of remote sensing
		3	2019/07/16	2019/07/18	Meeting (YTU), 3rd Preparation meeting for Consortium, Student Seminar
		4	2019/09/26	2019/10/03	JST workshop, Meeting (YTU)
Transport & Human Mobility Group (6 total)					
	Y.Sekimoto (L)	1	2019/05/01	2019/05/04	Meeting (YTU, ALMEC, YRTA)
		2	2019/08/07	2019/08/10	Meeting (YTU, YRTA)
		3	2019/09/25	2019/09/28	JST workshop
	Ko Ko Lwin (SL)	1	2019/07/15	2019/07/25	Meeting (YTU), 3rd Preparation meeting for Consortium, Student Seminar
		2	2019/09/13	2019/10/05	YTU WebGIS (Geospatial Dashboard) installation, JST workshop, Student Seminar
	K. Kashiyama	1	2019/08/07	2019/08/12	Meeting (YTU, YRTA)
Earthquake-related Disaster (Building) Group (6 total)					
	Mikio Koshihara,	1	2019/05/14	2019/05/18	Heritage WS, Meeting (YTU)
	T. Ikeda	1	2019/05/19	2019/05/27	Microtremor survey, Meeting (YTU)
	Tomoko Matsushita	1	2019/05/12	2019/05/23	Heritage WS, Meeting (YTU), 3D image processing
		2	2019/07/16	2019/07/26	Meeting (YTU), 3rd Preparation meeting for Consortium, Student Seminar, U-doppler & Microtremor Training
		3	2019/09/22	2019/10/06	JST workshop, Student Seminar, Meeting (YTU)
	Chaitanya Krishna Gadagamma	1	2019/07/17	2019/07/24	U-doppler & Microtremor Training

*(L): Group leader, (SL): Sub group leader

b) Training Course in Japan

No training course was provided in Japan during this monitoring term.

c) International Conference / Meeting

2 members of The Project from Myanmar side attended international conferences. Details are shown in Table 2.

Table 2. Conference and attendees

No.	Conference Detail	Attendee name	Title	Affiliation
1	Redesigning Transport & Logistics for the Rise of Asia (EASTS Conference 2019) Colombo, Sri Lanka 9-12 September, 2019	Daw Kyaing	Assoc. Professor	Dept of Civil Engineering, YTU
		Thiri Aung	PhD Student	Dept of Civil Engineering, YTU

d) Provision of equipment

No equipment was provided during this term.

e) Local cost for the activity of Japanese experts

The Project spent local cost for the activities of Japanese experts such as airfare, travel allowance, vehicle, and so on.

(2) Input by Myanmar side

a) Assignment of project members
The Myanmar side continued to assign the same project members as shown in Annex “List of project members”.

b) Provision of Project space, necessary equipment and expenses
- YTU continued to provide office space for the Project.
- YTU continued to pay for the utility such as electricity and water for the Project space and for some consumable goods.
- No expenses were spent for receiving equipment as no equipment was provided.

c) Coordination
YTU Coordinated with DOHE to obtain multiple re-entries VISA for Japanese experts.

1-2 Progress of Activities

Progress of activities during this monitoring term is summarized as follows.

■ **Activity 1-1: Develop hydrological and flood inundation model of study area**
- Completed in March 2019.
- **Activity 1-2: Establish Earthquake vulnerability assessment method and create of Yangon digital map database**
- **(Activity 1-2-2)** Construction of the fragility curve for normal timber structures, stilt houses and bamboo houses are in progress.
- **(Activity 1-2-3)** Microtremor measurement has been conducted in Yangon City in May 2019 in order to make an amplification factor map. Negotiation and coordination with concerned parties to acquire ground data (borehole data) is still on-going.
- **(Activity 1-2-4)** Completed.
- **(Activity1-2-5)** Heritage Workshop with YTU Architecture students was conducted on 13-17 May 2019 to survey a historical residential building as a part of field curriculum for Undergraduate Architecture students. Certificate of Participation was given to the participants who learned how to conduct building survey using simple tools as well as equipment such as 3D scanner.
- (Activity 1-2-6) The integrated digital map is updated as new data is added.
- An integrated database has already been built on WebGIS platform.

■ **Activity 1-3: Development of urban development model in survey area**
- **(Activity 1-3-1)** Completed in May 2018.
- **(Activity 1-3-2)** Traffic monitoring of taxi and recording of the movements is continuing.
- Additional work was done in response to a request from YRTA to carry out a fixed point observation using a camera to extract the traffic flow at the road intersection and the number of cars automatically, with a cooperation of the Traffic Control Center.
- CCTV camera movie in YRTA Traffic Control Center is analyzed for the number of vehicles in each direction in main road intersection in Yangon.

■ **Activity 2-1: Assess characteristics of water-related disaster vulnerability**
- **(Activity 2-1-5)** Expected inundation areas in Bago River basin in case of Precipitation Return Period from 2 years, 100 years, and 500 years were simulated and demonstrated on "Bago River

Near Real-time Inundation Analysis System."

- Social surveys for poor livelihoods in flood-prone areas were conducted in Yangon and Bago as an important factor of water-related disaster vulnerability assessment.

■ **Activity 2-2: Assess characteristics of earthquake disaster vulnerability and create earthquake vulnerability map**

- **(Activity 2-2-1)** Making of an amplification map is to be continued because of a pro-longed negotiation with YCDC to acquire borehole data.
- **(Activity 2-2-2)** Third version of seismic vulnerability map has been arranged using updated datasets.
- **(Activity 2-2-3)** Microtremor measurements in Yangon City has been conducted. Making of a ground motion map will be continued because of a pro-longed negotiation with YCDC to acquire borehole data
- **(Activity 2-2-4)** Tentative ground condition data, building data, and fragility curves were created to make a damage prediction map.
- **(Activity 2-2-6)** Making of a booklet to summarize result of the survey for each building is in the process in collaboration with YTU Architecture Department. Survey of historic buildings will continue until the end of the Project as a part of the new curriculum (a compulsory course called “Heritage Management & Conservation” (Arch 71034) of the Architecture Department as it is requested by the head of the Department.
- **(Activity 2-2-7)** Tentative damage prediction map has been created using the disaster vulnerability assessment model.

■ **Activity 3-1: Develop activities in research centre for urban safety in YTU**

- **(Activity 3-1-2)** Completed in March 2019.
- **(Activity 3-1-3)** The Project continued to support the activity of RC after its launch.
- **(Activity 3-1-4)** Workshop was held at YTU to both students and faculty members using the developed Web GIS database system and feedback was received in order to improve the system and expand the database.
- **(Activity 3-1-5)** RC has been used for a number of seminars, workshops and meetings by the Project since its establishment. Student seminars continued to be conducted bi-monthly to enhance the research and presentation skill of the YTU researchers.

■ **Activity 3-2: Develop educational program for government officials and graduate students as specialist of urban safety**

- **(Activity 3-2-3) (Activity 3-2-4)** Discussion for the development of YTU’s curriculum especially for RS/GIS group and Earthquake-related disaster group are on-going and lectures and workshops have been conducted. RS/GIS Group conducted lectures to graduate students as a part of existing curriculum in the Department of Electronics. Heritage workshop to survey a historic architecture was conducted with the Department of Architecture.

■ **Activity 3-3: Establishment of consortium among government, academia, and industry**

- **(Activity 3-3-3)** The 3rd Preparation Meeting for the Consortium was held at YTU on 18 July 2019 and Workshop for Work Breakdown Structure (WBS) was conducted with participants including CPs and SPs to discuss necessary actions under 4 themes namely 1) research collaboration, 2) research management, 3) organizational structure & management and 4) funding.
- Feedback from the participants (IWUMD, DWIR, DUHD, DMH, MOC, MGS, MES, MEC and YCDC) were received after the meeting to confirm their willingness to participate and to finalize the Article of Association to submit to MOE.
- The Consortium Launch was scheduled to be held at the time of JCC meeting and the Project made

"Action Plan" starting from March 2019, clarifying all necessary actions to be done in order to achieve the goal. However the launch did not realize.

- **(Activity 3-3-4)** Discussion for possible collaborative research projects have been going on among YTU and the Japanese side in order to utilize the resources effectively and promote active exchange among related organizations.

■ **Activity 4-1: Propose improved infrastructure management and maintenance system, and technology for securing disaster mitigation function in Myanmar**

- **(Activity 4-1-2)** Completed in March 2019.
- **(Activity 4-1-3)** Field investigation using non-destructive test equipment for actual structures continued to be conducted in order to promote the application of non-destructive tests to evaluate the performance of existing structures. In addition, bridge retrofit method was proposed to MOC based on the investigation of the damage level of Twantay bridge and Pathein bridge.
- Concrete sample was prepared to be used for the training of the use of equipment.
- **(Activity 4-1-4)** A course on seismic retrofitting of existing non-engineered buildings was conducted.

■ **Activity 4-2: Develop integrated disaster response support system for Earthquake and Water-related disaster**

- **(Activity 4-2-1)** Completed in March 2019.
- **(Activity 4-2-2)** For Water-related disaster Group, test operation of the "Bago River Near Real-time Inundation Analysis" among IWUMD, DWIR, DHM, DHPI and YTU was started from July to September 2019 and then the system was modified based on their feedback.
- Technical meeting on satellite rainfall product (GSMaP) and Probablic Rainfall Density Evaluation, High-level meeting on Data Integration for Flood Risk Reduction was held in July 2019.
- For Disaster Management Group, a flowchart of disaster response activities was completed and "Disaster response support system" was completed.
- **(Activity 4-2-3)** For Water-related disaster Group, "Bago River monitoring and flood simulation system" is under development on DIAS platform. Near real-time hydro-meteorological station data are now available ad shared among Myanmar governmental departments, such as IWUMD, DWIR, DHM, and DHPI.
- For Disaster Management Group, user interface is almost completed.
- **(Activity 4-2-4)** For Disaster Management Group, trainings were conducted in 5 townships in CBD in May and August to YCDC staffs and the system was introduced.

1-3 Achievement of Output

Achievement of Output during this monitoring term is summarized as follows. For more detail, see the Form 3-2 (PDM Monitoring Sheet I).

■ **Output 1: Development of physics model to evaluate disaster vulnerability**

- An integrated digital map for the earthquake vulnerability assessment is updated.
- Traffic monitoring of taxi and the data of the movement is collected.

■ **Output 2: Development of scenario analysis system for assessing future disaster vulnerability**

- Version 2 of the Earthquake vulnerability map was developed using tentative ground data.

■ **Output 3: Development of main roles and activities of research centre for urban safety in YTU to sustain and enhance research activities and human resource development**

- Research center is used for various research activities.

- The 3rd preparation meeting for the Consortium was held at YTU with CPs and SPs.

■ **Output 4: Development of integrated disaster response support system including infrastructure maintenance management with adequate technologies**

- A new JICA project for technical transfer for road and bridge maintenance is formulated based on the output from the Project and the project leader prepared a detailed plan in collaboration with MOC, YTU and Japanese organizations. In the next project, the equipment donated for the Project will continued to be used.
- Research for infrastructure management will be continued with a new research fund by Japan Society of Civil Engineers (JSCE) for an application of non-destructive inspection and monitoring technology in Myanmar and human resource development.
- Trial run of the "Bago River monitoring and flood simulation system" was conducted to improve the system.
- Trainings using the Disaster management support system were conducted at city government offices.

1-4 Achievement of Project Purpose

Achievement of Project Purpose during this monitoring term is summarized as follows for each of three Objectively Verifiable Indicators (OVI). For more detail, see the Form 3-2 (PDM Monitoring Sheet I).

■ **OVI 1: At least 20 research papers related to the project, which are submitted by mainly YTU during the project period, are accepted by international journals:**

- A total of 11 papers related to the project were submitted by mainly YTU (main author is from YTU) and accepted by international journals by March 2019.
- Total of 31 papers (23 International journal / 8 domestic (Japanese) journal) were submitted and accepted by March 2019.
- During this monitoring period, 1 paper (international journal) was submitted and accepted.

■ **OVI 2: Some suggestions, advises and policy proposals by using the Comprehensive Disaster Resilience System are submitted to relevant governments:**

- Total of 3 documents related to suggestions, advices and policy proposals were submitted.

■ **OVI 3: The Comprehensive Disaster Resilience System is developed and under operations by YTU:**

- Several kinds of operations records of comprehensive disaster resilience system have been recorded in water related disaster group, transportation and mobility group and disaster management group.

1-4-1 Papers submitted / announced to international journals/conferences

1 research paper was submitted to peer review international journal (Table 3) and 8 research papers were presented at conferences during this monitoring period.

Table 3. List of papers submitted to peer-review journals

#	Name of journal	Date	Paper Title	Authors	Group
1	(international journal) *Scientific Reports, 9(1), 9862.*	Jul. 2019	Large-Scale Channel Migration in the Sittang River Estuary	T.shimozono, Y.Tajima, S.Akamatsu, Y. Matsuba, A. Kawasaki	Water

Table 4. List of papers presented at conferences

#	Name of journal/conference	Date	Title	Author	Group
1	Proceedings of JSCE Annual Conference, CS12-59	Sept. 2019	Report of investigation of seismic performance of suspension bridge in Myanmar - Analysis of Twantay Bridge-(in Japanese)	Tsuyoshi Yoshida, Tetsuro Goda, Kohei Nagai, Koji Matsumoto, Eiji Iwasaki	Infrastructure
2	Proceedings of JSCE Annual Conference, CS12-60	Sept. 2019	Report of investigation of seismic performance of suspension bridge in Myanmar - modeling based on design and current condition -(in Japanese)	Tetsuro Goda, Yasuhiro Nozue, Kohei Nagai, Koji Matsumoto, Eiji Iwasaki	Infrastructure
3	Proceedings of JSCE Annual Conference, CS12-61	Sept. 2019	Report of investigation of seismic performance of suspension bridge in Myanmar - Analysis of Pathein Bridge- (in Japanese)	Yasuhiro Nozue, Tetsuro Goda, Kohei Nagai, Koji Matsumoto, Eiji Iwasaki	Infrastructure
4	Summaries of technical papers of annual meeting Architectural Institute of Japan (Hokuriku)	Sep. 2019	Research on the actual condition of slum district in Yangon (in Japanese)	Hiroto Yamada, Osamu Murao	Earthquake
5	(EASTS Conference 2019) Colombo, Sri Lanka, pp. 1114-1133,EASTS Journal Vol.13	Sep. 2019	Identification and Classification of Land Use Types in Yangon City by Using Mobile Call Detail Records (CRDs) Data, Redesigning Transport & Logistics for the Rise of Asia	Thiri AUNG, KYAING, KO KO LWIN, Yoshihide SEKIMOTO	Transportation
6	(EASTS Conference 2019) Colombo, Sri Lanka, pp. 841-860,EASTS Journal Vol.13	Sep. 2019	Identification of Transportation Mode and Transit Behaviour from Mobile CDRs Data: A case of Yangon City, Redesigning Transport & Logistics for the Rise of Asia	KYAING, KO KO LWIN, Yoshihide SEKIMOTO:	Transportation
7	Proceeding of EASTS 2019 (Eastern Asia Societies for Transportation Studies), Colombo, Sri Lanka	Sep. 2019	Optimization of Bus Stop Allocation and Time Scheduling Using Bus GPS Data: Sep. 2019.	That Htun Aung, Kyaing, Ko Ko Lwin, Yoshihide Sekimoto	Transportation
8	Proceeding of EASTS 2019 (Eastern Asia Societies for Transportation Studies), Colombo, Sri Lanka	Sep. 2019	Taxi Customers Travel Behavior Analysis for Allocation of Taxi Stands in Yangon City:	Moe Myint Mo, Kyaing, Ko Ko Lwin, Yoshihide Sekimoto:	Transportation

1-5 Changes of Risks and Actions for Mitigation

1) Difficulty of data inquiry

[Issue]

The Project requires various kinds of data from Myanmar organizations, e.g. YCDC for ground data and DMH for climate and hydrological data to be used for the research activity, however it has been difficult to acquire. Because of this, the Project missed the opportunity to carry out some capacity building activity or research collaboration.

[Countermeasure]

For climate and hydrological data, training courses “Data analysis of satellite rainfall products” and “the

Bago River monitoring and flood simulation system" were held at YTU in July 2019 and the Project requested DMH to bring their dataset to this training course.

For ground data, the Project member is coordinating with the CP from Geotechnical team to obtain the requested data from YCDC and also requested for support from JICA as well to get borehole data from other sources.
For building data, Project members continued to coordinate with YTU to request the use of the building data from Yangon Mapping Project delivered to the Urban Planning Division (UPD) of YCDC in January 2019.

2) Participation of researchers from Myanmar side
[Issue]
Participation of YTU's faculty members and students is sometimes difficult due to the coincidence with the school duty and assigned curriculum. Sometimes the visiting time of the Japanese experts is not convenient for the Myanmar side. Despite the fact that the student seminar has brought positive impact by improving the level of research presentation by the students, the number of participants is still low.
[Countermeasure]
For participation in general, the Japanese side and Myanmar side are discussing to understand the needs and condition of YTU in order to provide courses that can be incorporated into the regular curriculum so that students can participate and gain credits.
For the student seminar, the Japanese side is trying to hand over the management of the seminar including scheduling to YTU side to promote their active involvement and to set appropriate schedule for more participation. For 2019, the Japanese side announced that all who have been involved with the Project can utilize the student seminar as their opportunity to practice their presentation, since all members are expected to present their research outcome at USMCA which will be held at YTU in December 2019.

3) Management of the equipment
[Issue]
The Project donated a number of equipment including highly sensitive devices which are not easy to repair or replace in Myanmar. Sometimes the Myanmar side is hesitant to use the equipment due to a lack of information sharing / discussion between Myanmar and Japan side for a proper understanding of its purpose. For some, necessary manuals or trainings have not been provided.
[Countermeasure]
The Project office hired a staff to be in charge of the management of the equipment to make sure that necessary information and technical transfer is completed before the end of the project. The Project requested the staff in charge to make a list with all necessary information regarding the equipment including information about the manufacturer, contact info, manual, person-in-charge from YTU, etc. and any missing information to be fulfilled before the end of the project.
A seminar was conducted by an expert dispatched from Japan to give lectures and hands-on seminar and conducted field survey using the equipment in order to increase proper understanding of the use of donated equipment.

1-6 Progress of Actions undertaken by JICA
JICA hired 2 staffs (1 continued, 1 newly hired) in order to improve the situation concerning the issues described in 2. Delay of work schedule/ problems. One staff was hired to manage the equipment and the other staff was hired as an Operating Officer for the Consortium. This has

greatly improved the situation.
JICA formed a joint team to conduct final evaluation of the project and conducted interviews and meetings in September.

1-7 Progress of Actions undertaken by Government of Myanmar (and/or YTU)
YTU prepared necessary documents to submit to MOE for the Consortium.

1-8 Progress of Environmental and Social Considerations (if applicable)
None.

1-9 Progress of Considerations on Gender/Peace Building/Poverty Reduction (if applicable)
None.

1-10 Other remarkable/considerable issues related/affect to the project (such as other JICA's projects, activities of counterparts, other donors, private sectors, NGOs etc.)
Pro-rector (Research Head of the Project) resigned due to expiration of term of office in May but the successor has not yet been assigned. Regarding the successor of Research Head, Japan and Myanmar side discussed a number of times in prior to this and YTU assigned 3 heads of departments (Civil Engineering, Architecture and RS/GIS) to be responsible to carry out the duty of Research Head until the new pro-rector is assigned. However concerning the Consortium, the rector requested the former pro-rector to continue to handle the matter. According to a number of discussion with YTU side, the former pro-rector was supposed to become an advisor to YTU after her resignation but it has not been officially granted therefore pro-rector requested the Project to write a letter to authorize her involvement with the project such as attending project related meetings such as JCC meeting.

2. Delay of Work Schedule and/or Problems (if any)

Two main issues continued to exist; 1) Difficulty of data inquiry as stated in 1-5 and 2) Difficulty of executing the Consortium - due to uncertainty of the governmental agencies and their lack of understanding on consortium.

2-1 Detail
1) Difficulty of data inquiry
See 1-5.
2) Difficulty of executing the Consortium
The situation regarding the Consortium continued to remain the same as previous monitoring period. First of all, there has been a difficulty in executing the Consortium due to an uncertainty of the governmental agencies and their lack of understanding on consortium. For example, it takes a long time to get a feedback from the Ministry of Education and also there has been a great uncertainty about time and contents which makes it difficult to plan.
Secondly, there is a lack of administrative support in YTU for the Consortium management.
To execute the consortium, it requires assigned person(s) to 1) prepare necessary documents to submit to MOE for getting permission and also to 2) coordinate with concerned parties and potential members from government, academia and private sectors. However, there has been a problem in carrying out this mission with the existing human resource in YTU and this could cause some delay.

2-2 Cause

1) Not known but it could be partially due to a lack of understanding caused by a lack of communication.
2) Not certain but it could be due to limited understanding on Consortium by all Myanmar organizations, and also a lack of YTU's experience to know the staffing needs as this is the first time for YTU to establish the Consortium.

2-3 Action to be taken

1) YTU members to review the proposal or situation of data inquiry carefully and follow up regularly to monitor the situation, share the result with the Japanese side for taking necessary actions.
2) It is important to continue explaining the consortium concept and its advantage to relevant organizations in Myanmar. About an uncertainty of the governmental agencies which make it difficult to plan of time schedule and contents, despite an uncertainty, YTU shall make an assumption and create an Action Plan to share with all stakeholders with detailed schedule including conducting preparation meetings and try to carry out accordingly. Necessary action shall be taken promptly if/when there is a delay.
For the issue of staffing, the Japanese side requested YTU to find a proper person to handle necessary administrative work and one person (a recent graduate from water-related disaster group) was hired as an Operating Officer for the Consortium to carry out the task without delay.

2-4 Roles of Responsible Persons/Organizations

As stated above.

3. Modification of the project Implementation Plan

3-1 PO

None.

3-2 Other modifications on detailed implementation plan

None.

4. Preparation of Gov. of Myanmar (and/or YTU) toward after completion of the Project

- The project has been discussing with various stakeholders in the governmental organizations, private sectors and NPOs regarding the social implementation of the research outcome and will continue to do so.
- Necessary procedure for establishing the Consortium has been conducted by YTU.

II. Project Monitoring Sheet I & II As attached

Project Monitoring Sheet I

Project Title: Project for Development of a Comprehensive Disaster Resilience System and Collaboration Platform in Myanmar
Target Group: faculty members of Yangon Technological University (YTU), Indirect: Ministries in charge of disaster management and, local governments, major infrastructure and residents in target area
Project Site: Republic of the Union of Myanmar (Bago River Basin and Yangon)

Ver.8（Term: April - September 2019）
Dated 9 March 2020

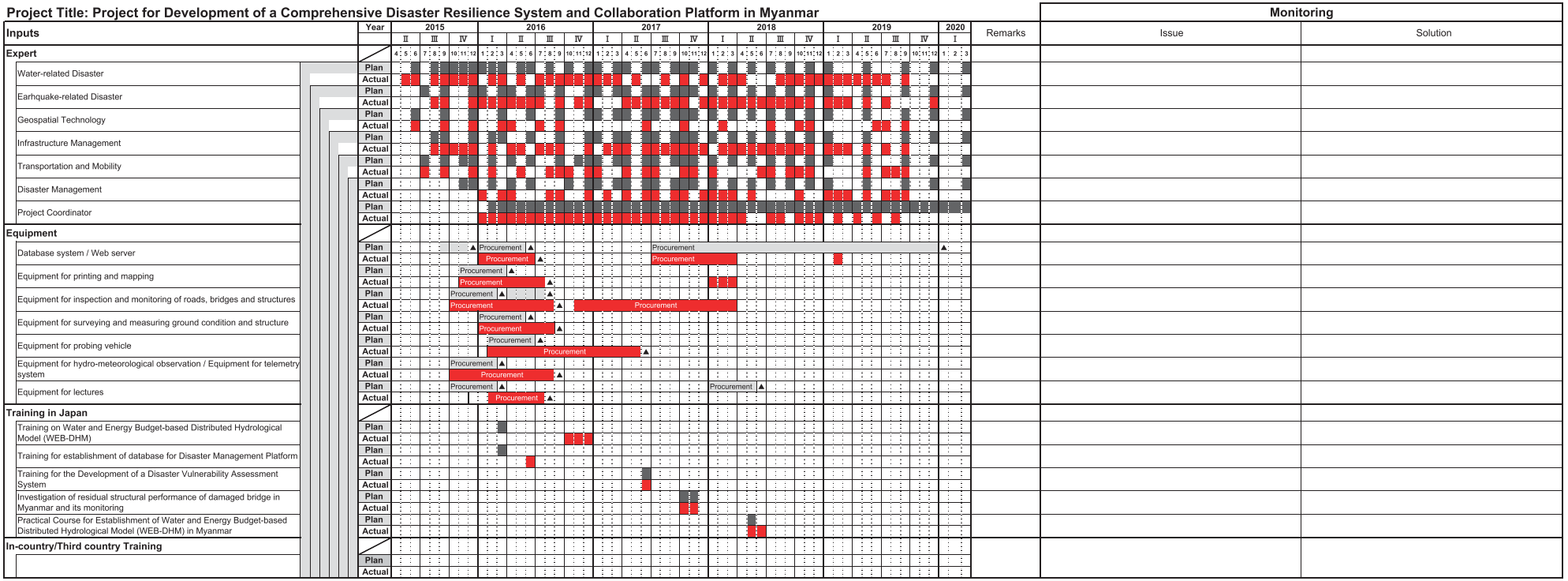
Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Achievement	Remarks
Overall Goal				
YTU further utilizes the Collaboration Platform to contribute to the urban safety in Yangon and Bago	1 At least 4 policy proposals on the result of the Comprehensive Disaster Resilience System are made for relevant governments by YTU team	1 Number of proposals made by YTU team	A total of 3 policy related documents were submitted (see below Achievement for Project Purpose 2)	
	2 At least 20 specialized persons in urban safety sector are trained at YTU	2 Number of certified specialized persons trained by YTU	A total of 216 certified specialized persons were trained by YTU, UTokyo and other related organizations. (Water related disaster group: 22, Disaster management group : 194) [Water-related disaster group] - Training workshops for installing and maintaining hydro-meteorological equipment were conducted at YTU for 8 times, and 10 governmental officers from IWUMD, DWIR, DMH, DHPI, and YTU faculty members and students participated the training. [Disaster management group] - Trainings were conducted in May and August 2019 using a disaster response support system for government staffs at 5 GAD township offices in CBD.	
Project Purpose				
YTU understands and develops a Comprehensive Disaster Resilience System and a Collaboration Platform for urban safety in Yangon and Bago	1 At least 20 research papers related to the project, which are submitted by mainly YTU during the project period, are accepted by international journals	1 Papers submitted to journal papers	A total of 11 papers related to the project were submitted by mainly YTU (main author is from YTU) and accepted by international journals by March 2019. Total of 31 papers (23 International journal / 8 domestic (Japanese) journal) were submitted and accepted by March 2019. During this monitoring period, 1 papers (international journal) was submitted and accepted.	
	2 Some suggestions, advises and policy proposals by using the Comprehensive Disaster Resilience System are submitted to relevant governments.	2 Relevant documents submitted	A total of 3 policy related documents were submitted and some policy recommendations were made. [Infrastructure management group] - A report of the investigation of the collapse of Myaung Mya Bridge was submitted to MOC. - A report of the safety investigation of cable-type bridges was submitted to MOC. - A policy reommendation was made to establish a regulation for cable-type bridges such as periodical inspection to MOC. [Water-related disaster group] - A situation report of a summary of the 2018 Myanmar floods response including data analysis was submitted to the Myanmar government.	
	3 The Comprehensive Disaster Resilience System is developed and under operations by YTU	3 Operations records	[Water-related disaster group] - Near real-time hydro-meteorological station data is available ad shared among Myanmar governmental departments namely IWUMD, DWIR, DHM, and DHPI. - Test operation of the "Bago River Near Real-time Inundation Analysis" among IWUMD, DWIR, DHM, DHPI and YTU was started from July to September 2019 and then the system was modified based on their feedback. [Transportation and mobility group] - Yangon City Geospatial Dashboard is developed and installed at YTU server and new function such as “Geovisualization of Link Population and Flow Directions” for geovisualization and analysis purposes is added. [Disaster management group] - Disaster Response Support System is nearly completed and introduced at trainings provided to the GAD training school. - The developed system is used for the training at Lanmataw Township (20190513), Latha Township (20190514), Pabedan Township (20190516), Kyauktada Township (20190806), Botahtaung Township (20190807) under the operations of YTU.	
Outputs				**Expected achievement by the end of the project:**
1 Development of physics model to evaluate disaster vulnerability	1-1 Meteorological and hydrological observation of target areas, performance evaluation of structures, and capacity of people / traffic monitoring are improved and Hydrology and flood inundation model in research area is developed	1-1 Use of equipment, observation data and operation / maintenance system of equipment, Database: temperature, water, and river environment	[Water related disaster group] - Installation of all planned equipment for the meteorological and hydrological observation is completed and the data has been archived in the YTU server.	
	1-2 Earthquake vulnerability assessment method is established Yangon digital map database is created	1-2 Database: infrastructures, buildings, and topographical information	[Building group] - Quality of other fragility curves were improved. - Amplification map was developed based on a result of field survey. - The final digital map is arranged by all data.	
	1-3 Urban development model in survey area is developed	1-3 Database: traffic and crowd flow	[Transportation and mobility group] - CCTV camera movie in YRTA Traffic Control Center is analyzed for the number of vehicles in each direction in main road intersection in Yangon.	- Database will be improved. - Collaborative research activities will be realized.
2 Development of scenario analysis system for assessing future disaster vulnerability	2-1 Water-related disaster vulnerability is assessed	2-1 Flood inundation map	[Water related disaster group] - Expected inundation areas in Bago River basin in case of Precipitation Return Period from 2 years, 100 years, and 500 years were simulated and demonstrated on "Bago River Near Real-time Inundation Analysis System." - Social vulnerability of people residing in flood prone areas was assessed through household interview survey in Bago.	Results from survey and analysis will be stored in the System and will be accessibley by government organizations such as IWUMD, DWIR, DHM, and DHPI.
	2-2 Earthquake-related disaster vulnerability is assessed Earthquake vulnerability map is created	2-2 Earthquake vulnerability map	[Building group] - Version 3 of the Earthquake vulnerability map has been arranged using updated datasets..	
3 Development of main roles and activities of research centre for urban safety in YTU to sustain and enhance research activities and human resource development	3-1 Framework of research centre for urban safety is developed in YTU	3-1 Approval document, Proposal document	[All] - Official opening ceremony for the research center was held and the board members was discussed.	- Research center will be managed and operated by YTU.
	3-2 Educational program to foster specialized persons is developed	3-2 Curriculum, syllabus, record of training courses	[All] - Joint lectures and workshops were developed and conducted by both Myanmar and Japaense members of RS/GIS G and Earthquake-related disaster Group (Heritage Team) as a part of existing curriculum.	- A new curriculum will be developed based on discussion between both sides and the class will be taught by the Myanmar side.
	3-3 Basic concept of Consortium among government, academia, and industry is developed in YTU through trial activities	3-3 Activity records	[All] - The second meeting for the preparation of the Consortium was held in March 2019 in Nay Pyi Taw and the draft of the Article of Association was presented.	- Consortium among government, academia, and industry will be established.
4 Development of integrated disaster response support system including infrastructure maintenance management with adequate technologies	4-1 Improved infrastructure management and maintenance system, and technology for securing disaster mitigation function in Myanmar is proposed	4-1 Proposal documents	[Infrastructure management group] - An establishment of the maintenance scheme for cable bridges was proposed. - A bridge retrofit method was proposed to MOC based on the investigation of the damage level of Twantay bridge and Pathein bridge. - Concrete sample was prepared to be used for the training of the use of equipment.	
	4-2 Integrated disaster response support system is developed	4-2 Software and operation manual for integrated disaster response support system, record of trainings, recommendation for sustainability	[Water-related disaster group] - The initial proto-type of "Bago River monitoring and flood simulation system" was introduced to IWUMD, DWIR, DHM, DHPI and YTU and the system was improved after reflecting the feedback from the participants. - Test operation of the "Bago River Near Real-time Inundation Analysis" among IWUMD, DWIR, DHM, DHPI and YTU was started from July to September 2019 and then the system was modified based on their feedback. [Disaster management group] - Training using the Disaster management support system was conducted to the directors and staff officers of GAD and Lanmataw Township (20190513), Latha Township (20190514), Pabedan Township (20190516), Kyauktada Township (20190806), Botahtaung Township (20190807)	- Disaster management system will be operated YTU. - An inter-departmental framework for water-related disaster preparedness and response among IWUMD, DWIR, DHM, and DDM will be organized to realize collaboration including data-sahring.

Plan of Operation

Ver.8（Term: April - September 2019）
Dated 9 March 2020

PM Form 3-2 PO (Monitoring Sheet II)

Project Title: Project for Development of a Comprehensive Disaster Resilience System and Collaboration Platform in Myanmar



Activities / Sub-Activities	Year	Responsible Organization: Japan	Responsible Organization: GOM	Achievements	Issue & Countermeasures
Output 1-1: Develop hydrological and flood inundation model of study area					
1-1-1 Collect information and data in meteorology, hydrology, and water resource management and build database	Plan / Actual			[Water related disaster group] Completed (March 2019). See Summary.	[Issue] Climate and hydrological data are not provided by DHM despite repeated requests.[Countermeasure]Request DMH to bring their dataset to the training to be held at YTU in 2019.
1-1-2 Build hydrological and flood inundation model in the target river basin for flood vulnerability assessment	Plan / Actual			[Water related disaster group] Completed (Oct.2018).	
Output 1-2: Establish Earthquake vulnerability assessment method and create of Yangon digital map database					
1-2-1 Investigate damage by past earthquakes in Myanmar	Plan / Actual			[Building group] Completed (May 2018).	
1-2-2 Develop an earthquake vulnerability evaluation model (understanding building characteristics and developing of seismic fragility function) from the viewpoint of building characteristics in	Plan / Actual			[Building group] On going as planned. See Summary.	
1-2-3 Construct vulnerability assessment model based on the ground characteristics (including topographic information) in Yangon	Plan / Actual			[Building group] On going as planned. See Summary.	
1-2-4 Establish disaster vulnerability assessment model from Yangon's regional urban functions based on the performance and distribution survey of important facilities in case of disaster	Plan / Actual			[Building group] On going as planned. See Summary.	
1-2-5 Survey on distribution and characteristics of historic buildings in Yangon	Plan / Actual			[Building group] On going as planned. See Summary.	
1-2-6 Create integrated digital map database	Plan / Actual			[Building group] On going as planned. See Summary.	
Output 1-3: Development of urban development model in survey area					
1-3-1 Collect and analyze geo-spatial data and develop urban expansion simulation	Plan / Actual			[GIS and remote sensing group] Completed (May 2018).	
1-3-2 Collect data and predict traffic and people movement with people activity model	Plan / Actual			[Transportation and mobility group] On going as planned. See Summary for additional activity.	

Output 2-1: Assess characteristics of water-related disaster vulnerability					
2-1-1	Analyze climate change impact in local scale	Plan	[Water related disaster group] Completed (Oct 2018).		
		Actual			
2-1-2	Investigate land-use change in the target river basin	Plan	[Water related disaster group] Completed (Oct 2018).		
		Actual			
2-1-3	Assess river runoff and inundation hazard considering tidal effect	Plan	[Water related disaster group] Completed (Oct 2018).		
		Actual			
2-1-4	Generate flood inundation map considering tidal effect	Plan	[Water related disaster group] Completed (Oct 2018).		
		Actual			
2-1-5	Evaluate water-related disaster vulnerability based on scenarios with climate change and urban development	Plan	[Water related disaster group] On going as planned.		
		Actual			
Output 2-2: Assess characteristics of earthquake disaster vulnerability and create earthquake vulnerability map					
2-2-1	Examine possible scenario patterns with proper input and algorithm	Plan	[Building group] On going as planned.		
		Actual			
2-2-2	Assess vulnerability based on earthquake scenarios	Plan	[Building group] On going as planned. See Summary.		
		Actual			
2-2-3	Create earthquake ground motion map based on ground property evaluation	Plan	[Building group] On going as planned.		
		Actual			
2-2-4	Create building damage prediction map	Plan	[Building group] On going as planned.		
		Actual			
2-2-5	Create evaluation map of disaster response of urban function	Plan	[Building group] Completed (Oct 2018).		
		Actual			
2-2-6	Assess earthquake resistance of historic building for preservation and create distribution map	Plan	[Building group] To be continued. See Summary.		
		Actual			
2-2-7	Evaluate earthquake disaster vulnerability and create integrated earthquake vulnerability map	Plan	[Building group] On going as planned.		
		Actual			
Output 3-1: Develop activities in research centre for urban safety in YTU					
3-1-1	Make proposal and formulating road map of research center	Plan	[All] Completed (Oct 2018).		
		Actual			
3-1-2	Take necessary procedures for establishing research center	Plan	[All] Completed (March 2019).		
		Actual			
3-1-3	Manage and operate research center before and after official launch	Plan	[All] On going as planned.		
		Actual			
3-1-4	Install integrated digital map database at research center	Plan	[All] On going ahead of the schedule. See Summary.		
		Actual			
3-1-5	Conduct seminars, workshops and meetings for research activities and further development of research center	Plan	[All] On going as planned. See Summary.	[Issue] The number of participants in the student seminar is decreasing. [Countermeasure] Encourage participation regardless of involvement with the Project.	
		Actual			
Output 3-2: Develop educational program for government officials and graduate students as specialist of urban safety					
3-2-1	Observe current education program at YTU and MTU	Plan	[All] Completed (May 2018).		
		Actual			
3-2-2	Propose trial lectures and curriculums to YTU education program	Plan	[All] Completed (May 2018).		
		Actual			
3-2-3	Implement and verify educational program jointly by Japanese and YTU faculty members	Plan	[All] On going as planned. See Summary.		
		Actual			
3-2-4	Implement educational program mainly by YTU faculty members and support revision of education program	Plan	[All] On going as planned. See Summary.		
		Actual			
Output 3-3: Establishment of consortium among government, academia, and industry					
3-3-1	Identify expected roles and activities of consortium and formulating road map	Plan	[All] Completed (Oct 2018).		
		Actual			
3-3-2	Study research output and potential external partners	Plan	[All] Completed (Oct 2018).		
		Actual			
3-3-3	Prepare main tasks for operation	Plan	[All] To be continued. See Summary.		
		Actual			
3-3-4	Conduct a couple of trial collaborative research activities for improvement of management/operation capacity	Plan	[All] On going as planned. See Summary.		
		Actual			

Output 4-1: Propose improved infrastructure management and maintenance system, and technology for securing disaster mitigation function in Myanmar				
4-1-1	Collect data, review management and maintenance system, and technology of Infrastructures, especially bridges, in Myanmar	Plan / Actual		[Infrastructure management group] Completed (May 2018).
4-1-2	Propose improved management and maintenance system	Plan / Actual		[Infrastructure management group] Completed (March 2019).
4-1-3	Apply and propose inspection and monitoring method for infrastructures and buildings with adequate retrofit technology for damaged infrastructure	Plan / Actual		[Infrastructure management group] On going as planned.
4-1-4	Propose adequate retrofit technology for vulnerable buildings including those with historic value	Plan / Actual		[Building group] On going as planned. See Summary.
Output 4-2: Develop integrated disaster response support system for Earthquake and Water-related disaster				
4-2-1	Survey and analyze disaster management plan of local & central government	Plan / Actual		[Water-related disaster group, Disaster management group] Completed (March 2019).
4-2-2	Analyze requirement of functions and needs of users for disaster response system	Plan / Actual		[Water-related disaster group, Disaster management group] Completed (March 2019).
4-2-3	Develop a prototype of support system for hazard assessment	Plan / Actual		[Water-related disaster group, Disaster management group] On-going as planned. See Summary.
4-2-4	Introduce support system to research center in YTU and conduct training for YTU faculty members and potential users	Plan / Actual		[Water-related disaster group, Disaster management group] On-going as planned. See Summary.

Duration / Phasing	Plan / Actual			

Monitoring Plan	Year	2016				2017				2018				2019				2020	Remarks	Issue	Solution
		II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I			
Monitoring																								
Joint Coordination Committee	Plan / Actual																							
Set-up the Detailed Plan of Operation	Plan / Actual																							
Submission of Monitoring Sheet	Plan / Actual																					Monitoring Sheet I & II was revised in the version 5 as PDM/PO was modified and approved at the 3rd JCC in Oct. 2017.		
Monitoring Mission from Japan	Plan / Actual																							
Joint Monitoring	Plan / Actual																							
Post Monitoring	Plan / Actual																							
Reports/Documents																								
	Plan / Actual																							
Project Completion Report	Plan / Actual																							
Public Relations																								
Newsletter	Plan / Actual																							
Website for the project	Plan / Actual																							

TO CR of JICA MYANMAR OFFICE

PROJECT MONITORING SHEET

Project Title: Development of a Comprehensive Disaster Resilience System and Collaboration Platform in Myanmar
Version of the Sheet: Ver.9（Term: October, 2019 - March, 2020）

Name: DG of MoHE
Title: Project Director
Name: Kimiro Meguro
Title: Principle Investigator
Submission Date:31 March 2020

I. Summary

1 Progress

1-1 Progress of Inputs

(1) Input by Japanese side

a) Dispatch of experts
Total number of dispatch of experts is 34 during this monitoring term. Details are as shown in Table 1. (Note: student members and researchers travelled with another budget are not included in this list)

Table 1. List of dispatched researchers

Name		#	Period (From / To)		Purpose
Disaster Management Group (5 total)					
	Kimiro Meguro (L)	1	2019/09/25	2019/10/02	Attending the seminar on commencement of activities of the Consortium and JCC
		2	2019/12/07	2019/12/14	Attending the 18th International Symposium on New Technologies For Urban Safety of Mega Cities in Asia (USMCA) , Meeting (YTU)
		~~3~~	~~2020/03/27~~	~~2020/04/01~~	~~Final report meeting~~ Postponed
	Muneyoshi Numada (SL)	1	2019/09/29	2019/10/02	Attending the seminar on commencement of activities of the Consortium and JCC
		2	2019/12/02	2019/12/04	Attending the 19th Science Council of Asia Conference
		3	2020/02/09	2020/02/12	Conducting the workshop for the Utilization of Disaster Management System
		~~4~~	~~2020/03/~~	~~2020/03/~~	~~Final report meeting~~ Postponed
Water-related Disaster Group (8 total)					
	Akiyuki Kawasaki (L)	1	2019/11/09	2019/11/12	Meeting (YTU, DWIR)
		2	2020/03/	2020/03/	Final report meeting
	B.Seemanta Sharma	1	2019/09/25	2019/10/02	Attending the seminar on commencement of activities of the Consortium and JCC
		2	2019/12/08	2019/12/19	Attending the 18th International Symposium on New Technologies For Urban Safety of Mega Cities in Asia (USMCA), Maintenance check of AWS and AHS in Bago
		3	2020/02/20	2020/02/28	Upgrading Automatic Weather Station, maintain Automatic Hydrologic Station and conduct the workshop for Flood Risk Reduction Plan for Socioeconomic Development in Bago as well as do courtesy call for the chief minister of Bago Regional Government and the DGs at the related ministries in Nay Pyi Taw
	Badri Bhakta	1	2019/10/21	2019/11/04	Meeting (YTU), Conducting household surveys

	Shrestha	2	2019/12/08	2019/12/13	Attending the 18th International Symposium on New Technologies For Urban Safety of Mega Cities in Asia (USMCA)
		3	2020/02/24	2020/03/01	Conducting the workshop for Flood Risk Reduction Plan for Socioeconomic Development in Bago as well as do courtesy call for the chief minister of Bago Regional Government the DGs at the related ministries in Nay Pyi Taw
		~~4~~	~~2020/03/~~	~~2020/03/~~	~~Final report meeting~~ Postponed
Infrastructure Group (5 total)					
	Koji Matsumoto (SL)	1	2019/09/29	2019/10/02	Attending the seminar on commencement of activities of the Consortium and JCC
		2	2020/03/	2020/03/	Final report meeting
	Jiradilok Punyawut	1	2019/12/08	2019/12/13	Attending the 18th International Symposium on New Technologies For Urban Safety of Mega Cities in Asia (USMCA)
		2	2019/11/05	2019/11/09	Conducting Lecture on Application of geo-spatial database for infrastructure monitoring, Meeting (YTU)
		~~3~~	~~2020/03/~~	~~2020/03/~~	~~Final report meeting~~ Postponed
RS/GIS Group (4 total)					
	W.Takeuchi (L)	1	2019/09/26	2019/10/03	Attending the seminar on commencement of activities of the Consortium and JCC, Meeting (YTU)
		2	2019/12/10	2019/12/11	Research meeting with Mr. Hein Thura Aung on automated building foot print extraction from high resolution remote sensing data
		3	2019/11/05	2019/11/09	Conducting Lecture on Application of geo-spatial database for infrastructure monitoring, Meeting (YTU)
		~~4~~	~~2020/03/~~	~~2020/03/~~	~~Final report meeting~~ Postponed
Transport & Human Mobility Group (6 total)					
	Y.Sekimoto (L)	1	2020/01/13	2020/01/14	Conducting the workshop for Mobility Data Collections and utilization in Urban and Transport Planning, Meeting (YTU, Almec)
	Ko Ko Lwin (SL)	1	2019/09/13	2019/10/05	Attending the seminar on commencement of activities of the Consortium and JCC, Meeting (YTU)
		2	2019/11/04	2019/11/12	Conducting Lecture on Application of geo-spatial database for infrastructure monitoring, Meeting (YTU)
		3	2020/01/11	2020/01/24	Conducting the workshop for Mobility Data Collections and utilization in Urban and Transport Planning, Meeting (YTU, Almec, YCDC, YRTA)
		~~4~~	~~2020/03/~~	~~2020/03/~~	~~Final report meeting~~ Postponed
	Yudai Honma	1	2019/12/08	2019/12/11	Attending the 18th International Symposium on New Technologies For Urban Safety of Mega Cities in Asia (USMCA)
Earthquake-related Disaster (Building) Group (6 total)					
	Osamu Murao (L)	1	2019/12/09	2019/12/13	Attending the 18th International Symposium on New Technologies For Urban Safety of Mega Cities in Asia (USMCA)
		2	2020/02/14	2020/02/18	Conducting the field verification of recent residential development trends in Northern Yangon and report to YCDC
		~~3~~	~~2020/03/~~	~~2020/03/~~	~~Final report meeting~~ Postponed
	H. Gokon (SL)	1	2020/12/02	2020/12/10	Implementing microtremor measurement of subsurface in the site, Attending the 18th International Symposium on New Technologies for Urban Safety of Mega Cities in Asia (USMCA)
	T. Ikeda	1	2020/12/02	2020/12/10	Implementing microtremor measurement of subsurface in the site, Attending the 18th International Symposium on New Technologies for Urban Safety of Mega Cities in Asia (USMCA)
		~~2~~	~~2020/03/~~	~~2020/03/~~	~~Implementing microtremor measurement of subsurface in the site and training, Meeting (YTU)~~ Postponed
	M. Koshihara	~~1~~	~~2020/03/2~~	~~2020/03/6~~	~~Final report meeting~~ Postponed
	Tomoko Matsushita	1	2019/09/22	2019/10/06	Attending the seminar on commencement of activities of the Consortium and JCC, Meeting (YTU)

		2	2019/12/04	2019/12/17	Attending the 18th International Symposium on New Technologies For Urban Safety of Mega Cities in Asia (USMCA), Meeting (YTU)
		3	2020/02/10	2020/02/18	Conducting the workshop for the Utilization of Disaster Management System and the Joint Seminar on Remote Sensing & GIS in collaboration with YTU, MTU and U Tokyo
		~~4~~	~~2020/03/~~	~~2020/03/~~	~~Final report meeting~~ Postponed
	Chaitanya Krishna Gadagamma	1	2019/12/03	2019/12/16	Attending the 18th International Symposium on New Technologies For Urban Safety of Mega Cities in Asia (USMCA), Meeting (YTU), Conducting workshop on Data Processing and Analysis of Vibration Measurements as well as workshop on Earthquake Resistant Design and Condition Assessment of Reinforced Concrete Buildings
	E. Yoshimoto	~~1~~	~~2020/03/~~	~~2020/03/~~	~~Final report meeting~~ Postponed

*(L): Group leader, (SL): Sub group leader

b) Training Course in Japan

No training course was provided in Japan during this monitoring term.

c) International Conference / Meeting

13 members of The Project from Myanmar side attended international conference as shown in Table 2.

Table 2. Conference and attendees

No.	Conference Detail	Attendee name	Title (at the time of conference)	Affiliation
1	The 18th International Symposium on New Technologies for Urban Safety of Mega Cities in Asia (USMCA2019), Yangon, Myanmar, Dec. 9-10, 2019.	Tun Naing	Professor	Dept. of Engineering Geology
		Win Win Zin	Professor	Dept of Civil Engineering, YTU
		Daw Kyaing	Assoc. Professor	Dept of Civil Engineering, YTU
		San San Moe	Assoc. Professor	Dept. of Architecture, YTU
		Khin Maung Zaw	Assoc. Professor	Dept of Civil Engineering, YTU
		Su Thinzar	Assistant Lecturer	Dept. of Engineering Geology
		May Myat Mon	M.S. Student	Dept. of Engineering Geology
		Thiri Aung	PhD Student	Dept of Civil Engineering, YTU
		Hein Thura Aung	PhD Student	Dept. of Electrical Engineering, YTU
		Sann Win Maung	PhD Student	Dept of Civil Engineering, YTU
		Wai Toe	M E Student	Dept of Civil Engineering, YTU
		Wai Yan Soe	M.S. Student	Dept of Civil Engineering, YTU
		Ei Ei Tun	Graduated from M. Arch.	Dept. of Architecture, YTU

d) Provision of equipment

Additional equipment was requested by the Project members and provided during this term as shown in Table 3. The total cost of equipment is 9.611.048JPY.

Table 3: List of equipment for provision

No.	Items	Group	Qty.	Unit price	Subtotal
1	Transportation/crowd operational system	Transport & Human Mobility	1	4,928,000JPY	4,928,000JPY
2	Weather station	Water-related Disaster	2	491,085JPY	982,173JPY
3	Total station	Earthquake-related Disaster (Building)	1	321,476JPY	321,476JPY
4	Echo Sounder	Water-related Disaster	1	250,672JPY	250,672JPY
5	Monitor	RS/GIS	1	24,773JPY	24,773JPY

6	Weather station for rain gage	Water-related Disaster	1	211,313JPY	211,313JPY
7	Weather station for rain gage and temperature	Water-related Disaster	1	253,576JPY	253,576JPY
8	Soil moisture sensor	Water-related Disaster	1	38,196JPY	38,196JPY
9	Water Level Station	Water-related Disaster	1	993,086JPY	993,086JPY
10	Ground water level measurement (500feet)	Water-related Disaster	1	258,858JPY	258,858JPY
11	GeoStudio Basic standalone license (Activation)	Earthquake-related Disaster (Building)	1	187,159JPY	187,159JPY
12	Hard Disk	RS/GIS	7	15,605JPY	109,239JPY
13	Hard Drive Storage	RS/GIS	1	32,739JPY	32,739JPY
14	GPS	Water-related Disaster	2	69,516JPY	139,032JPY
15	Ground water level measurement (300feet)	Water-related Disaster	1	201,891JPY	201,891JPY
16	Salinity portable meter	Water-related Disaster	1	59,349JPY	59,349JPY
17	Safety Box	All	1	910JPY	910JPY
18	Server PC Rack	RS/GIS	1	7,088JPY	7,088JPY
19	Drone	All	1	181,685JPY	181,685JPY
20	High Spec Desktop PC	RS/GIS	1	429,833JPY	429,833JPY

e) Local cost for the activity of Japanese experts
The Project spent local cost for the activities of Japanese experts such as airfare, travel allowance, vehicle, and so on.

(2) Input by Myanmar side

a) Assignment of project members
The Myanmar side continued to assign the same project members as shown in Annex “List of project members”.

b) Provision of Project space, necessary equipment and expenses
- YTU continued to provide office space for the Project.
- YTU continued to pay for the utility such as electricity and water for the Project space and for some consumable goods.
- No expenses were spent for receiving equipment as no equipment was provided.

c) Coordination
YTU Coordinated with DOHE to obtain multiple re-entries VISA for Japanese experts.

1-2 Progress of Activities

Progress of activities during this monitoring term is summarized as follows.

Activity 1-2: Establish Earthquake vulnerability assessment method and create of Yangon digital map database

- **(Activity 1-2-2)** Construction of the fragility curves for normal timber structures, stilt houses, RC buildings, and Brick-nogging buildings were developed and a vulnerability map version 3 was created using the data.

- **(Activity 1-2-3)** Microtremor measurement has been conducted in Yangon City in December 2019 in order to make an amplification factor map.
- As a result of negotiation and coordination with concerned parties, some of the ground data (borehole data) were acquired and used for making a map.
- **(Activity1-2-5)** Historical buildings surveyed during the Project was put together as a map.
- **(Activity 1-2-6)** An integrated digital map database is completed and built on WebGIS platform.

■ **Activity 1-3: Development of urban development model in survey area**
- **(Activity 1-3-2)** Traffic monitoring of taxi and recording of the movements is continuing.
- Additional work was done in response to a request from YRTA to carry out a fixed point observation using a camera to extract the traffic flow at the road intersection and the number of cars automatically, with a cooperation of the Traffic Control Center.
- CCTV camera movie in YRTA Traffic Control Center is analyzed for the number of vehicles in each direction in main road intersection in Yangon.

■ **Activity 2-1: Assess characteristics of water-related disaster vulnerability**
- **(Activity 2-1-5)** Expected inundation areas in Bago River basin in case of Precipitation Return Period from 2 years, 100 years, and 500 years were simulated and demonstrated on "Bago River Near Real-time Inundation Analysis System."
- Social surveys for poor livelihoods in flood-prone areas were conducted in Yangon and Bago as an important factor of water-related disaster vulnerability assessment.

■ **Activity 2-2: Assess characteristics of earthquake disaster vulnerability and create earthquake vulnerability map**

(Activity 2-2-1) Possible scenario patterns with proper input and algorithm was examined.
- **(Activity 2-2-2)** Vulnerability based on earthquake scenarios were assessed and third version of seismic vulnerability map has been arranged using updated datasets.
- **(Activity 2-2-3)** Microtremor measurements in Yangon City has been conducted in December. An amplification map is completed using acquired borehole data.
- **(Activity 2-2-4)** Ground condition data, building data, and fragility curves were created to make a damage prediction map.
- **(Activity 2-2-6)** Earthquake resistance of some of the historic building were assessed and distribution map was created.
- **(Activity 2-2-7)** Earthquake disaster vulnerability was evaluated and integrated earthquake vulnerability map was created.

■ **Activity 3-1: Develop activities in research centre for urban safety in YTU**
- **(Activity 3-1-3)** The Project continued to support the activity of RC after its launch.
- **(Activity 3-1-4)** Workshop was held at YTU to both students and faculty members using the developed Web GIS database system and feedback was received in order to improve the system and expand the database.
- **(Activity 3-1-5)** RC has been used for a number of seminars, workshops and meetings by the Project since its establishment. Student seminars continued to be conducted bi-monthly to enhance the research and presentation skill of the YTU researchers as well as research guidance skill of YTU faculty members.

■ **Activity 3-2: Develop educational program for government officials and graduate students as specialist of urban safety**
- **(Activity 3-2-3) (Activity 3-2-4)** Short term training courses and lectures, and OJT programs were

prepared and proposed to be adopted by Myanmar partner organizations including YTU by each research group. Discussion for the development of YTU's curriculum especially for RS/GIS group and Earthquake-related disaster group are on-going and lectures and workshops have been conducted. RS/GIS Group conducted lectures to graduate students as a part of existing curriculum in the Department of Electronics. Heritage workshop to survey a historic architecture was conducted with the Department of Architecture.

- **Activity 3-3: Establishment of consortium among government, academia, and industry**
- **(Activity 3-3-3)** Seminar on Commencement of Activities of Consortium was held before the 5th Joint Coordination Committee Meeting on 1st of October 2019. Organization structure, constitution and future plan of the Consortium were introduced and 3 systems developed through the Project were demonstrated.
- In February 2020, YTU informed the Japanese side that the MOE would formally authorize the establishment of the Consortium and requested the Japanese side to provide names of two signers to be included as Board members in an official document. After acquiring names from other concerned parties, a formal signing ceremony was supposed to be held at the end of March 2020 attended by a number of Japanese members. However the ceremony is postponed in mid-March due to the situation caused by COVID-19.
- **(Activity 3-3-4)** Discussion for possible collaborative research projects have been going on among YTU and the Japanese side in order to utilize the resources effectively and promote active exchange among related organizations.

- **Activity 4-1: Propose improved infrastructure management and maintenance system, and technology for securing disaster mitigation function in Myanmar**
- **(Activity 4-1-3)** Workshop was held to introduce the use of donated equipment (non-destructive test equipment) to be used for infrastructure maintenance and management in December and manuals were provided.
- **(Activity 4-1-4)** A course on seismic retrofitting of existing non-engineered buildings was conducted.
- **Activity 4-2: Develop integrated disaster response support system for Earthquake and Water-related disaster**
- **(Activity 4-2-3)** For Water-related disaster group, feedback from the test run of "Bago River Near Real-time Inundation Analysis System" was received from 5 Myanmar governmental departments and then the system was improved based on the comments. All the system development was completed in March 2020.
- For Disaster Management Group, user interface is completed.
- **(Activity 4-2-4)** For Disaster Management Group, training was conducted at YTU and the system was introduced.

1-3 Achievement of Output

Achievement of Output during this monitoring term is summarized as follows. For more detail, see the Form 3-2 (PDM Monitoring Sheet I).

- **Output 1: Development of physics model to evaluate disaster vulnerability**
- An integrated digital map for the earthquake vulnerability assessment is completed.
- **Output 2: Development of scenario analysis system for assessing future disaster vulnerability**
- Version 3 of the Earthquake vulnerability map was developed after collecting necessary set of data.

- **Output 3: Development of main roles and activities of research centre for urban safety in YTU to sustain and enhance research activities and human resource development**

- Research center is used for various research activities.
- Seminar on Commencement of Activities of Consortium was held and Organization structure, Constitution and future plan of the Consortium were introduced with CPs and SPs.

- **Output 4: Development of integrated disaster response support system including infrastructure maintenance management with adequate technologies**

- A new JICA project for technical transfer for road and bridge maintenance is formulated based on the output from the Project and the project leader prepared a detailed plan in collaboration with MOC, YTU and Japanese organizations. In the next project, the equipment donated for the Project will continued to be used.
- Research for infrastructure management will be continued with a new research fund by Japan Society of Civil Engineers (JSCE) for an application of non-destructive inspection and monitoring technology in Myanmar and human resource development.
- Trial run of the "Bago River monitoring and flood simulation system" was conducted and based on the feedback, the system was modified for improvement.
- Trainings using the Disaster management support system were conducted at city government office and YTU.

1-4 Achievement of Project Purpose

Achievement of Project Purpose during this monitoring term is summarized as follows for each of three Objectively Verifiable Indicators (OVI). For more detail, see the Form 3-2 (PDM Monitoring Sheet I).

- **OVI 1: At least 20 research papers related to the project, which are submitted by mainly YTU during the project period, are accepted by international journals:**

- A total of 19 papers related to the project were submitted by mainly YTU (main author is from YTU) and accepted by international journals by March 2020.
- Total of 64 papers (54 International journal / 10 domestic (Japanese) journal) were submitted and accepted by March 2019.
- During this monitoring period, 21 paper (international journal) was submitted and accepted.

- **OVI 2: Some suggestions, advises and policy proposals by using the Comprehensive Disaster Resilience System are submitted to relevant governments:**

- Total of 3 documents related to suggestions, advices and policy proposals were submitted.

- **OVI 3: The Comprehensive Disaster Resilience System is developed and under operations by YTU:**

- “Bago River Near Real-time Inundation Analysis" is completed and handed over to YTU for operation.
- “City Geospatial Dashboard” is completed and handed over to YTU for operation.
- “Myanmar G-Spatial Information Dashboard” is completed and handed over to YTU for operation.
- “Disaster Response Support System” is completed and handed over to YTU for operation.
-

1-4-1 Papers submitted / announced to international journals/conferences

31 research papers was submitted to peer review international journal (Table 3) and 32 research papers were presented at conferences during this monitoring period.

Table 3. List of papers submitted to peer-review journals

#	Name of journal	Date	Paper Title	Authors	Group
1	Architectural Institute of	Mar	Study on the revitalization of	Tomoko MATSUSHITA,	Earthqua

	Japan Journal of architecture and planning, Architectural Institute of Japan, Vol. 85, No. 769, 567-577	2020	Back Drainage Space in Yangon City, Myanmar - Investigation on the alley revitalization project implemented by social enterprise and the local community and its impact	Aya KUBOTA	ke
2	Journal of Disaster Research, Vol.15, No.1	Mar 2020	Earthquake Building Collapse Risk Estimation for 2040 in Yangon, Myanmar,	Osamu Murao, Tomohiro Tanaka	Earthqua ke
3	Journal of the Eastern Asia Society for Transportation Studies, 13, 841-860.	2019	Identification of Transportation Mode and Transit Behaviour from Mobile CDRs Data: A Case of Yangon City.	Kyaing, D., Lwin, K.K., Sekimoto, Y	Transport ation
4	Journal of the Eastern Asia Society for Transportation Studies, 13, 277-297.	2019	Estimation of Intercity Travel Pattern and Impact on Yangon-Pathein Road between Ayeyarwady Region and Yangon Region Using Call Detail Record.	Nan, T.Z.K.O., Kyaing, D., Lwin, K.K., Sekimoto, Y.	Transport ation
5	Journal of the Eastern Asia Society for Transportation Studies, 13, 1114-1133.	2019	Identification and Classification of Land Use Types in Yangon City by Using Mobile Call Detail Records (CDRs) Data.	Thiri, A., Kyaing, D., Lwin, K.K., Sekimoto, Y.	Transport ation
6	Theory and Applications of GIS, 27 (2), 29-37.	2019	Estimation of income level in individual buildings using satellite images and household survey data.	Okuda, K., Kawasaki, A., Hamaguchi,R.	Water
7	Journal of Flood Risk Management	2020	Assessment of the Tidal Effect on Flood Inundation in a Low-Lying River Basin under Composite Future Scenarios.	Yonehara, S., Kawasaki, A.	Water
8	Journal of Disaster Research, Vol.15, No.3	Mar 2020	Development of flood damage estimation model for agriculture – Case study in the Bago floodplain, Myanmar.	Win, S., Win, W.Z., Kawasaki, A., San, Z.M.L.T	Water
9	Journal of Disaster Research, Vol.15, No.3	Mar 2020	Multivariate flood loss estimation of 2018 Bago Flood in Myanmar	Win, W.Z., Kawasaki, A., Hörmann, G., Acierto, R.A., San, Z.M.L.T., Thu, A.Y.	Water
10	Journal of Disaster Research, Vol.15, No.3	Mar 2020	Impact of bias-correction methods in assessing the potential flood frequency change in Bago River.	Acierto, R.A., Kawasaki, A., Win, W.Z., Aung, T.O., Khon, R., Komori, D.	Water
11	Journal of Disaster Research, Vol.15, No.3	Mar 2020	Characteristic of the 2018 Bago River flood of Myanmar.	Komori, D., Kawasaki, A., Sakai, N., Shimomura, N., Harada, A., Okuda, K., Chit, B.B.W., Thu, A.M., Htun, K.Y., Toe, W., Win, W.Z.,	Water
12	Journal of Disaster Research, Vol.15, No.3	Mar 2020	Application and flood discharge analysis with hydrological model (WEB-DHM) in Bago River Basin.	Maung, S.W., San, Z.M.L.T., Win, W.Z., Kawasaki, A., Kyu Kyu Thin	Water
13	Journal of Disaster Research, Vol.15, No.3	Mar 2020	Projecting Rainfall, Temperature and Impact of	Myo, H.T., Win, W.Z., Shwe, K.P., San,	Water

			Climate Change on Discharge of the Bago River Basin, Ayeyarwady Delta.	Z.M.L.T., Kawasaki, A., Acierto, R.A.	
14	Journal of Disaster Research, Vol.15, No.3	Mar 2020	Estimation of run-of-river hydropower potential in Myitnge River Basin.	Thin, K.K., Win, W.Z., San, Z.M.L.T., Kawasaki, A., Moiz, A., Bhagabati, S.S.	Water
15	Journal of Disaster Research, Vol.15, No.3	Mar 2020	Developing Flood Inundation Map using RRI and SOBEK models: A Case Study of the Bago River Basin, Myanmar.	San, Z.M.L.T., Win, W.Z., Kawasaki, A., Acierto, R.A., Oo, T.Z.	Water
16	Journal of Disaster Research, Vol.15, No.3	Mar 2020	User-Stories-Based Requirement elicitation for data visualization to decision making support for water resource management in Bago River Basin, Myanmar.	Kodaka, A., Shirai, N., Bhagabati, S., Kohtake, N., Kawasaki, A., Acierto, R.A., Win, W.Z.	Water
17	Journal of Disaster Research, Vol.15, No.3	Mar 2020	Acquisition of ground information in downtown Yangon for Bosai Operation Support system	Tun Naing, Su Thinzar, Muneyoshi Numada, Khin Than Yu, Kimiro Meguro	Earthquake
18	Journal of Disaster Research, Vol.15, No.3	Mar 2020	An Investigation of socioeconomic and land use influenceon car ownership in Yangon City	Thiri Aung, Kyaing, Ko Ko Lwin, Yoshihide Sekimoto	Transportation
19	Journal of Disaster Research, Vol.15, No.3	Mar 2020	Analysis of trip distributions of human mobility patterns and their transit behaviours using mobile call detail records	Kyaing, Ko Ko Lwin, Yoshihide Sekimoto	Transportation
20	Journal of Disaster Research, Vol.15, No.3	Mar 2020	Traffic conditions and route choice of road users between two roudabouts	Lin Zarni Win, Kyaing, Ko Ko Lwin, Yoshihide Sekimoto	Transportation
21	Journal of Disaster Research, Vol.15, No.3	Mar 2020	Condition Monitoring of Yangon Circular Railway and Yangon-Mandalay Railway based on Car-Body Acceleration Response using Portable Device	Hein Thura Aung, Kazuki Inoue, Sao Hone Pha, and Wataru Takeuchi	RS/GIS
22	Journal of Disaster Research, Vol.15, No.3	Mar 2020	Analysis of bus operation at peak hours using bus GPS data: a case study of YBS – 36	Thet Htun Aung, Kyaing, Ko Ko Lwin, Yoshihide Sekimoto	Transportation
23	Journal of Disaster Research, Vol.15, No.3	Mar 2020	Estimation of Run-of-River Hydropower Potential in Myitnge River Basin	Seemanta Sharma Bhagabati	Water
24	Journal of Disaster Research, Vol.15, No.3	Mar 2020	Building footprint extraction in Yangon city from monocular optical satellite image using deep learning	Hein Thura Aung, Sao Hone Pha, and Wataru Takeuchi	RS/GIS
25	Journal of Disaster Research, Vol.15, No.3	Mar 2020	Measuring Traffic Congestion Based on the Taxi Operations of Traditional and On-Demand Taxis in Yangon	Moe Myint Mo, Kyaing, Ko Ko Lwin, Yoshihide Sekimoto	Transportation
26	Journal of Disaster Research, Vol.15, No.3	Mar 2020	Earthquake Building Collapse Risk Estimation for 2040 in Yangon	Osamu Murao, Tomohiro Tanaka	Earthquake
27	Journal of Disaster Research, Vol.15, No.3	Mar 2020	Seismic Fragility Analysis of Poor Timber Buildings in Yangon Slum Areas	Khin Myat Kyaw, Chaitanya Krishna, Kyaw Kyaw, Hideomi Gokon,	Earthquake

				Osamu Murao and Kimiro Meguro	
28	Journal of Disaster Research, Vol.15, No.3	Mar 2020	Analysis of Seismic Performance of Suspension Bridge in Myanmar	Punyawut Jiradilok, Kohei Nagai, Koji Matsumoto, Takeshi Yoshida, Tetsuro Goda, Eiji Iwasaki	Infrastructure
29	Journal of Disaster Research, Vol.15, No.3	Mar 2020	Expectations for training transfer after a capacity development project on road and bridge technology in Myanmar.	Michael Henry, Kohei Nagai, Koji Matsumoto, and Hiroshi Yokota	Infrastructure
30	Journal of Disaster Research, Vol.15, No.3	Mar 2020	Improving River Bathymetry and Topography Representation of a Low-Lying Flat River Basin by Integrating Multiple Sourced Datasets	Seemanta Sharma Bhagabati, Akiyuki Kawasaki, Wataru Takeuchi and Win Win Zin	Water
31	Journal of Disaster Research, Vol.15, No.4 *(accepted in March, 2020, to be published in April 2020)*	Apr 2020	Traffic Impacts of Street Parking Cars on Secondary North-South Streets in Downtown Yangon	Yudai HONMA and Kimiro MEGURO	Transportation

Table 4. List of papers presented at conferences

#	Name of journal/conference	Date	Title	Author	Group
1	40th Asian Conference on Remote Sensing (ACRS), Daejeon, Korea.	18 Oct. 2019	High Resolution Air Pollution Assessment for Road Transport in Yangon, Myanmar.	Takashi Misumi and Wataru Takeuchi	RS/GIS
2	The 18th International Symposium on New Technologies for Urban Safety of Mega Cities in Asia (USMCA 2019), Yangon, Myanmar	9-10 Dec. 2019	Optimization of building footprint extraction model with color and texture analysis in Yangon City	Hein Thura Aung, Sao Hone Pha and Wataru Takeuchi:	RS/GIS
3	American Geophysical Union (AGU) Fall Meeting 2019, San Francisco, U.S.	Dec 2019	Assessing Long-term Effects of Multiple Flood Risk Management Strategies under Climate Change Scenarios: Case Study in Bago River Basin, Myanmar.	Yamagami, C., Kawasaki, A.	Water
4	American Geophysical Union (AGU) Fall Meeting 2019, San Francisco, U.S.	Dec 2019.	The vicious circle of flood and poverty under the urbanization: a case study in Bago city in Myanmar.	Shimomura, N.,Kawasaki, A.,	Water
5	American Geophysical Union (AGU) Fall Meeting 2019, San Francisco, U.S.	Dec 2019	Estimation of Poverty Residents Distribution Using Satellite Images and Household Survey Data.	Okuda, K., Kawasaki, A.,	Water
6	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Development of flood inundation map using HEC-HMS and HEC-RAS, USMCA 2019, Yangon, Myanmar, 9-10, Dec. 2019	Wai Toe, Win Win Zin, Mar Lar Tin San and Akiyuki Kawasaki:	Water
7	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Estimation of flood dscharge using with WEB-DHM model in Bago River	Sann Win Maung, Zin Mar Lar Tin	Water

			Basin, USMCA 2019, Yangon, Myanmar, 9-10, Dec. 2019	San, Win Win Zin, Akiyuki Kawasaki:	
8	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Climate change scenarios in Myanmar using MRI-AGCM3.2S model	WinWinZin:	Water
9	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Flood risk assessment based on quantification of flood damage, USMCA 2019, Yangon, Myanmar	Badri Bhakta Shrestha and Akiyuki Kawasaki:	Water
10	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Flood risk assessment based on quantification of flood damage	Shrestha, B. B., Kawasaki, A.,	Water
11	The 6th ICT-DM'2019 (International Conference on Information and Communication Technologies in Disaster Management), Paris, France,	18-20, Dec.	City Geospatial Dashboard: IoT and Big Data Analytics for Geospatial Solutions Provider in Disaster Management	Lwin, K. K., Sekimoto, Y., Takeuchi, W and Zettsu, K.	Transportation
12	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Analysis on the Effect of Land Use and Socioeconomic Characteristics on Travel Behavior	Thiri Aung, Kyaing, Ko Ko Lwin, Yoshihide Sekimoto	Transportation
13	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Overview of urban growth and Yankin Rdevelopment towards sustainable land use planning in Yangon	SanSanMoe:	Transportation
14	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Economic and operational analysis of public transportation in Pathein Township	Emmanuel and Kyaing:	Transportation
15	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Mathematical relationship between minimization of travel time and detouring behavior on grid networks: A case study of Yangon downtown	Yudai Honma, Kimiro Meguro:	Transportation
16	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Slope modeling for future slope stability in Kakka City, Chin Sate, Myanmar	May Myat Mon, Tun Naing, Kyaw Zin Latt, Muneyoshi Numada, Kimiro Meguro	Earthquake
17	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Estimation of site amplification factor in Yangon City, USMCA 2019, Yangon, Myanmar, 9-10 Dec. 2019.	Takumi Matsumoto, Takaaki Ikeda, Hideomi Gokon, Atsuya Minagawa, Tun Naing Osamu Murao:	Earthquake
18	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Study on amplification factor ofmaximum acceleration for seismic hazard assessment	Atsushi Minagawa, Takaaki Ikeda, Hideomi Gokon, Takumi Matsumoto and TunNaing:	Earthquake
19	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Developing evacuation areas in Yangon for emergency response with GIS system, USMCA 2019, Yangon, Myanmar, 9-10, Dec. 2019	Ei Ei Tun, Tin Tin Aye, Takaaki Kato, Tomoko Matsushita:	Earthquake
20	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	: Difference in building collapse risk in Yangon due to applicable dataset, USMCA 2019, Yangon, Myanmar, 9-10, Dec. 2019	Osamu Murao, Takaaki Ikeda, Mikio Koshihara,	Earthquake

				Kimiro Meguro and Theing Shwe	
21	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	A feasibility study on the scaling of operational mode shapes of building using a shaker, USMCA 2019, Yangon, Myanmar, 9-10 Dec. 2019.	Gadagamma Chaitanya Krishna, Muneyoshi Numada, Kimiro Meguro,	Earthquake
22	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Determination of site condition based on microtremors survey and boring data in three selected townships of Yangon, Myanmar	Tun Naing, Su Thizar and Aung Myo Zaw,	Earthquake
23	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Soil-structure-interaction effects on the damage state of typical buildings in Yangon, USMCA 2019, Yangon, Myanmar	Khin Myat Kyaw, Kimiro Meguro:	Earthquake
24	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	One-dimensional seismic respose analysis by equivalent linear method in Kyauktada, Pazundaung and Botahtaung Townships, Yangon, Myanmar	Su Thinzar and Tun Naing:	Earthquake
25	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	A study of evacuation risk in the central business district of Yangon City and discussion on the role of Back Drainage Space	Tomoko Matsushita, Aya Kubota, Kimiro Meguro:	Earthquake
26	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Seismic hazard assessment in Yangon City using the empirical earthquake evaluation method	Yoshito Yokoe, Takaaki Ikeda, Takumi Matsumoto Atsuya Minagawa:	Earthquake
27	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Effect of surface ground characteristics on structural damage	Haruki Suzuki, Takaaki Ikeda, Yukiko Kojima:	Earthquake
28	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Source modeling and ground motion simulation of the mid-scale crustal earthquake	Takaaki Ikeda:	Earthquake
29	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Seismic risk assessment of existing timber building: A case study of pyay hostel in Yangon University	Wai yan Soe and Kyaw Kyaw:	Earthquake
30	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Monitoring Results of Pathein Bridge Towers and Bearings	Khin Maung Zaw, Win Bo, Amy Aung, Koji MATSUMOTO, Kohei NAGAI	Infrastructure
31	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Development of a comprehensive disaster resilience system and collaboration platform in Myanmar, USMCA 2019, Yangon, Myanmar, 9-10 Dec. 2019.	Kimiro Meguro:	Disaster Management
32	USMCA 2019, Yangon, Myanmar	9-10 Dec. 2019	Investigation of disaster response activities of administration offices of Yangon City	Hideomi Gokon, Takaaki Kato, May Myat Mon, Tun Naing, Muneyoshi Numada, Kimiro Meguro	Disaster Management

1-5 Changes of Risks and Actions for Mitigation

1) Difficulty of data inquiry

[Issue]

The Project requires various kinds of data from Myanmar organizations to be used for the research activity, however it has been difficult to acquire. Because of this, the Project missed the opportunity to carry out some capacity building activity or research collaboration.

[Countermeasure]

- For ground data, the Project member is coordinating with the CP from Geotechnical team to obtain the requested data from YCDC and also requested for support from JICA as well to get borehole data from other sources.
- For building data, Project members continued to coordinate with YTU to request the use of the building data from Yangon Mapping Project delivered to the Urban Planning Division (UPD) of YCDC in January 2019.

2) Management of the equipment

[Issue]

The Project donated a number of equipment including highly sensitive devices which are not easy to repair or replace in Myanmar. Sometimes the Myanmar side is hesitant to use the equipment due to a lack of information sharing / discussion between Myanmar and Japan side for a proper understanding of its purpose. For some, necessary manuals or trainings have not been provided.

[Countermeasure]

- The Project office collected necessary information from respective groups to complete the equipment management list so that all required information and technical transfer is completed before the end of the project.
- Additional seminar was conducted by an expert dispatched from Japan to give lectures and hands-on seminar and conducted field survey using the equipment in order to increase proper understanding of the use of donated equipment.

1-6 Progress of Actions undertaken by JICA

- JICA assisted and succeeded in acquiring requested ground data needed for making amplification map.
- Joint Evaluation was conducted and evaluation result was presented along with recommendation at JCC meeting.

1-7 Progress of Actions undertaken by Government of Myanmar (and/or YTU)

- YTU prepared necessary documents and rector attended a Committee meeting at MOE to explain to submit to MOE for the Consortium and

1-8 Progress of Environmental and Social Considerations (if applicable)

None.

1-9 Progress of Considerations on Gender/Peace Building/Poverty Reduction (if applicable)

None.

1-10 Other remarkable/considerable issues related/affect to the project (such as other JICA's projects, activities of counterparts, other donors, private sectors, NGOs etc.)

- Situation regarding the pro-rector (Research Head of the Project) remained the same and no assignment of the new pro-rector was assigned and the Project had to continue with a help of former pro-rector.
- Prof. Pwint, a professor from Architecture Department who has been one of the main project members since the beginning of the project has passed away in February 2020 and the Heritage team has lost its main counterpart.

2. Delay of Work Schedule and/or Problems (if any)

Two main issues continued to exist; 1) Difficulty of data inquiry as stated in 1-5 and 2) Difficulty of executing the Consortium - due to uncertainty of the governmental agencies and their lack of understanding on consortium.

2-1 Detail

1) Difficulty of data inquiry
See 1-5.
2) Difficulty of executing the Consortium
The situation regarding the Consortium continued to remain the same as previous monitoring period.

2-2 Cause

1) Not known but it could be partially due to a lack of understanding caused by a lack of communication.
2) Not certain but it could be due to limited understanding on Consortium by all Myanmar organizations, and also a lack of YTU's experience to know the staffing needs as this is the first time for YTU to establish the Consortium.

2-3 Action to be taken

1) YTU members to review the proposal or situation of data inquiry carefully and follow up regularly to monitor the situation, share the result with the Japanese side for taking necessary actions.
2) YTU to make close communication with MOE as well as Japan side through Operating officer and make necessary arrangement promptly to complete all procedure for the establishment of the Consortium. Japan side to continue supporting YTU to realize the establishment.

2-4 Roles of Responsible Persons/Organizations

As stated above.

3. Modification of the project Implementation Plan

3-1 PO

None.

3-2 Other modifications on detailed implementation plan

None.

4. Preparation of Gov. of Myanmar (and/or YTU) toward after completion of the Project

- The project has been discussing with various stakeholders in the governmental organizations,

private sectors and NPOs regarding the social implementation of the research outcome and will continue to do so.

- Necessary procedure for establishing the Consortium has been conducted by YTU.

II. Project Monitoring Sheet I & II As attached

Project Monitoring Sheet I

Project Title: Project for Development of a Comprehensive Disaster Resilience System and Collaboration Platform in Myanmar
Target Group: faculty members of Yangon Technological University (YTU), Indirect: Ministries in charge of disaster management and, local governments, major infrastructure and residents in target area
Project Site: Republic of the Union of Myanmar (Bago River Basin and Yangon)

Ver.9（Term: October 2019 - March 2020）
Dated 26 March 2020

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Achievement	Remarks
Overall Goal				
YTU further utilizes the Collaboration Platform to contribute to the urban safety in Yangon and Bago	1 At least 4 policy proposals on the result of the Comprehensive Disaster Resilience System are made for relevant governments by YTU team	1 Number of proposals made by YTU team	A total of 5 policy related documents were submitted (see below Achievement for Project Purpose 2)	
	2 At least 20 specialized persons in urban safety sector are trained at YTU	2 Number of certified specialized persons trained by YTU	A total of 216 certified specialized persons were trained by YTU, UTokyo and other related organizations. (Water related disaster group: 22, Disaster management group : 194) [Water-related disaster group] - Training workshops for installing and maintaining hydro-meteorological equipment were conducted at YTU for 8 times, and 10 governmental officers from IWUMD, DWIR, DMH, DHPI, and YTU faculty members and students participated the training. [Disaster management group] - Trainings were conducted at 5 townships in CBD as we as at YTU using a disaster response support system.	
Project Purpose				
YTU understands and develops a Comprehensive Disaster Resilience System and a Collaboration Platform for urban safety in Yangon and Bago	1 At least 20 research papers related to the project, which are submitted by mainly YTU during the project period, are accepted by international journals	1 Papers submitted to journal papers	A total of 19 papers related to the project were submitted by mainly YTU (main author is from YTU) and accepted by international journals by March 2020. Total of 64 papers (54 International journal / 10 domestic (Japanese) journal) were submitted and accepted by March 2020. During this monitoring period, 21 papers (international journal) was submitted and accepted.	
	2 Some suggestions, advises and policy proposals by using the Comprehensive Disaster Resilience System are submitted to relevant governments.	2 Relevant documents submitted	A total of 5 policy related documents were submitted and some policy recommendations were made. [Infrastructure management group] - - A report of the investigation of the collapse of Myaung Mya Bridge was submitted to MOC in 2018. - A report of the safety investigation of cable-type suspension bridges was submitted to MOC in 2018 to help improve safety investigation and maintenance works for similar type of bridges in Myanmar. - A policy recommendation was made to establish a regulation for cable-type bridges such as periodical inspection to MOC in 2018. [Water-related disaster group] -- A flood-control plan and urban development plan in Bago were presented to DMN, DWIR, IWUMD and DDM using the result of assessing water-related disaster vulnerability in the Bago River Basin in 2018. - A summary report of the 2018 Myanmar flood response including data analysis was submitted to DMH, DWIR, IWUMD, DHPI and DDM in August 2018 using the Near-real time flood inundation simulation system developed by the Project.	
	3 The Comprehensive Disaster Resilience System is developed and under operations by YTU	3 Operations records	[Water-related disaster group] - "Near-real time floor inundation simulation system" is completed and handed over to YTU for operation. [Transportation and Human Mobility group] - "City Geospatial Dashboard" is completed and handed over to YTU for operation. - "Myanmar G-Spatial Information Dashboard" is completed and handed over to YTU for operation. [Disaster Management group] - "Disaster Response Support System" is completed and handed over to YTU for operation	
Outputs				**Expected achievement by the end of the project:**
1 Development of physics model to evaluate disaster vulnerability	1-1 Meteorological and hydrological observation of target areas, performance evaluation of structures, and capacity of people / traffic monitoring are improved and Hydology and flood inundation model in research area is developed	1-1 Use of equipment, observation data and operation / maintenance system of equipment, Database: temperature, water, and river environment	[Water related disaster group] - Installation of all planned equipment for the meteorological and hydrological observation is completed and the data has been archived in the YTU server.	
	1-2 Earthquake vulnerability assessment method is established Yangon digital map database is created	1-2 Database: infrastructures, buildings, and topographical information	[Building group] - (Activity 1-2-2) Construction of the fragility curves for normal timber structures, stilt houses, RC buildings, and Brick-nogging buildings were completed and a vulnerability map version 3 was created using the data. - (Activity 1-2-3) Microtremor measurement has been conducted in Yangon City in December 2019 in order to make an amplification factor map. - As a result of negotiation and coordination with concerned parties, some of the ground data (borehole data) were acquired and used for making a map. - (Activity1-2-5) Historical buildings surveyed during the Project was put together as a map. - (Activity 1-2-6) An integrated digital map database is completed and built on WebGIS platform.	
	1-3 Urban development model in survey area is developed	1-3 Database: traffic and crowd flow	[Transportation and mobility group] - Traffic monitoring of taxi and recording of the movements is continuing. - Additional work was done in response to a request from YRTA to carry out a fixed point observation using a camera to extract the traffic flow at the road intersection and the number of cars automatically, with a cooperation of the Traffic Control Center. - CCTV camera movie in YRTA Traffic Control Center is analyzed for the number of vehicles in each direction in main road intersection in Yangon.	- Database will be improved. - Collaborative research activities will be realized.
2 Development of scenario analysis system for assessing future disaster vulnerability	2-1 Water-related disaster vulnerability is assessed	2-1 Flood inundation map	[Water related disaster group] - (Activity 2-1-5) Expected inundation areas in Bago River basin in case of Precipitation Return Period from 2 years, 100 years, and 500 years were simulated and demonstrated on "Bago River Near Real-time Inundation Analysis System." - Social surveys for poor livelihoods in flood-prone areas were conducted in Yangon and Bago as an important factor of water-related disaster vulnerability assessment.	Results from survey and analysis will be stored in the System and will be accessibley by government organizations such as IWUMD, DWIR, DHM, and DHPI.
	2-2 Earthquake-related disaster vulnerability is assessed Earthquake vulnerability map is created	2-2 Earthquake vulnerability map	[Building group] (Activity 2-2-1) Possible scenario patterns with proper input and algorithm was examined. - (Activity 2-2-2) Vulnerability based on earthquake scenarios were assessed and third version of seismic vulnerability map has been arranged using updated datasets. - (Activity 2-2-3) Microtremor measurements in Yangon City has been conducted in December. An amplification map is completed using acquired borehole data. - (Activity 2-2-4) Ground condition data, building data, and fragility curves were created to make a damage prediction map. - (Activity 2-2-6) Earthquake resistance of some of the historic building were assessed and distribution map was created. - (Activity 2-2-7) Earthquake disaster vulnerability was evaluated and integrated earthquake vulnerability map was created.	
3 Development of main roles and activities of research centre for urban safety in YTU to sustain and enhance research activities and human resource development	3-1 Framework of research centre for urban safety is developed in YTU	3-1 Approval document, Proposal document	[All] - (Activity 3-1-3) The Project continued to support the activity of RC after its launch. - (Activity 3-1-4) Workshop was held at YTU to both students and faculty members using the developed Web GIS database system and feedback was received in order to improve the system and expand the database. - (Activity 3-1-5) RC has been used for a number of seminars, workshops and meetings by the Project since its establishment. Student seminars continued to be conducted bi-monthly to enhance the research and presentation skill of the YTU researchers.	- Research center will be managed and operated by YTU.
	3-2 Educational program to foster specialized persons is developed	3-2 Curriculum, syllabus, record of training courses	[All] - (Activity 3-2-3) (Activity 3-2-4) Discussion for the development of YTU's curriculum especially for RS/GIS group and Earthquake-related disaster group are on-going and lectures and workshops have been conducted. RS/GIS Group conducted lectures to graduate students as a part of existing curriculum in the Department of Electronics. Heritage workshop to survey a historic architecture was conducted with the Department of Architecture.	- A new curriculum will be developed based on discussion between both sides and the class will be taught by the Myanmar side.
	3-3 Basic concept of Consortium among government, academia, and industry is developed in YTU through trial activities	3-3 Activity records	(Activity 3-3-3) Seminar on Commencement of Activities of Consortium was held before the 5th Joint Coordination Committee Meeting on 1st of October 2019. Organization structure, constitution and future plan of the Consortium were introduced and 3 systems developed through the Project were demonstrated. - (Activity 3-3-4) Discussion for possible collaborative research projects have been going on among YTU and the Japanese side in order to utilize the resources effectively and promote active exchange among related organizations.	- Consortium among government, academia, and industry will be established.
4 Development of integrated disaster response support system including infrastructure maintenance management with adequate technologies	4-1 Improved infrastructure management and maintenance system, and technology for securing disaster mitigation function in Myanmar is proposed	4-1 Proposal documents	[Infrastructure management group] Activity 4-1: Propose improved infrastructure management and maintenance system, and technology for securing disaster mitigation function in Myanmar - (Activity 4-1-3) Workshop was held to introduce the use of donated equipment (non-destructive test equipment) to be used for infrastructure maintenance and management in December and manuals were provided. - (Activity 4-1-4) A course on seismic retrofitting of existing non-engineered buildings was conducted	
	4-2 Integrated disaster response support system is developed	4-2 Software and operation manual for integrated disaster response support system, record of trainings, recommendation for sustainability	- (Activity 4-2-3) For Water-related disaster group, feedback from the test run of "Bago River Near Real-time Inundation Analysis System" was received from 5 Myanmar governmental departments and then the system was improved based on the comments. All the system development was completed in March 2020. `- For Disaster Management Group, user interface is completed. - (Activity 4-2-4) For Disaster Management Group, training was conducted at YTU and the system was introduced.	- Disaster management system will be operated YTU. - An inter-departmental framework for water-related disaster preparedness and response among IWUMD, DWIR, DHM, and DDM will be organized to realize collaboration including data-sahring.

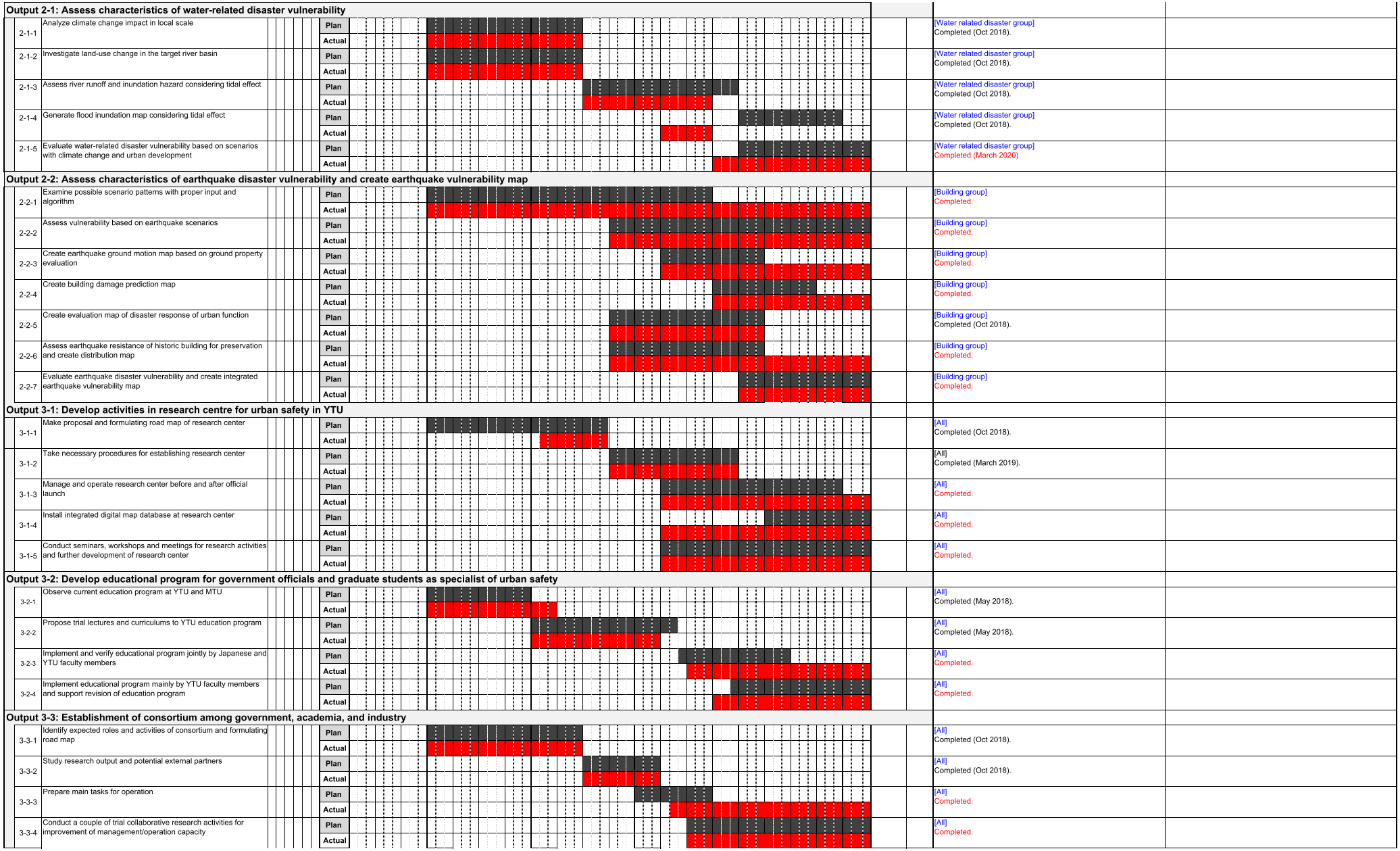
Plan of Operation

Ver.9（Term: October - March 2020）
Dated 26 March 2020

Project Title: Project for Development of a Comprehensive Disaster Resilience System and Collaboration Platform in Myanmar

Inputs	Year	2015				2016				2017				2018				2019				2020	Remarks	Monitoring: Issue	Monitoring: Solution
		II	III	IV		I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I			
Expert		4 5 6 7 8 9 10 11 12				1 2 3 4 5 6 7 8 9 10 11 12				1 2 3 4 5 6 7 8 9 10 11 12				1 2 3 4 5 6 7 8 9 10 11 12				1 2 3 4 5 6 7 8 9 10 11 12				1 2 3			
Water-related Disaster	Plan																								
	Actual																								
Earhquake-related Disaster	Plan																								
	Actual																								
Geospatial Technology	Plan																								
	Actual																								
Infrastructure Management	Plan																								
	Actual																								
Transportation and Mobility	Plan																								
	Actual																								
Disaster Management	Plan																								
	Actual																								
Project Coordinator	Plan																								
	Actual																								
Equipment																									
Database system / Web server	Plan				▲	Procurement ▲								Procurement								▲			
	Actual					Procurement ▲								Procurement											
Equipment for printing and mapping	Plan				Procurement ▲																				
	Actual				Procurement ▲																				
Equipment for inspection and monitoring of roads, bridges and structures	Plan				Procurement ▲				▲																
	Actual				Procurement ▲					Procurement ▲															
Equipment for surveying and measuring ground condition and structure	Plan					Procurement ▲																			
	Actual					Procurement ▲																			
Equipment for probing vehicle	Plan					Procurement ▲																			
	Actual					Procurement ▲																			
Equipment for hydro-meteorological observation / Equipment for telemetry system	Plan				Procurement ▲																				
	Actual				Procurement ▲																				
Equipment for lectures	Plan				Procurement ▲									Procurement ▲											
	Actual					Procurement ▲																			
Training in Japan																									
Training on Water and Energy Budget-based Distributed Hydrological Model (WEB-DHM)	Plan					▲																			
	Actual								▲	▲															
Training for establishment of database for Disaster Management Platform	Plan					▲																			
	Actual							▲																	
Training for the Development of a Disaster Vulnerability Assessment System	Plan									▲															
	Actual									▲															
Investigation of residual structural performance of damaged bridge in Myanmar and its monitoring	Plan												▲												
	Actual												▲												
Practical Course for Establishment of Water and Energy Budget-based Distributed Hydrological Model (WEB-DHM) in Myanmar	Plan														▲										
	Actual														▲										
In-country/Third country Training																									
	Plan																								
	Actual																								

Activities / Sub-Activities		Year	2015 II	III	IV	2016 I	II	III	IV	2017 I	II	III	IV	2018 I	II	III	IV	2019 I	II	III	IV	2020 I	Responsible Organization: Japan	GOM	Achievements	Issue & Countermeasures
Output 1-1: Develop hydrological and flood inundation model of study area																										
1-1-1	Collect information and data in meteorology, hydrology, and water resource management and build database	Plan																							[Water related disaster group] Completed (March 2019).	
		Actual																								
1-1-2	Build hydrological and flood inundation model in the target river basin for flood vulnerability assessment	Plan																							[Water related disaster group] Completed (Oct.2018).	
		Actual																								
Output 1-2: Establish Earthquake vulnerability assessment method and create of Yangon digital map database																										
1-2-1	Investigate damage by past earthquakes in Myanmar	Plan																							[Building group] Completed (May 2018).	
		Actual																								
1-2-2	Develop an earthquake vulnerability evaluation model (understanding building characteristics and developing of seismic fragility function) from the viewpoint of building characteristics in	Plan																							[Building group] Completed.	
		Actual																								
1-2-3	Construct vulnerability assessment model based on the ground characteristics (including topographic information) in Yangon	Plan																							[Building group] Completed.	
		Actual																								
1-2-4	Establish disaster vulnerability assessment model from Yangon's regional urban functions based on the performance and distribution survey of important facilities in case of disaster	Plan																							[Building group] Completed.	
		Actual																								
1-2-5	Survey on distribution and characteristics of historic buildings in Yangon	Plan																							[Building group] Completed.	
		Actual																								
1-2-6	Create integrated digital map database	Plan																							[Building group] Completed.	
		Actual																								
Output 1-3: Development of urban development model in survey area																										
1-3-1	Collect and analyze geo-spatial data and develop urban expansion simulation	Plan																							[GIS and remote sensing group] Completed (May 2018).	
		Actual																								
1-3-2	Collect data and predict traffic and people movement with people activity model	Plan																							[Transportation and mobility group] Completed.	
		Actual																								



Output 2-1: Assess characteristics of water-related disaster vulnerability			
2-1-1	Analyze climate change impact in local scale	Plan / Actual	[Water related disaster group] Completed (Oct 2018).
2-1-2	Investigate land-use change in the target river basin	Plan / Actual	[Water related disaster group] Completed (Oct 2018).
2-1-3	Assess river runoff and inundation hazard considering tidal effect	Plan / Actual	[Water related disaster group] Completed (Oct 2018).
2-1-4	Generate flood inundation map considering tidal effect	Plan / Actual	[Water related disaster group] Completed (Oct 2018).
2-1-5	Evaluate water-related disaster vulnerability based on scenarios with climate change and urban development	Plan / Actual	[Water related disaster group] Completed (March 2020)
Output 2-2: Assess characteristics of earthquake disaster vulnerability and create earthquake vulnerability map			
2-2-1	Examine possible scenario patterns with proper input and algorithm	Plan / Actual	[Building group] Completed.
2-2-2	Assess vulnerability based on earthquake scenarios	Plan / Actual	[Building group] Completed.
2-2-3	Create earthquake ground motion map based on ground property evaluation	Plan / Actual	[Building group] Completed.
2-2-4	Create building damage prediction map	Plan / Actual	[Building group] Completed.
2-2-5	Create evaluation map of disaster response of urban function	Plan / Actual	[Building group] Completed (Oct 2018).
2-2-6	Assess earthquake resistance of historic building for preservation and create distribution map	Plan / Actual	[Building group] Completed.
2-2-7	Evaluate earthquake disaster vulnerability and create integrated earthquake vulnerability map	Plan / Actual	[Building group] Completed.
Output 3-1: Develop activities in research centre for urban safety in YTU			
3-1-1	Make proposal and formulating road map of research center	Plan / Actual	[All] Completed (Oct 2018).
3-1-2	Take necessary procedures for establishing research center	Plan / Actual	[All] Completed (March 2019).
3-1-3	Manage and operate research center before and after official launch	Plan / Actual	[All] Completed.
3-1-4	Install integrated digital map database at research center	Plan / Actual	[All] Completed.
3-1-5	Conduct seminars, workshops and meetings for research activities and further development of research center	Plan / Actual	[All] Completed.
Output 3-2: Develop educational program for government officials and graduate students as specialist of urban safety			
3-2-1	Observe current education program at YTU and MTU	Plan / Actual	[All] Completed (May 2018).
3-2-2	Propose trial lectures and curriculums to YTU education program	Plan / Actual	[All] Completed (May 2018).
3-2-3	Implement and verify educational program jointly by Japanese and YTU faculty members	Plan / Actual	[All] Completed.
3-2-4	Implement educational program mainly by YTU faculty members and support revision of education program	Plan / Actual	[All] Completed.
Output 3-3: Establishment of consortium among government, academia, and industry			
3-3-1	Identify expected roles and activities of consortium and formulating road map	Plan / Actual	[All] Completed (Oct 2018).
3-3-2	Study research output and potential external partners	Plan / Actual	[All] Completed (Oct 2018).
3-3-3	Prepare main tasks for operation	Plan / Actual	[All] Completed.
3-3-4	Conduct a couple of trial collaborative research activities for improvement of management/operation capacity	Plan / Actual	[All] Completed.

Output 4-1: Propose improved infrastructure management and maintenance system, and technology for securing disaster mitigation function in Myanmar				
4-1-1	Collect data, review management and maintenance system, and technology of Infrastructures, especially bridges, in Myanmar	Plan / Actual	[Infrastructure management group] Completed (May 2018).	
4-1-2	Propose improved management and maintenance system	Plan / Actual	[Infrastructure management group] Completed (March 2019).	
4-1-3	Apply and propose inspection and monitoring method for infrastructures and buildings with adequate retrofit technology for damaged infrastructure	Plan / Actual	[Infrastructure management group] Completed.	
4-1-4	Propose adequate retrofit technology for vulnerable buildings including those with historic value	Plan / Actual	[Building group] Completed.	
Output 4-2: Develop integrated disaster response support system for Earthquake and Water-related disaster				
4-2-1	Survey and analyze disaster management plan of local & central government	Plan / Actual	[Water-related disaster group, Disaster management group] Completed (March 2019).	
4-2-2	Analyze requirement of functions and needs of users for disaster response system	Plan / Actual	[Water-related disaster group, Disaster management group] Completed (March 2019).	
4-2-3	Develop a prototype of support system for hazard assessment	Plan / Actual	[Water-related disaster group, Disaster management group] Completed.	
4-2-4	Introduce support system to research center in YTU and conduct training for YTU faculty members and potential users	Plan / Actual	[Water-related disaster group, Disaster management group] Completed.	

Duration / Phasing	Plan / Actual		

Monitoring Plan	Year	2016 II	2016 III	2016 IV	2017 I	2017 II	2017 III	2017 IV	2018 I	2018 II	2018 III	2018 IV	2019 I	2019 II	2019 III	2019 IV	2020 I	Remarks	Issue	Solution
Monitoring																				
Joint Coordination Committee	Plan / Actual																			
Set-up the Detailed Plan of Operation	Plan / Actual																			
Submission of Monitoring Sheet	Plan / Actual																	Monitoring Sheet I & II was revised in the version 5 as PDM/PO was modified and approved at the 3rd JCC in Oct. 2017.		
Monitoring Mission from Japan	Plan / Actual																			
Joint Monitoring	Plan / Actual																			
Post Monitoring	Plan / Actual																			
Reports/Documents																				
	Plan / Actual																			
Project Completion Report	Plan / Actual																			
Public Relations																				
Newsletter	Plan / Actual																			
Website for the project	Plan / Actual																			