

PROJECT MONITORING SHEET

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

Version of the Sheet: Ver.1 (Term: April, 2017- September, 2017)

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Submission Date: 24 October, 2017

I. Summary

1 Progress

1-1 Progress of Inputs

(1) Input by Japanese side

(a) Dispatch of experts

The Japanese side has dispatched project researchers consisting of 6 sub-groups.

Details are as shown in Table 1.

Table 1: List of dispatched researchers

Period	Group name	No.*1	Place of Visit	Purpose(main)
2 Apr. – 5 Apr.	Disaster Management	2	Yangon	Meeting, seminar
1 Apr. – 9 Apr.	Building	2	Yangon	Meeting, seminar
3 Apr. – 4 Apr.	Transport & Mobility	1	Yangon	Meeting, seminar
2 Apr. – 5 Apr.	Infrastructure	2	Yangon	Field, seminar
1 May – 8 May	Building	1	Yangon	Meeting
4 May – 12 May	Water	5	Yangon, Nay Pyi Taw, Bago	Conference, field, survey
22 May – 29 May	Building	1	Yangon	Meeting
9 Jun. – 23 Jun.	Transport & Mobility	2	Yangon	Meeting, lecture
14 Jun. – 1 Aug.	Disaster Management	1	Yangon	Meeting, survey
14 Jun. – 24 Jun.	Infrastructure	4	Yangon, Mawlamyaing	Field, survey, seminar
21 Jun. – 23 Jun.	GIS	1	Yangon	Lecture, seminar
28 Jun. – 29 Jun.	Building	2	Yangon	Meeting
11 July – 16 July	Building	3	Yangon	Survey
13 July – 31 July	Building	1	Yangon	Meeting, survey, seminar
25 July – 1 Aug.	Infrastructure	1	Yangon, Patheingyi	Meeting, field, seminar
27 July – 1 Aug.	Disaster Management	2	Yangon	Meeting, seminar
31 July – 2 Aug.	Transport & Mobility	1	Yangon	Meeting

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9 Aug. – 17 Aug.	Building	2	Yangon	Meeting, lecture
9 Aug. – 16 Aug.	Water	3	Yangon, Nay Pyi Taw, Bago	Meeting, field
17 Aug. – 20 Aug.	Infrastructure	1	Yangon	Meeting, survey
12 Sep. – 13 Sep.	Disaster Management	1	Yangon	Meeting
20 Sep. – 22 Sep.	Infrastructure	2	Yangon	Meeting, survey
20 Sep. – 27 Sep.	Building	3	Yangon	Meeting

*1: Project members only

(b) Training Course in Japan

Training course “Development of a disaster vulnerability assessment system using GIS/RIS technology” was conducted in Japan from 2nd June to 20th June 2017. Trainees are as shown in Table 2-A.

Table 2: List of trainees

	Name	Title	Department
1	Tin Tin Aye	Lecturer	Department of Architecture
2	Ei Ei Tun	Master Student	Department of Architecture

(c) International Conference in overseas

The Project dispatched following project members and strategic partners for attending international conference to make presentation. Attendees and name of conferences are as shown in Table 3.

Table 3-A: RCCE-ICCER2017, 1 - 2 August 2017

Regional Conference in Civil Engineering and the 3rd International Conference on Civil Engineering Research, Surabaya, Indonesia (1-2 August 2017)

	Name	Title	Department / Organization
1	Daw Kyaing	Lecturer	Dept. of Civil Engineering, YTU

Table 3-B: EASTS2017, 18 – 21 September 2017

Eastern Asia Societies for Transportation Studies, Ho Chi Min, Vietnam

	Name	Title	Department /Organization
1	Daw Kyaing	Lecturer	Dept. of Civil Engineering, YTU
2	Thiri Aung	Master Student	Dept. of Civil Engineering, YTU

Table 3-C: The 10th GEOSS Asia-Pacific Symposium, 18 – 20 September 2017

	Name	Title	Department /Organization
1	Daw Tin Ti	Director	DMH, MOTC
2	Aung Myo Khaing	Deputy Director	DWIR, MOTC

3	Aung Than Oo	Assistant Director	IWUMD, MOALI
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(d) Provision of equipment

The Japanese side has provided equipment for project office and research activities as shown in Table 2. The total cost of equipment is 2,800,000JPY.

Table 4: List of equipment for provision

No.	Items	Unit	Unit Price	Sub total
1	GPS Device (CD-BGB-M)	50	56,000JPY	2,800,000JPY

(e) Local cost for the activity of Japanese experts

The Project has spent local cost for the activity 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 has assigned project leaders and members for 6 sub-groups as shown in Annex "List of project members".

(b) Project space with necessary equipment

YTU has provided project office including Mini Lecture Room facilities and Researchers' office attached with infrastructure, facilities for RS/GIS Laboratory and research center with basic furniture such as table, chair and steel locker.

(c) Running expenses for Project space

YTU has covered cost for utility such as electricity and water for Project space and some consumable.

(d) Expenses for received equipment within Myanmar

YTU has spent a cost for received equipment within Myanmar such as transportation cost from Yangon Airport to YTU, storage fee at custom office and agent fee for custom clearance. YTU has compromised and arranged for equipment installation at the sites concerned cost via mutual negotiation with Ministry of Agriculture, Livestock and Irrigation, and Ministry of Transport and Communication including costs for infrastructure for equipments such as weather sensors and hydro stations, and long-term operation. It is around 20,000 USD for initial set up per each equipment for water group. Operation costs are under concerned by concerned ministries' budget.

(e) Coordination with DOHE on the arrangement for obtaining permission from concerned authorities in installing received equipment

YTU has coordinated with DOHE for obtaining permission for receiving equipment such as import license, tax exemption letter and special order.

(f) Coordinate with DOHE on travel permit for Japanese Experts

YTU has coordinated with DOHE for obtaining multiple re-entries VISA for Japanese experts

(g) Cost for foundation work for provided equipment

IWUMD (Irrigation and Water Utilization Management Dept.) of MOALI (Ministry of Agriculture, Livestock and Irrigation) has shouldered cost for foundation work for water level station at Tawa sluice gate, Bago.

1-2 Progress of activities

1-2-1 Activities for overall project planning and management

(1) Progress of each activity is described as follow (Fig.1).

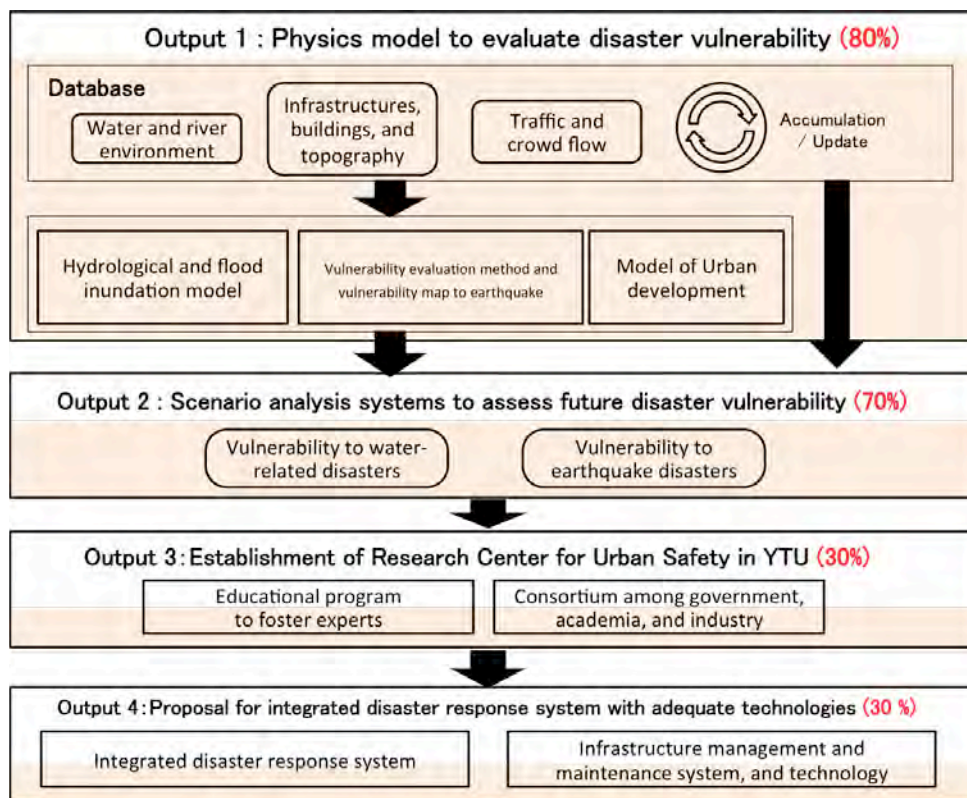


Fig.1 Progress of each activity. Color means the proportion of the progress.

Regarding **output 1** and **output 2**, the progress is fine. However, regarding establishment of research center for urban safety at YTU of **output 3**, this activity is delayed. Currently, educational program has been suggested to YTU, and the adjustment with other classes at is on progress. Proposal of the research center was sent to YTU from the UTokyo in August 2017, and discussion has been held in YTU. Regarding **output 4**, a prototype of disaster response system was created and shown to YTU for discussing future plan. However, the development

of this system started from this year, and we need to spend more time for completing. Infrastructure management and system have been studied well, and the progress is fine.

1-2-2 Activities for Output 1

- **[Water related disaster group]** An enhanced Digital Elevation Model (DEM) of Bago River Basin was developed for better inundation modeling using different sources.
- **[Water related disaster group]** One water level station at Tawa Sluicagate was installed on May 2017 (**Fig.2**). Real-time visualizations at YTU server were also developed related with the installed hydrometeorological observation stations.
- **[Water related disaster group]** High tide inundation model for the lower Bago River basin was developed to understand the more accurate hydrological characteristics.
- **[Water related disaster group]** Water levels have been continuously observed using the stations installed in this project.
- **[Water related disaster group]** Stakeholder meeting for future observation station installation.
- **[Water related disaster group]** Management of water level station at Tawa Sluice gate.
- **[Water related disaster group]** Management of weather station at Zaung Tu Weir.
- **[Water related disaster group]** Maintenance and checking of YTU SATREPS server and equipment for future installment.
- **[GIS and remote sensing group]** In FY 2017, as for data collection of changes in maps and land use, in-situ measurement, analysis and evaluation of existing infrastructure information such as buildings, bridges and railroads were carried out using three-dimensional laser measurement and close-range photogrammetry (**Fig.3**).
- **[Transport and mobility group]** Based on the past one week mobile phone CDR data with traffic simulation, the project calculated several traffic congestion scenarios, depending on the future traffic policy, such as lane capacity design and total traffic demand prediction.
- **[Transport and mobility group]** Relationships of a fare and a distance have been investigated in case of traditional taxis and on demand taxis.



Fig.2 Installation of water level station at Tawa sluice gate .



Fig.3 3D measurement of Twantay bridge using three-dimensional laser measurement and close-range photogrammetry.

1-2-3 Activities for Output 2

- **[Water related disaster group]** Social and economic characteristics of the residents in Bago River Basin and the impact of flood on livelihood has been investigated from field survey and workshops to investigate the impact of climate and land-use change on flood vulnerability considering various future development scenarios.
- **[Water related disaster group]** Questionnaire surveys have been conducted for identifying damages on buildings and agricultures due to the historical flood disaster.
- **[Water related disaster group]** Flood damage functions have been developed by integrating the flood inundation map and the data from the questionnaire survey.

- **[Water related disaster group]** Flood inundation model for historical and future events have been simulated using WEB-DHM model.
- **[Earthquake related disaster group]** Building survey was conducted in Central Business District in Yangon in June 2017, and floors of buildings were investigated to develop a method to expect the distribution of types of buildings using digital elevation model.
- **[Earthquake related disaster group]** Meetings and explanation of activities of urban planning have been done to the new director in May and July 2017. Then, after confirmation of data applicability based on sample data and realization of system construction in August, a discussion in September was arranged.
- **[Earthquake related disaster group]** Future plan for geotechnical survey was discussed at YTU.
- **[Earthquake related disaster group]** Meeting with architecture department, head of architecture department was done.
- **[Earthquake related disaster group]** Lecture was done by prof. Koshihara about heritage.
- **[Earthquake related disaster group]** Meeting with urban planning division of YCDC for data acquisition.
-Interview with fire department and hospitals was conducted.
- **[GIS and remote sensing group]** In FY 2017, as for data collection of changes in maps and land use, in-situ measurement, analysis and evaluation of existing infrastructure information such as buildings, bridges and railroads was carried out using three-dimensional laser measurement and close-range photogrammetry. Database preparation is completed from 1970's to 2010's dataset. More efforts will be carried out to collect 1900's to 1960's old historical map to grasp the land cover change in the last 100 years of Yangon city.

1-2-4 Activities for Output 3

- **[All]** We have held the second meeting of the preparatory committee on April 4, 2017, and the research groups on "Land / Ground / Micro Topography / Social Infrastructure Facilities" and on "Transportation / People Flow" introduced concrete examples of cooperation with private companies. Furthermore, we have exchanged information for continued use of technologies developed by SATREPS project in Myanmar. Until now, we have been engaged in activities to establish a consortium focusing on surveys on the technology and data required from academic institutions from the enterprise side and public relations activities on the research results of the project.
- **[All]** Educational materials and syllabus created for lectures and workshops are the core part of the educational program and are still under construction. Workshops includes

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fieldwork and design studio conducted to enhance the understanding. In addition, based on consultation with the YTU side, each research group has been conducting lectures necessary to deepen the understanding and effective utilization of the research output.

- **[All]** Meetings with YTU and Japanese private companies towards an establishment of consortium have been held. Based on the results obtained above mentioned meetings, the project team created concept note of consortium in July 2017. Tentative schedule for establishment of the center was discussed between YTU and Japan side and made.
- **[All]** Attended and organized students' seminar at YTU for capacity development.
- **[All]** Had a meeting with YTU about the research center and the consortium establishment.

1-2-5 Activities for Output 4

- **[Disaster management group]** Job descriptions for disaster management in Yangon City have been investigated to create a flowchart of disaster response. In addition, a prototype of disaster response support system has been developed, and demonstrated at YTU for discussing the functions which are needed to be included in future.
- **[Water related-disaster group]** Workshops for water-related governmental officers were conducted to identify needs and functions of the flood disaster management system. In addition, requirements of local residents about disaster information dissemination were investigated through interviews and questionnaire survey.
- **[Infrastructure management group]** From the results of monitoring, measurements, and FEM simulation of damaged bridges in Yangon, cause of the damages and structural performances were evaluated.
- **[Infrastructure management group]** Non-destructive testing was applied to examine the quality of concrete of structures.
- **[Infrastructure management group]** Maintenance system of infrastructures was surveyed by interview to MOC engineers and literature review.

1-3 Achievement of Output

1-3-1 Achievement of Output 1

- **[Water related disaster group]** Semi-real time data has been transferred from 4 weather stations and 1 water level station in Bago River Basin to servers of YTU and U Tokyo and been analyzed which contributes to build hydrological and flood inundation model.
- **[Water related disaster group]** A better inundation modeling using different sources became possible by developing an enhanced Digital Elevation Model (DEM) of Bago River Basin.
- **[Water related disaster group]** An environment for observing water elevation in Bago river was enhanced by installing new water level station at Tawa Sluiceway, and developing

real-time visualizations at YTU server related with the installed hydro-meteorological observation stations.

- **[Water related disaster group]** The inundation model in Bago river basin has been enhanced by developing high tide inundation model for the lower Bago River basin.
- **[GIS and remote sensing group]** As the result of data collection, comprehensive land cover data set from 1970's to 2010's were prepared and it was found that urban area in Yangon city from 1970's to 2010's has increased around 7 times bigger with the decrease of forested area down to 10% of 1970's.
- **[Transport and mobility group]** Traffic and crowd flow model have been studied by calculating several traffic congestion scenarios.

1-3-2 Achievement of Output 2

- **[Water related disaster group]** Impact of climate and land-use change on flood vulnerability was investigated considering various future development scenarios.
- **[Earthquake related disaster group]** Data of building height could be collected for enhancement of a method for expecting distributions of structure in Yangon City.
- **[Earthquake related disaster group]** Proper land use planning, knowledge to think of facility locations for emergency, and vulnerability maps including emergency vehicles and open space, which are significant skills and knowledge for disaster risk reduction, were provided to Yangon side.
- **[GIS and remote sensing group]** Database preparation has been completed from 1970's to 2010's dataset. More efforts will be carried out to collect 1900's to 1960's old historical map to grasp the land cover change in the last 100 years of Yangon city.

1-3-3 Achievement of Output 3

- **[All]** As a result of activities to establish a consortium, the recognition of the enterprise in Myanmar for this project is increasing which has a possibility to emphasize future collaborative research/work between YTU and private enterprises..
- **[All]** Based on consultation with the YTU side, each research group has been conducting lectures necessary to deepen the understanding and effective utilization of the research output.
- **[All]** Meetings with YTU and Japanese private companies towards an establishment of consortium have been held. Based on the results obtained above mentioned meetings, the project team created concept note of consortium in July 2017. Tentative schedule for establishment of the center was discussed between YTU and Japan side and made.

1-3-4 Achievement of Output 4

- **[Disaster management group]** A tentative flowchart of disaster management in Yangon City could be created, which will be a part of disaster response system. In addition, a prototype of disaster response support system has been developed, and demonstrated at YTU for discussing the functions which are needed to be included in future. Based on the discussion, it became clear that analytical functions about hazard scenario, damage situations and response patterns are necessary for disaster response in Myanmar.
- **[Water related-disaster group]** Some needs and functions of the flood disaster management system were identified in Workshops for water-related governmental officers. In addition, some requirements of local residents about disaster information dissemination were clarified through interviews and questionnaire survey.
- **[Infrastructure management group]** It was proposed that the future maintenance method of the damaged bridges as the results of evaluation of cause of the damages and structural performances of bridges in Yangon.
- **[Infrastructure management group]** It was confirmed that non-destructive testing is applicable to evaluate the concrete surface quality.
- **[Infrastructure management group]** It was confirmed that the maintenance system is not well established and need to be improved as the result of survey of maintenance system of infrastructures

1-4 Achievement of Project Purpose

12 research papers in Japanese and international journals have been published or accepted, which are related to the SATREPS project during the whole project period. As of the end of September 2017, 7 of them are accepted in the international journals, and 3 of them were the collaborative results. The paper written by member of water related disaster group was ranked 3 on the list of "Most downloaded articles for each year".

1-4-1 Papers submitted to international journal

Following papers were submitted / announced in journals/conferences.

Table 4: List of Published/announced papers

Title	Author	Group	Name of journal/conference	Date
Effect of Ground Control Points in Terms of Distribution and Location On Geometric Correction of CORONA Satellite Image	Sao Hone Pha	GIS Group	ACRS 2016 (Asian Conference on Remote Sensing, Sri Lanka)	Oct. 2016

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Study on Punctuality Index for Bus Operation	Daw Kyaing	Transport and Mobility Group	ACRS 2016 (Asian Conference on Remote Sensing, Sri Lanka)	Oct. 2016
An Investigation of Bus Travel Time Comparing with Private Car Travel Time	Moe Myint Mo	Transport and Mobility Group	ACRS 2016 (Asian Conference on Remote Sensing, Sri Lanka)	Oct. 2016
Route Choice Estimation Based on CDR Remote Sensing Applications Data in Yangon	Thein Aye Zin	Transport and Mobility Group	ACRS 2016 (Asian Conference on Remote Sensing, Sri Lanka)	Oct. 2016
TIDAL FLOW CHARACTERISTICS IN YANGON RIVER CONFLUENCE	Shota SETO, Takenori SHIMOZONO, Yoshimitsu TAJIMA, Akiyuki KAWASAKI	Water related disaster group	Journal of Japan Society of Civil Engineers, Ser. B2 (Coastal Engineering), Vol. 72 (2016) No. 2 p. I_1669-I_1674 (in Japanese)	Nov. 2016
Community-level Flood Response and Relief in Thailand and Myanmar Flood Plains	Yukiko TAHIRA, Akiyuki KAWASAKI	Water related disaster group	JOURNAL OF JAPAN SOCIETY OF HYDROLOGY AND WATER RESOURCES, Vol. 30 (2017) No. 1 p. 18-31 (in Japanese)	Feb. 2017
Urban Development Management Programs, 5.4 Legal and Administrative Framework, 5.4.2 Procedure for Development Activities (3) Data Platform and Risk Monitoring System, The Strategic Urban Development Plan and the Urban Transport Development Plan of the Greater Yangon	JICA, Part 5	All	SUDP 5-24	December 2016
Inclusive flood disaster risk reduction in the Bago River basin	Kawasaki, A., Win, W.Z., Acierto, R., Shimozono, T., Tajima, Y., Bhagabati, S., Shirai, N., Kohtake, N	Water related disaster group	Proceedings of the Seventh International Conference on Science and Engineering, 2016 (7th ICSE 2016), pp. 483-487, Yangon, Myanmar	Dec. 2016
The relationship between flood and poverty: The case study in Myanmar	Kawamura, G., Kawasaki, A., Win, W.Z.	Water related disaster group	Proceedings of the Seventh International Conference on Science and Engineering, 2016 (7th ICSE 2016), pp. 888-893, Yangon,	Dec. 2016

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			Myanmar	
Tentative Building Vulnerability Assessment of Yangon	Murao, O., Gokon, H., Meguro, K., Yu, K. T	Earthquake related disaster group	Proceedings of the 7th International Conference on Science and Engineering 2016 (USB), Yangon, Myanmar	Dec. 2016
A Proposal of Installation of Simple Monitoring System for Damaged Bridges in Myanmar	Liyanto EDDY, Koji MATSUMOTO, Kohei NAGAI, Takeshi MIYASHITA, Zin Naung Htun	Water related disaster group	Proceedings of The 6th International Conference of ACF (ACF2016), 2016	
Material Analysis of Fractured Bolts in Ayeyarwady Bridge (Yadanarbon), Myanmar	Kohei NAGAI, Liyanto EDDY, Yi Yi Mon	Infrastructure management group	Proceedings of 15th International Symposium on New Technology for Urban Safety of Mega Cities in Asia (USMCA), 2016	Dec. 2016
Prospect for Implementation of Road Infrastructure Asset Management	Hiroshi YOKOTA, Kohei NAGAI, Koji MATSUMOTO, Yi Yi Mon	Infrastructure management group	, Proceedings of the International Conference - Towards a Sustainable Urban Environment (EBUILT-2016), 2016.	
Report of Monitoring Results of Main Tower Inclination of Twantay Bridge in Myanmar	Liyanto EDDY, Kohei NAGAI, Koji MATSUMOTO, Takeshi MIYASHITA, Win Bo	Water related disaster group	Proceedings of The Seventh International Conference on Science and Engineering (ICSE 2016), 2016	Dec. 2016
3D Structure-From-Motion Data Acquisition and Processing for Twantay Bridge Inclination Assessment	Nunitkorn KITRATPORN, Wataru TAKEUCHI, Koji MATSUMOTO, Kohei NAGAI	GIS	Proceedings of The Seventh International Conference on Science and Engineering (ICSE 2016), 2016	Dec. 2016

1-4-2 Research theme for project members

List of research theme is as shown in Table 5.

Table 5: List of research theme

Name/Group	Dept. / University	Academic Year	Theme
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Water-related Disaster	YTU	-	Development of Flood Inundation Map for Bago River
			Flood Risk Assessment for Bago River Basin
			Flood Simulation using WEB-DMH model for Bago River
			Flood Simulation using IFAS Model for Bago River
			Study on Tide Effect of Bago River
Earthquake-related Disaster <Land use and urban Planning>	YTU	-	A New Methodology for Monitoring Urban Growth to Direct a Safer Future Development of Yangon City
Earthquake-related Disaster <Build Environment>	YTU	-	Proposal Zoning Plan for Yangon and its Environs
			Urban Redevelopment Planning of Mingalartaung Nyunt Township Yangon
			Redevelopment of Botathaung Pagoda Environs
			Development multifamily Residence on Post Independent period in Yangon
			Urban Redevelopment of Kyauktada Township Yangon
			Urban Renewal of Pabedan Township Yangon
			Design Guideline for Heritage Responsive Buildings in Kyauktada Township Yangon
Earthquake-related Disaster <Heritage>	YTU	-	Property Management Plan of Yangon Heritage Conservation
			Architecture of Colonial Office Buildings in Downtown Yangon
			Analysis of Colonial Public Building Facades in Downtown Yangon
Infrastructure management	YTU	-	Maintenance Strategy for Bayinnaung Bridge
			Monitoring the Inclination and Settlement of Tower and Piers of TwanTay Bridge
			Monitoring the Inclination and Settlement of Tower and Piers of ThaKyut Bridge
Transport and Mobility	YTU	-	Development of Bus Location System for Smooth Operation in Yangon
			Effect of Flyover Construction (Thamwe) on Traffic Flow to the near Road Network by using CDR Data
Geospatial Technology	YTU	-	Effect on Ground Control Points in Terms of Distribution and Location on Geometric Correction of CORONA Satellite Image
			Estimation of land use change and building heights from 1966 to 2015 in Yangon by CORONA LandSAT and Geo-eye images

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Disaster Management	YTU	-	Review on Regional level Disaster Management System and its Issues in Yangon Region
Geotechnical	YTU	-	Development of Liquefaction Potential Map for selected areas in Yangon
			Liquefaction Potential Map based on Probabilistic Approach in selected areas in Yangon
			Ground information for Infrastructure Development and Earthquake in certain areas
			Micro-tremor Measurements used to Map Thickness of Soft Sediments in certain areas

1-5 Changes of Risks and Actions for Mitigation

Frequent power down in the YTU building may cause serious damage to data server and internet connection for the server is very unstable at this moment. Continuous efforts for the improvements on the operational use of data server are really appreciated. Some equipment such as 3D laser scanner, infrared thermal camera, etc. are very precise devices and difficult to repair/replace parts in Myanmar so that it must be carefully treated and the know-how to use the device is properly transferred to the new users especially students when it is used for field survey outside the campus. Furthermore, rules and regulation for equipment shall be set by the project. Some providing equipment has changed mainly due to adjustment for latest research situation.

1-6 Progress of Actions undertaken by JICA

Project has revised a list of providing equipment to YTU. The project conducted a joint meeting on April 2017 and discussed the importance of proper operation/maintenance and setting projects rules and regulations

1-7 Progress of Actions undertaken by Yangon Technological University

YTU has set up research fund for Ground Information Exploration Project in 6 Down Town Area for Geotechnical Group. In addition, educational program has been suggested to YTU, and the adjustment with other classes at is on progress. Proposal of the research center was sent to YTU from UTokyo in August 2017, and discussion has been held in YTU.

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.)

Department of Ministry of Education in charge of YTU has changed from DTPC to DOHE (Dept. of Higher Education since October 2016.

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

2-1 Detail

(1)Progress of each activity is described as follow (Fig.5).

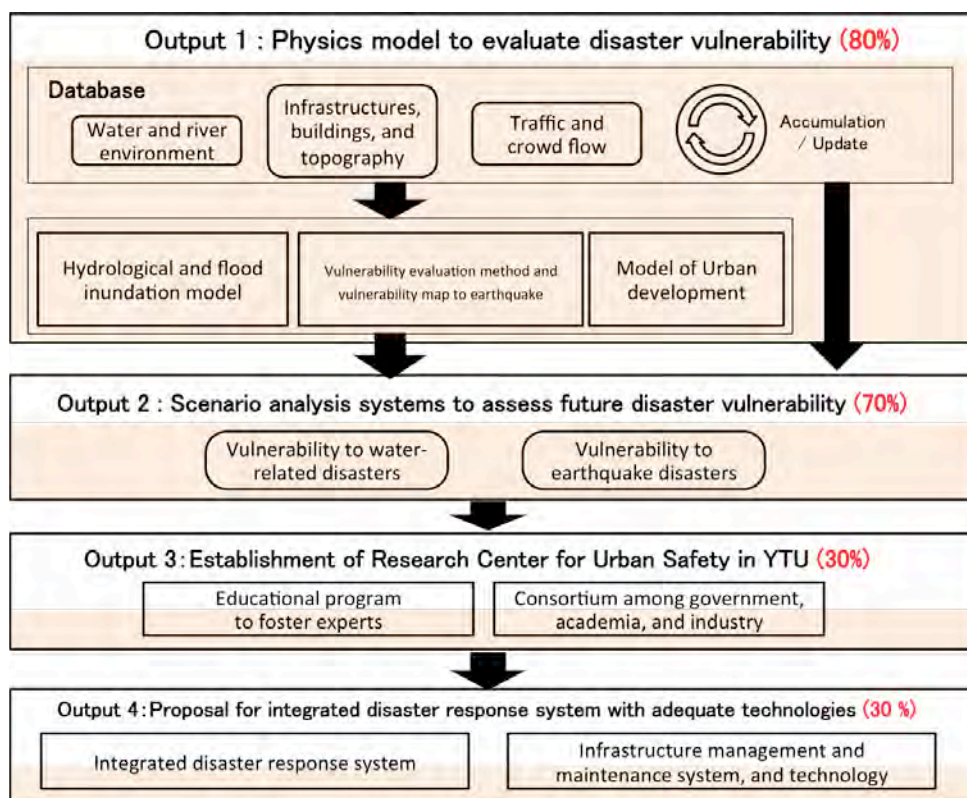


Fig.5 Progress of each activity. Color means the proportion of the progress.

Regarding establishment of research center for urban safety at YTU of **output 3**, this activity is delayed. Currently, educational program has been suggested to YTU, and the adjustment with other classes at is on progress. Proposal of the research center was sent to YTU from UTokyo in August 2017, and discussion has been held in YTU.

(2) Creation of earthquake vulnerability map is behind the schedule.

2-2 Cause

(1) It takes much time to obtain permission for receiving equipment by YTU due to complicated procedure of concerned authorities in Myanmar. And Japan side had not finalized a list of

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providing equipment. No. of GPS devices planned to be provided had reduced from 200-250 to 50 mainly due to change of Yangon Bus Authority and their policy.

(2) The project has not received necessary data for urban planning team from YCDC.

2-3 Action to be taken

(1) Necessary document for procedure of import should be submitted to YTU at least one and a half months prior to arrival date in Myanmar. Finalized list of providing equipment shall be approved by JCC steering committee during JCC meeting to be held on October 2017.

(2) The project continues to discuss with YCDC for receiving data with good explanation of importance and merit both for YCDC and the project.

2-4 Roles of Responsible Persons/Organizations

YTU, Group leaders from Japan side

3. Modification of the project Implementation Plan

3-1 PO

PDM and PO shall be modified and utilized from next monitoring sheet. Reasons for modification are as follows;

- (1) Earthquake related disaster group has divided into 4 sub groups (Building fragility curve, Urban Planning, Geotechnical and Heritage) since beginning of 2016, and discrepancy has been seen between actual activities and activities described in PDM and PO.
- (2) Some actual activities can't be monitored by current PDM and PO. The project couldn't specify detail activities at the beginning of the project as some activities were not defined clearly.
- (3) Some means of verification for outputs should be modified with quantification for proper monitoring.

3-2 Other modifications on detailed implementation plan

- Activity 2-2 should be break down from next monitoring sheet as earthquake related disaster group has divided into 4 sub groups..
- Activity 3-1 and 3-2 should be break down from next monitoring sheet as some activities were not defined clearly at the beginning of the project.
- Other description should be minor modified to match with actual activities.

4. Preparation of YTU toward after completion of the Project

- The Project has started to discuss with various stakeholders in the government and NPOs regarding the social implementation of the research outcome and will continue to do so.

II. Project Monitoring Sheet I & II *as Attached*

Project Monitoring Sheet I

Version 1

Dated 26 October, 2017

Period of Project: 5 years

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

Target Group: Direct: 13 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)

Narrative Summary		Objectively Verifiable Indicators	Means of Verification	Important Assumption	Achievement	Remarks
Overall Goal YTU further develops the scenario analysis systems by its Research Centre for Urban Safety		At least 1 suggestion based on the result of the updated scenario analysis is submitted to relevant governmental departments mainly by YTU's Research Centre for Urban Safety	1 Updated and improved database 2 Documents submitted	Budget and personnel of YTU is maintained	Data base server has been constructed at YTU, and a system to collect data related research was developed.	
Project Purpose YTU understands in use of scenario analysis systems to assess Myanmar's future disaster vulnerability		1 At least 20 research papers related to the project, which are submitted by mainly YTU international journals 2 Suggestions based on the result of the scenario analysis are submitted to relevant governmental departments	1 Papers submitted to journal papers 2 Suggestion documents submitted		12 research papers in Japanese and international journals have been published or accepted, which are related to the SATREPS project. 7 of them are accepted in the international journals, and 3 of them were the collaborative results.	The paper written by Win Win Zin from water related disaster group was ranked 3rd on the list of "Most downloaded articles for each year".
Outputs						
1 Development of physics model to evaluate disaster vulnerability	1-1	Recent flood events simulated by the developed hydrological and hydraulic model	1-1 Database: hydro-climate, water, and river environment		Water related disaster group: To construct water-related database, following achievement have been made. -An enhanced Digital Elevation Model (DEM) of Bago River Basin was developed for better inundation modeling using different sources. -One water level station at Tawa Sluiceway was installed on May 2017. Real-time visualizations at YTU server were also developed related with the installed hydrometeorological observation stations. -High tide inundation model for the lower Bago River basin was developed to understand the more accurate hydrological characteristics.	
	1-2	Building damage grade estimated at certain earthquake	1-2 Database: infrastructures, buildings, and topographical information		GIS and remote sensing group: As for data collection of changes in maps and land use, in-situ measurement, analysis and evaluation of existing infrastructure information such as buildings, bridges and railroads was carried out using three-dimensional laser measurement and close-range photogrammetry. As a result, comprehensive land cover data set from 1970's to 2010's are prepared and it was found that urban area in Yangon city from 1970's to 2010's has increased around 7 times bigger with the decrease of forested area down to 10% of 1970's.	
	1-3	Daily people movement simulated by the model	1-3 Database: traffic and crowd flow		Transport and mobility group: -Based on the past one week mobile phone CDR data with traffic simulation, the project calculated several traffic congestion scenarios, depending on the future traffic policy, such as lane capacity design and total traffic demand prediction. -Research and development issues using mobile CDR development issues using mobile CDR and GPS trajectory taxi data were investigated to understand human mobility patterns, trip distributions, travel behaviors and evaluated various taxi services that will help to solve current traffic congestion problems and effective emergency planning.	
2 Development of scenario analysis system for assessing future disaster vulnerability	2-1	Assessment of water-related disaster vulnerability	2-1 Flood inundation map		Water related disaster group: Social and economic characteristics of the residents in Bago River Basin and the impact of flood on livelihood has been investigated from field survey and workshops. Impact of climate and land-use change on flood vulnerability was investigated considering various future development scenarios. Finally, a river basin management plan will be proposed.	
	2-2	Assessment of earthquake vulnerability	2-2 Earthquake vulnerability map		Earthquake related disaster group: -Building survey was conducted in Central Business District in Yangon in June 2017, and floors of buildings were investigated to develop a method to expect the distribution of types of buildings using digital elevation model. The final coverage of the survey should be considered according to cost and workloads -Review the published papers and presentations of conferences regarding the damage due to past past earthquakes in Myanmar. GIS and remote sensing group: In FY 2017, as for data collection of changes in maps and land use, in-situ measurement, analysis and evaluation of existing infrastructure information such as buildings, bridges and railroads was carried out using three-dimensional laser measurement and close-range photogrammetry. Database preparation is completed from 1970's to 2010's dataset. More efforts will be carried out to collect 1900's to 1960's old historical map to grasp the land cover change in the last 100 years of Yangon city.	<ul style="list-style-type: none"> The data platform and the vulnerability map made by the project in 2016, aiming to be used for city planning field, was introduced in the JICA masterplan, as the Strategic Urban Development Plan and the Urban Transportation Development Plan of the Greater Yangon (December 2016). The data of past earthquakes are kept on collecting. Change of the director in Urban Planning Division, YCDC, in March 2017, made our well-organized communication with YCDC for building information supply difficult.
3 Support to establish Research Centre for Urban Safety in YTU to sustain and enhance research activities and human resource development	3-1	Establishment of Research Centre for Urban Safety in YTU	3-1 Approval document		All The Project created draft proposal of Research Center in August 2017. Tentative schedule for establishment of the center was discussed between YTU and Japan side and made.	
	3-2	Educational program to foster specialists	3-2 Data / record kept in relevant organizations		All Educational materials and syllabus created for lectures and workshops are the core part of the educational program and are still under construction. Workshops includes fieldwork and design studio conducted to enhance the understanding. In addition, based on consultation with the YTU side, each research group has been conducting lectures necessary to deepen the understanding and effective utilization of the research output.	

<p>4 Development of integrated disaster response system including infrastructure maintenance management with adequate technologies</p>	<p>3-3 Establishment of consortium among government, academia, and industry</p>	<p>3-3 Articles of incorporation</p>	<p>All Meetings with the project and Japanese private companies towards an establishment of consortium have been held. Based on the results obtained above mentioned meetings, the project team created concept note of consortium in July 2017. Tentative schedule for establishment of the center was discussed between YTU and Japan side and made.</p>
<p>4-1 Tutorial for integrated disaster response system</p>	<p>4-1 Contents of the tutorial</p>	<p>4-1 Contents of the tutorial</p>	<p>Disaster management group: Job descriptions for disaster management in Yangon City have been investigated to create a flowchart of disaster response. - In addition, a prototype of disaster response support system has been developed, and demonstrated at YTU for discussing the functions which are needed to be included in future. - Based on the discussion, it became clear that analytical functions about hazard scenario, damage situations and response patterns are necessary for disaster response in Myanmar. Water related disaster group: Workshops for water-related governmental officers were conducted to identify needs and functions of the flood disaster management system. In addition, requirements of local residents about disaster information dissemination were investigated through interviews and questionnaire survey. - Questionnaire surveys have been conducted for identifying damages on buildings and agricultures due to the historical flood disaster. - Flood damage functions have been developed by integrating the flood inundation map and the data from the questionnaire survey. - Flood inundation model for historical and future events have been simulated using WEB-DHM model.</p>
<p>4-2 Guideline proposed on improved infrastructure management and maintenance system</p>	<p>4-2 Proposal documents</p>	<p>4-2 Proposal documents</p>	<p>Infrastructure management group: - From the results of monitoring, measurements, and FEM simulation of damaged bridges in Yangon, cause of the damages and structural performances were evaluated. It was proposed that the future maintenance method of the damaged bridges. - Non-destructive testing was applied to examine the quality of concrete of structures. It was confirmed that this method is applicable to evaluate the concrete surface quality. - Maintenance system of infrastructures was surveyed by interview to MOC engineers and literature review. It was confirmed that the maintenance system is not well established and need to be improved.</p>

Activities	The Japanese Side	The Myanmar Side	Pre-Conditions
<p>(1-1) Develop hydrological and flood inundation model of study area (1-1-1) Gather information and data in river, hydro-climate and water resource management and build integrated database (1-1-2) Build hydrological and flood inundation model in the target river basin for flood vulnerability assessment</p>	<p>1. Dispatch of Experts Earthquake-related Disaster Geospatial Technology Infrastructure Management Transport and Mobility Disaster Management Project Coordinator 2. Training in Japan "Training for the Development of a Disaster Vulnerability Assessment System" (1 June - 21 June 2017 for 2 project members) 3. Machinery and Equipment - GPS (60 sets) 4. Local cost for the activity of Japanese experts</p>	<p>1. Assignment of Project members 2. Project space with necessary Equipment/Internet facilities - Project Office - Mini Lecture Room - Researchers' Office 3. Running expenses for Project space 4. Expenses necessary for transportation within Myanmar for received equipment 5. Coordinate with DOHE on the arrangement for obtaining permission from concerned authorities in installing received equipment 6. Coordinate with DOHE on travel permit for Japanese Expert for official travel 7. Cost for foundation work for water gauge installation (Tawa sluice gate, Bago)</p>	<p><Issues and countermeasures></p>
<p>(1-2) Build earthquake vulnerability evaluation method and earthquake vulnerability map of study area (1-2-1) Collect land use, population, buildings, infrastructures, and topographical information in study area (1-2-2) Investigate damage by past earthquakes in Myanmar</p>	<p>1. Disasters related information (1-3-1) Analyse collected geo-spatial data and develop urban expansion simulation by cellular automaton model (1-3-2) Collect and accumulate aggregated mobile phone base station usage data and probe vehicle GPS data (1-3-3) Project traffic and people movement with people activity model</p>	<p>1. Disasters related information (1-3-1) Analyse collected geo-spatial data and develop urban expansion simulation by cellular automaton model (1-3-2) Collect and accumulate aggregated mobile phone base station usage data and probe vehicle GPS data (1-3-3) Project traffic and people movement with people activity model</p>	<p><Issues and countermeasures></p>
<p>(2-1) Assess characteristics of water-related disaster vulnerability (2-1-1) Conduct climate change analysis in local scale (2-1-2) Investigate land use change in the target river basin (2-1-3) Assess river runoff and vulnerability to water-related disasters based on scenarios with climate change and urban development (2-2) Assess characteristics of earthquake disaster vulnerability (2-2-1) Examine possible scenario patterns with proper input and algorithm (2-2-2) Assess vulnerability to earthquake based on scenarios (3-1) Support establishment of Research Centre for Urban Safety in YTU (3-2) Develop educational program to foster experts (3-2-1) Observe current education program at YTU and MTU and examine a trial of YTU's educational program (3-3) Establish consortium among government, academia, and industry (3-3-1) Coordinate functions with MES (3-3-2) Identify expected role of consortium (4-1) Develop disaster response system (4-1-1) Analyse disaster management plan of central government and investigate needs on the system (4-1-2) Analyse disaster management plan of local government and investigate citizens' needs on disaster information (4-2) Propose improved infrastructure management and maintenance system, and technology for Myanmar (4-2-1) Review management and maintenance system, and technology of infrastructures, especially road and bridges, in Myanmar (4-2-2) Propose improved management and maintenance system (4-2-3) Apply and propose inspection and monitoring method for infrastructures and buildings with adequate retrofit technology for damaged infrastructure (4-2-4) Disseminate technology information</p>	<p>1. 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Project Title: Project for Development of a Comprehensive Disaster Resilience System and Collaboration Platform in Myanmar.

Inputs	Year																																																Remarks	Monitoring	Issue	Solution																								
	2015												2016												2017												2018																2019												2020											
	I			II			III			IV			I			II			III			IV			I			II			III			IV			I			II			III			IV																														
Expert																																																																												
Water-related Disaster																																																																												
Earthquake-related Disaster																																																																												
Geospatial Technology																																																																												
Infrastructure Management																																																																												
Transportation and Mobility																																																																												
Disaster Management																																																																												
Project Coordinator																																																																												
Equipment																																																																												
Database system / Web server																																																																												
Equipment for printing and mapping																																																																												
Equipment for inspection and monitoring of roads, bridges and structures																																																																												
Equipment for surveying and measuring ground condition and structure (micro-tremor etc.)																																																																												
Equipment for probing vehicles (from several hundreds to one thousand)																																																																												
Automatic meteorological and hydrological observation equipment																																																																												
Telemetry system																																																																												
Equipment for vehicles																																																																												
Training in Japan																																																																												
Training on Water and Energy Budget-based Distributed Hydrological Model (WEB-DHM)																																																																												
Training for establishment of database for Disaster Management Platform																																																																												
In-country/Third country Training																																																																												
Activities																																																																												
Sub-Activities																																																																												
Output 1-1: Development of physics model to evaluate disaster vulnerability																																																																												
1-1-1 Gather information and data in river-type climate and water resource management and build integrated database																																																																												
1-1-2 Build hydrological and flood inundation model in the target river basin for flood vulnerability assessment																																																																												
1-1-3																																																																												
Output 1-2: Build earthquake vulnerability evaluation method and earthquake vulnerability map of study area																																																																												
1-2-1 Collect land use, population, buildings, infrastructures, and topographical information in study area																																																																												
1-2-2 Investigate damage by past earthquakes in Myanmar																																																																												
1-2-3																																																																												
Output 1-3: Develop study area development model																																																																												
1-3-1 Analyze collected geo-spatial data and develop urban expansion simulation by cellular automaton model																																																																												
1-3-2 Collect and accumulate aggregator mobile phone base station usage data and probe vehicle GPS data																																																																												
1-3-3 Project traffic and people movement with people activity model																																																																												
Output 2-1: Assess characteristics of water-related disaster vulnerability																																																																												
2-1-1 Conduct climate change analysis in local scale																																																																												
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Output 2-2: Assess characteristics of earthquake disaster vulnerability																																																																												
2-2-1 Examine possible scenario patterns with program input and algorithm																																																																												
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Output 3-1: Support establishment of Research Centre for Urban Safety in YU																																																																												

Output	Activity	Actual	2015		2016		2017		2018		2019		2020		Remarks	Issue	Solution
			Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual			
Output 3-2: Develop educational program to foster experts																	
3-2-1	Observe current education program at YU and NIU and examine a list of YU's educational program																
3-2-2	Introduce YU's education program																
Output 3-3: Establishment of consortium among government, academia, and industry																	
3-3-1	Coordinate functions with MES																
3-3-2	Identify expected role of consortium																
Output 4-1: Develop disaster response system																	
4-1-1	Analyze disaster management plan of central government and investigate needs on the system																
4-1-2	Analyze disaster management plan of local government and investigate citizens' needs on disaster information																
Output 4-2: Propose improved infrastructure management and maintenance system, and technology for Bommar																	
4-2-1	Myanmar: Review management and maintenance system, and technology of infrastructures, especially road and bridges, in Myanmar																
4-2-2	Propose improved management and maintenance system																
4-2-3	Apply joint process inspection and monitoring method for infrastructures and buildings with adequate retrofit																
4-2-4	Disseminate technology information																
Duration / Phasing																	
Monitoring Plan																	
Monitoring	Joint Coordination Committee																
	Set-up the Detailed Plan of Operation																
	Submission of Monitoring Sheet																
	Monitoring Mission from Japan																
	Joint Monitoring																
	Post-Monitoring																
Reports/Documents																	
	Project Completion Report																
	Public Relations																