添　付　資　料

1. ミニッツ及び中間レビュー調査報告書（英文）
2. 評価グリッド
3. Tentative PDM（ver.2）

添付資料1. ミニッツ及び中間レビュー調査報告書

MINUTES OF MEETINGS
ON
JOINT COORDINATION COMMITTEE
FOR
DEVELOPMENT OF LANDSLIDE RISK ASSESSMENT TECHNOLOGY ALONG TRANSPORT ARTERIES IN VIETNAM PROJECT
(MID-TERM REVIEW)

The Japanese Mid Term Review Team (hereinafter referred to as "the Team"), which is organized by Japan International Cooperation Agency (hereinafter referred to as "JICA") and headed by Mr. Chikahiro Masuda, conducted the mid-term review on the Japanese technical cooperation (SATREPS: Science and Technology Research Partnership for Sustainable Development) titled "Development of Landslide Risk Assessment Technology along Transport Arteries in Vietnam Project" (hereinafter referred to as "the Project") from 15 July 2014 to 1 August 2014.

During the period of the review, the Team had field trip to the pilot site and a series of interviews and discussions to exchange views with Vietnam authorities concerned. In parallel, the project conducted SATREPS meeting on 29 July and Landslide Technical Forum on 30 July. Finally the Joint Coordination Committee (hereinafter referred to as "JCC") was held on 1 August. As the result of the discussion, the Team submitted the Mid-term review report as attached hereto and Vietnamese and Japanese sides agreed upon the description of the report.

Hanoi, 1 August 2014

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Main points discussed

1. Confirmation of target areas

Target areas of the Project are confirmed as follows:

- Haivan Station landslide in the National Railways from Hue to Danang as the pilot site; and
- Corridor along Ho Chi Minh Route from A Luoi town to Kham Duc, as a study area for mapping
- Landslides along National Highway No. 6 in Hoabinh province, as application sites by Vietnamese side

2. PDM modification

In order to clarify the contents and direction of the Project, the Team suggested modification of PDM. Tentative PDM (ver.2), including above target areas, is proposed to the Project for further consideration. The tentative PDM (ver.2) is attached as an Appendix II.

3. Mid-term review report

Mid-term Review Report is attached as Appendix I.

Appendix I

Mid-Term Review Report
on Japanese Technical Cooperation Project
for
Development of Landslide Risk Assessment Technology
along Transport Arteries
in Socialist Republic of Vietnam

Japan International Cooperation Agency
and
Ministry of Transport, Socialist Republic of Vietnam

July 2014

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ANNEX LIST

LIST OF ABBREVIATIONS

ALOS	Advanced Land Observing Systems
C/P	Counterpart
CCFSC	Central Committee for Flood and Storm Control
ICD	International Cooperation Department, MOT
ICL	International Consortium on Landslide
ITST	Institute of Transport Science and Technology
JCC	Joint Coordinating Committee
JICA	Japan International Cooperation Agency
JPY	Japanese Yen
MARD	Ministry of Agriculture and Rural Development, Vietnam
MEXT	Ministry of Education, Culture, Sports, Science & Technology of Japan
MONRE	Ministry of Natural Resources and Environment, Vietnam
M&E	Monitoring and Evaluation
MOT	Ministry of Transport, Vietnam
NHMS	National Hydro-Meteorological Service, MONRE
PDM	Project Design Matrix
PO	Plan of Operations
R/D	Record of Discussions
SATREPS	Science and Technology Research Partnership for Sustainable Development
STD	Science and Technology Department, MOT
VLAT	Vietnam Landslide Association for Transport
WG	Working Group

1. OUTLINE OF THE MID-TERM REVIEW STUDY

1.1 Background of the Mid-Term Review

Vietnam has a rate of mountainous terrain up to 3/4 area of its territory, which has a dangerous cleavage terrain due to earth crust's powerful tectonics. Moreover, it has complex geological structures with grave cleavages of soil layers. Besides, as Vietnam's geographical location is bordered by Pacific Ocean, it is influenced by the monsoon climate with the average annual rainfall around 3,000 -4,500 mm/year. With its geographical location and climate condition, Vietnam is usually against typhoon and flood with an annual density of 5 to 10 times/ year. Based on statistics, they found that the annual flood season in Vietnam is usually from June to November, equally 99% of frequency of annual floods. Typhoon density changes and tends to increase.

According to statistics up to 2006 of Ministry of Transport (MOT), total length of highway in Vietnam is about 17,300 km, makes up 6.87% of total length of road network in Vietnam. In which, 3/4 length of highway are on mountainous area and about 30% of those pass through areas with complex geological structures influenced by the tectonic destruction zone. That is why landslides usually occur every year on transport arteries in Vietnam after rainy season, with the annual volume up to hundred thousands of cubic meters. Landslides caused traffic congestion on highways and make serious damages for the economy. Annual State Funds for flood prevention, traffic guarantee and landslide treatment on road network often hold hundreds to thousands of billion VND. Landslides also killed people (average 30 persons/year), threaten to the stability of communities in mountainous areas. After the historical flood in 1999 in central region of Vietnam, landslides occurred on arterial roads caused serious traffic congestion.

Institute of Science and Technology of Transportation (ITST) under the MOT was established in 1956 as an institution for science and technology research and application of the transport sector. During more than 35 years it has been involved in research in landslides and proposed several solutions to handle the issue including temporary, semi-permanent and/or permanents solutions.

The "Project for Development of Landslide Risk Assessment Technology along Transport Arteries in Vietnam" (hereafter referred to as "the Project") is planned to contribute to geo-disaster reduction along main transport arteries and on residential areas through development of new landslide risk assessment technology and its application to forecast, monitoring and disaster preparedness of landslides in Vietnam in close cooperation between Vietnamese and Japanese organizations concerned. Since more than two and half years have passed since the initiation of the Project, a Mid-term Review Team (hereafter referred to as the review team) was dispatched to review the progress and the achievement of the Project so far jointly with Vietnamese side, and to discuss and agree on the countermeasure to solve the challenges if any.

1.2 Objectives of the Mid-Term Review

The Objectives of the Mid-Term Review are as follows;

(1) To verify the level of achievement of the Outputs and Project Purpose summarized in the Project Design Matrix (PDM);
(2) To identify factors that promoted or inhibited the effects of the Project if any;
(3) To analyze the JICA's technical cooperation based on the five evaluation criteria; and
(4) To identify recommendations for the Project for the latter half of the cooperation period.

1.3 Members of the Mid-Term Review Team

The Mid-Term Review Team consists of the following members:

1.3.1 Japanese Side:

	Name	Designation	Position, Organization
1	Mr. Chikahiro Masuda	Team Leader	Senior Representative, JICA Vietnam Office
2	Mr. Hideaki Matsumoto	Evaluation Planning	Deputy Director, Disaster Management Division 1, Global Environment Department, JICA
3	Ms. Yuko Tanaka	Evaluation Analysis	Consultant, Tekizaitekisho LLC
4	Dr. Toshitsugu Fujii	Observer	Program Officer of Natural Disaster Prevention for SATREPS, Japan Science and Technology Agency (JST)
5	Ms. Eriko Inoue	Observer	Chief, Department of International Affairs, Research Partnership for Sustainable Development Group, JST

1.3.2 Vietnamese Side:

	Name	Position, Organisation
1	Mr. NguyenVan Thach	Deputy Director General, International Cooperation Department (ICD), Ministry of Transport (MOT)
2	Mr. Bui Ngoc Hung	Chief of R&D Standards and International Cooperation Dept., MOT

1.4 Schedule of the Mid-Term Review

The detailed schedule of the Mid-Term Review is attached as **Annex 1**.

1.5 Methodology of the Mid-Term Review

1.5.1 Procedure

The PDM ver. 1 (see **Annex 3**) is adopted as a framework of the Mid-Term Review. The review team conducted surveys by questionnaires and interviews with the counterparts (hereinafter referred to as "C/P") and as well as those officials concerned with the Project. Both quantitative and qualitative data were gathered and utilized for analysis. Data collection methods used for the evaluation were as follows:

- Literature/Documentation Review;
- Questionnaires;
- Individual and/or group interviews;
- Direct Observations

1.5.2 Stakeholders consulted

The stakeholders who were consulted or interviewed for the Mid-Term Review consisted mainly of the following:

- JICA experts assigned to the Project
- Counterparts (C/Ps) from Institute of Transport Science and Technology (ITST), MOT
- Ministry of Agriculture and Rural Development (MARD)
- Ministry of Natural Resources and Environment (MONRE)
- University of Science, National University of Vietnam (VNU)

1.5.3 Items of the Mid-Term Review

(1) Achievement of the Project

Achievement of the Project is measured in terms of Inputs, Outputs, and the Project Purpose, with reference to the Objectively Verifiable Indicators identified in the PDM (ver.1).

(2) Implementation Process

Implementation process of the Project is reviewed from the various viewpoints, including communication among stakeholders, monitoring and project management etc., in order to identify promoting and/or inhibiting factors for the project effects.

(3) Analysis based on the Five Evaluation Criteria

Based on the observations made under the previous two items, the Project is assessed from the viewpoint of Five Evaluation Criteria, which was originally proposed by DAC (OECD)[1] shown in Table 1-1.

Table 1-1 Definition of the Five Evaluation Criteria

Five Evaluation Criteria		Definitions as per JICA Evaluation Guideline
1.	Relevance	Relevance of the Project is reviewed by the validity of the Project Purpose and Overall Goal in connection with the Government development policy and the needs of the target group and/or ultimate beneficiaries in Vietnam.
2.	Effectiveness	Effectiveness is assessed to what extent the Project has achieved its Project Purpose, clarifying the relationship between the Project Purpose and Outputs.
3.	Efficiency	Efficiency of the Project implementation is analysed with emphasis on the relationship between Outputs and Inputs in terms of timing, quality and quantity.
4.	Impact	Impact of the Project is assessed in terms of positive/negative, and intended/unintended influence caused by the Project.
5.	Sustainability	Sustainability of the Project is assessed in terms of institutional, financial and technical aspects by examining the extent to which the achievements of the Project will be sustained after the Project is completed.

Source: JICA Project Evaluation Guideline (June 2010), JICA

1.6 Limitation of the study

During the data collection process in Vietnam, Japanese side group leaders who are core JICA experts of the Project were absent due to their limited time schedule to come to Vietnam. Preliminary interview was conducted with them prior to initiate a data collection in Vietnam just for a brief time, however their absence during the whole data collection phase in Vietnam poses limitation to the Mid-term review exercise to effectively capture the overview and achievement of the Project at the time of review from more comprehensive point of view. Therefore most of the information regarding the achievement of the Project was collected through interview with counterpart members with few chance of confirmation or communication of experts from Japan.

[1] DAC website on Criteria for Evaluating Development Assistance (accessed on 9 March, 2014)
http://www.oecd.org/document/22/0,2340,en_2649_34435_2086550_1_1_1_1,00.html

2. OUTLINE OF THE PROJECT

The PDM (ver.1) is utilized as a framework of analysis. The Project Purpose is the aim to be achieved during the cooperation period; while the Overall Goal is the aim to be achieved within 3-5 years after the completion of the Project[2]. PDM (ver.1) identifies four outputs (medium-term objectives leading to the Project Purpose) in form of nominal sentence, therefore the review team rephrases each of four outputs by adding verbs in order to verify level of its achievement. Additional sentence to outputs is indicated with underlines.

2.1 Overall Goal

Social implementation of the developed landslide risk assessment technology and early warning system will contribute to the safety ensuring of transport arteries through urban and local communities in Vietnam.

2.2 Project Purpose

Landslide risk assessment technology to reduce landslide disasters along main transport arteries is developed through the collaborative research based on the Japanese pioneer technology, and capacity development for the effective use of this technology is implemented in Vietnam.

2.3 Outputs

1. Wide-area landslide mapping and identification of landslide risk area is completed.
2. (Development of) Landslide risk assessment technology based on soil testing and computer simulation is developed.
3. Risk evaluation and (development of) early warning system based on landslide monitoring is developed.
4. (Preparation of) Integrated guidelines for the application of developed landslide risk assessment technology is developed.

3. ACHIEVEMENT AND IMPLEMENTATION PROCESS

3.1 Inputs

Inputs to the Project as of July 2014 since its inception are as follows:

3.1.1 Japanese Side

a) Dispatch of the JICA experts

Long-term Experts: A total of two long-term experts were assigned to the Project since its commencement. The areas of expertise as well as contract period of long-term experts are shown in the following table.

Table 3-1 Summary of Long-term Experts

Areas of Expertise	Contract Period
Project Coordinator	August 2012 - Present
Project Coordinator	July 2014 - Present

Source: Data provided by the Project

Short-term Experts (Japan): A cumulative number of 80 experts were dispatched as short-term experts with total of 672days (as of July 2014). List of JICA experts is attached as Annex 4.

[2] According to JICA Project Evaluation Guidelines (June 2010)

b) Training in Japan

As of July 2014, a total of 6 counterparts (working group members) are studying in Japan as long term training participants. They undertake postgraduate courses for duration of two or three years (table 3-3). JICA provides each long-term participant flight tickets to Japan, tuition fee, and monthly living costs to cover the whole study period shown in Table 3-3.

Table 3-3 Summary of long term training participants in Japan

	Participant's name	Working Group, position	University	Course	From	To
1	Mr. Do Ngoc Ha	WG4, Researcher (Geo-Technical Science and Technology Center)	Shimane Univ.	Master	Oct. 2012	Sep. 2014
2	Mr. Le Hong Luong	WG2, Researcher (Specialized Institute of Road and Aerodome)	Tohokugakuin Univ.	Doctor	Apr. 2013	Mar. 2016
3	Mr. Doan Huy Loi	WG3, Researcher (Geo-Technical Science and Technology Center)	Kyoto Univ.	Master	Apr. 2013	Mar. 2015
4	Mr. Pham Van Tien	WG3, Researcher (Trasnsport Construction Quality Testing Center)	Kyoto Univ.	Master	Apr. 2013	Mar. 2015
5	Ms. Pham Thi Chien	WG4, Researcher (Specialized Institute of Bridge and Tunnel)	Shimane Univ.	Master	Oct. 2013	Sep. 2015
6	Mr. Vu The Truong	WG4, Researcher (Specialized Institute of Road and Aerodome)	Shizuoka Univ.	Master	Oct. 2013	Sep. 2015

Source: Data provided by the Project

In addition, 5 counterparts participated in short-term training course in Japan. Each training course was held for individual member and lasted approximately three weeks / course. All of the participants who joined the course play important roles within the Project. The following tables summarise the outlines of short-term training courses.

Table 3-4 Summary of the short term training in Japan

	Participant's name	Working Group	University	From	To
1	Mr. Dinh Van Tien	Project Manager, WG2 leader, Director (Planning, R&D Management and International Division)	Tohokugakuin Univ. etc.	Jun. 1, 2013	June 21, 2013
2	Mr. Lam Huu Quang	WG3 leader, Director (Road Lab. No.1)	ICL	Nov. 10, 2013	Nov. 30, 2013
3	Mr. Ngo Doan Dung	WG2, Vice Director (Planning, R&D Management and International Division)	Tohokugakuin Univ. etc.	Dec. 3, 2013	Dec. 24, 2013
4	Mr. Lam Huu Quang	WG3 leader, Director (Road Lab. No.1)	ICL	Feb. 10, 2014	Mar. 1, 2014
5	Mr. Ngo Doan Dung	WG2, Vice Director (Planning, Project Management Division)	Tohokugakuin Univ. etc.	Jul. 3, 2014	Jul. 23, 2014

Source: Data provided by the Project

In addition to the above mentioned course, 9 counterparts were dispatched to Japan for a preparation of JICA's long-term training and six members (three from MOT and three from ITST) were invited to

participate in ICL-IPL conference in Kyoto (Nov. 18-23, 2013). The detail of overseas trip covered by the Project is attached as Annex 4.

c) Equipment

Equipment worth a total of JPY **50,216,735** was either purchased or ordered (as of July 2014). Some of major equipment include: 1) pack tube for drilling (worth JPY 4 million), 2) extensometer monitoring system (worth JPY 10.8 million) and 3) global navigation satellite system (JPY 15.5million), which will be installed in Haivan landslides area. The detailed list is attached as Annex 5.

d) Local Expenses

A total of **US$129,483 (or approximately VND 2,723 million equivalent[3])** were provided by Japanese side as a local cost. As part of local expenses, aerial photo and map (worth around US$11,259.84) and laboratory building support (US$ 7,061.48) were spent to purchase materials and interior work for the construction of laboratory. Other items spend under the local expenses includes general operating expenses, travel expenses (air fare and others), fee and honorarium, local contract, and meeting expenses.

3.1.2 Vietnamese Side

a) Appointment of Counterpart

As of July 2014, a culminated number of 50 personnel from ITST are assigned as C/Ps to the Project. The detailed list of working group members is attached as **Annex 2.**

b) Provision of Facilities for Project Operations

The Vietnamese side secured office spaces within ITST for JICA experts. In addition, facilities such as access to the computer network, telephone line, printer, fax and photocopy were provided for the Project operations.

c) Other local activity cost

Local activity cost worth amount of VND 2,221million, including VND 449 million[4] for construction of laboratory was provided by Vietnamese side (as of June 2014).

3.2 Achievement of the Project

3.2.1 Activities

Most of the Project's activities, as specified in the PDM (ver.1) and the Project's Plan of Operation (PO) were implemented as planned although there was some delay in procurement of monitoring equipment in the first half of the Project.

3.2.2 Outputs

Output 1: Wide-area landslide mapping and identification of landslide risk area is completed.

The project conducted investigation on the slopes along 1) HCM route (between Danang and Hue), 2) Haivan Station and 3) national road No.6 in Hoa Binh province. Four sheets of landslide inventory map were developed for HCM route and one inventory map produced for Haivan station. Project also identifies one area along HCM route (Landslide No.18) for further investigation, which has potential influence on the dam

[3] Calculation rate as per US$1 is VND20,881.28 (FY2012), VND21,095.94 (FY2013) and 21,165.38 (FY2014).
[4] Of which VND 209,632 million from MOT.

sites. Vietnamese counterparts will complete another inventory map along highway #6.

Under the Output 1 (i.e. working group 2), one long-term training participant is studying PhD course in Japan. The main focus of the study is detecting landslide risk based on the results of aerial photograph interpretation. Additionally two short-term training participants were dispatched to Japan and they seek to obtain thesis doctor in the future.

Overall, the level of achievement of Output 1 is moderate. At the beginning there was some difficulty caused regarding the purchase of the aerial photos since it required coordination and permission from the Ministry of Defense. Project successfully obtained most of the aerial photos for the target areas, it is hoped that these photos will be useful input to carry out further activities. For the latter half of the cooperation period, the Project aims to develop more comprehensive mapping that identifies potential risk areas for landslides within the target areas and risk assessment technology by utilizing additional data obtained from ALOS (Advanced land observing systems) etc. It is also expected for the Project to cooperate with Working Group 1 (WG1) to produce integrated guidelines for application of landslide risk assessment technology in Vietnam.

The table 3-5 below shows the level of achievements of Output1 with reference to indicators specified in PDM (ver.1).

Table 3-5 Level of achievement with reference to Indicators (Output 1)

Indicators as per PDM (ver.1)	Level of Achievements
1-1 Landslide distribution map is completed for Chen Pass and Son La Pass and their surroundings areas in Son La Province, along HCM Route from A Loui town to Thanh My town and Asian Highway #17 from Dak Zon to Dak Pet, and National Highway #1 from Hue to Danang.	● Four sheets of landslide inventory map for HCM route and one for Haivan was produced. ● It identified one moving slopes for further investigation (i.e. No.18 landslide along HCM route, with possible effect on dam sites)

Source: Project Reports

Output 2: Landslide risk assessment technology based on soil testing and computer simulation is developed.

The project developed a new high stress ring shear apparatus in Japan utilizing JST budget and it is currently modifying a new practical apparatus to be produced by the end of Feb 2015. The new apparatus was originally designed for Vietnam and it will be transported to ITST around May/June 2015 upon completion. Four (4) CP (including two long-term participants at Kyoto Univ.)[5] were trained on the usage of the equipment so far.

Overall, the level of achievement of Output 2 is moderate. Soil sample was taken from one pilot site (i.e. Haivan station) and sent for analysis in Japan. ITST is waiting for the transfer of the ring shear apparatus so that they could initiate soil testing activities in Vietnam. One of the concerns raised during the Mid-term Review was that spare parts need to be purchased from Japan and the apparatus itself is also a unique product therefore no manufacturers in Vietnam will be able to provide technical support nor maintenance of the apparatus. The review team also observes some issues regarding technical and financial sustainability of the maintenance of the apparatus (details will be discussed later in section 4.5).

The level of achievements of Output 2 with reference to indicators identified in PDM is shown in the table

[5] Additionally, one person from VNU is invited to Japan as a researcher in ICL with JST budget.

below.

Table 3-6 Level of achievement with reference to Indicators (Output 2)

Indicators as per PDM (ver.1)	Level of Achievements
2-1 Landslide initiation and motion is simulated based on the measured parameters of soil taken from the targeted landslides.	● 4 CPs (including 2 long-term training participants) were trained on the usage of the ring shear apparatus in Japan. ● One staff of VNU is invited to Japan by JST Budget. He has mastered how to use the apparatus. The training for above 4 counterpart members is conducted by him in Vietnamese language. ● The project is now modifying the apparatus and plans to transfer to ITST during 2015 to start further investigation in Vietnam.

Source: Project Reports

Output 3: Risk evaluation and early warning system based on landslide monitoring is developed.

The Project started a preliminary monitoring by using extensometers at Haivan Station landslide[6] and a slope deformation during rainfalls was monitored during Oct-Dec 2013. Project has either purchased or ordered additional equipment for more comprehensive monitoring and these equipment were currently stored in regional office of ITST in Danang and await for installation. The project is now the procurement process of contractor(s) for installation of these equipment at Haivan station landslide area.

Under this Output 3 (i.e. WG 4), three CP (long-term training participants) are studying postgraduate courses in Japan. All of them are involved in the research of landslide monitoring and will be among the core members to carry out activities upon their returning to Vietnam.

Overall, the level of achievement of Output 3 is moderate. It started a preliminary monitoring and the comprehensive monitoring is yet to be started and awaits for the installation of monitoring equipment. The utilization of the monitoring equipment depends on the outcome of research, therefore there are some uncertainties for sustainable usage of monitoring equipment.

In terms of early warning systems, it is subject to the outcome of research and to MOT's decision whether to incorporate the monitoring equipment into warning systems of Haivan station. ITST, in coordination with MOT, is expected to clarify institutional arrangement for early warning systems in Haivan station in coordination with Vietnam Railway Company. MOT is yet to determine the responsible institution of the monitoring equipment after the end of the Project, therefore MOT is expected to develop a plan on how to use a human resources and equipment for ITST after the Project is completed.

The level of achievements of Output 3 with reference to indicators identified in PDM is shown in the table below.

Table 3-7 Level of achievement with reference to Indicators (Output 3)

Indicators as per PDM (ver.1)	Level of Achievement
3-1 Early warning signal is issued based on the slope movement monitoring	● Preliminary monitoring was initiated in Haivan landslide area ● Project awaits for the installation of equipment for more comprehensive monitoring system.

[6] This extensometer was transported and installed by JST budget.

	● Early warning system for Haivan landslide area will be developed based on the results of the above comprehensive monitoring.

Source: Project Reports

Output 4: Integrated guidelines for the application of developed landslide risk assessment technology is developed.

As part of activities under Output 4, the Project developed an "ICL Landslide Teaching Tools" through funding from Ministry of Education, Culture, Sports, and Science & Technology of Japan (MEXT)[7]. This teaching tool is a collection of existing guidelines and manuals (PDF tools), PowerPoint presentations (PPT tools) as well as newly developed documents (text tools) and will be utilized for teaching purposes on general landslide issues. In addition, the Project plans to elaborate integrated guidelines by incorporating results of the study of other working groups (i.e. WG 2, 3 and 4) at the latter half of the cooperation period. This integrated guidelines are to be utilized for more practical application of landslide risk assessment technology developed through the Project into the society.

Overall, the level of achievement of Output 4 is moderate. The integrated guidelines are to be elaborated toward the latter half of the Project based on the contents of ICL teaching tools as well as results of further research activities in order to promote practical application of the risk assessment technology in Vietnam. Some members of the WG1 are also core members (group leaders) from other WGs, therefore the activity will take place in close coordination with other WGs.

The level of achievements of Output 4 with reference to indicators identified in PDM is shown in the table below.

Table 3-8 Level of achievement with reference to Indicators (Output 4)

Indicators as per PDM (ver.1)	Level of Achievement
4-1 Integrated guidelines for landslide risk assessment is developed	● The Project developed an "ICL Landslide Teaching Tools" as a reference material. ● The integrated guidelines for practical application of landslide risk assessment shall be developed based on the results of research of other working groups (i.e. WG2, 3 and 4).

Source: Project Reports

3.2.3 Project Purpose

Project Purpose: Landslide risk assessment technology to reduce landslide disasters along main transport arteries is developed through the collaborative research based on the Japanese pioneer technology, and capacity development for the effective use of this technology is implemented in Vietnam.

Objectively Verifiable Indicators in PDM (ver.1)

1. Landslide risk assessment technology is developed for disaster preparedness such as early warning, route design, slope protection etc.
2. Capacity of engineers and post graduate students is developed through the project activities.

All of the four Outputs mentioned earlier contribute to the development of landslide risk assessment technology in Vietnam. Through collaborative research under Output 1, 2 and 3, capacity development of Vietnamese counterparts is undertaken. 6 members (in addition 1 member from VNU with other budget) are

[7] Through a grant program for UNESCO's exchange program in education, science and technology in Asia and the Pacific region.

currently undertaking postgraduate studies in Japan as long-term training participants (for the length of two to three years /each participant). They are already contributing to communicate their knowledge and technology acquired in Japan to their colleagues in Vietnam by accompanying site surveys and research activities in Vietnam.

Development of integrated guidelines under Output 4 (WG1) will be one of the key focuses for the latter half of the Project in a sense that guidelines will show practical ways to apply risk assessment technologies developed through the Project.

Recent development of VLAT (Vietnamese Landslide Association for Transport) is a potential contributing factor to enhance achievement of Project Purpose. A mobilising committee is currently set up to prepare institutional arrangement of VLAT, with major members from ITST, Univ. of Mining and Geology, VNU and Geotechnics Institute.

3.3 Crosscutting Implementation Process

3.3.1 Specific Issues regarding Implementation Process

The followings are some issues of importance regarding the implementation process of the Project:

- The Project is implemented under the collaborative scheme of JICA and JST known as SATREPS (i.e. Science and Technology Research Partnership for Sustainable Development). This is relatively a new scheme starting from 2008, with a divided role of two organizations as follows: JST to fund research activities within Japan, while JICA funds activities in counterpart countries utilizing framework of its "technical cooperation projects".
- Modification of PDM was made in March 2012, few months after the signing of RD in November 2011. The current PDM (ver.1) was approved during the 1st Joint Coordination Committee (JCC) held in March 2012. Further modification of the PDM was also discussed during the 2nd JCC (May 2013) due to the change in target areas.
- Monitoring of the Project activities are made through regular monthly meetings within ITST joined by project coordinator from Japan. Japanese side group leaders report the progress of the Project through annual report. However, PDM is not fully utilized or referred as a framework of monitoring, therefore no data collection is practiced with reference to objectively verifiable indicators stipulated in current PDM (ver. 1).

3.3.2 Factors Promoted the Realization of Project's Effects

The Review Team noted the followings as factors that promoted the realization of The Project effects:

- The recent development of legislative framework for disaster management including enforcement of Law on Natural Disaster Prevention and Control in May 2014 is a potential promoting factor to enhance the effects of the Project.
- Japan has a leading role in development of landslide risk assessment technology. The Project could benefit from the utilization of advanced technology in this field, which has been built on the previous research projects overseas such as Croatia.

3.3.3 Factors Inhibited the Realization of Project's Effects

The Review Team noted the followings as risk and/or inhibiting factors for the realization of The Project effects:

- Change of the management member of the counterpart affected to the modification of project activity plan especially with regard to target areas. The change of the target areas also affected the approval of the Project Document by Vietnamese side, all of which undermined the effective implementation of the Project during the first year.
- Procurement process including preparation of A4 Form and procurement of some equipment (such as aerial photographs and monitoring equipment) required long time partly because some of the equipment required coordination and permission with other department (i.e. Ministry of Defense). As for the aerial photographs most of the necessary parts are already purchased and monitoring equipment are also either purchased or ordered and await for the installation in pilot site (i.e. Haivan landslide area).
- Procedure to get approval by Vietnamese side for installation of equipment in Haivan landslide area has a risk of delay or the limitation of achievement of the Project.
- The utilization of monitoring equipment and testing apparatus is subject to the outcome of the research. Incorporation of mentioned equipment and apparatus into early warning system is subject to outcomes of research as well as MOT's decision. Therefore, there are some uncertainties in relation to the efficiency of the Project as well as their technical and financial sustainability. Operation and maintenance of equipment are another issue of importance observed during the Mid-term review (see for example section 3.2.2 for details). Project may refer to experiences from other countries (such as Croatia) for their practice of O&M of similar equipment.

4. EVALUATION RESULTS BY FIVE EVALUATION CRITERIA

4.1 Relevance

Relevance is a criterion for considering the validity and necessity of a project regarding whether the expected effects of a project meet with the needs of target beneficiaries; whether a project intervention is appropriate as a solution for problems concerned; whether the contents of a project is consistent with policies etc. Relevance of the Project remains relatively high for the following reasons:

- The Project design is in line with national policies of Vietnam, namely "National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020" and its implementation plan (2009) which identify the needs for natural disaster prevention including flash floods and landslides in mountainous areas and central highlands.
- The Project is consistent with priority areas for Japan's Assistance Strategy to Vietnam. The Project is part of disaster management program located under the development issue of "responding to the threats of climate change, disaster, and environmental destruction".
- Regarding the selection of target area, it is verified as appropriate, however coordination with wider stakeholder may be useful in order to achieve Overall Goal of the Project, i.e. social application of risk assessment technology and development of early warning systems. VLAT may be one potential platform to promote this coordination.

4.2 Effectiveness

Effectiveness is a measure of the extent to which a project activity attains its objective. It is a criterion that asks "to what extent the Project has been effective in producing the intended effects". Effectiveness of the Project is considered to be moderate for the following reasons:

- The possibility of achieving the Project Purpose "Landslide risk assessment technology to reduce landslide disasters along main transport arteries is developed through the collaborative research based on

the Japanese pioneer technology, and capacity development for the effective use of this technology is implemented in Vietnam" by the end of the Project is considered to be moderate at the time of Mid-term review.

- In relation to the application of risk assessment technology into disaster preparedness such as early warning, effectiveness would increase once the results of the Project research on the early warning is proved to be reliable, ITST would submit the results to MOT for approval to apply the research outcome to railway operations at Haivan landslide area.
- The Mid-term Review Team revised the PDM (ver.1) in order to enhance the effectiveness of the Project by clarifying the contents and the direction of the Project. The tentative PDM (ver.2) is proposed to the Project for further consideration.

4.3 Efficiency

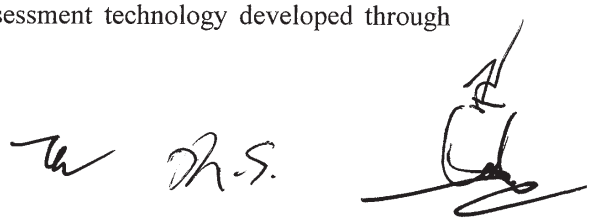
Efficiency measures the outputs – qualitative and quantitative – in relation to the inputs. It is an economic term which signifies that the project uses the least costly resources possible in order to achieve the desired results. Overall, the level of efficiency at the time of mid-term review is considered to be appropriate for the following reasons:

- The review team observed that there was some delay in Project's activities such as procurement of aerial photos and monitoring equipment for Haivan landslide areas. It required permission and coordination with Ministry of Defense to acquire aerial photos. Aerial photos are obtained for most of the target areas and monitoring equipment are either purchased or ordered hence the Project is expected to be back on track shortly.
- There were several changes made in terms of the target areas as a result of change of personnel at the decision making levels of concerned agencies. The approval of the project document was also affected partly by the change of target areas. Some preliminary studies were conducted and series of discussion were made in order to consolidate the target areas.
- The utilization of monitoring equipment and testing apparatus in the future is subject to the outcomes of the research. It is not clear how much budget, human resources and any other arrangement is needed especially for maintenance because actual operation does not start yet. In this sense it is still uncertain whether these equipment and testing apparatus will be utilized as expected and/or incorporated into regular early warning systems. From an efficiency point of view, it is important for the Project to assure that equipment would be utilized and maintained after the completion of the Project.

4.4 Impact

Impact is a viewpoint that asks "whether expected or unexpected long-term effects are brought about as a result of the Project". Overall Goal, which is expected to be achieved within three to five years after the Project completion, is one of the expected impacts of the Project.

As for the level of achievement of overall goal "Social implementation of the developed landslide risk assessment technology and early warning system will contribute to the safety ensuring of transport arteries through urban and local communities in Vietnam.", it is still premature to examine to what extent the outcome of the Project could contribute to the actual social implementation or application for landslide disaster mitigation. The Project expects to set up an early warning system for Haivan landslide area to prevent potential effects of landslide, combining different risk assessment technology developed through three Outputs (i.e. Output 1, 2 and 3).



One possible impact other than the overall goal is the development of legislative framework regarding landslide risk assessment in transport sector such as setting up of standards. No negative impacts have been reported so far.

4.5 Sustainability

4.5.1 Policy Aspects

Sustainability of the Project from policy aspects is considered to be high for the following reasons:

- Law on Natural Disaster Prevention and Control is promulgated in June 2013 and became effective since May 2014. Development of national strategy is to be elaborated every 10 years and its 5 years plans are to be developed at local, ministerial and national levels (Article 14 and 15). In terms of identification, assessment and zoning of natural disaster risks; monitoring and supervision of natural disasters, MONRE and Vietnam Academy of Science and Technology assume responsibilities for its provision (Article 17).
- Science and Technology Development Strategy in transport sector (2014-2020) and its orientation up to 2030 is approved by MOT in June 2014. The enhancement of application of advanced technology in landslide prevention, development of monitoring and early warning systems are all mentioned in long-term strategy.

4.5.2 Organizational and Financial Aspects

In terms of organizational and financial aspects, level of sustainability is considered to be premature to determine at the time of the mid-term review. The review team observes there are some potential contributing factors to organizational sustainability, while financial sustainability is yet to be determined.

- ITST develops a proposal for organizational restructuring (2014-2020) which include a plan for establishment of specialized institute of geotechnics and disaster prevention. When it is approved, the main function of this center would be 1) Research activities, 2) Setting up standards, and 3) Application of technologies into landslide prevention. At this moment, it is premature to verify this center would contribute to sustain the effects of the Project.
- VLAT is under preparatory phase, once it is set up it may be a potential platform for technical exchange among ITST and related organizations (such as universities).
- In terms of operation and maintenance (O&M) of monitoring equipment provided by the project, the review team observes that MOT, at the time of mid-term review, is yet to decide the responsible institution (either ITST or Vietnam Railway) for operation and maintenance after completion of the Project.
- In terms of O&M of the monitoring equipment and testing apparatus, it is not clear how much budget is needed especially for maintenance because actual operation does not started yet. According to the regulation on public assets management, all equipment owned by MOT have to be taken care properly with budget, and all equipment of the project will be maintained under this regulation once it is approved by MOT.

4.5.3 Technical Aspects

As for technical aspects, it is also premature to determine the technical sustainability of the Project for the following reasons:

- The long-term training participants (6 from ITST and 1 from VNU) are solidly acquiring knowledge and techniques for landslide risk assessment under WG2, 3 and 4. They are expected to be core personnel to disseminate technologies to their colleagues from ITST upon completion of their study in Japan.

- Short-term training participants acquire knowledge about mapping and risk evaluation, and operation of ring shear apparatus. Additionally, a manual of theory and operation of the ring shear apparatus is also developed to share knowledge with other ITST colleagues.
- Dissemination, application and development of risk assessment technologies are important factors for technical sustainability. With this end, Project will develop integrated guidelines to disseminate and apply technologies from the technical view point. ITST also seeks to apply and develop by setting up an institute of geotechnics and disaster prevention under ITST and VLAT.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The Project is fairly making good progress. Though it has experienced some delay in procuring process of some equipment, it will be back on track to complete the planned activities within the cooperation period. Regarding the level of achievements of Output, it is considered to be moderate for all the four Outputs by the time of mid-term review. In terms of five evaluation criteria, relevance is considered to be remained relatively high, effectiveness is moderate, efficiency is appropriate at the time of mid-term review. It is still premature to examine the impact of the Project, though efforts are made to apply risk assessment technology into practice within the target area, and it is hoped that the social implementation will be realized in areas outside the target area in order to ensure achievement of Overall Goal. In terms of sustainability, it is considered to be high from the policy aspect, while its organizational and financial and technical sustainability is premature to be determined.

5.2 Recommendations

On the ground of the results of the study summarized above, the Mid-term Review Team has made the following recommendations to the Project.

1) To modify the PDM (ver.1) in order to clarify the contents and direction of the Project for the latter half of the cooperation period. Tentative PDM (ver.2) is proposed to the Project for further consideration.
2) To utilize indicators specified in the PDM as a framework of monitoring exercise as well as terminal evaluation prior to the Project completion.
3) To assure operation and maintenance of all equipment provided by the Project after its completion.
4) ITST to make a proposal to MOT for development of a strategy for utilization of landslide early warning technology and its application to early warning systems.
5) For timely installation of monitoring equipment, ITST to make a proposal to MOT to 1) actively follow-up local authority to issue the approval and 2) direct Vietnam Railway to make necessary arrangement.
6) ITST to make a proposal to MOT, to develop a plan on sustainable utilization of equipment including human resource development.

Annex 1

Tentative Schedule of the Joint Mid-term Review
Project for Development of Landslide Risk Assessment Technology along Transport Arteries in Viet Nam

	Date	Contents
1	July 15 Tue	Tokyo – Hanoi
2	16 Wed 0930-1000 1030-1130 1400-1430 1500-1600	 JICA Viet Nam Office Meeting with JICA experts (Ms. Yoda, other experts) Meeting with ITST (Project Director, Project Manager) Meeting with ITST (WG 1 leaders and core members)
3	17 Thu 0900-1020 1020-1140 1330-1445 1530-1600	 Meeting with ITST (WG 2 leaders and core members) Meeting with ITST (WG 3 leaders and core members) Meeting with ITST (WG 4 leaders and core members) Meeting with ICD-MOT (briefing of the purpose and methods of mid-term review)
4	18 Fri 0930-1030 1100-1200 1400-1530	 Meeting with ITST (Project Manager, WG1, 2, 3, 4 leaders) Meeting with MOT (regarding "National policy on transportation sector") Meeting with JICA experts (Ms. Yoda, other experts)
5	19 Sat	Report writing
6	20 Sun	Report writing
7	21 Mon 0900-1000 1400-1500 1530-1630	 Interview with National Hydrology and Meteorology Service (NHMS) Interview with Department of Hydrology, Meteorology and Climate Change, MONRE Interview with Directorate of Water Resources, MARD
8	22 Tue 0930-1030 1100-1200 1400-1500	 University of Science, Vietnam National University (VNU) Transportation and Communication University Consultant of civil engineering
9	23 Wed 1000-1100	 Meeting with ex-participants (group discussion)

	PM	Documentation (report writing)	
10	24 Thu 1100-1200 PM	Meeting with Disaster Management Center, MARD (fixed) Documentation (Report writing)	Tokyo (1525) – Danan (1845) VN319
11	25 Fri AM/PM 1700	Report writing Meeting with JICA experts (preparation of handouts)	Site Survey National Railway Warehouse of ITST
12	26 Sat	Report writing	Site Survey HCR
13	27 Sun 19:45-22:30	Report writing Internal Meeting: Discussion on the draft report	Site Survey Hai van Station Danan (1650) – Hanoi (1805) VN7172
14	28 Mon 0900-1200 1330-2000	Internal meeting (Japanese mid-term review team) ITST, ICD (MOT): Explanation and Discussion on the draft report	
15	29 Tue 0800-0900 0900-1800 1900-2100	ITST, ICD (MOT): Explanation and Discussion on the draft report Participating SATREPS Report Meeting ITST, ICD (MOT): Discussion on the draft report	
16	30 Wed 0800-0845 0900-1700	ICD, MOT, ITST: Explanation about the final draft report Landslide Technical Forum	
17	31 Thu 0900-1130 PM	ICD, MOT, ITST: Explanation about the final draft report Preparation for JCC meeting (Japanese side)	
18	Aug 1 Fri	JCC Meeting Embassy of Japan Departure from Hanoi	
19	2	Narita	

Annex 2 List of Vietnamese counterpart

Vietnamese members of SATREPS Project:
Development of Landslide Risk Assessment Technology along Transport Arteries in Vietnam

添付資料1

WG-1

No.	Institution	Name	Status	Activity	E-mail
1	Institute of Transport Science and Technology (ITST)	Assoc.Prof. Doc. Nguyen Xuan Khang	Director General	Project Director G1-Leader	nxkhang@itst.gov.vn
2	Institute of Transport Science and Technology (ITST)	Msc. Dinh Van Tien	Director of Planning, project Management Division	Member of G1	dvtien.gbn@gmail.com
3	Institute of Transport Science and Technology (ITST)	Msc. Lam Huu Quang	Vice Director of Road Lab No.1	Member of G1	lhqlinh@yahoo.com
4	Institute of Transport Science and Technology (ITST)	Msc. Huynh Dang Vinh	Director of Geo-Technical Science and Technology Center	Member of G1	huynhdangvinh@gmail.com
5	Institute of Transport Science and Technology (ITST)	Doc. Do Huu Thang	Vice Director General	Member of G1	dohuuthang@itst.gov.vn
6	Institute of Transport Science and Technology (ITST)	Assoc.Prof. Doc. Nguyen Huu Tri	Expert	Member of G1	nghtris@itst.gov.vn
7	Institute of Transport Science and Technology (ITST)	Msc. Bui Ngoc Hung	Director of standards, science and International Cooperation Division	Member of G1	bnhungitst@gmail.com
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WG-2

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1	Institute of Transport Science and Technology (ITST)	Msc. Dinh Van Tien	Director of Planning, project Management Division	G2-Leader	dvtien.gbn@gmail.com
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6	Institute of Transport Science and Technology (ITST)	Eng. Nguyen Thanh Tuan	Researcher	Member of G2	tuankqh@gmail.com
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9	Institute of Transport Science and Technology (ITST)	Msc. Tran Thi Thuy Anh	Researcher	Member of G2	tranthithuyanh.itst@gmail.com

WG-3

No.	Institution	Name	Status	Activity	E-mail
1	Institute of Transport Science and Technology (ITST)	Msc. Lam Huu Quang	Vice Director of Road Lab No.1	G3-Leader	lhqlinh@yahoo.com
2	Institute of Transport Science and Technology (ITST)	Msc. Nguyen Kim Thanh	Researcher/ Planning, project Management Division	Member of G3/Project Secretary	nguyenkimthanh.itst@gmail.com
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11	Institute of Transport Science and Technology (ITST)	Msc. Cao Anh Tuan	Researcher	Member of G3	caotuanitst@gmail.com

WG-4

No.	Institution	Name	Status	Activity	E-mail
1	Institute of Transport Science and Technology (ITST)	Msc. Huynh Dang Vinh	Director of Geo-Technical Science and Technology Center	G4-Leader	huynhdangvinh@gmail.com
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3	Institute of Transport Science and Technology (ITST)	Msc. Huynh Thanh Binh	Vice Director of Geo-Technical Science and Technology Center	Member of G4	huynhthanhbinh@gmail.com
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5	Institute of Transport Science and Technology (ITST)	Msc. Do Ngoc Ha	Researcher	Member of G4	hangoc910@gmail.com
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A-23

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添付資料1

Project Design Matrix (PDM)

Project on the "Development of Landslide Risk Assessment Technology along Transport Arteries in Viet Nam"

PDM Version 1 (23/03/2012) ANNEX 2

Beneficiaries: MOT and ITST / Highway, railway design companies and management agencies / passengers and their economic activities between Northern and Southern regions of Vietnam linked by transport arteries / urban and local communities along transport arteries

Study Sites: Chen Pass and Son La Pass in Son La Provice, National Highway #1 (Asian Highway #1) and National Railways from Hue to Da Nang, Ho Chi Minh Route from A Luoi town to Thanh My and Asian Highway #17 from Thanh My to Le Xo Pass, (The study areas shall be selected in the early stage of the Project implementation through mutual consultation.)

Project Period: 7 November 2011- 6 November 2016 (5 years)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Objective Social implementation of the developed landslide risk assessment technology and early warning system will contribute to the safety ensuring of transport arteries through urban and local communities in Viet Nam.	・ Reduction of landslide loss in transportation (human loss, property loss, vehicle loss, etc.) ・ Reduction of road closure days due to landslides	・ Data of landslide loss of the Committee for Safety Transportation and CCFSC ・ Data of road closure days of DRVN	
Project Purpose Landslide risk assessment technology to reduce landslide disasters along main transport arteries is developed through the collaborative research based on the Japanese pioneer technology, and capacity development for the effective use of this technology is implemented in Viet Nam.	・ Landslide risk assessment technology is developed for disaster preparedness such as early warning, route design, slope protection, etc. ・ Capacity of engineers and post graduate students is developed through the project activities.	・ Published reports/papers on landslide risk assessment technology developed through the joint research of the Project ・ Number of engineers and students awarded master or doctor degrees	
Outputs 1. Wide-area landslide mapping and identification of landslide risk area	1. Landslide distribution map in Chen Pass and Son La Pass and their surroundings areas in Son La Provice, along Ho Chi Minh Route from A Loui town to Thanh My town and Asian Highway #17 from Dak Zon to Dak Pet, and National Highway #1 from Hue to Da Nang	1. Landslide distribution map made by the project.	
2. Development of landslide risk assessment technology based on soil testing and computer simulation	2. Landslide initiation and motion is simulated based on the measured parameters of soil taken from the targeted landslides.	2. Test result and simulation result by the Project.	
3. Risk evaluation and development of early warning system based on landslide monitoring	3. Early warning signal is issued based on the slope movement monitoring.	3. Early warning signal issued.	
4. Preparation of integrated guidelines for the application of developed landslide risk assessment technology	4. Integrated guidelines for landslide risk assessment	4. Integrated guidelines for landslide risk assessment prepared by the Project	

Activities

Activity for Output (1)
1-1. Identification of previous landslide sites from air and satellite photos
1-2. Identification of the precursor stage of landslides by the pattern analysis of digital surface model (DSM) of forested areas.
1-3. Formation of landslide risk map based on detailed field investigation and analytical model such as Analytical Hierarchy Process method (AHP)
1-4. Development of the technology to visualize the feature of landslide

Activity for Output (2)
2-1 Development of undrained dynamic-loading ring shear apparatus
2-2 Elucidation of the initiation mechanism and the dynamics of post-failure motion of the targeted landslides
2-3. Development of hazard assessment technology of the precurser stage of landslides

Activity for Output (3)
3-1 Selection of pilot area for landslide monitoring based on the field investigation
3-2 Development of the monitoring system for rainfall, groundwater, earthquakes, and slope movement
3-3. Establishment of early warning system suitable for the region based on the landslide experiments with artificial rains

Activity for Output (4)
4-1. Prepare integrated guidelines for the application of developed landslide risk assessment technology based on the Activities (1) ~ (3)
4-2. Conduct workshops, research meetings and conferences for information dissemination

Inputs

Japanese Side

Human Resource
- Long-term Expert
  - Project coordinator
  - Project research and capacity building
- Short-term Experts
  - Landslide mapping
  - Landslide testing
  - Landslide monitoring
  - Education and C/B
  - Other area upon necessity

Equipment
- Undrained dynamic loading ring shear apparatus
- Portable direct shear apparatus
- Permeability testing apparatus and other apparatuses to investigate soil physical parameters
- Terrestrial laser survey system
- Global positioning system
- Slope monitoring apparatus
- Ground water and earthquake monitoring system
- Data logging system and sensors
- Landslide experiment monitoring system
- Landslide experimental flume
- Personal Computers

Counterparts Training
- Training in Japan

Vietnamese Side

Human Resource
- Project Director
- Project Manager
- Researchers/administrators
  - MOT
  - ITST
  - DRVN

Facility and materials
- Office space with necessary office equipment (furniture, air conditioner, internet, telephone, electricity, etc.)
- Maintainace of machinery, spare parts and other materials already owned

Services and Information
- Available data (including maps and photographs) and information

Pre-conditions

・ MOT gains the permission from the Ministry of Defense for air photos and laser scanning (LIDAR).

・ Vietnam Landslide Association for Transportation (VLAT) is established.

・ Landslide Technical Forum (LTF) is established.

Annex 4 Lists of Inputs

Counter part training and trip supported by JICA project

1 JICA Long term training participants (ITSY)

	Participant's name	Working Group, position	University	Course	From	To	Supervisor
1	Mr. Do Ngoc Ha	WG4, Researcher (Geo-Technical Science and Technology Center)	Shimane Univ.	Master	Oct. 2012	Sep. 2014	Prof. Wang
2	Mr. Le Hong Luong	WG2, Researcher (Specialized Institute of Road and Aerodome)	Tohokugakuin Univ.	Doctor	Apr. 2013	Mar. 2016	Prof. Miyagi
3	Mr. Doan Huy Loi	WG3, Researcher (Geo-Technical Science and Technology Center)	Kyoto Univ.	Master	Apr. 2013	Mar. 2015	Prof. Takara
4	Mr. Pham Van Tien	WG3, Researcher (Trasnsport Construction Quality Testing Center)	Kyoto Univ.	Master	Apr. 2013	Mar. 2015	Prof. Takara
5	Ms. Pham Thi Chien	WG4, Researcher (Specialized Institute of Bridge and Tunnel)	Shimane Univ.	Master	Oct. 2013	Sep. 2015	Prof. Wang
6	Mr. Vu The Truong	WG4, Researcher (Specialized Institute of Road and Aerodome)	Shizuoka Univ.	Master	Oct. 2013	Sep. 2015	Prof. Tsuchiya

2 JICA short term training (ITST)

	Participant's name	Working Group	University	From	To	Supervisor	Course Title
1	Mr. Dinh Van Tien	Project Manager, WG2 leader, Director (Planning, R&D Management and International Division)	Tohokugakuin Univ. etc.	Jun. 1, 2013	June 21, 2013	Prof. Miyagi	Investigation of Landslides and Evaluation using Fuzzy and AHP method
2	Mr. Lam Huu Quang	WG3 leader, Director (Road Lab. No.1)	ICL	Nov. 10, 2013	Nov. 30, 2013	Prof. Sassa	Acquisition of Direct Shear Apparatus Usage and Test Analysis
3	Mr. Ngo Doan Dung	WG2, Vice Director (Planning, R&D Management and International Division)	Tohokugakuin Univ. etc.	Dec. 3, 2013	Dec. 24, 2013	Prof. Miyagi	Landslide Mapping
4	Mr. Lam Huu Quang	WG3 leader, Director (Road Lab. No.1)	ICL	Feb. 10, 2014	Mar. 1, 2014	Prof. Sassa	Acquisition of Direct Shear Apparatus Usage and Test Analysis
5	Mr. Ngo Doan Dung	WG2, Vice Director (Planning, Project Management Division)	Tohokugakuin Univ. etc.	Jul. 3, 2014	Jul. 23, 2014	Prof. Miyagi	Landslide Mapping and the Risk Evaluation Technique

3 Overseas business trip

(1) Preparation visit as JICA long term traning candidates (ITST)

	Participant's name	Working Group	University	Course	From	To	Supervisor
1	Mr. Doan Huy Loi	WG3	Kyoto Univ.	Master	Dec. 3, 2012	Dec. 16, 2013	Prof. Takara
2	Mr. Pham Van Tien	WG3	Kyoto Univ.	Master	Dec. 3, 2012	Dec. 16, 2013	Prof. Takara
3	Mr. Doan Huy Loi	WG3	Kyoto Univ.	Master	Feb. 7, 2013	Feb. 20, 2013	Prof. Takara
4	Mr. Pham Van Tien	WG3	Kyoto Univ.	Master	Feb. 7, 2013	Feb. 20, 2013	Prof. Takara
5	Mr. Le Hong Luong	WG2	Tohokugakuin Univ.	Doctor	Feb. 17, 2013	Feb. 22, 2013	Prof. Miyagi
6	Mr. Doan Huy Loi	WG3	Kyoto Univ.	Master	Mar. 8, 2013	Mar. 14, 20113	Prof. Takara
7	Mr. Pham Van Tien	WG3	Kyoto Univ.	Master	Mar. 8, 2013	Mar. 14, 20113	Prof. Takara
8	Mr. Vu The Truong	WG4	Shizuoka Univ.	Master	Apr. 21, 2013	Apr. 26, 2013	Prof. Tsuchiya
9	Ms. Pham Thi Chien	WG4	Shimane Univ.	Master	Jun. 15, 2013	Jun. 18, 2013	Prof. Wang

(2) ICL-IPL conference in Kyoto (Nov. 18-23, 2013)

Name	Institution	Position
Assoc. Professor Hoang Ha	MoT	Director of Science and Technology
Mr. Tran Quoc Toan	MoT	Vice Director of Transport Infrastructure Department
Mr. Tran Thanh Liem	MoT	Officer of Planning and Investment
Assoc. Prof. Nguey Xuan Khang	ITST	General Director, Project Director
Mr. Dinh Van Tien	ITST	Director of Planning, R&D Management and International Division, Project Manager
Mr. Tran Dang Ninh	sub (central)-ITST	Deirector

(3) WLF3 conference in Beijing (June 1-7, 2014)

Name	Institution	Position
Assoc. Prof. Nguey Xuan Khang	ITST	General Director, Project Director
Mr. Dinh Van Tien	ITST	Director of Planning, R&D Management and International Division, Project Manager

(4) Business trip for Project appratus check (June 16-29, 2014) (ITST)

	Participant's name	Working Group	Visiting Institution	From	To	Supervisor
1	Mr. Lam Huu Quang	WG3 leader, Director (Road Lab. No.1)	ICL	Jun. 16, 2014	Jun. 29, 2014	Prof. Sassa
2	Mr. Nguyen Kim Thanh	WG3, Project secretary, Researcher (Planning and R&D Management and	ICL	Jun. 16, 2014	Jun. 29, 2014	Prof. Sassa

4 Domestic arifare support for ITST C/P (Oct. 21,24) (for Haivan field survey with experts before the project document approval)

Name	Position (then)	remarks
Assoc. Prof. Nguyen Xuan Khang	Director General, Project Director	one way
Mr. Dinh Van Tien	Director of Planning, R&D Management and International Division, Project Manager, WG2 leader	one way
Mr. Bui Ngoc Hung	Director of Personel Department, WG1	
Mr. Huynh Thanh Binh	Vice Director of the center of science and Technology of Geotechnics, WG4	
Mr. Nguyen Dinh Thanh	Researcher, Center of Science and Technology of Geotechnics, WG4	
Ms. Tran Thi Thuy Anh	Researcher, Project secretary, WG1	

添付資料1

Experts and JICA/JST official visits (JFY2012 (Aug. 2012 – Mar. 2013))

year	from Month	from Date	to Month	to Date	duration	Name of experts	No. of exeprts	Man*day (experts)	Accompnaied JICA training participant	No.of training participants	Man*day (training participant)	Place	Purpose, Counterpart
2012	Aug.	25	Aug.	27	3	Prof. Miyagi	1	3				Hanoi	ITST to update the program, Meeting with SAMCOM about aerial photo purchase, Met Ms. Linh and Dr. Duc for her study prog. In Japan. Met Mr. Dung about his study plan in Japan. Met Ui san and Le san at JICA to update information.
	Oct.	20	Oct.	25	6	Dr. Abe, Dr. Omiya	2	12				Hanoi, Danang	Hai Van Station survey (with Assoc. Prof. Khang, Mr. Tien, Mr Hung, Mr. Quanh, Mr. Thanh, Ms. Anh, Mr. Ninh (sub-ITST), Mr. Vu (sub-ITST), Project Document, Equipment purchase preparation
	Oct.	20	Oct.	25	6	Dr. Asano	1	6				Hanoi, Danang	Hai Van Station survey (with Assoc. Prof. Khang, Mr. Tien, Mr Hung, Mr. Quanh, Mr. Thanh, Ms. Anh, Mr. Ninh (sub-ITST), Mr. Vu (sub-ITST), Project Document, Equipment purchase preparation
	Oct.	20	Oct.	26	7	Prof. Sassa, Ms. Fujita, Dr. Nagai, Dr. He	4	28	Mr. Ha	1	7	Hanoi, Danang	Hai Van Station survey (with Assoc. Prof. Khang, Mr. Tien, Mr Hung, Mr. Quanh, Mr. Thanh, Ms. Anh, Mr. Ninh (sub-ITST), Mr. Vu (sub-ITST), Project Document, Equipment purchase preparation
	Oct.	23	Oct.	26	4	Prof. Miyagi	1	4				Hanoi	Project Document, Equipment purchase preparation, Group acitivity plan
	Dec	2	Dec.	7	6	Prof. Miyagi, Dr. Daimaru, Dr. Yoshimatsu, Dr. Chiba, Dr. Hamasaki, Dr. Kato, Mr. Shibasaki	7	42				Hanoi, A Luoi, Danang	HCM route survey (Mr. Dung, Mr. Vu (sub-ITST), Mr. Phuc (sub-ITST), Hai Van survey (Mr. Dung, Mr.Vu (sub-ITST), Mr. Phuc (sub-ITST)), Lecture on aerial phtograph interpretation at ITST (Prof. Miyagi), Lecture on Adcalc 3D (Dr. Hamasaki)
	Dec	2	Dec	28	27	Dr. Abe	1	27				Hanoi, Danang	HCM route survey and Hai van survey with WG2 and HCM route detailed survey with Mr. Luong
	Dec.	3	Dec.	5	3	Dr. Kanno	1	3				Danang→A Luoi → Danang	HCM route survey and Haivan survey with WG2
2013	Feb	14	Feb	17	4	Prof. Miyagi	1	4				Hanoi	Airphoto interpretatin, Advice to the Tohokugakuin univ. entrance examinee (Mr. Le Hong Luong-a JICA training candidate)
	Feb	20	Mar	19	28	Dr. Abe	1	28				Hanoi, Danar	HCM route survey (with Mr. Tien and Mr. Son, Lecture at ITST on landslides, Equipment

	FY2012	FY2013	FY2014	TTL
TTL (days)	157	401	114	672
training participants (days) or JICA budget	7	28	0	35

Experts and JICA/JST official visits (JFY2013 (April 2013 – March 2014))

year	from Month	from Date	to Month	to Date	duration	name of experts. JST members	No.of experts	Man*day (experts)	accompanied JICA training participant	No.of training participatns	Man*day (training participants)	Stay	Purpose, Counterpart
2013	April	20	May	17	28	Dr. Abe	1	28				Hanoi, Danang, Yenbai	Hai Van survey preparation (Mr. Phuc (sub-ITST)), HCM route survey, JCC/LTF, Hoa Binh survey
	May	1	May	11	11	Prof. Miyagi, Dr. Daimaru, Dr. Hamasaki, Dr. Kato, Dr. Yoshimatsu, Dr. Chiba, Mr. Shibasaki	7	77	Mr. Le Hong Luong	1	11	Hanoi, Danang	HCR survey (Mr. Dung), JCC/LTF, Hai Van survey (Assoc. Prof. Khang, Mr. Tien, Mr. Quang, Mr. Binh, Mr. Son, Mr. Kim, Mr. Lap (sub-ITST), Mr. Phuc (sub-ITST))
	May	2	May	6	5	Mr. Kitaoka, Mr.	2	10				Hanoi	Laboratory building design
	May	2	May	8	7	Prof. Ochiai	1	7				Hanoi	Laboratory building desing, JCC/LTF
	May	6	May	14	9	Prof. Sassa, Dr. He, Mr. Quang, Mr. Setiawan	4	36				Hanoi, Danang, Yenbai	JCC/LTF, Hai Van survey (with Dr. Tam (road association), HCR survey, Hoa Binh survey
	May	6	May	14	9	Dr. Asano, Mr. Yamamura	2	18				Hanoi, Danang, Yenbai	JCC/LTF, Hai Van survey (with Dr. Tam (road association), HCR survey, Hoa Binh survey
	June	26	July	19	24	Dr. Abe	1	24				Hanoi	Equipment installation plan
	Aug	18	Aug	25	8	Mr. Shibasaki	1	8				Danang, Prau	HCR survey with Mr. Dung, Mr. Lap (sub-ITST)
	Aug	18	Aug	25	8	Dr. Yoshimatsu, Dr. Kato	2	16				Hanoi, Danang, Prau	Meeting at ITST, HCR survey, Hoa Binh survey
	Aug	18	Aug	27	10	Dr. Abe		10				Hanoi, Danang, Prau	Meeting at ITST, HCR survey, Hoa Binh survey
	Aug	22	Aug	25	4	Prof. Miyagi	1	4				Hanoi	Airphoto interpretation, Lecture at ITST
	Oct	1	Oct	21	21	Dr. Abe	1	21				Hanoi, Danang, Nghe Anh, Hoa Binh	Meeting at ITST, Consultant, Surveys (Haivan, Nam Non Bridge (Mr. Tien, Mr. Dung), Highway No.6 (Mr. Thanh))
	Oct	1	Oct	8	8	Dr. Yamada	1	8				Hanoi, Haivan	Meeting at ITST, Consultant, Haivan Survey with Dr. Abe
	Oct.	11	Oct	17	7	Prof. Miyagi, Dr. Yoshimatsu, Dr. Daimaru, Dr. Kato	4	28	Mr. Le Hong Luong	1	7	Hanoi, Nghe Anh, Hoa Binh	Meeting at ITST, Consultant, Surveys (Haivan, Nam Non Bridge (Mr. Tien, Mr. Dung), Highway No.6 (Mr. Thanh))
	Oct.	11	Oct.	15	5	Dr. Hamasaki	1	5				Hanoi, Nghe Anh	Meeting at ITST, Nam Non Bridge survey
	Oct.	16	Oct.	19	4	Prof. Sassa, Dr. Nagai, Dr. He, Mr. Dan Quang Khang	4	16				Hanoi	Meeting at JICA, ITST, Hoa Binh (highway No. 6) survey (with Mr. Dung)
	Dec.	9	Dec.	26	18	Dr. Abe	1	18				Hanoi	Planning for monitoring equipments and boring, Lecture at ITST
2014	Jan.	14	Jan.	23	10	Dr. Abe	1	10				Danang, Prau, Hanoi	Haivan boring site check, HCM survey with Mr. Dung
	Jan.	14	Jan.	18	5	Mr. Sato	1	5				Danang, Hanoi	Haivan boring site check with Dr. Abe
	Jan.	18	Jan.	23	6	Dr. Yoshimatsu, Dr. Kato, Dr. Hayashi	3	18				Hanoi, Prau	HCM route survey with Dr. Abe and Mr. Dung
	March	5	March	18	14	Dr. Abe	1	14				Hanoi, Danang	Haivan, HCM, Hoa Binh site guide to Prof. Tsuchiya, Haivan Installation planning
	March	5	March	9	5	Prof. Tsuchiya	1	5	Mr. Vu The Truong	1	5	Hanoi, Danang	Haivan, HCM, Hoa Binh site check with Dr. Abe Mr. Yumen (student)
	March	18	March	22	5	Prof. Miyagi, Dr. Daimaru, Mr. Shibasaki	3	15	Mr. Le Hong Luong	1	5	Hanoi, HoaBinh	Hoa Binh site survey with Ms. Makabe (student), Ms. Nakagawa (student), Mr. Dung (ITST)

Man*day	TTL (days)	401	Man*day	JICA training participant	28

添付資料1

Experts and JICA/JST official visits (JFY2014 (April 2014 – June, 2014))

year	from Month	from Date	to Month	to Date	duration	expert name	No.of experts	Man*day (experts)	accompanied JICA training participant	No.of training participant	Man*day (training participants)	Stay	Purpose, counterpart
2014	April	5	April	12	8	Dr. Abe	1	8				Hanoi, Danang	Hai Van to check euipment installation plan (with Mr. Binh (ITST) and Mr. Tien (ITST), Highway No.6 (with Mr. Dung (ITST), Meeting with JICA, ITST
	April	8	April	12	5	Prof. Sassa, Prof. Ochiai, Mr. Dang Quang Khang	3	15				Hanoi, Danang	Hai Van to check euipment installation plan (with Mr. Binh (ITST) and Mr. Tien (ITST), Highway No.6 (with Mr. Dung (ITST), Meeting with JICA, ITST, Embassy and VNU professors
	April	23	April	26	4	Dr. Abe	1	4				Hanoi	Finalizing Haivan installation plan
	May	5	May	12	8	Dr. Kato	1	8				Danang, Hanoi	Haivan geological survey with Mr. Binh
	May	5	May	12	8	Dr. Chiba	1	8				Danang	Haivan geological survey with Mr. Binh
	May	5	May	14	10	Dr. Daimaru	1	10	(Advice to Mr. Pham Tien (univ. budget))			Danang, Hanoi	Haivan geological survey with Mr. Binh, aerial photo interpretation (at ITST)
	May	5	May	12	8	Dr. Hamasaki	1	8				Danang, Kham Duc	Haivan geological survey, HCM route (Thanh My – Kham Duc) survey with Mr. Dung
	May	5	May	15	11	Prof. Miyagi	1	11				Danang, Kham Duc, Hanoi	Haivan geological survey, HCM route (Thanh My – Kham Duc) survey with Mr. Dung, aerial photo interpretation at ITST
	May	5	May	12	8	Dr. Yoshimatsu, Dr. Hayashi	2	16				Hanoi	Working with Mr. Tien on his research plan, analysis and paper
	June	11	June	24	14	Dr. Abe	1	14				Danang, Hanoi	Haivan (extensometer installation for safety network) with Mr. Vu (sub-ITST), tendering work
	June	15	June	18	4	Dr. Takimoto	1	4				Danang	Network check around Haivan station
	June	15	June	18	4	Dr. Asano	1	4				Danang	Haivan (weather data download, extensometer installation for safety network)
	June	15	June	18	4	Dr. Nagai	1	4				Danang	Haivan (weather data download, extensometer installation for safety network)

Man*day	TTL (days)	114	man*day	JICA training participants	0

List of Equipment provided by the Project

Item	number	Price (JPY)	Dates of receipt	Remarks (users)
Laptop computer and power media dock	2 sets	671,580 (2 sets)	2012.3.28	installed at ICL
Simulation Software (LS-RAPID)	2 sets	357,000 (2 sets)	2012.3.28	installed at ICL
Potable direct shear apparatus	1	2,205,000	2012.9.15	installed at ICL
Robotic Total Station set for teaching in Japan	1	3,990,000	2013.3.25	installed at Forestry and Forest Products Research Institute (FFPRI), Japan
Software for total station	1	840,000	2014.1.21	FFPRI, Japan
Laptop Computer and Power Media Dock (Sony Vaio SVP1321A2J)	1	232,190 (including tax)	24-Feb-14	Mr. Lam Huu Quang
Laptop Computer and Power Media Dock (Sony Vaio VPCZ23AJ)	2 sets	671,580 (2 set) (including tax) (including Virus buster cloud: JPY98,020)	23-Dec-13	Mr. Doan Huy Loi and Mr. Pham Van Tien
LS-Rapid ver. 2.01(LS41030)	1	183,600 (including tax)	11-Apr-14	Mr. Nguyen Kim Thanh
LS-Rapid ver. 2.01(LS41030)	3	550,800 (including tax)	* wil be delivered later	ICL
Pack Tube for Drilling	1set	4,019,400 (excluding packing, freight, insurance and other export charges)	(Arrived at sub-ITST, 2014/6/26, to be inspected on July 22)	temporarily stored in sub-ITST
Extensometer Monitoring system for Haivan Landslides	1set	10,791,000 (excluding packing, freight, insurance and export other charges)	(Arrived at sub-ITST, 2014/6/26, to be inspected on July 22)	temporarily stored in sub-ITST
AdCalc 3D (software)	1	1,080,000 (including tax)	19-Jul-14	Mr. Ngo Doan Dung
Global Navigation Satellite System (GNSS)	5	15,533,640	waits for arrival	order completed
Soil shearing test machine and data logger	1	2,654,640	waits for arrival	order completed
Robotic Total Station Set for monitoring in Haivan Landslides	1	6,436,305	waits for arrival	order completed
	total (JPY)	50,216,735		

Aerial Photo and Map

Aerial Photo and map	number	payment date	cost (including VAT)
HCM route (A Luoi –Thanh My) airphoto	273	March 2013	US$3,158.03
HCM route (A Luoi – Thanh My) map 1/10,000	70	August 2013	US$1,641.14
HCM route (A Luoi – Thanh My) map 1/25,000	11	August 2013	
Haivan area airphoto	43	August 2013	
Haivan area map 1/10,000	8	August 2013	
Haivan area map 1/25,000	2	August 2013	
HCM route (North of A Luoi and South of Thanh My) airphoto	272	March 2014	US$4,260.67
HCM route (North of A Luoi and South of Thanh My) map 1/10,000	76	March 2014	
HCM route (North of A Luoi and South of Thanh My) map 1/25,000	14	March 2014	
Highway No. 49 (A Luoi – Hue) airphoto	(107)	(July, 2014)	(VND 46,645,500 ≒ US$2,200)
Highway No. 49 (A Luoi – Hue) map 1/10,000	(17)	(July, 2014)	
Highway No. 49 (A Luoi – Hue) map 1/25,000	(7)	(July, 2014)	
Highway No.6 (Hoa Binh area) airphoto	(37)	(July, 2014)	
Highway No.6 (Hoa Binh area), map 1/10,000	(16)	(July, 2014)	
Highway No.6 (Hoa Binh area), map 1/25,000	(4)	(July, 2014)	
		Total	US$9,059.84

Laboratory buidling support

Laboratory for Flume (Interior work (electric wiring, installation of doors, windows, water tanks, aircondition and curtains)	March, 2014	US$7,061.48
	Total	US$7,061.48

Tentative Project Design Matrix (PDM)

PDM Version 2 (Aug. 1, 2014)

Beneficiaries: MOT and ITST / Highway, railway design companies and management agencies / passengers and their economic activities between Northern and Southern regions of Vietnam linked by transport arteries/ urban and local communities along Transport Arteries.

Target areas: Hai van Station landslide in the National Railways from Hue to Da Nang and Ho Chi Minh Route from A Luoi town to Thanh My

Project Period: Nov. 7, 2011- Nov.6, 2016 (5 years)

Narrative Summary		Means of Verification	Important Assumptions
Overall Objective Social implementation of the developed landslide risk assessment technology and early warning system is realised to ~~will~~ contribute to the safety ensuring of transport arteries and ~~through~~ urban and local communities in Vietnam~~-Nam~~.	~~1. Stop of railway train before landslide occurrence to avoid disasters in the Haivan Station~~ 1. Early warning system in Haivan landslide area is established by using technology and equipment of the project. ~~2. Identfication of landslide risk slopes along the Ho Chi Minh Route~~ 2. Landslide risk slopes is identified and assessed both within and outside the target areas. ~~(along the Ho Chi Minh Route)~~	1. Annual report of ITST ~~•Number of warning to stop railway strain before landslides in the Haivan Station.~~ 1. Annual report of ITST ~~•Number of landslide risk slopes~~	
Project Purpose Landslide risk assessment technology incorporating outcomes of all WGs is developed to reduce landslide disasters along main transport arteries through the collaborative research based on the Japanese pioneer technology, and capacity development for the effective use of this technology is undertaken in Viet Nam.	~~1. Landslide risk assessment technology is developed for disaster preparedness such as early warning, route design, slope protection, etc.~~ 1. Landslide risk such as area, depth, volume, speed of landslide motion is identified by incorporating results of mapping, testing and monitoring. ~~2. Capacity of engineers and post graduate students is developed through the project activities.~~ 2. Capacity of ITST staff in the field of landslide risk assessment is developed.	1-1 Progress report of the project~~/Published reports/papers on landslide risk assessment technology developed through the joint research of the Project~~ •Number of engineers and students awarded master or doctor degrees	MOT will adopt outcomes of research to incorporate early warning systems of Vietnam railway.
Outputs 1. Wide-area landslide mapping and identification of landslide risk area is completed.	1-1 Landslide distribution map along Ho Chi Minh Route from A Loui town to Kham Duc, and Haivan Pass area and National Highway No. 6 at Hoabinh province. 1-2 Long-term activated landslide risk area is identified out of the wide-area mapping in target areas mentioned above. 1-3 No. of ITST staff who are trained to detect landslide risk.	1-1 Landslide distribution map made by the project. 1-2 Progress reports of the Project/ Thesis by long-term training participants 1-3 Progress reports of the Project	No major natural disaster will occur to affect the research activities of the Project.
2. Landslide risk assessment technology based on soil testing for computer simulation is developed.	2-1 Landslide initiation and motion is simulated based on the measured parameters of soil taken from the targeted landslides.	2-1 Progress report of the Project/ Test result and simulation result by the Project.	
3. ~~Risk evaluation and development of early warning system based on landslide monitoring~~ Early warning technology based on landslide monitoring is developed.	~~3-1 Early warning signal is issued based on the slope movement monitoring.~~ 3-1 Monitoring system is equipped with data gathering and real time transmitting system 3-2 Landslide motion data is accumulated and analysed 3-3 The way of setting warning and alert level is drafted based on the actual fugures in pilot area and laboratory test	3-1 Progress reports of the Project~~/ Early warning signal issued.~~ 3-2 Progress reports of the Project 3-3 Progress reports of the Project	
4. Integrated guidelines for the application of developed landslide risk assessment technology is developed.	4-1 Integrated guidelines is submitted to MOT for approval as a reference material.	4-1 Progress report of the Project 4-2 Integrated guidelines for landslide risk assessment prepared by the Project	

Activities

Activity for Output (1)

1-1. Identification of previous landslide sites from aerial photographs and satellite image data

1-2. Identification of the precursor stage of landslides by the pattern analysis of digital surface model (DSM) of forested areas.

1-3. Formation of landslide risk map based on detailed field investigation and analytical model such as Analytical Hierarchy Process method (AHP) , susceptibility evaluation by Fuzzy method.

1-4. Development of the technology to visualize the feature of landslide

Activity for Output (2)

2-1. Development of undrained dynamic-loading ring shear apparatus

2-2. Elucidation of the initiation mechanism and the dynamics of post-failure motion of the targeted landslides

2-3. Development of hazard assessment technology of the precursor stage of landslides

Activity for Output (3)

3-1. Selection of pilot area for landslide monitoring based on the field investigation

3-2. Development of the monitoring system for rainfall, groundwater, earthquakes, and slope movement

3-3. Establishment of early warning system suitable for the region based on the landslide experiments with artificial rains

Activity for Output (4)

4-1. Prepare integrated guidelines for the application of developed landslide risk assessment technology based on the Activities (1) ~ (3)

4-2. Conduct workshops, research meetings and conferences for information dissemination

Inputs

Japanese Side

Human Resource
•Long-term Expert
- Project coordinator
- Project research and capacity development
•Short-term Experts
- Landslide mapping
- Landslide testing
- Landslide monitoring
- Education and capacity development
- Other area upon necessity

Equipment
- Undrained dynamic loading ring shear apparatus
- Portable direct shear apparatus
- Permeability testing apparatus and other apparatuses to investigate soil physical parameters
- Robotic Total Station set
- Global Navigation Satellite System (GNSS)
- Extensometer Monitoring System for Haivan Landslide
- Borehole inclinometer
- In place inclinometer system
- Pack tude for drilling
- Data acqusition system andpore pressure sensors
- Landslide experiment monitoring system
- Landslide experimental flume
- Personal Computers
- Landslide simulation software (LS-Rapid)
- AdCalc 3D software

Counterparts Training
- Training in Japan

Vietnamese Side

Human Resource
•Project Director
•Project Manager
•Researchers/administrators
- MOT
- ITST

Facility and materials
•Office space with necessary office equipment (furniture, air conditioner internet, telephone, electricity, etc.)
•Construction of building for landslide flume experiment
•Maintainace of machinery, Electricity, water for experiment.

Services and information
•Available data (including maps and photographs) and information

Pre-conditions

•MOT gains the permission from the Ministry of Defense for air photos.

•Landslide Technical Forum (LTF) is established.

Appendix Ⅲ

Japanese members of SATREPS Landslide Project in Vietnam

WG-1

	Institution		Name	Status	Activity
1	International Consortium on Landslides	佐々恭二	Kyoji SASSA	Executive Director	G1-Leader
2	Tohoku Gakuin University	宮城豊彦	Toyohiko MIYAGI	Professor	G1
3	Forestry & Forest Products Research In	落合博貴	Hirotaka OCHIAI	Research Coordinator	G1
4	International Consortium on Landslides	永井 修	Osamu NAGAI	Research Promoter	G1
5	Kyoto University	松浦純生	Sumio MATSUURA	Professor	G1
6	Shizuoka University	土屋 智	Satoru TSUCHIYA	Professor	G1
7	Nippon Steel & Sumikin Metal Products	巌 明光	Hikamitsu OMIYA	Senior Manger	G1
8	OSASI Technos Inc	板山達至	Satoshi ITAYAMA	Sales Director	G1
9	Kokusai Kogyo Co., Ltd.	向山栄	Sakae MUKOYAMA	Researcher	G1
10	Japan Agency for Marine-Earth Science	高橋桂子	Keiko TAKAHASHI	Researcher	G1
11	Japan Agency for Marine-Earth Science	大西領	Ryo ONISHI	Researcher	G1
12	Niigata University	福岡 浩	Hiroshi FUKUOKA	Professor	G1
13	International Consortium on Landslides	上田美恵	Mie UEDA	Research Associate	G1
14	International Consortium on Landslides	木村直子	Naoko KIMURA	Researcher	G1
15	International Consortium on Landslides	片岡 稚	Waka KATAOKA	Research Associate	G1
16	Godai Kaihatsu Corporation	瀧本圭介	Keisuke TAKIMOTO	Engineer	G1
17	International Consortium on Landslides	ファイサル・ファターニ	Faisal FATHANI	Researcher	G1
18	International Consortium on Landslides	ダン・クワン・カン	Khang Quang DANG	Researcher	G1
19	International Consortium on Landslides	ヘンディ・セチアワン	Hendy SETIAWAN	Graduate Student	G1
20	International Consortium on Landslides	ゼリコ・アルバナス	Zeljko ARBANAS	Researcher	G1
21	International Consortium on Landslides	スネジャナ・ミハリッチ-アルバナス	Snjezana MIHALIC-ARBANAS	Researcher	G1
22	International Consortium on Landslides	ドウイコリタ・カルナワティ	Dwikorita KARNAWATI	Researcher	G1
23	International Consortium on Landslides	アランペポラ	NMSI Arambepola	Researcher	G1
24	International Consortium on Landslides	ド・ク・ド・ミン	Do Minh DUC	Researcher	G1
25	International Consortium on Landslides	アピ・プ・アリーフ	Apin ARIEF	Researcher	G1

WG-2

	Institution		Name	Status	Activity
1	Tohoku Gakuin University	宮城豊彦	Toyohiko MIHAGI	Professor	G2-Leader
2	Forestry & Forest Products Research In	大丸裕武	Hiromu DAIMARU	Section Leader	G2
3	Okuyama-Boring Co., Ltd	阿部真郎	Shinro ABE	Senior Advisor	G2
4	Tohoku Gakuin University	柳沢英明	Hideaki YANAGISAWA	Associate Professor	G2
5	Advantechnology Co., Ltd	濱崎英作	Eisaku HAMASAKI	Researcher	G2
6	Graduate School of Kyoto University	柴崎達也	Tatsuya SHIBASAKI	Doctor course student	G2
7	Tohoku Institute of Technology	千葉則行	Noriyuki CHIBA	Professor	G2
8	Kawasaki Geological Engineering Co., L	吉松弘行	Hiroyuki YOSHIMATSU	General Manager	G2
9	Kawasaki Geological Engineering Co., L	加藤猛士	Takeshi KATO	Manager	G2
10	Remote Sensing Technology Center of	古田竜一	Ryoichi FURUTA	Researcher	G2
11	Okuyama-Boring Co., Ltd	林 一成	Kazunori HAYASHI	Engineer	G2
12	National Research Institute for Earth Sc	内山庄一郎	Shoichiro UCHIYAMA	Researcher	G2
13	Tohoku Gakuin University	中川理恵	Rie NAKAGAWA	Research Associate	G2

WG-3

	Institution		Name	Status	Activity
1	International Consortium on Landslides	佐々恭二	Kyoji SASSA	Executive Director	G3-Leader
2	International Consortium on Landslides	賀 斌	Bin HE	Associate Professor	G3
3	International Consortium on Landslides	永井 修	Osamu NAGAI	Research Promoter	G3
4	Gunma University	若井明彦	Akihiko WAKAI	Associate Professor	G3
5	Shimane University	汪 発武	Fawu WANG	Associate Professor	G3
6	Forestry & Forest Products Research In	岡田康彦	Yasuhiko OKADA	Senior Researcher	G3
7	Tohoku Gakuin University	柳沢英明	Hideaki YANAGISAWA	Associate Professor	G2
8	Japan Conservation Engineers Co., Ltd	柴崎達也	Tatsuya SIHBASAKI	Researcher	G3
9	Shizuoka University	土屋 智	Satoru TSUCHIYA	Professor	G3

WG-4

	Institution		Name	Status	Activity
1	Forestry & Forest Products Research In	落合博貴	Hirotaka OCHIAI	Director	G4-Leader
2	Forestry & Forest Products Research In	大丸裕武	Hiromu DAIMARU	Section Leader	G4
3	Forestry & Forest Products Research In	浅野志穂	Shiho ASANO	Group leader	G4
4	Forestry & Forest Products Research In	岡本 隆	Takashi OKAMOTO	Senior Researcher	G4
5	Japan Conservation Engineers Co., Ltd	山村 充	Mitsuru YAMAMURA	Senior Researcher	G4
6	Kyoto University	松浦純生	Sumio MATSUURA	Professor	G4
7	Kawasaki Geological Engineering Co., L	吉松弘行	Hiroyuki YOSHIMATSU	General Manager	G4
8	Kawasaki Geological Engineering Co., L	菅野孝美	Takami KANNO	General Manager	G4
9	International Consortium on Landslides	永井 修	Osamu NAGAI	Research Promoter	G4
10	Kyowa Giken Co., Ltd.	佐藤昭光	Akimitsu SATO	Engineer	G4
11	Kyowa Giken Co., Ltd.	北岡正治	Shoji KITAOKA	Engineer	G4
12	True Co., Lte.	小林弘幸	Hiroyuki KOBAYASHI	Engineer	G4
13	Information Conservation Engineers Co.	山田正雄	Masao YAMADA	Representative Director	G4
14	OYO Corporation	平松 晋一	Shinichi HIRAMATSU	Deputy General Manag	G4
15	OYO Corporation	矢部 満	Mitsuru YABE	Deputy Manager	G4
16	OYO Corporation	宮崎 良	Ryo MIYAZAKI	Leader	G4
17	Nasu Corporation	佐藤則生	Norio SATO	Construction Chief	G4
18	Godai Kaihatsu Corporation	瀧本圭介	Keisuke TAKIMOTO	Engineer	G4

Evaluation Grid for Project on "Development of Landslide Risk Assessment Technology along Transport Arteries in Vietnam" 2014/10/9

1. ACHIEVEMENT — To what extent the Project have made its achievements so far?

Items of Study	Evaluation Questions	Information to be collected	Data Source	Means of Analysis
1-1 Input	Extent and adequacy of the Inputs made so far by JICA	Dispatch of Japanese Experts, C/P training in Japan, Provision of Equipments, Local Cost	Project Reports, JE, C/P	Document Review
	Extent and adequacy of the Inputs made so far by the counterpart government	Assignment of counterparts, Budgetary allocation for Project activities, Spaces and facilities provided for project activities.	Project Reports, JE, C/P	Document Review
1-2 Achievement of Outputs	Outputs	Indicators as per PDM (Version 1)	Project Reports, JE, C/P	Document Review
	1. Wide-area landslide mapping and identification of landslide risk area is completed?	1-1 Landslide distribution map is completed for Chen Pass and Son La Pass and their surroundings areas in Son La Province, along Ho Chi Minh Route i) from A Loui town to Thanh My town and Asian highway #17; ii) from Dak Zon to Dak Pet; iii) National Highway # 1 from Hue to Danang.		
	2. Development of landslide risk assessment technology based on soil testing and computer simulation is completed?	2-1 Landslide initiation and motion is simulated based on the measured parameters of soil taken from the tageted landslides.		
	3. Risk evaluation and development of early warning system based on landslide monitoring is established? 地すべり自動計測システムの構築と早期警戒技術の確立	3-1 Early warning signal is issued based on the slope movement monitoring (issued by whom?)	Project Reports, JE, C/P	Document Review, Interview, Questionnaire
	4. (Preparation of) integrated guidelines for the application of developed landslide risk assessment technology is developed?	4-1 Integrated guidelines for landslide risk assessment is developed?	Project Reports, JE, C/P	Document Review
1-3 Achievement of the Project Purpose	Project Purpose	Indicators as per PDM (Version 1)	Project Reports, JE, C/P	Document Review, Interview, Questionnaire
	Landslide risk assessment technology to reduce landslide disasters along main transport arteries is developed through the collaborative research based on the Japanese pioneer technology, and capacity development for the effective use of this technology is implemented in Vietnam.	1. Landslide risk assessment technology is developed for disaster preparedness such as early warning, route design, slope protection etc. 2. Capacity of engineers and post graduate students is developed through the project activities. (to what extent?)		

2. IMPLEMENTATION PROCESS — How has the process of implementation been going?

Items of Study	Evaluation Questions	Information to be collected	Data Source	Means of Analysis
2-1 Progress of Activities	Has the activities been implemented as planned? What are the reasons for modification of the Plan, if any?	Progress of activities, reasons for modification	Project Reports, JE, C/P	Document Review, Interview, Questionnaire
2-2 Monitoring	In what process has the modification of PDM been made so far? Are the indicators identified in PDM appropriate to measure level of achievement of Outputs/Project Purpose?	method and process of PDM modification, logic of PDM (narrative summary, indicators etc.)	Project Reports, JE, C/P	Document Review, Interview
2-3 Decision Making Process	Has the participatory approach of the Project been useful/effective in order to achieve the effects of the project?	decision-making process	Project Reports, JE, C/P	Document Review, Interview
2-4 Communications among stakeholders	Has there been good communication among Japanese experts/counterparts/any related agencies? How was the communication with other stakeholders?	frequency and method of communication, feedback system etc.,	JE, C/P, Central and Provincial level	Interview, Questionnaire
2-5 Others	Are there any issues/problems identified in the process of implementation? What are the causes?	issues/problems raised so far	Project Reports, JE, C/P	Document Review, Interview, Questionnaire

3. RELEVANCE — To what extent is the Project justifiable and/or needed?

Items of Study	Evaluation Questions	Information to be collected	Data Source	Means of Analysis
3-1 Necessity	Do the Project objectives and strategies still match the needs of target groups or society?	needs/issues in the relevant sector in Vietnam	C/P, JE,	Document Review, Interview, Questionnaire
3-2 Priority	Is the Project still consistent with the policies and programs of partner country?	National development plan of the Vietnamese government	C/P, JE, other related institutions	Document Review, Interview, Questionnaire
	Is the Project still consistent with the Japan's foreign assistance policy/country program for the partner country?	Japan's Cooperation Policy to Vietnam	Japan's Assistance Strategy for Vietnam	Document Review
3-3 Adequacy of means	Is the Project approach adequate in order to tackle issues of transport sector / disaster management in Vietnam?	application of existing know-how in both Japan and Vietnam, adequacy of methodology	Ex-ante Evaluation Report, JE, C/P, other related institutions	Document Review, Interview, Questionnaire

4. EFFECTIVENESS ― To what extent has the Project been effective in producing the intended effects?

Items of Study	Evaluation Questions	Information to be collected	Data Source	Means of Analysis
4-1 Likelihood of the project purpose to be achieved	Is the Project purpose likely to be achieved by the end of the Project?	level of achievement of project purpose	Examine with reference to section 1-3	Document Review, Questionnaire
4-2 Causal relationships (Extent to which the outputs are being converted into the results)	Do all the outputs contribute to the achievement of the Project purpose?	relationships between project purpose and outputs	Project Reports, JE, C/P	Document Review, Interview
	Are the indicators for Outputs and/or Project Purpose appropriately identified in PDM?	logic of PDM (narrative summary, indicators etc.)	Project Reports, JE, C/P	Document Review, Interview
	Are there any other factors that promote and/or hinder the realization of the Project purpose?	If any, examine corresponding cases	Project Reports, JE, C/P	Document Review, Interview

5. EFFICIENCY ― Has the Project been implemented efficiently?

Items of Study	Evaluation Questions	Information to be collected	Data Source	Means of Analysis
5-1 Level of achievement of Outputs	Is the level of achievement of outputs adequate? (in comparison with the level of inputs)	level of achievements of each output	Examine with reference to section 1-2	
5-2 Causal relationships	Have the sets of activities and/or inputs sufficient to produce outputs?	Likelihood of achieving each Output by implementation of Project's activities as planned.	JE, C/P	Interview
	Are there any hindering factors for attaining the outputs?	corresponding cases, if any	JE, C/P	Questionnaire, Interview
5-3 Appropriateness of inputs	Are the size/quantity and the quality of inputs appropriate? Were inputs delivered in an appropriate time frame?	quantity and quality of inputs timing of inputs deliverance	JE, C/P	Questionnaire

6. IMPACT — Has there been any positive/negative long-term effects of the Project?

Items of Study	Evaluation Questions	Information to be collected	Data Source	Means of Analysis
6-1 Likelihood of Achieving Overall Goal	Overall Goals	Indicators as per PDM (Version 1)	JE, C/P	Questionnaire
	Social implementation of the developed landslide risk assessment technology and early warning system will contribute to the safety ensuring of transport arteries through urban and local communities in Vietnam.	1. Reduction of landslide loss in transportation (human loss, property loss, vehicle loss etc.) 2. Reduction of road closure days due to landslides		
6-2 Causal relationships	Is the overall goal consistent with the project purpose?	logic of the PDM, influence of important assumptions, promoting/inhibiting factors etc.	JE, C/P	Interview
6-3 Other effects	Is there any other positive/negative impacts caused by the implementation of the Project?	If any, examine corresponding cases.	JE, C/P	Interview

7. SUSTAINABILITY — To what extent will the effects of the Project be sustained after the period of cooperation is completed?

Items of Study	Evaluation Questions	Information to be collected	Data Source	Means of Analysis
7-1 Policy aspects	Is the development policy of the government of Vietnam regarding the Project likely to be maintained after completion of the Project?	Positioning (priorities) of National Policies	JE, C/P	Interview, Questionnaire
	Does the government (especially MOT) possess any mechanism or system to diffuse the effects of the Project?	* Concrete measures to apply experience of pilot areas to other areas in Vietnam.	JE, C/P	Interview, Questionnaire
7-2 Organisational and financial aspects	Is the institutional capacity of MOT and related organizations at both central and provincial levels sufficient in order to implement activities after the termination of the project? (human allocations, budget planning etc.)?	Institutional capacity of central/provincial levels (human resources, budgets etc.)	JE, C/P	Interview, Questionnaire
	Is the budget for activities at central and provincial levels secured through its own and/or external sources?	Budget planning of MOT, ITST	JE, C/P	Interview, Questionnaire
7-3 Technical Aspects	Do counterpart institutions (ITST, MOT and related organizations) have sufficient technical capacity to continue and/or develop activities in order to sustain the effects of the Project?	*Utilization, revision/update of guidelines developed by the Project etc.	JE, C/P	Interview

Notes: 1. C/P stands for counterparts assigned to the Project.
2. JE stands for Japanese experts assigned to the Project.

Tentative Project Design Matrix (PDM)

Appendix II

Beneficiaries: MOT and ITST / Highway, railway design companies and management agencies / passengers and their economic activities between Northern and Southern regions of Vietnam linked by transport arteries/ urban and local communities along Transport Arteries.

PDM Version 2 (Aug. 1, 2014)

Target areas: Hai van Station landslide in the National Railways from Hue to Da Nang and Ho Chi Minh Route from A Luoi town to Thanh My

Project Period: Nov. 7, 2011- Nov.6, 2016 (5 years)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Objective Social implementation of the developed landslide risk assessment technology and early warning system is realised to ~~will~~ contribute to the safety ensuring of transport arteries and ~~through~~ urban and local communities in Vietnam ~~Nam~~.	~~1. Stop of railway train before landslide occurrence to avoid disasters in the Haivan Station~~ 1. Early warning system in Haivan landslide area is established by using technology and equipment of the project. ~~2. Identfication of landslide risk slopes along the Ho Chi Minh Route~~ 2. Landslide risk slopes is identified and assessed both within and outside the target areas ~~(along the Ho Chi Minh Route)~~	1. Annual report of ITST ~~・Number of warning to stop railway strain before landslides in the Haivan Station.~~ 1. Annual report of ITST ~~・Number of landslide risk slopes~~	
Project Purpose Landslide risk assessment technology incorporating outcomes of all WGs is developed to reduce landslide disasters along main transport arteries through the collaborative research based on the Japanese pioneer technology, and capacity development for the effective use of this technology is undertaken in Viet Nam.	~~1. Landslide risk assessment technology is developed for disaster preparedness such as early warning, route design, slope protection, etc.~~ 1. Landslide risk such as area, depth, volume, speed of landslide motion is identified by incorporating results of mapping, testing and monitoring. ~~2. Capacity of engineers and post graduate students is developed through the project activities~~. 2. Capacity of ITST staff in the field of landslide risk assessment is developed.	1-1 Progress report of the project~~t,/Published reports,/papers on landslide risk assessment technology developed through the joint research of the Project~~ ・Number of engineers and students awarded master or doctor degrees	MOT will adopt outcomes of research to incorporate early warning systems of Vietnam railway.
Outputs 1. Wide-area landslide mapping and identification of landslide risk area is completed.	1-1 Landslide distribution map along Ho Chi Minh Route from A Loui town to Kham Duc, and Haivan Pass area and National Highway No. 6 at Hoabinh province. 1-2 Long-term activated landslide risk area is identified out of the wide-area mapping in target areas mentioned above. 1-3 No. of ITST staff who are trained to detect landslide risk.	1-1 Landslide distribution map made by the project. 1-2 Progress reports of the Project/ Thesis by long-term training participants 1-3 Progress reports of the Project	No major natural disaster will occur to affect the research activities of the Project.
2. Landslide risk assessment technology based on soil testing for computer simulation is developed.	2-1 Landslide initiation and motion is simulated based on the measured parameters of soil taken from the targeted landslides.	2-1 Progress report of the Project/ Test result and simulation result by the Project.	
3. ~~Risk evaluation and development of early warning system based on landslide monitoring~~ Early warning technology based on landslide monitoring is developed.	~~3-1 Early warning signal is issued based on the slope movement monitoring~~. 3-1 Monitoring system is equipped with data gathering and real time transmitting system 3-2 Landslide motion data is accumulated and analysed 3-3 The way of setting warning and alert level is drafted based on the actual fugures in pilot area and laboratory test	3-1 Progress reports of the Project~~/ Early warning signal issued.~~ 3-2 Progress reports of the Project 3-3 Progress reports of the Project	
4. Integrated guidelines for the application of developed landslide risk assessment technology is developed.	4-1 Integrated guidelines is submitted to MOT for approval as a reference material.	4-1 Progress report of the Project 4-2 Integrated guidelines for landslide risk assessment prepared by the Project	

Activities

Activity for Output (1)

1-1. Identification of previous landslide sites from aerial photographs and satellite image data

1-2. Identification of the precursor stage of landslides by the pattern analysis of digital surface model (DSM) of forested areas.

1-3. Formation of landslide risk map based on detailed field investigation and analytical model such as Analytical Hierarchy Process method (AHP) , susceptibility evaluation by Fuzzy method.

1-4. Development of the technology to visualize the feature of landslide

Activity for Output (2)

2-1. Development of undrained dynamic-loading ring shear apparatus

2-2. Elucidation of the initiation mechanism and the dynamics of post-failure motion of the targeted landslide

2-3. Development of hazard assessment technology of the precursor stage of landslides

Activity for Output (3)

3-1. Selection of pilot area for landslide monitoring based on the field investigation

3-2. Development of the monitoring system for rainfall, groundwater, earthquakes, and slope movement

3-3. Establishment of early warning system suitable for the region based on the landslide experiments with artificial rains

Activity for Output (4)

4-1. Prepare integrated guidelines for the application of developed landslide risk assessment technology based on the Activities (1) ~ (3)

4-2. Conduct workshops, research meetings and conferences for information dissemination

Inputs

Japanese Side

Human Resource
- ・Long-term Expert
  - Project coordinator
  - Project research and capacity development
- ・Short-term Experts
  - Landslide mapping
  - Landslide testing
  - Landslide monitoring
  - Education and capacity development
  - Other area upon necessity

Equipment
- Undrained dynamic loading ring shear apparatus
- Portable direct shear apparatus
- Permeability testing apparatus and other apparatuses to investigate soil physical parameters
- Robotic Total Station set
- Global Navigation Satellite System (GNSS)
- Extensometer Monitoring System for Haivan Landslide
- Borehole inclinometer
- In place inclinometer system
- Pack tude for drilling
- Data acqusition system andpore pressure sensors
- Landslide experiment monitoring system
- Landslide experimental flume
- Personal Computers
- Landslide simulation software (LS-Rapid)
- AdCalc 3D software

Counterparts Training
- Training in Japan

Vietnamese Side

Human Resource
- ・Project Director
- ・Project Manager
- ・Researchers/administrators
  - MOT
  - ITST

Facility and materials
- ・Office space with necessary office equipment (furniture, air conditioner internet, telephone, electricity, etc.)
- ・Construction of building for landslide flume experiment
- ・Maintainace of machinery, Electricity, water for experiment.

Services and information
- ・Available data (including maps and photographs) and information

Pre-conditions

・MOT gains the permission from the Ministry of Defense for air photos.

・Landslide Technical Forum (LTF) is established.


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