

## Mid-term Review Summary Sheet

<b>1 Outline of the Project</b>	
<b>Country:</b> Republic of Croatia	<b>Project Title :</b> Project on Risk Identification and Land-use Planning for Disaster Mitigation of Landslides and Floods in Croatia
<b>Thematic Area :</b> Disaster Management	
<b>Division in Charge :</b> Disaster Management Division II, Water Resources and Disaster Management Group, Global Environment Department	
<b>Project Period :</b> Mar 2009~Mar 2014	<b>Cooperation Scheme :</b> SATREPS (Science and Technology Research Partnership for Sustainable Development)
<b>Project Period :</b> Mar 2009~Mar 2014	<b>Total Cost :</b> 350 million JPY (JICA budget)
<b>Supporting Organization in Japan :</b> Niigata University, Kyoto University, ICL(International Consortium on Landslides), Tohoku Gakuin University, Yamagata University	<b>Counterpart Agency :</b> MZOS (Ministry of Science, Education and Sport), UZ (University of Zagreb), UR (University of Rijeka), US (University of Split), Croatian Water, Croatian Geological Survey
<b>1.1 Background of the Project</b>	
<p>Croatia has frequent earthquakes and, along the Adriatic coast, has a large amount of precipitation. At some places, average annual rainfall is 3,500mm and more. Triggered by such earthquakes and rainfall, sediment disasters occur quite often such as landslides, slope failure, and debris flow. The land of Croatia has a complex, fragile terrain and geological structure affected by earth faults and folds. Sediment disaster are common at the alternation of sandstone-shale strata that is prone to weathering, as well as at slopes with marl layer containing large amounts of clay with low friction angle. Local flood (flash flood) occurs at limestone regions where water roads are easily formed in the strata.</p> <p>Sprawling of cities is causing the accumulation of assets and population growth in sub-urban areas, but many of these areas are at high risk of such disasters in Croatia, thus raising concerns about increasing damages by flash floods and landslides. In some areas, disaster risk is likely to become even higher with a change in rainfall patterns due to climate change.</p> <p>In Croatia, however, techniques to assess flash-flood/landslide risk and mechanisms to take measures on the risk assessment are not yet developed. Sprawling control as well as disaster warning systems and evacuation rules are not in place yet, either. Towards such disaster risk management, researches are required to develop methodologies for hazard mapping and risk assessment based on scientific data of these phenomena, and to improve the land use taking into consideration such disaster risks.</p> <p>In this context, this Project was requested by the Government of Croatia. Based on a detailed planning survey in January 2009 and a following consultation mission in March 2009, the R/D (Record of Discussion) of the Project was signed on 27 March 2009 under the scheme of SATREPS. In July 2012, about the halfway point of the Project period, a mid-term review is to be conducted as dictated by the Article V of the signed R/D.</p>	
<b>1.2 Project Overview</b>	
<p>1) Project Purpose</p> <p>Integrated landslide/flood hazard mapping technology and land-use guidelines formulation methodologies are developed for nation-wide application in Croatia.</p>	

<p>2) Outputs</p> <ol style="list-style-type: none"> <li>1. Methodologies for landslide risk assessment, prediction of affecting areas, and early warning systems are developed adapting to hydrological and geological conditions in Croatia.</li> <li>2. Flash-flood/debris-flow simulation models and early warning systems are developed adapting to hydrological and geological conditions in Croatia.</li> <li>3. Integrated landslide/flood hazard maps and land-use guidelines for landslide/flood risk mitigation are developed for study areas.</li> </ol> <p>3) Inputs</p> <p>(Japanese Side)</p> <p>Experts: 17 researchers (82 times, total 997 days) in May 2010 through Jul 2012, and 1 project coordinator.</p> <p>Counterpart Training in Japan: 4 researchers (2010) and 7 researchers (2011)</p> <p>Provision of Equipment: 128 million JPY (2010 - 2011)</p> <p>Project Cost: 237 million JPY (2010 – 2011 for Dispatch of Experts, Trainings, Equipment, Local Costs, and others)</p> <p>(Croatian Side)</p> <p>Counterpart: Project Director (MZOS), Project Manager (UR), Deputy Project Manager (UZ), Project Coordinator (UZ), and 31 researchers.</p> <p>Local Operational Cost: lump sum of 360,000 Kuna/year, salaries of 9 young researchers working for the Project, shipment and installation costs of equipment provided, and meeting and travel costs.</p> <p>4) Target Area</p> <p>Study Areas: Zagreb, Rijeka, and Split</p>			
<b>2 Review Team</b>			
<b>Member of the Review Team</b>	<ol style="list-style-type: none"> <li>1. Mr. Hideo Miyamoto (Leader) Senior Advisor to the Director General, Water Resources and Disaster Management Group, Global Environment Department, JICA</li> <li>2. Mr. Jun Murakami (Survey Planning) Water Resources and Disaster Management Group, Global Environmental Department, JICA</li> <li>3. Mr. Hiroyuki Okuda (evaluation and Analysis) Tekizaitekisho, LLC</li> </ol>		
(Observer)	<ol style="list-style-type: none"> <li>4. Dr. Yoshimori Honkura (SATREPS Evaluation) Program officer of Natural Disaster Prevention, Research Partnership for Sustainable Development Division, JST</li> <li>5. Mr. Masayuki Sato (SATREPS Evaluation) Principal Researcher, Research Partnership for Sustainable Development Division, JST</li> <li>6. Dr. Koichi Tsukioka (SATREPS Evaluation) Senior Staff, Research Partnership for Sustainable Development Division, JST</li> <li>7. Ms. Kikuko Sakai (SATREPS Evaluation) Senior Program Coordinator, JST Paris Office</li> </ol>		
<b>Review Period</b>	<table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">25 June 2012~15 July 2012</td> <td style="width: 50%;"><b>Type of Evaluation</b> : Mid-term Review</td> </tr> </table>	25 June 2012~15 July 2012	<b>Type of Evaluation</b> : Mid-term Review
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<b>3 Project Performance</b>			
<b>3.1 Achievements of Outputs</b>			
(Output 1)			

- There are four model sites selected: Kostanjek Landslide (a part of Medvednica Hilly Area, City of Zagreb), Grohovo Landslide (a part of Rječina River Basin, Primorsko-Goranska County, Rijeka), Duće and Omiš (Split-Dalmatian County).
- A low-cost undrained shear test apparatus was developed in Japan, and two Croatian researchers were trained for the operation of and the testing with the apparatus.
- Soil samples from model sites (Kostanjek and Grohovo) were sent to Japan and tested with the apparatus. At the time of mid-term review, 2 July 2012, the apparatus was at the Croatian custom still on its way for shipping to the University of Rijeka.
- Researchers indicated that the installation of monitoring equipment has completed more than 90% at Grohovo site and the monitoring has been in progress. At Kostanjek, extensometers were installed, largely depending on which an early warning system is to be established.

(Output 2)

- There are five model sites selected: Rječina River Basin, Dubračina River Basin, and Mošćenička Draga (Primorsko-Goranska County, Rijeka), Imotski and Sutina-Karakašica (Split-Dalmatian County). Besides, at Daruvar, the UR is conducting a research to clarify essential factors on flash-flood/debris-flow simulation model, considering sustainable land management to mitigate water erosion on different tillage treatments.
- Rainfall measurement equipment was installed at model sites in Rijeka and the data are being collected. The analysis of rainfall-discharge characteristics continues with new hydro-meteorological data.
- Physical experiments of debris-flow have been carried out in Kyoto University where the Croatian trainees jointed the experiments. The development of flashflood and debris flow simulation model (Hydro-Debris 3D) for Dubračina River is completed.

(Output 3)

- There are five model sites selected: Hilly area of the Medvednica Mountain (Zagreb), Rječina River and Dubračina River basin (Primorsko-Goranska County, Rijeka) and Duće and Omiš areas (Split-Dalmatian County).
- In Zagreb and Rijeka, topography interpretation of model sites and surrounding areas, mainly based on aerial photos, were completed. In addition, digital topography maps are being created based on LiDAR scanning with airplane. In Split, WG (Working Group) 4 is conducting ground-based LiDAR scanning once a month since September 2011.
- In Zagreb and Rijeka, WG3 is preparing landslide inventory maps and conducting landslide susceptibility analysis using AHP methodology.
- Researchers of the implementing universities meet local authorities more often than not, raising their awareness towards the development of integrated landslide/flood hazard map and land-use guidelines.

### **3.2 Achievements of Project Purpose**

Although indicators for the Project Purpose were not set in the Master Plan included in the signed R/D, as of the Mid-term review, the project is making a steady progress of research activities at each output level as summarized in the above section. Considering the overall progress towards attaining the Project Purpose, in spite of the delay of launching the Project and setting up the monitoring equipment at model sites, the Project has

a good potential to achieve its goal by the end of project period, March 2014.

#### **4 Review Based on the 5 Criteria**

##### **4.1 Relevance**

The relevance of the Project is high.

- There are several laws and policies speaking to the importance of disaster mitigation in Croatia such as Protection and Rescue Plan for Croatia (Official Gazette 96/10) and Law on Protection from Natural Disasters (Official Gazette 73/97). The project is aligned with these Croatian laws/policies, and contributes to their realization.
- The model sites of the Project were proposed by Croatian researchers. The Kostanjek in Zagreb is the largest landslide in Croatia, and one of primal concerns of the Emergency Management Office in the City of Zagreb. At the downstream of Rječina River located the city of Rijeka, and the flood waters can cause significant damage to the city; it could be an even higher hazard in case of concurrent rock avalanche at Grohovo landslide. The model sites in Split are Omiš and Duće where a rock fall is quite frequent, causing damages and posing threats to many houses and population in the towns. The project can also meet the needs and expectation of these local authorities and population.

##### **4.2 Effectiveness**

The effectiveness of the Project is medium.

- The basic design of the Project is clear as per summarized in the Master Plan, and the three outputs are essential components for the Project to achieve its purpose.
- The current PO doesn't describe the process and schedule of how Output 1 and Output 2 can be integrated or utilized in Output 3 to attain the Project Purpose. Specific PO for the 2<sup>nd</sup> half of the project period is necessary; it is to provide further breakdown of each activity to show how each activity can be conducted and completed for the next two years. The breakdown of each activity with timeline is helpful for better understanding and communication among researchers of different working group and also between Croatian and Japanese researchers.
- Indicators were not set in the Master Plan included in the signed R/D. The indicators by foreseeing the goal to be reached two years ahead was set by discussing in the Mid-term review.

##### **4.3 Efficiency**

The efficiency of the Project is medium.

- The R/D of the project was signed on 27 March 2009, but it was 9 March 2010 when the Note Verbal was exchanged for launching the Project as it took long time for Croatian side to conduct necessary inter-organizational coordination.
- Concerning the procurement of project equipment, the exemption of VAT (25%) was agreed on the R/D but administrative procedures for this VAT's exemption to become effective was not clear among concerned agencies both in Japanese and Croatian side. As a result, the procurement of equipment took longer than planned, affecting the research plan and project progress significantly.
- The project held the 1<sup>st</sup> JCC (Joint Coordination Committee) on 23<sup>rd</sup> February 2012 at the Faculty of Agriculture, UZ, where counter personnel from the three universities and Croatian Geological Survey attended, including representatives of local community (City of Zagreb's Emergency Management Office).

This JCC was the first meeting where administrative instructions for the project such as equipment and procurement were shared among all those who were involved in the Project.

- For project implementation, MZOS has prepared a counter-budget, which includes the lump-sum 360,000 Kuna/year, salary payments of nine young researchers who are expected to obtain doctor's degree through researches in the Project, payment for equipment installation and maintenance, and travel allowance & accommodation for researchers. Each faculty of the three universities implementing project activities also has borne a part of operational costs such as conference and travel.
- The formation of WG4 based in US is a response to administrative issues of project coordination such as the distance between US and UR/UZ and resulting difficulty for US to have meetings and smooth communication as a part of WG1, WG2 and WG3. Research subject and activities remain unchanged, though, in US with the formation of WG4, and the leader of WG4 as US is now able to directly contact with Project Manager in UR.
- The Project organizes annual international conferences to share the research progress and findings. Meetings and communication for research coordination between Japanese researchers and their Croatian counterparts have been properly held as and when necessary. On the other hand, communication of researchers among different working groups is much less and confined to such opportunities as the annual international conferences and JCC.

#### **4.4 Impact**

It is still premature to evaluate the impact of the Project.

- Positive impacts such as measures against natural hazard and disaster risk mitigation can be expected once the Project achieves its purpose and the application of research results to local/national government policies starts realized. At the time of mid-term review, such expected impacts have not been observed yet.
- It is widely indicated that the relationship between the universities and the local governments has been forged and strengthened due to the presence of the Project. Representative of local governments are not listed as counterpart in the R/D, but they are now recognized as essential partners of the Project by researchers towards achieving the Project goal.
- Through international conference organized by the Project, research results and findings on landslides and flash-floods/debris-flow are shared among researchers from neighboring countries such as Serbia, Bosnia and Herzegovina, Kosovo, Macedonia, and Slovenia, where studies on disaster risk management are important and required for societies.
- The Project Manger, on behalf of MZOS, has become a member of National Protection and Rescue Directorate since 2012 due to her function in the Project.

#### **4.5 Sustainability**

The prospect of sustainability of the Project is medium.

- Prospect of sustainability from the viewpoints of human resource and technical capacity is indicated more than medium. Currently, nine young researchers, doctoral students, are sponsored by MZOS to work for the Project. Equipment installed in model sites is currently well maintained and MZOS bears the costs of these protective and maintenance measures.
- From an institutional viewpoint, it still needs to be further clarified how the research results will be

incorporated into the local government policy such as the preparation of land-use guideline. The relationship between the local authorities and the universities should be institutionalized as a system for disaster risk management between the two entities. Moreover, for research results to feed into national disaster management policies, an involvement of disaster management agency, namely National Protection and Rescue Directorate, will become more important in future.

- At present, MZOS has prepared a counter-budget, financing a part of project operation. From a financial viewpoint, however, budgetary commitment for the Project in future is still uncertain.

#### **4.6 Factors that have promoted or hindered the implementation of project**

##### (1) Promoting factors

Efforts of both Japanese and Croatian researchers to make up for the initial delay of project progress, and frequent visits of Japanese researchers to Croatia for research coordination and cooperation are recognized as promoting factors for the Project.

##### (2) Hindering factors

Little experience in Croatian side to conduct JICA technical cooperation before and the absence of JICA branch office in Croatia are mainly attributed to the initial delays of Project implementation such as the exchange of Note Verbal and the procurement of equipment.

### **5 Results of the Mid-term Review**

#### **5.1 Conclusion**

The relevance of the Project is high - the Project is not only aligned with national laws and policies associated with disaster mitigation, but also meets the needs of local authorities and population. The effectiveness of the Project is medium as the Project is properly constructed, but the process and timeline for the remaining 2 years need to be further clarified and agreed toward achieving the Project Purpose. The efficiency of the project to date is rated medium mainly due to the initial delay of project launching and further delay of equipment installation. It is still premature to evaluate the impact of the Project at the time of Mid-term review. The prospect of sustainability of the Project is medium as technical and human resource capacity are indicated enough to sustain Project activities, but it is still uncertain from institutional and financial viewpoints.

#### **5.2 Recommendations**

1. The project has a good potential to achieve its goal by the end of project period, March 2014, in spite of the delay of launching the project and setting up monitoring equipment at model sites. The followings are recommended to ensure the goal to be attained: clarification of activities and plan, cooperation among working groups, and implementation monitoring.

1-1. A revised Master Plan has been drafted with indicators. The Project will be carried out based on the revised Master Plan.

1-2. A revised PO has been drafted with activity breakdown and timeline for the next two years. The implementation will be undertaken according to the revised PO, which is subject to change and updated as and when necessary.

1-3. WG2 (flash-floods/debris-flow research) and WG1 & WG3 (landslide research) are to promote coordination and cooperation on the image of research outputs and its time of completion so that the results of both researches can be synthesized to produce integrated landslide/flood hazard maps.

- 1-4. Communication and cooperation among WG1, WG2, WG3 and WG4 is to be further promoted towards the intended Project Purpose; meetings in between the annual conference can be considered, not only among WG leaders but also of all researchers involved. .
2. In order for the application of research results, the followings are recommended: coordination with local authorities and continuous data collection.
  - 2-1. The data that can be collected within Project period is limited, and hence the arrangement for continuous data collection after the project should be established for better research outputs, including the maintenance of installed equipment.
  - 2-2. A system to strengthen the relationship between the local authorities and the universities in the study areas need to be explored - such as standardized procedures, documentation of protocol, memorandum of understanding – towards the application of research results.
  - 2-3. For nation-wide application in Croatia of the Project outputs in future, the involvement of national authority for disaster risk management need to be explored while the Project is being undertaken.
3. The terminal evaluation can be conducted as a joint evaluation by both Japanese and Croatian evaluators.