

Country Name	Landslide Disaster Management Project
Republic of Armenia	

I. Project Outline

Background	<p>The landslide disaster was one of the major natural disasters in Armenia. Although the Concept for Landslide Disaster Management was approved by the Armenian government (the government) in 2007, the plan of countermeasures was not implemented due to lack of national budget in situation of the Lehman Crash in 2008. Meanwhile, a serious landslide occurred in the northern area of Armenia in 2011, which caught 35 vehicles, killing 5 persons, and brought about the closure of the main road to Georgia for a long period. Recognizing the importance of the countermeasures, the new Concept for Landslide Disaster Management was developed and approved by the government in July 2013, and Ministry of Emergency Situation (MES) was appointed as the lead authority. Based on the new Concept, the permanent Landslide Disaster Management Inter-Agency Working Group (the WG) was established by MES in collaboration with the related ministries and institutes. (Figures at the time of ex-ante evaluation.)</p>				
Objectives of the Project	<p>The project aimed to improve landslide disaster risk reduction capacity of the WG in Armenia through (i) having the members of the WG acquire technology and know-how on investigation, assessment, and design/order/supervision of measures, (ii) formulation of the Comprehensive Landslide Disaster Management Plan (CLDMP), preparation of the Guideline for landslide disaster risk reduction (DRR) (investigation, assessment, and design/order/supervision of measures), and improvement of laws and regulations for implementation of the measures, and (iii) improvement of organizational and institutional framework for implementation of monitoring, proactive measures, emergency measures, and permanent measures in related ministries and agencies, in accordance with the Concept for Landslide Disaster Management in Armenia, thereby reducing landslide disaster risk in Armenia through development of the CLDMP and implementation of measures on the basis of results of investigation/assessment of landslides.</p> <ol style="list-style-type: none"> Overall Goal: Landslide disaster risk in Armenia is reduced through the development of CLDMP and implementation of measures on the basis of results of investigation/assessment of landslides. Project Purpose: Landslide DRR capacity of the WG is improved. 				
Activities of the Project	<ol style="list-style-type: none"> Project site: Whole country of Armenia. (Pilot project sites in Arapi/Shirak Region, Getahovit/Tavesh Region, and Vtoghjaberd/Kotayk Region¹). Main activities: (i) Updating the existing landslide distribution maps, landslide inventory sheets, and priority list of landslide measures; proposing landslide DRR measures; (ii) formulating the CLDMP and the Guideline for landslide DRR and improving the laws/regulations for implementation of the measures; (iii) installing landslide real-time monitoring systems for regional Crisis Management Centers (RCMCs) of MES in the pilot project sites; acquirement of techniques by Rescue Service (RS)/MES to plan, implement and maintain drainage drilling works through the pilot projects, preparing plans of landslide DRR measures by the responsible ministries with assistance and advice of the WG. Inputs (to carry out above activities) <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> Japanese Side 1) Experts: 8 persons 2) Trainees received: 21 persons 3) Equipment: Landslide monitoring equipment, landslide stability analysis software, drilling equipment, etc. 4) Local cost </td> <td style="width: 50%; vertical-align: top;"> Armenian Side 1) Staff allocated: 24 WG members (14 from MES and 10 from the other 9 WG member ministries and institutes²) 2) Building and facilities: Project Office at MES, etc. 3) Local cost </td> </tr> </table> 			Japanese Side 1) Experts: 8 persons 2) Trainees received: 21 persons 3) Equipment: Landslide monitoring equipment, landslide stability analysis software, drilling equipment, etc. 4) Local cost	Armenian Side 1) Staff allocated: 24 WG members (14 from MES and 10 from the other 9 WG member ministries and institutes ²) 2) Building and facilities: Project Office at MES, etc. 3) Local cost
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Project Period	(ex-ante) July 2014-July 2017 (actual) June 2014-June 2017	Project Cost	(ex-ante) 349 million yen, (actual) 341 million yen		
Implementing Agency	Rescue Service (RS) of Ministry of Emergency Situations (MES) ³				
Cooperation Agency in Japan	Ministry of Land, Infrastructure, Transport, and Tourism; Nippon Koei Co., Ltd.				

II. Result of the Evaluation

¹ Originally, the number of the pilot project sites were 2 (Arapi and Getahovit). The third site (Voghjaberd) was added in 2015 for the importance of maintaining the road.

² At the time of project completion, the WG member ministries and institutions other than MES were Ministry of Nature Protection (presently Ministry of Environment), Ministry of Energy Infrastructure and Natural Resources (presently Ministry of Territorial Administration and Infrastructure), Ministry of Agriculture (presently Ministry of Economy), Ministry of Culture (presently Ministry of Education, Science, Culture and Sports), Ministry of Transport, Communication and Information Technologies (presently Ministry of Territorial Administration and Infrastructure), Ministry of Territorial Administration and Development (presently Ministry of Territorial Administration and Infrastructure), State Urban Development Committee (presently Urban Development Committee), Yerevan State University, and Institute of Geological Science -National Academy of Science).

³ After commencement of the project, MES was united with Ministry of Territorial Administration and reorganised into Ministry of Territorial Administration and Emergency Situations (MTAES) in December 2014. Then, MTAES was reorganized into Ministry of Territorial Administration and Development and MES in December 2016.

< Special Perspectives Considered in the Ex-Post Evaluation >

- The evaluator considered that the implementation of landslide DRR measures mentioned in the Project Purpose Indicator 4 included preparation for implementation because, according to the project's logical framework, the means of verification of the indicator t included the approved CLDMP as well as the design and tender documents for the pilot projects.
- The 3 RCMCs stated in Overall Goal Indicator 2 meant the 3 RCMCs responsible for the pilot project sites according to the Action Plan for monitoring system developed under the project.
- In checking the achievement status of the Overall Goal indicators, contribution status of the results of the indicators towards landslide DRR was also confirmed by asking the implementing agency's opinion with grounds because the Overall Goal reads "Landslide disaster risk in Armenia is reduced through the development of CLDMP and implementation of measures on the basis of results of investigation/assessment of landslide".

1 Relevance

<Consistency with the Development Policy of Armenia at the Time of Ex-Ante Evaluation >

At the time of ex-ante evaluation, the project was consistent with development policy of Armenia for landslide disaster management set forth in the Concept for Landslide Disaster Management (2013) as described in the "Background".

<Consistency with the Development Needs of Armenia at the Time of Ex-Ante Evaluation >

At the time of ex-ante evaluation, the project was consistent with the needs of Armenia for landslide disaster management as described in the "Background".

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

At the time of ex-ante evaluation, the project was consistent with the Country Assistance Policy for the Republic of Armenia (2012), including "Strengthening of disaster prevention measures" as one of its prioritized areas.

<Evaluation Result>

In light of the above, the relevance of the project is high.

2 Effectiveness/Impact

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

The Project Purpose was achieved at the time of project completion. Firstly, the WG (i.e., MES and Institute of Geological Science (IGS)) became able to investigate and assess landslide risks through the Workshop on Stability Analysis organized by the project, at the end of which all the ten participants⁴ passed an internal test. The WG also acquired the knowledge on design/order/supervision of landslide DRR measures through the landslide DRR activities at the pilot project sites conducted by MES (Indicator 1). Secondly, the WG was able to formulate the Guideline for Landslide Risk Management, which was approved by the Minister of MES in April 2017. Through the work carried out mainly by the WG members, they acquired the capacity to update and revise the Guideline on their own in the future (Indicator 2). Thirdly, the WG became able to propose improvement of organizational and legal frameworks through compiling recommendations on important points for efficient implementation of landslide measures, including implementation system for effective countermeasures, which had been submitted to the Minister of MTAES (then), and preparing the draft of the Operational Rules for Appropriately Restricting Water Use and Earthworks in Landslide Areas, which was under approving process of MES (Indicator 3). Lastly, the WG became able to prepare for landslide DRR measures through preparing the CLDMP as the main author, which was approved by the Minister of MES in April 2017. The WG (i.e., MES) also became able to implement and manage landslide DRR measures through groundwater drainage drilling works at 3 pilot project sites, including 2 drilling works in Arapi solely conducted by MES, as well as 9-month test operation of the real-time landslide monitoring system at the RCMCs responsible for the pilot project sites according to the Standard Operation Procedure (SOP) prepared under the project (Indicator 4).

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

The project effects were continued at the time of ex-post evaluation although a new WG was established by the order of the Minister of MES in 2020 due to changes in the governmental administration system⁵. The landslide distribution maps and inventory sheets, improved under the project, were continuously managed as a GIS database by the National Crisis Management Center (NCMC)/MES and updated as needed. The recommendations on important points for efficient implementation of landslide measures were implemented⁶. The CLDMP and the Guidelines were approved by the Prime Minister and continuously utilized by the new WG⁷. The Guidelines were used mainly by MES, which was appointed as the responsible body for landslide management by the Prime Minister, and other WG member ministries/agencies (such as Ministry of Territorial Administration and Infrastructure (MTAI) and Urban Development Committee (UDC)) and the regional administrations cooperated with MES on the landslide management. The Operational Rules were approved by the Minister of MES after the project completion in 2017 and distributed to the residents of landslide areas. The new WG (i.e., MES and IGS) maintained the capacity to investigate and assess landslide risks through application of the Guideline/manuals/materials prepared under the project. The new WG also maintained the knowledge on design/order/supervision of the measures for the landslide DRR by sharing it at its regular meetings. The new WG sustained the capacity to update/revise the CLDMP and the Guideline through information sharing and discussions at its regular meetings and the capacity to propose for improvement of organizational and legal framework through information sharing and discussions at its regular meetings, attendance to seminars and awareness raising activities, etc. The new WG maintained the capacity to update/revise the CLDMP through information sharing and discussions at its regular meetings. The new WG (i.e., MES) maintained the skills and knowledge to implement and manage landslide DRR measures through groundwater drainage drilling works at

⁴ These 10 participants selected by the Armenian side included 3 WG members and other 5 staff from MES as well as 2 staff from IGS who participated on behalf of the WG members.

⁵ The new WG consisted of MES, the succeeding ministries/agencies of the original members (i.e., Ministry of Environment, Ministry of Economy, Ministry of Education, Science, Culture and Sports, Ministry of Territorial Administration and Infrastructure, and Urban Development Committee), the original academic members (i.e., Yerevan State University and IGS), and the new members (i.e., Urban Development, Technical Standards and Fire Safety Inspectorate and Cadastre Committee).

⁶ For example, MES was developing regulatory documents based on the recommendations. Further details were not available.

⁷ For example, in accordance with the Emergency Response Plan of the CLDMP, MES took preventive landslide measures (i.e., groundwater drainage drilling holes) at high-risk landslides in Tumanyan and Atan communities of Lori region in 2018-2019, which were not included in the priority landslides selected under the project, using the acquired skills and the provided equipment. (Also see <Status of Achievement for Overall Goal at the Time of Ex-Post Evaluation> below.)

the landslide areas in Lori Region conducted in accordance with the Emergency Response Plan of the CLDMP (see footnote 7 for details) and operation of the real-time monitoring system.

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

The Overall Goal was not achieved at the time of ex-post evaluation because neither indicator was achieved mainly due to adverse effects of external conditions. MES planned groundwater drainage drilling holes at 4 priority landslides selected under the project⁸ in a year from 2018-2021, which were included in the Mid-Term Expenditure Project (MTEP) for 2017-2019 and 2019-2021 and submitted to the government. In addition, as an emergency response based on the CLDMP, MES planned the groundwater drainage drilling holes at 2 other landslides in 2018-2019, which were given the utmost priority based on the landslide risk assessment conducted by MES. (Target for the indicator of planning at 2 sites in a year was achieved every year). Unfortunately, no works at the priority landslides selected under the project were implemented so far because of change in the political administration in 2018 and shortage of the national budget due to the war with Azerbaijan in 2020 and the COVID-19 in 2020-2021; however, the works at the 2 other priority landslides were implemented in 2018-2019 as planned, using the emergency budget. They contributed to the landslide DRR in Armenia to some extent by preventing the landslides in the areas with the utmost risk. It is noted that the implementation of the priority landslides selected under the project was not cancelled but postponed: the budget proposal (4 priority landslides selected under the project in a year) included in the next MTEP for 2022-2024 was already approved by the government. MES expected that the groundwater drainage drilling holes would be implemented as planned in the MTEP from 2022 (Indicator 1). The real-time landslide monitoring system was functional in accordance with the latest SOP only at 1 RCMC in the project pilot site in Arapi (target: 3 RCMCs) because the equipment provided at all of the 3 RCMCs regularly broke down due to thunder, and only the monitoring system in Arapi could be fixed and worked in normal condition as of June 2021. MES carried out repairs as much as possible; however, replacement of some of the damaged parts (i.e., information transfer cables) of the equipment provided at the other 2 sites was impossible since they could not be found neither in Armenian market nor international internet market⁹. Meanwhile, it was confirmed that the operating monitoring system contributed to landslide DRR in Armenia to some extent because it helped the community to prevent landslides by making it possible to detect a landslide risk and to take appropriate countermeasures in advance (Indicator 2).

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

Other positive impacts on landslide DRR related activities by WG member organizations were observed. For example, Ministry of Environment (MEnv) used the improved landslide distribution maps for landslide inventory in specially protected areas. IGS utilized the acquired knowledge and the provided software to conduct landslide risk assessment at several active landslides in Armenia from 2019 to 2020. UDC initiated and approved the revision of the norms of seismic construction, which introduced mandatory requirements for the implementation of anti-landslide measures. UDC also developed the draft budget request for a program on the “Landslide Disaster Management” (2022-2024) and submitted it to MES in July 2021 for incorporation in the consolidated budget proposal on landslide DRR measures for the MTEP for 2022-2024 compiled by MES. Meanwhile, negative impacts were not observed.

<Evaluation Result>

Therefore, the effectiveness/impact of the project is fair.

Achievement of Project Purpose and Overall Goal

Aim	Indicators	Results	Source
(Project Purpose) Landslide DRR capacity of the WG is improved.	Indicator 1: WG is able to perform DRR process, including investigation, assessment, and design/order/supervision of measures [knowledge].	Status of the Achievement (Status of the Continuation): achieved (continued) (Project Completion) -The WG acquired the skills to investigate and assess landslide risks and the knowledge to design/order/supervision of landslide DRR measures respectively through the Workshop on Stability Analysis organized by the project and the landslide DRR activities at the pilot project sites respectively. (Ex-post Evaluation) -The new WG maintained the capacity to investigate and assess landslide risks and design/order/supervision of the landslide DRR measures respectively through application of the guidelines/manuals/materials prepared under the project and regular meetings.	Terminal Evaluation Report (TER), questionnaire and interview survey to MES, IGS, UDC, MEnv, and MTAI.
	Indicator 2: WG is able to formulate Guideline for standardization of necessary technology on landslide disaster risk reduction [technology].	Status of the Achievement (Status of the Continuation): achieved (continued) (Project Completion) -The WG formulated the Guideline for landslide risk management. Through the work carried out mainly by the WG members, they also acquired the capacity to update/revise the Guideline if needed. (Ex-post Evaluation) -The new WG maintained the capacity to update/revise the Guideline through its regular meetings.	TER, 2nd-year Completion Report, questionnaire and interview survey to MES.
	Indicator 3: WG is able to propose for improvement of organizational and legal framework [organization and	Status of the Achievement (Status of the Continuation): achieved (continued) (Project Completion) -The WG compiled the recommendations, including implementation system for effective landslide countermeasures as well as the draft of the Operational Rules for appropriately restricting water use and earthworks in landslide areas. (Ex-post Evaluation)	ditto

⁸ In total, 17 priority landslides were selected under the project and groundwater drainage drilling works were selected as countermeasures for 16 priority landslides.

⁹ Spare parts of the information transfer cables were not provided by the project. Information about how and where all the spare parts and consumable items could be obtained was not shared to MES, either. It is noted that the monitoring equipment was procured in Japan, because it was not manufactured or sold in Armenia and the Japanese monitoring system was better than the one in the third countries in terms of performance and durability.

	institution].	-The new WG maintained the capacity to propose for improvement of organizational and legal framework through its regular meetings, attendance to seminars and awareness raising activities, etc.																				
	Indicator 4: WG is able to implement and manage landslide DRR measures [implementation of measures].	Status of the Achievement (Status of the Continuation): achieved (continued) (Project Completion) -The WG developed the CLDMP approved by the Minister of MES and implemented and managed the draining drilling works and test-operation of the real-time landslide monitoring system at the pilot project sites. (Ex-post Evaluation) -The new WG maintained the capacity to update/revise the CLDMP through its regular meetings and the capacity to implement and manage landslide DRR measures through drainage drilling works at landslide areas and operation of the real-time monitoring system in the pilot project sites.	ditto																			
(Overall Goal) Landslide disaster risk in Armenia is reduced through the development of CLDMP and implementation of measures on the basis of results of investigation/assessment of landslides.	Indicator 1: Groundwater drainage drilling holes are planned and implemented at 2 priority landslides in a year.	(Ex-post Evaluation) not achieved <Number of priority landslides where groundwater drainage drilling holes were planned and implemented> A=priority landslides selected under the project; B=other priority landslides identified after the project completion based on the landslide risk assessment.	Questionnaire and interview survey to MES.																			
		<table border="1"> <thead> <tr> <th></th> <th>2018</th> <th>2019</th> <th>2020</th> <th>2021 (as of July)</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Planned</td> <td>4 (A)</td> <td>4 (A)</td> <td rowspan="2">4 (A)</td> <td rowspan="2">4 (A)</td> </tr> <tr> <td colspan="2">2 (B)</td> </tr> <tr> <td rowspan="2">Implemented</td> <td>0</td> <td>0</td> <td rowspan="2">0</td> <td rowspan="2">Completed: 0 (Ongoing: 0)</td> </tr> <tr> <td colspan="2">2 (B)</td> </tr> </tbody> </table>		2018	2019	2020	2021 (as of July)	Planned	4 (A)	4 (A)	4 (A)	4 (A)	2 (B)		Implemented	0	0	0	Completed: 0 (Ongoing: 0)	2 (B)		
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	2 (B)																					
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	2 (B)																					
	Indicator 2: Landslide monitoring system is functioned at 3 RCMCs in accordance with the latest SOP.	(Ex-post Evaluation) not achieved -The real-time landslide monitoring system was functional only at 1 out of 3 RCMCs in accordance with the latest SOP because the equipment provided under the project at all 3 RCMCs broke down regularly due to thunder, and only the one at 1 RCMC was working in normal condition as of June 2021.	Questionnaire and interview survey to MES, and field observation in Arapi.																			

3 Efficiency

The project cost and period were within their respective plans (ratio against the plan: 98% and 100 % respectively). The Outputs of the project were produced as planned. Therefore, the efficiency of the project is high.

4 Sustainability

<Policy Aspect>

The Concept for Landslide Disaster Management (2013) mentioned in “Relevance” was still effective. In addition, the CLDMP and the Guideline developed under the project were approved by the Prime Minister.

<Institutional/Organizational Aspect>

Organizational structure for landslide DRR was established. The new WG belonged to Operational Emergency Countermeasures Headquarters established by the order of the Prime Minister, in which all the Ministers participate, so that coordination on landslide issues became easier. It was functioning as described in “Effectiveness/Impact, and the necessary number of staff were assigned by the member organizations (17 in total). MES was appointed as the responsible body for landslide management by the Prime Minister and allocated the necessary number of staff for the landslide DRR introduced by the project at the headquarters and the 3 RCMCs overseeing the pilot project sites (8 in total).

<Technical Aspect>

As described in “Effectiveness/Impact”, the new WG maintained the capacity to promote landslide DRR and the project deliverables such as the CDLMP, the Guideline, the SOP, manuals, etc. were continuously utilized. The landslide stability analysis software provided under the project was also continuously used by IGS. Meanwhile, some of other provided equipment was not fully utilized. The drilling equipment was not used for the preventive works at the project priority landslides as planned because the planned works were postponed to the next MTEP (2022-2024) due to lack of the national budget caused by the external conditions such as the war and COVID-19; however, it was maintained in good condition and was used for the emergency preventive works at 2 other landslides in 2021. As the budget for the next MTEP was approved, the drilling equipment was expected to be fully utilized from 2022. As for the landslide monitoring equipment, only 1 out of 3 sets was maintained in usable condition and utilized due to malfunctioning of the other sets caused by the frequent thunder and unavailability of the spare parts for the damaged information transfer cables in the domestic market and the international internet market.

<Financial Aspect>

In accordance with the Armenian budget system, MES submitted to the government a budget proposal on landslide DRR for the MTEP. The budget proposal incorporated the one from other WG member ministries/agencies such as MEnv, MTAI and UDC. MES secured the necessary budget except for the one for the groundwater drainage drilling works at the priority landslides that were postponed to the next MTEP due to lack of the national budget as mentioned earlier. MEnv and MTAI could not secure the sufficient budget due to the same reason, but UDC secured the necessary budget as per the MTEP. IGS also secured the necessary budget by the national budget and fund from the private sector. It is noted that MES expected that the budget for the drilling works would be secured from 2022.

<Evaluation Result>

In light of the above, some problem has been observed in terms of the technical and financial aspects of the implementing agency. Therefore, the sustainability of the project effects is fair.

5 Summary of the Evaluation

The project achieved the Project Purpose of improving the landslide DRR capacity of the WG at the time of project completion and the

effects of the project continued. The Overall Goal of reducing the landslide disaster risks was not achieved: groundwater drainage drilling holes were planned at 4 priority landslides selected under the project in a year and at 2 other priority landslides identified after the project completion in 2018-2019 (target: planning at 2 sites in a year), but no works were implemented at the priority landslides selected under the project while the works were implemented at the 2 other priority landslides in 2018-2019 (target: implementation at 2 sites in a year); and the real-time landslide monitoring system was functional only 1 out of 3 RCMCs. As for the sustainability, some problems were observed in terms of the technical aspect (i.e., insufficient utilization of some of the provided equipment) and financial aspect (i.e., insufficient budget for landslide DRR for some WG member organizations) but no problems were observed in terms of the policy and institutional/organizational aspects. Considering all of the above points, this project is evaluated to be satisfactory.

III. Recommendations & Lessons Learned

Recommendations for Implementing Agency:

-It is recommended that MES find out appropriate information transfer cables that connect landslide measurement instrument with monitoring system at the pilot project sites in Getahobit and Voghjaberd and replace the damaged ones with them as soon as possible. Since MES cannot find it by themselves, support from Japanese side may be required.

Lessons Learned for JICA:

-At the time of project planning and implementation, the information about how and where all the consumable items necessary to sustain the project effects can be obtained should have been defined and shared with implementing agencies.



An MES engineer checking the operational status of landslide monitoring equipment provided by the project (in Arapi)



A set of tipping bucket rain gauge provided by the project also maintained in good condition (in Arapi)