FY2022 Simplified Ex-Post Evaluation Report of Japanese Grant Aid Project

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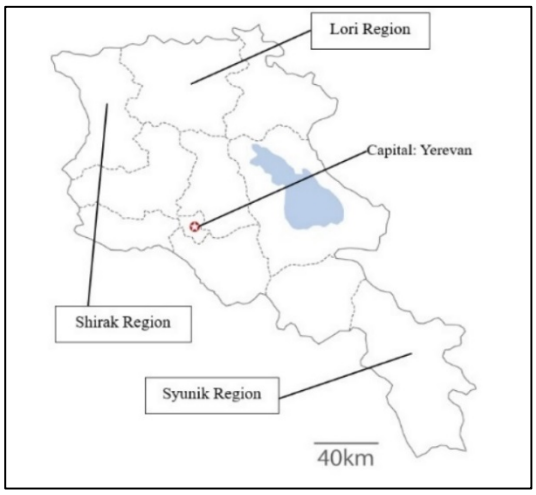
Duration of the Study: September 2022–October 2023

Duration of the Field Study: January 2023

Country Name	**Project for Improvement of Fire Fighting Equipment**
The Republic of Armenia	



Location of the Project Sites

Procured Fire Truck (Shirak Province: Gyumri II Fire Station)
(Source: Taken by Evaluator)

I. Project Outline

Background	In Armenia, many fire trucks and equipment were very old, and fire extinguishing and rescue activities could not be carried out adequately. While Gyumri City in Shirak Province was undergoing urbanization, the firefighting equipment necessary for urban disaster prevention was not in place. In Lori and Syunik Provinces, there were occurrences of forest fires, caused by slash-and-burn farming but firefighting activities were slow. This is because approximately 90% of the fire trucks had been deployed in the former Soviet era (1980s); they were in use but had exceeded their standard service life. As manufacturers had ceased production of the parts, the trucks could not be properly maintained and serviced, resulting in poor safety and functionality. Geographically, these three provinces are characterized by extreme elevation differences with many slopes, which were difficult for the aging fire trucks to climb. There were some cases in which fire extinguishing activities were insufficient.[1] Therefore, it was urgent to maintain and secure fire trucks that could climb hills and operate in hot and cold temperatures, so as to carry out firefighting and rescue activities in times of emergencies. Considering that the improvement of firefighting and rescue in the three provinces was as an important task, the government of Armenia requested that the Japanese government procure fire trucks.			
Objectives of the Project	To improve firefighting and rescue capabilities by upgrading firefighting vehicles and equipment, thereby contributing to the safety of the residents in Lori, Shirak and Syunik Provinces.			
Content of the Project	Project Sites: Lori, Shirak and Syunik Provinces 1) Procurement of Equipment, etc. Fire pump trucks with water tanks (3,500 Lit. water tank, 36 units), ladder trucks (more than 25 m, 3 units), a mobile workshop vehicle (1 unit), spare parts, etc. 2) Consulting Service / Soft Component Detailed design, bidding assistance, procurement supervision and training for firefighters on safety management and firefighting techniques			
Implementation Schedule	E/N Date	September 6, 2017		
	G/A Date	September 7, 2017	Completion Date	November 2019 (the timing of the hand over)
Project Cost	E/N Grant Limit / G/A Grant Limit: 1,540 million yen		Actual Grant Amount: 1,524 million yen	
Executing Agency	Rescue Service under the Ministry of Internal Affairs of the Republic of Armenia (hereinafter referred to as “Rescue Service”[2])			
Contracted Agencies	Main (equipment procurement): ITOCHU Corporation Consultant: INGÉROSEC Corporation			

[1] In Shirak Province (population of approx. 360,000), Lori Province (approx. 330,000) and Syunik Province (approx. 160,000) prior to the start of this project (2017), the number of fires had increased as the construction of houses and mid-to-high-rise buildings accelerated with the growing population, due to the influx of residents from rural areas and urbanization. There were many cases of forest fires, and the number of firefighting dispatches was higher than in other provinces (source: JICA’s document).

[2] After the ex-post evaluation (January 2023), the Rescue Service is transferred under the jurisdiction of the newly established Ministry of Internal Affairs. Prior to that, Rescue Service is under the Ministry of Emergency Situations (here referred to as “MES”).

II. Result of the Evaluation

[Summary]
The objective of this project was to improve firefighting and rescue capabilities by upgrading firefighting vehicles and equipment in Lori, Shirak and Syunik Provinces. At the planning stage, the government of Armenia formulated the *Disaster Risk Management National Strategy*, aiming to protect its people and land through disaster risk reduction measures. In order to achieve this goal, "improving firefighting and rescue capabilities of fire stations nationwide and reinforcing firefighting and rescue equipment" were listed as one of the priorities, so as to effectively respond to disasters, such as fires and accidents. At the planning stage, approximately 90% of the fire trucks had been deployed in the former Soviet era (1980s); they were in use but had exceeded their standard service life. As manufacturers had ceased production of the parts, the trucks could not be properly maintained and serviced. Geographically, these three provinces are characterized by extreme elevation differences with many slopes, which were difficult for the aging fire trucks to climb. There were some cases in which fire extinguishing activities were insufficient. Therefore, introducing fire trucks with the latest technology was an urgent task. Based on the above, this project was in line with the development policy of the country and the needs of the firefighting and rescue sector. Regarding the "Consistency with Japan's ODA Policy," this project was in line with the development policy and needs stipulated in Japan's Country Assistance Policy for Armenia (December 2012). However, no specific collaboration/coordination had been envisioned since the planning stage in terms of "Internal Coherence" (collaboration with other JICA project/assistance) and "External Coherence" (collaboration with organizations other than JICA and coordination with international frameworks, etc.). With reference to international frameworks, this project is consistent with one of the Sustainable Development Goals (SDG), "11. Sustainable cities and communities," therefore, the relevance and coherence are high. Concerning efficiency, the outputs were implemented as planned. The project period was slightly longer than the initial plan, as certain parts of the fire trucks were subject to a model change after the project began, and it became necessary to manufacture these parts at an alternative factory, which required time. On the other hand, the project cost was within the plan, therefore, the efficiency is high. In relation to the project's effectiveness, the target values were mostly achieved in relation to the quantitative effects, such as "average time required to dispatch a fire truck after receiving a dispatch order," "ratio of fire trucks which can turn out within one minute of a dispatch order," "average time required to start hosing the fire after arriving at a fire scene." As for the qualitative effect, interviews confirmed that procured fire trucks were contributing to the improvement of firefighting and rescue operations of the fire stations in Lori, Shirak and Syunik Provinces. Regarding impacts, the interviews also confirmed that the safety and security of local residents were secured by the strengthening of firefighting capabilities. Therefore, the effectiveness and impacts of the project are high. No issues were reported with regard to sustainability as there are no problems in terms of the policies/systems, the institutional/organizational aspect, the technical aspect, the financial aspect or the status of operations and maintenance. Therefore, the sustainability of the project effects is very high.
In light of the above, this project is evaluated to be highly satisfactory.

Overall Rating[3]	A	**Relevance & Coherence**	③[4]	**Effectiveness & Impacts**	③	**Efficiency**	③	**Sustainability**	④

1 Relevance / Coherence

[Relevance]

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

In 2012, the government of Armenia formulated the *Disaster Risk Management National Strategy*, aiming to protect its people and land through disaster risk reduction measures. In order to achieve this goal, "improving firefighting and rescue capabilities of fire stations nationwide and reinforcing firefighting and rescue equipment" were listed as one of the priorities, so as to effectively respond to disasters, such as fires and accidents. In addition, Armenia's Ministry of Finance formulated the *Medium-Term Disbursement Plan* (2015-2017), which recognized the capacity improvement of the fire extinguishing and lifesaving rescue activities in emergencies as a priority. This project provided support to ensure a seamless response in times of emergency, such as disasters in Armenia, and thus, was consistent with the policy of the Armenian government.

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

In Armenia, approximately 90% of the fire trucks had been deployed in the former Soviet era (1980s); they were in use but had exceeded their standard service life. As the manufacturers had ceased production of the parts, the trucks could not be properly maintained and serviced. Geographically, Lori, Shirak and Syunik Provinces are characterized by extreme elevation differences with many slopes, which were difficult for the aging fire trucks to climb. There were some cases in which fire extinguishing activities were insufficient, therefore, it was urgent to maintain and secure fire trucks that could climb hills and operate in hot and cold temperatures, so as to carry out firefighting and rescue activities in times of emergencies. It can be said that this project was consistent with Armenia's development cooperation policy and needs in the field of firefighting and rescue activities.

- Appropriateness of Project Design / Approach

No significant differences were observed between the plan and the output implementation during the period of the project implementation or at the time of project completion. Therefore, it can be judged that the project plan and the policy/approach were appropriate.

According to this project's ex-ante evaluation report, a lesson was drawn from a grant aid project, "Project for Improvement of Fire Fighting Equipment in Yerevan City" (E/N signed in 2009), at the time of its ex-post evaluation that the Rescue Service's executives, participating in topic-based trainings, had strengthened their leadership and played an important role in creating a sense of unity within the team. As a lesson to be applied to the follow-on project (i.e., this project), it was suggested that senior staff of the Rescue Service, who were high achievers and motivated to implement improvements, should participate in topic-based trainings in Japan, so that the organization can acquire knowledge and skills related to firefighting activities under the leadership of such executives. In this project, training was conducted for the

[3] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory.
[4] ④ : Very High ③: High, ②: Moderately low, ①: Low.

Rescue Service staff (regional staff). In addition, when the trucks were introduced, the manufacturer provided on-site instructions for the initial operation, techniques for operating fire and ladder trucks and operation guidance for firefighting and rescue activities. At the same time, revised manuals on firefighting and rescue activities were provided. Through this on-site training and manual revision at the time of the equipment introduction, it is believed that technology and knowledge are being disseminated within the Rescue Service, and that they will (eventually) contribute to improvements in the quality of firefighting and rescue activities.

[Coherence]

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

"Strengthening disaster prevention measures" was listed as one of the priority areas in the *Country Assistance Policy for Armenia* (December 2012) formulated by the Japanese Ministry of Foreign Affairs. The cooperation program of the ministry's project development plan advocated a "program to strengthen local disaster prevention measures."

This project aimed to improve Armenia's firefighting and rescue capabilities by providing fire trucks and equipment, thereby contributing to the safety of local residents, which is in line with the *Country Assistance Policy for Armenia*. Therefore, it can be said that this project is consistent with Japan's assistance policy for Armenia.

- Internal Coherence

Prior to the planning process (2017), Japan assisted the enhancement of firefighting capabilities by providing firefighting equipment (vehicles and equipment) and operational guidance in the capital, Yerevan City, through a grant aid project titled, "Project for Improvement of Fire Fighting Equipment in Yerevan City," (E/N was signed in February 2009). Through its soft component training, manuals were provided regarding the operation of firefighting activities in relation to the fire trucks with water tanks and ladder trucks. However, this previous project, as well as the current project were implemented at different times and targeted different areas. Therefore, it cannot be said that the effect was realized through cooperation at the planning and implementation stages.

- External Coherence

Prior to the planning process (2017), the United Nations Development Programme (UNDP) provided geographic information systems and communication equipment to the MES[5] and regional crisis management centers to support the domestic establishment of emergency management networks. The Swiss Agency for Development and Cooperation (SDC) provided fire departments with rescue equipment. The German International Cooperation Agency (GIZ) assisted the installation of fire hydrants. The implementation periods and target areas of the assistance given by these international organizations other than JICA are different from those of this project. As there is no duplication or collaboration, it is difficult to say that a concrete, synergistic effect was produced.[6]

In relation to the international frameworks, it can be said that this project is in line with SDG, "11. Sustainable cities and communities" in the sense that it contributes to the safety of residents in rural Armenia by improving firefighting and rescue capabilities.

[Evaluation Result]

In light of the above, the relevance and coherence of the project are high.[7]

2 Effectiveness / Impacts[8]

[Effectiveness]

<Quantitative Effects>

The quantitative effect indicators of this project (baseline, target and actual values) are shown in Table 1. Three indicators and target values were set at the time of the planning, and improvements in firefighting and rescue capabilities were expected in Lori, Shirak and Syunik Provinces.

Table 1: Quantitative Effect Indicators (Baseline, Target, Actual Values)

Indicators	Baseline Value 2016 Baseline Year	Target Value 2022 3 Years after Completion	Actual Value 2021 and 2022
(1) Average time required to dispatch a fire truck after receiving a dispatch order (min)	More than 10 minutes	Within 1 minute	Within 1 minute
(2) Ratio of fire trucks which can turn out within one minute of a dispatch order (%)	0%	100%	97.4%
(3) Average time required to start hosing the fire after arriving at a fire scene (min)	More than 5 minutes	Less than 5 minutes	Less than 5 minutes

Source: JICA's document (baseline, target values), answers to the questionnaire and interviews, site visits (actual values).
Note 1: In this evaluation, the actual values of 2021 and 2022 were confirmed through the questionnaire, interviews with the Rescue Service and each fire station, as well as site visits.
Note 2: The quantitative effect indicators (1)-(3) were planned to be measured using the equipment procured under this project, (source: JICA's document). The actual results show the effects generated by the procured equipment.

[5] At that time, the Rescue Service was under the jurisdiction of MES.
[6] There were no particular agreements or meetings of the international organizations, including JICA, concerning assistance in the field of firefighting. Based on this, it cannot be said that there was a high level of cooperation.
[7] Relevance: ③, Coherence: ②
[8] When providing the sub-rating, Effectiveness and Impacts are to be considered together.

Regarding (1) and (2), prior to the start of this project, the fire trucks, which had been deployed in the former Soviet era (1980s), were in use but had exceeded their standard service life. As the manufacturers had ceased production of the parts, there were problems in terms of safety and functionality. Due to aging, some trucks could not be driven unless the air brakes had been filled with air,[9] and refilling the air would take time after a dispatch order was issued. Other trucks had air leaks in their air brakes. In addition, there were many days when the temperature was below freezing in winter, and time was required to warm up the vehicle when filling the air brakes to prevent malfunctioning. Furthermore, some vehicles had problems with their engine transmissions and fuel pumps or were subject to fuel and oil leaks, etc., therefore, they were not fully prepared for dispatches. Under such circumstances, even if a dispatch order was issued, the average preparation time for dispatch was more than 10 minutes; none of the vehicles could be dispatched within one minute. Fire trucks with high power performance were introduced as a result of this project: vehicles are being properly maintained, as will be discussed later in "Current Status of Operation and Maintenance" under "Sustainability;" vehicle operation techniques were taught through the soft component training and it is no longer necessary to fill the air brakes with air and warm them up. For these reasons, (1) it became possible to dispatch a vehicle within one minute of a dispatch order at the fire stations in the target areas and (2) the maintenance ratio, while recorded as 100% among the vehicles in operation, this is calculated to be 97.4%[10] since one fire engine was badly damaged after the handover, as will be discussed later in "Outputs" under "Efficiency."

With regard to (3), prior to the start of this project, fire trucks took more than five minutes from the time they arrived at the site until they started connecting the fire hoses and spraying water, etc. In addition, it took more than five minutes for a ladder truck to start the rescue operation (until the ladder had been extended and the rescuers had climbed to the top of the ladder) after arriving at the scene. As safety devices (body levelness, ladder extension / retraction, elevation angle, turning angle, etc.) were also out of order, it was not possible to operate the ladders. The Rescue Service literally prohibited the use of the ladder trucks, as they were concerned about vehicles overturning. Through this project, new fire trucks, equipped with fire hose couplers were procured, and soft component training was given on operation techniques. As a result, quick responses have become possible in the field, and a time period of "less than 5 minutes" has been achieved, according to staff interviewed at each fire station that was visited.

<Quantitative Effect (Realization of Safe and Effective/Efficient Fire/Rescue Activities)>

Prior to the start of this project, it was expected that firefighting and rescue activities would become safe, effective and efficient through the procurement and utilization of firefighting equipment. Field firefighters and rescue crews were interviewed during this evaluation,[11] through which the following effects were confirmed:

(Fire Station in Lori Province)

- The capacity of the water tanks of the procured trucks was around 1,200 Lit. more than that of the old trucks.
- In cases of fire and medical emergencies, firefighting and rescue crews can be dispatched quickly. The fire trucks are reliable function-wise, and they are stable and capable of driving to the sites on all road types.
- Compared to the older vehicles, the new vehicles are not only technically better but have also enabled efficient firefighting and rescue activities.
- There are fewer cases of breakdowns or defects.
- The ladder trucks can deploy ladders quickly and working in high places is now safer, as the ladder has a cage and crews can focus on rescue activities without anxiety.

(Fire Station in Shirak Province)

- The procured fire trucks can arrive quickly at the scene and carry out fire extinguishing activities in a timely manner.
- Compared with the previous fire hoses, the hoses introduced by this project are of good quality and are durable. Reliability is high among the firefighters during firefighting activities.

(Fire Station in Syunik Province)

- The water tank capacity of the newly-introduced fire trucks is considerable. In Syunik Province, where it is not easy to procure water due to water resource shortages, fire trucks can now be used efficiently.
- The fire trucks are very reliable and never break down on the road. They can even handle bad roads without a problem, and take less time to reach the fire/rescue sites than previously.
- Accident/rescue responses and firefighting activities have become efficient. As there are many multi-story houses in the central city of Kapan, the ladder trucks have been useful on many occasions.

In addition, the mobile workshop vehicle, introduced by this project (deployed at the maintenance base in Yerevan City), repairs fire trucks by traveling all over the country. According to the Rescue Service, because a compressor and a generator are attached to the mobile workshop vehicle introduced by this project, it is now easy to supply power to vehicles experiencing problems, and the maintenance work has become efficient. Prior to the start of this project, there was no portable maintenance vehicle.

Based on the aforementioned comments, the procured fire trucks and ladder trucks arrive quickly at the location of a fire, realizing efficient fire extinguishing and rescue activities with improved work safety. Therefore, it can be concluded that safe, effective and efficient firefighting and rescue activities have been achieved in the project areas. Both the quantitative and qualitative effects have been achieved as per expectations at the planning stage.[12]

[9] For many fire trucks, it used to take around five minutes to fill the air brake with air after starting the engine.

[10] The calculation was: 38 units in operation / 39 units procured (breakdown: 36 fire trucks and 3 ladder trucks) = 97.4%. As will be explained in the "Status of the Operation and Maintenance" under "Sustainability," considering that another vehicle was not in operation due to parts' replacement at the time of the ex-post evaluation (as of the end of January 2023), the "actual value in 2023" is calculated / can be calculated at around 95%. (37 units in operation / 39 units procured = approx. 95%).

[11] We interviewed three to six firefighters and rescue crews at each of the eight fire stations that were visited.

[12] In addition, regarding the soft component training, interviews were conducted with the firefighters and the Rescue Service who actually participated in the training, and they

[Impacts]

<Quantitative and Qualitative Effects (Contribution to the Safety and Security of Residents in Project Areas by Enhancing Firefighting Capabilities)>

Prior to the start of this project, "ensuring the safety and security of residents in the project areas through the enhancement of firefighting capabilities" was expected as an impact. In order to carry out firefighting and rescue operations in cases of emergencies, the introduction of fire trucks that can climb hills and operate in hot and cold temperatures was an urgent issue in the three provinces.

For reference purposes, Tables 2, 3 and 4 show the number of fires, deaths, injuries and the amount of damage caused by fires in the three provinces.

(Reference) Table 2: Number of Fires, Fire Fatalities, Injuries and Damage in Lori Province (Five Years After the Start of the Project)

	2017	2018	2019	2020	2021
Number of fires (cases)	443	234	626	423	325
Fire deaths (number of people)	0	3	1	0	3
Fire injuries (number of people)	0	10	4	2	10
Damage caused by fire (thousand AMD)	160,294	57,632	Unknown	58,739	196,832 *Note

Source: The Urban Development, Technical and Fire Safety Inspectorate of Armenia.
Note: The reason for the considerable amount of damage is due to forest fires. According to the Rescue Service, fire and damage were widespread.

(Reference) Table 3: Number of Fires, Fire Fatalities, Injuries and Damage in Shirak Province (Five Years After the Start of the Project)

	2017	2018	2019	2020	2021
Number of fires (cases)	320	269	373	227	303
Fire deaths (number of people)	1	1	0	2	2
Fire injuries (number of people)	4	3	9	3	8
Damage caused by fire (thousand AMD)	642,538	3,279,790	4,805,954	3,041,018	1,099,666

Source: The Urban Development, Technical and Fire Safety Inspectorate of Armenia

(Reference) Table 4: Number of Fires, Fire Fatalities, Injuries and Damage in Syunik Province (Five Years After the Start of the Project)

	2017	2018	2019	2020	2021
Number of fires (cases)	413	496	516	318	389
Fire deaths (number of people)	0	0	0	0	0
Fire injuries (number of people)	4	6	3	-	1
Damage caused by fire (thousand AMD)	11,264	18,590	66,660	54,049	16,687

Source: The Urban Development, Technical and Fire Safety Inspectorate of Armenia

As the number of fires and the amount of damage vary from year to year, it is difficult to analyze the trends. While correlations with this project could not be identified, the following comments were received during interviews with the crews of each fire station and the Rescue Service headquarters: "The procured fire and ladder trucks can arrive at the scene quickly to carry out firefighting and rescue activities, compared to those used prior to the start of this project. Not only is the power performance excellent, but firefighters have more confidence in the vehicles and feel safer during firefighting and rescue activities, leading to improved firefighting capabilities. Residents are also aware of the existence of fire trucks arriving at the scene promptly.[13] The presence of firefighters and fire trucks safeguard the lives, bodies and assets of the local residents" and "A previous project titled, "Project for the Improvement of Fire Fighting Equipment in Yerevan City" (E/N was signed in February 2009), aimed to strengthen firefighting capabilities by providing firefighting equipment (vehicles and equipment) and operational guidance in the capital, Yerevan City. Through its soft component training, manuals were provided on operation and firefighting activities in relation to fire trucks with water tanks and ladder trucks, and some of the firefighters, rescue crews and vehicle mechanics who received support at that time were able to improve their skills and knowledge. The project introduction process, experience and knowledge were shared with the fire stations in Lori, Shirak and Syunik Provinces. As a result, the introduction and operation of fire trucks went smoothly."

In addition, according to the results of a 2022 questionnaire survey by the International Republican Institute Armenia, the MES which was the supervising authority of the Rescue Service prior to January 2023, is recognized as the most trusted public agency in the country (a highly reliable ministry organization with high job performance) although it is not limited to the field of firefighting and rescue.[14]

Based on the above, while the quantitative data cannot clearly prove the project's contribution to ensuring the safety and security of residents in the target areas, the aforementioned comments suggest that this project is supporting the enhancement of firefighting capabilities and the assurance of safety/security of the residents in the target areas.

commented: "As a result of the training, emergency responders began to participate in many training programs and exercises in a planned and motivated manner" (Fire Station in Lori Province); "Our fire and rescue team received training when the fire truck was handed over, which was useful for their respective works" (Fire Station in Shirak Province) and "Since the soft component training, the field staff of the firefighting and rescue crews have been trained regularly. Our on-site training is conducted based on plans and by setting themes related to our respective works" (Fire Station in Syunik Province). It is believed that the soft component training has promoted the dissemination of skills and knowledge within the Rescue Service as an organization, leading to an improvement in the quality of firefighting and rescue activities.

[13] It has been said that some local governments held a ceremony when the fire truck was handed over. According to the Rescue Service, the Japanese flags on the vehicle doors are eye-catching, and local residents are aware that these vehicles are manufactured in Japan.

[14] Source: https: //www.iri.org/resources/public-opinion-survey-residents-of-armenia-june-2022/ (page 21, accessed on January 27, 2023).

(2) Other Positive and Negative Impacts

① Impacts on the Environment

This project was classified as Category C, as the undesirable impact on the environment was judged to be minimal, based on *JICA Guidelines for Confirmation of Environmental and Social Considerations* (promulgated in April 2010). It was confirmed through the questionnaire and interviews with the field firefighters and rescue crews that there were no negative environmental impacts (air pollution, water quality, noise/vibration, negative impact on the ecosystem, etc.) during the project implementation and after its completion.[15]

② Impacts on the Social Environment (Land Acquisition and Resettlement)

Since this project mainly comprised the procurement of fire trucks, there was no resettlement or land acquisition.

③ Gender Equality, Marginalized People / Human Rights, Social Systems and Norms, and Human Well-being

It can be said that this project contributes to strengthening Armenia's firefighting functions and ensuring the safety and security of local residents. Regarding gender impacts and the realization of equality, the impacts on people barred from equitable participation in society, social systems, human well-being and human rights, the questionnaire and interviews could not confirm any specific cases in which this project had a direct impact. Nevertheless, the Rescue Service continuously updates its fire trucks, working toward reliable firefighting and rescue activities. Equipment that enables timely firefighting and rescue activities has been procured, and safety and security for the residents have improved, bringing many benefits to the people. In addition, considering that the poverty rate is higher in rural areas than in urban areas, the fact that the latest fire trucks were introduced in rural areas suggests that consideration was given to the poor households, for whom this project is thought to play a role.

[Evaluation Result]

Regarding the quantitative effect indicators, the actual values for 2021/2022 (two years after the completion) have mostly achieved the targets in terms of the three indicators: (1) average time required to dispatch a fire truck after receiving a dispatch order; (2) ratio of fire trucks which can turn out within one minute of a dispatch order; and (3) average time required to start hosing the fire after arriving at a fire scene. The fire stations in the three provinces targeted by this project have become able to rapidly dispatch fire trucks and carry out efficient fire extinguishing and rescue activities. Concerning the impacts, the safety and security of the residents are ensured by strengthened firefighting capacities. The expected outcomes and impacts of this project have largely been achieved as planned. Therefore, the effectiveness and impacts of the project are high.

3 Efficiency

<Outputs>

The outputs of this project are described above in the section "I. Project Outline, Contents of the Project" and were implemented as planned.

After the project completion, one fire truck, deployed to the fire station in Lori Province (around Alaverdi to Vanadzor), was badly damaged in an accident. At the time of the ex-post evaluation, it had not been formally scrapped, but there was no prospect of repairing it according to the Rescue Service. Apparently, the vehicle overturned and fell on to a road in a mountainous area.[16]

<Inputs>

1) Project Period

This was planned from September 2017 to June 2019 (22 months). The actual period was from September 2017 to November 2019 (27 months), which was slightly longer than planned (approx. 123% of the plan). The main reason was that the model of the fire engine cab (double cabin) parts was changed, which made it difficult to manufacture these at the original plant, thus, it became necessary to manufacture them at an associated plant. As a result, the project could not be completed within the planned time period.

2) Project Cost

The initial plan was 1,544 million yen. However, the actual cost was approx. 1,530 million yen (approx. 99% of the plan), which was within the plan.

[Evaluation Result]

Although the project period slightly exceeded the plan, the project cost was within the plan. Therefore, the efficiency of the project is high.

4 Sustainability

- Policy/System

The *Disaster Risk Management National Strategy* issued by the government of Armenia in 2012 advocated the protection of its people and land in emergencies, such as disasters, through disaster risk reduction measures, listing "improving firefighting and rescue capabilities of fire stations nationwide and reinforcing firefighting and rescue equipment" as a priority. In addition, the Ministry of Finance of Armenia formulated the *Medium-Term Disbursement Plan* (2015-2017), which recognized the capacity improvement of the lifesaving fire

[15] According to the Rescue Service, no environmental monitoring data are being measured, including air pollution, water quality, noise, vibration and impacts on the ecosystem; they do not have a dedicated department, either. On the other hand, they argued that the field staff would quickly take countermeasures upon finding a problem. According to them, should a negative impact on the environment be found, the Rescue Service would request that the Ministry of the Environment of Armenia take action, and the Ministry would respond accordingly. Interviews with the Rescue Service headquarters, field firefighters and rescue crews confirmed that there had been no particular negative impact on the environment up until the time of the ex-post evaluation. It was also confirmed that no particular countermeasures had been implemented. During the interviews with the field firefighters and the rescue crews, some expressed that negative impacts on the environment would be insignificant, as the fire trucks procured by this project generate less emission gas than the older models.

[16] At the time of the ex-post evaluation, it was stored at the maintenance base in Yerevan City. According to the Rescue Service, the vehicle is the property of the state, and thus, procedures in accordance with government laws and regulations will determine how it is handled. Given the severe damage, it is expected that the vehicle will eventually be scrapped, as the possibility of repair is low. Apparently, the vehicle overturned and fell on to a winding mountain road, and the firefighter who was driving it broke his leg. According to the information gathered through interviews, it is thought that the stability of the vehicle was affected by the road conditions in the mountainous area. The consultants of this project assisted the Rescue Service by investigating the cause of the accident and conducted training to prevent recurrence after the accident.

extinguishing and rescue activities in emergencies as an important issue and pointed out the need for fiscal stimulus. This project aimed to reduce disaster risks by strengthening disaster prevention and rescue activities, through support for Armenia's firefighting sector, therefore, the sustainability of the policies and systems is high.

- Institutional/Organizational Aspect

The executing agency of this project is the Rescue Service. In Armenia, as a result of organizational restructuring, the Ministry of Internal Affairs was newly established in January 2023, and the supervisory authority of the Rescue Service is the Ministry. Table 5 shows the number of fire department personnel in Lori, Shirak and Syunik Provinces; the Rescue Service has 3,308 employees. Interviews with the Rescue Service Headquarters and each fire station confirmed that there was no problem with the operational system and that they had a sufficient number of staff.

Regarding the procured fire trucks and ladder trucks, the back office / Logistics Support Department of the Rescue Service Headquarters is responsible for the technical maintenance of the fire trucks, seasonal inspection services, replacement and repair of parts, engine and gearbox oil changes, as well as tire replacement and repair. Routine and periodic maintenance are performed by firefighters and rescue crews in each province. In the case of a large-scale repair, the Yerevan city maintenance base (with around 30 staff members) handles the matter. The procurement of parts for the fire trucks is often handled by outsourcing companies.[17]

Table 5: Number of Fire Department Employees of the Three Provinces Covered by This Project

(Unit: Number of People)

	Fire Truck and Ambulance Drivers	Maintenance Staff	Firefighters and Rescue Crews	Total
Lori Province	64	61	128	253
Shirak Province	64	50	124	238
Syunik Province	39	56	85	180

Source: Rescue Service (data as of November 2022); all employees work full-time.

In light of the above, it can be judged that there are no major problems regarding the institutional and organizational aspects of operation and maintenance.

- Technical Aspect

In this evaluation, the questionnaire, interviews and site visits confirmed the following: most of the field firefighters / rescue crews, maintenance staff and drivers have sufficient work experience; many are skilled in the operation and driving of the fire trucks and there is no technical gap.

The Rescue Service regularly conducts training for staff working at the headquarters and fire stations in the provinces. Multiple training sessions are conducted, covering the topics essential for firefighting and rescue scenarios.[18] Training is organized both internally by the Rescue Service and by external training organizations. In addition, on-the-job training (OJT) is provided for newly hired employees, regardless of whether they are employed at the headquarters or in the provinces. In addition to the theoretical and practical training given on a regular basis, not only new recruits but also all members of the Rescue Service involved in firefighting rescue (fire department staff nationwide) are engaged in firefighting drills, simulating actual fire or rescue scenarios.

In this project, maintenance manuals for the fire trucks and others were provided. Each fire station utilizes the manuals as necessary.

Based on the above, it can be judged that the technical level of the operation and maintenance of this project is sufficient, and that there are no major problems.

- Financial Aspect

Table 6 shows the budget allocated for the maintenance of the Rescue Service's fire trucks and ladder trucks.

Table 6: Budget for the Maintenance of the Rescue Service's Fire Trucks and Ladder Trucks*Note

(Unit: thousand AMD)

2021	2022	2023
8,500,000	8,500,000	14,000,000 (An estimate as of January 2023)

Source: Answers to the questionnaire, interviews.
Note: The maintenance budget before 2021 was also approx. 8,500,000 thousand AMD.
Remark: 1 Armenia dram = 0.33 Japanese yen (Oanda.com exchange rate at the end of January 2023).

The figures shown in Table 6 include the maintenance budget for the equipment procured during this project.[19] The budget is not calculated for each fire station; it is budgeted collectively at the headquarters. The budget for 2023 is an estimate; it is expected to increase from the

[17] Outsourcing companies are, in principle, selected through competitive bidding. The Rescue Service Headquarters is in a position to supervise the repairs conducted by the outsourced companies. After the accident occurred, the consultant of this project assisted the Rescue Service in investigating the cause of the accident and provided training for recurrence prevention.

[18] Examples of the training conducted in the last few years include: "Training for firefighting leaders" (10 participants in February 2022); "How to extinguish a large-scale fire involving flammable material in a storage space" (two participants in July 2022); "Rescue techniques, equipment operation and safety for rescue activities in the event of a traffic accident'" (10 participants in February 2022); " Forest fire extinguishing tactics'" (three participants in March-April 2021); "Search and Rescue Activities in Collapsed Buildings" (six participants in July 2022) and "How to remove gas and smoke during firefighting" (three participants in June 2022).

[19] Procurement for this project was completed at the end of 2019. Since the equipment was still new in 2020, there was no maintenance cost for either year. Therefore, the figures only represent the maintenance cost for the three years from 2021, when expenditure began to occur.

previous year. The reasons are: prompt and thorough maintenance and operation of the firefighting trucks and equipment, and some fire trucks are reaching the end of their service life, therefore, a larger budget will be allocated than the previous year (loss on redemption).

In light of the above, it can be judged that no major problems have been identified as regards the financial aspect of the operation and maintenance of this project.

- Social and Environmental Aspect

No negative environmental and social impacts have been observed and no specific mitigation measures have been taken.

- Preventative Measures to Risks

Throughout the project implementation, there were no drastic changes in the development policy or the security and political situations concerning the disaster prevention sector in Armenia. There were no risks, external conditions or tasks to be controlled. The progress of the project was not affected by large-scale disasters, neither was the introduction of the equipment or the implementation of training.

- Current Status of Operation and Maintenance

In this evaluation, the maintenance status of the fire trucks and ladder trucks was assessed using the questionnaire and interviews with the staff of the Rescue Service Headquarters, local fire stations and the maintenance base in Yerevan City, and by conducting site inspections. All the fire stations are sufficiently staffed, and these staff are regularly trained. In addition, considering the fact that the fire trucks are maintained on a daily or regular basis, as mentioned in the section above, “Institutional/Organizational Aspect,” it is likely that the project effects will be sustained in the future.

At the time of the ex-post evaluation, one fire truck deployed to a fire station in Shirak Province was not in use, as it had a problem with its transmission which was being replaced. Apparently, the part had been ordered through an agent in Yerevan City. Undulating road conditions in the mountainous area were thought to have been the cause of the issue. Therefore, the number of fire trucks in operation at the time of the ex-post evaluation was 34 (the actual number is 36 (also in the original plan), however, one vehicle was badly damaged after delivery and another had a problem with the transmission, which was being replaced at the time of the ex-post evaluation). There are no problems regarding the operating status of the three ladder trucks and one mobile workshop vehicle.

The work schedule of the firefighters and rescue crews is as follows: staff are on duty for one day (24 hours), are on standby at home for one day (24 hours) in case of emergencies and are off-duty for the remaining two days (48 hours). However, in the case of a large-scale fire or disaster, all members are called in. It was confirmed that all the fire stations are fully staffed, that their shift system is functioning and that there is no problem with the dispatching system.

Spare parts for the fire trucks are procured by outsourcing companies. The outsourcing companies communicate with each fire station concerning the procurement procedure, thereby handling the purchase and delivery. According to the Rescue Service, delivery takes one to two months on average and no significant delays have been experienced.

In light of the above, the operation and maintenance status of this project is good.

<Evaluation Result>

Therefore, the sustainability of the project effects is very high.

III. Recommendations & Lessons Learned

- Recommendations to Executing Agency

Since the completion of the project, the fire trucks, ladder trucks and the mobile workshop vehicle have been properly maintained. Appropriate, daily and periodic maintenance will guarantee sustained vehicle performance and long-term use. It is recommended that the Rescue Service and local fire stations continue the proper maintenance works including daily and periodic inspections of the fire trucks, the service of vehicles at every oil change, the replacement/repair of parts, oil changes for the engines and gearboxes, and tire replacement/repair.

In addition, regarding the incident in which the fire truck was badly damaged in an accident after the completion of the project (overturned and fell while being driven on a road in a mountainous area), the consultants of this project assisted the Rescue Service by investigating the cause of the accident and provided training to prevent recurrence after the accident. It is desirable that the Rescue Service continue to take measures to prevent the recurrence of accidents, advocating that their fire trucks be driven safely.

- Recommendations to JICA

None

- Lessons Learned

(Importance of Introducing Necessary Training Along with the Introduction of Special-purpose Equipment such as Fire Trucks and Establishing a Solid Maintenance System)

Daily and periodic maintenance is crucial for the safe use of the fire trucks over a long period of time and for maintaining their performance. In this project, support was provided in the following areas: initial operation guidance by the fire truck manufacturer, fire and ladder truck operation techniques, operation guidance on firefighting and rescue activities and the revision of manuals related to firefighting and rescue activities, using fire engines and ladder trucks as part of the soft-component training. Since the local fire stations targeted by the project did not have any prior experience with trucks manufactured in Japan, training was essential for the smooth operation and maintenance of the vehicles. The interviews confirmed that the fire stations visited during this survey were aware that the fire trucks were “assets.” When introducing special-purpose equipment such as fire trucks, conducting the necessary training will help ensure the correct maintenance on the part of the recipient. When introducing special-purpose equipment, it is desirable that both the assisting side and the recipient side consider and discuss the introduction of the appropriate training from the initial planning stage.

IV. Non-Score Criteria

- Performance

[Objective Perspective]

In this project, as part of the consulting service, support was provided in the following areas: initial operation guidance by the fire engine manufacturer, operation techniques for fire and ladder trucks, operation guidance on firefighting and rescue activities and the revision of manuals related to firefighting and rescue activities, using fire engines and ladder trucks as part of the soft-component training. As it was the first time that vehicles made in Japan were introduced in the fire stations in Lori, Shirak and Syunik Provinces, such training was necessary to ensure smooth operation and maintenance. It was a response aimed at adapting to the project environment, thus, it can be said that the necessary support was provided to the executing agency.

- Additionality

None

Procured Ladder Truck
(Lori Province: Vanadzor Fire Station)
(Source: Taken by Evaluator)

Procured Fire Truck (left) and
Fire Truck Made in Russia (right)
(Shirak Province: Ashotsk Fire Station)
(Source: Taken by Evaluator)

Fire Hoses on the Fire Truck
(Lori Province: Vanadzor Fire Station)
(Source: Taken by Evaluator)

Vehicle Maintenance Manual Provided
(Lori Province: Alaverdi Fire Station)
(Source: Taken by Evaluator)

Procured Fire Truck
(Syunik Province: Kapan Fire Station)
(Source: Taken by Local Consultant)

Image of the Town Where the Fire Truck Operates
(Syunik Province: Goris)
(Source: Taken by Local Consultant)