Georgia

Tbilisi City

Collaboration Program with the Private Sector for Disseminating Japanese Technology for Road Safety against falling rocks in Georgia

Final Report

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Japan International Cooperation Agency(JICA)

MITSUI & CO., LTD.

TOKYO ROPE MFG. CO., LTD.

OS
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Map

Western Asia (Georgia is shown in red)

List of Abbreviations

Acronym	Full term
APEC	Asia-Pacific Economic Cooperation
CIS	Commonwealth of Independent States
C/P	Counter Part
CRP	Caucasus Road Project LTD
JICA	Japan International Cooperation Agency
MENRP	Ministry of Environment and Natural Resources Protection
MN	Mighty Net
MOU	Memorandum of Understanding
NEA	National Environment Agency
TCH	Tbilisi City
RDMRDI	Roads Department, Ministry of Regional Development and Infrastructure

Chapter 1 Abstract

1.1. Abstract

Mitsui & Co., Ltd. and Tokyo Rope Manufacturing Co., Ltd. (hereinafter, collectively "the Joint Venture") have been proposing designs and supplying materials for disaster-prevention products, based on their proven track record in Japan, to other countries. As their next focus, business expansion into CIS and Caucasus nations was prioritized, and in 2014 the Joint Venture held discussions with municipal officials of Tbilisi, Georgia, who are in charge of such projects. In Georgia, about 40,000 km2 – constituting some 60% of the national land area – is comprised of hazardous areas prone to natural disasters of various magnitudes. Every year, people lose their lives or are injured, and property is damaged. The officials showed an interest in the potential of the products of the Joint Venture with a proven track record, so it was decided to look into business opportunities through this project.

The technology to be promoted by the Joint Venture is Mighty Net (MN), a product manufactured by Tokyo Rope Manufacturing Co., Ltd., which is designed to prevent rock falls. Not only is this product capable of preventing rock falls, but it is maintenance-free. The rock-fall-prevention products currently in widespread use in Georgia are less expensive initially, but require maintenance. So from the perspective of their life cycle costs, they impose a larger cost burden on the purchaser.

The Joint Venture intended to contrast its products with European manufacturers' products and increase the relevant local people's understanding of the technical features and product characteristics proposed by the Joint Venture through various promotional activities in Georgia and training program in Japan.

The Joint Venture explained the Japanese technology involved and MN's characteristics to the C/P through four promotional activities in Georgia and one training program in Japan. During the training program in Japan, an opportunity was provided for the C/P to gain actual experience in practical installation. It is understood that this training was quite beneficial, which not only improved understanding of the characteristics of the Japanese technology, but also supports good results at the time of practical installation. After completion of the installations, the Joint Venture set up inspection points for both the MN and European manufacturer's installation methods, and followed up four times in total over a year-long period. The follow-up results were reported to the C/P as part of the promotional activities in Georgia. As a result, they came to understand how well MN prevents rock falls. At the report meeting, the advantages of MN, specifically being maintenance-free from the perspective of lifecycle costs, were explained. Costs for both installation methods were calculated assuming they will be used for 26 years, and it was concluded that the MN product offers a 10% cost reduction compared with the European manufacturers' products. Tokyo Rope Manufacturing Co., Ltd. has developed new products, the use of which enables costs to be reduced by about 40% compared with the European manufacturers' products. The C/P expressed interest in these results, and initiated procedures to change the existing bidding standards, taking into consideration the technical data for Tokyo Rope Manufacturing Co., Ltd.'s new products.

Points to note for promoting business in Georgia through this project have also been clarified. Firstly, the national budget in Georgia is quite limited. Although, bidding is conducted, cheaper measures tend to be selected. Secondly, the C/P does not currently take preventative construction work into consideration, so no budget is provided until there has been a disaster. It can be said that these two issues must be resolved to develop future business.

Further discussions will be held regarding business development after this project based on the following three measures.

① Development based on Georgia's own budget

Bidding is conducted by the city governments regarding measures for rock falls and landslides. The Joint Venture prioritizes being awarded the project based on the national budget of Georgia. The C/P is currently in the process of revising the bidding criteria with respect to this project. The revisions have not yet been completed. While it has been decided to maintain the current price-based bidding system, the C/P is considering selection measures, which also takes into account the mechanical features of the proposed products (e.g., tensile strength, product life). Through the promotional activities in Georgia, additional projects with specific schedules have been introduced to the Joint Venture. We also will discuss the future bidding participation in those projects together with the local partner.

② Acquisition of Phase 2 of the East-West Highway Improvement Project

Meeting demand related to the East-West Highway Maintenance Project in Georgia that has been promoted by JICA was one of the pillars for business development for the Joint Venture from the beginning. It is understood that Phase 2 of the East-West Highway Maintenance Project is still under consideration by JICA, but when the project details are publically announced, presentations will be made again for the relevant parties to have Japanese technologies incorporated in the specifications based on the results of this project, and the Joint Venture plans to propose Japanese construction methods that are locally suitable.

③ Reinforcing competitiveness through newly developed products

Tokyo Rope Manufacturing Co., Ltd. has developed new next-generation products bearing in mind that lower priced products tend to be selected to minimize the initial investment in Georgia, which has been the bottleneck. The new products enable better reinforcement (high quality), durability (economical), and lightness (improved workability) than existing MN products. Also, the pricing system was reviewed and made closer to the easy-to-purchase price zone. The products will not only be promoted to the C/P, but also to RDMRDI and other city governments.

1.2. Project overview

Roadway disaster-prevention (countermeasures against rock falls) promotion project (Georgia)
Mitsui & Co., Ltd. and Tokyo Rope Manufacturing Co., Ltd.

Developmental needs in Georgia

- Risks of rock falls or landslides exist across about 15% of the national land area.
- Insufficient measures have been taken for areas at risk of rock falls, and damage as well as several fatalities have occurred due to rock falls and landslides, and direct damage of about 200~300 million yen has occurred.

Technologies and products of the proposing company

Product/technology name

Maintenance-free "Mighty Net" to prevent initiation of rock falls

Results expected from Georgian side

- Reduction in scale and frequency of disasters by promoting countermeasures for areas at risk of rock falls.
- Standardization of appropriate safety criteria for disaster prevention
- Improved safety awareness

Details of the promotional project

- Verification of superiority through trial installation of the product near where competitors' products are installed.
- Hold seminars to increase understanding about the concept of life cycle costs (LCC).
- Increase Georgian government's understanding regarding disaster-prevention standards and measures in Japan.

Project points

- Verification of effects through test installation, promotion of product characteristics
- Increase understanding of LCC concept

Results expected for Japanese company side

Current conditions

- There are no assessment standards for products to prevent rock falls, and understanding of the LCC concept is low, so differentiation from other countries' products is difficult.

Future

- Promoting safety/disaster-prevention products, including Mighty Net, by explaining products' superiority and LCC concept, and standardization of Japanese specifications
- Promoting technologies to neighboring countries and expansion of business opportunities

Chapter 2 Background to this project

2.1. Background to this project

Georgia is located between the Black Sea and Caspian Sea in the Caucasus. It was part of the former Soviet Union until independence was declared in April 1991. Its importance has recently grown as a logistics center because of its important geopolitical location, linking Europe and Asia, as well as Russia and the Middle East. Its national land area is 69,700 km2, which is about a fifth that of Japan, of which about 30,000 km2 is said to be used for agriculture. (The primary industries in Georgia are agriculture, mining, and food processing.)

The South Caucasus region, which includes Georgia, is considered to be at serious risk of natural disasters due to its complex geology, diverse geological formations, weather, and ground environment covered with plants. Natural disasters, such as earthquakes, landslides, mudflows, and flooding, have occurred not only in Georgia, but also in Azerbaijan and Armenia, causing widespread human suffering and extensive economic losses. Georgia is comprised of a number of rock types and geological structures. Landslides and rock falls often occur on steep slopes, which are mainly comprised of hard bedrock. On the other hand, landslides and mudflows occur in areas with soft geological conditions and areas with unstable rocks. According to the National Environment Agency of Georgia, about 40,000 km2 – accounting for about 60% of the national land area – is mountainous, including hazardous areas of various sizes with a risk of natural disasters. Landslides and rock falls comprise about 25% of such disasters. The number of disaster prone areas is about 53,000, or 10,000 km2 in terms of area. Although there are many dangerous areas in Georgia, the reality is that implementing countermeasures for those areas remains insufficient. Countermeasures have been implemented using a European manufacturer's safety products in Georgia, but additional maintenance costs are incurred, and congestion still occurs due to rock falls and the like, so the fundamental issue has not been solved. Also, the national budget for rock falls is limited, so lower priced products tend to be selected, with the result that maintenance costs increase.

The Joint Venture has been proposing designs and supplying materials for products manufactured by Tokyo Rope and proven in disaster-prevention locales in Japan, to other countries. The Joint Venture has been prioritizing expansion into CIS and Caucasus nations based on its successful experience in Russia and Kazakhstan. In 2014, the Joint Venture held discussions with relevant government officials from Tbilisi, Georgia, and explained the results and experience that have been accumulated and the features of Tokyo Rope Manufacturing Co., Ltd.'s products and technologies. The officials have expressed interest in the efforts of the Joint Venture, so we have recently decided to seek out business opportunities through this project.

At the same time, the Japanese government also suggests promoting disaster prevention based on experience and technology as a leading country in terms of disaster prevention as part of its "infrastructure export strategy". The Joint Venture aims to promote Japan's original concept, which differs from manufacturers mainly in Europe, through this project and considers contributions to improving the disaster-prevention functions of emerging countries, ensuring safety for companies who expand and start businesses overseas, and realizing people-related security to be in line with the Japanese government's policy. Expansion of Japanese companies into the CIS and Caucasus nations has been delayed compared with other developed countries, but it is understood that this project could be a breakthrough by bolstering local governments' understanding of Japanese technologies through this project.

2.2. Technologies to be promoted, and contribution prospects for development issues

2.2.1. Detail of technologies to be promoted

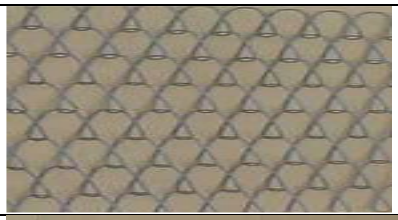
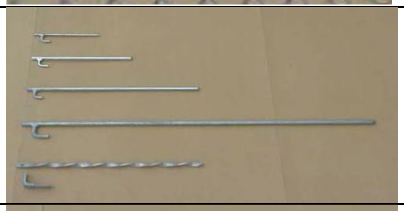
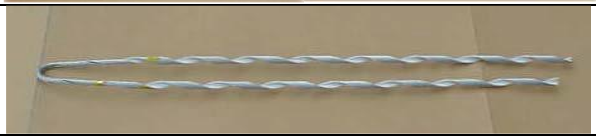
- Characteristics of technologies

The technology to be promoted by the Joint Venture through this project is “Mighty Net” (hereinafter, MN) manufactured by Tokyo Rope Manufacturing Co., Ltd. The purpose of installation of MN is to prevent rock falls, and the fact that it is maintenance-free is the main characteristic. The concept is fundamentally different from the mainstream method of “retaining fallen rocks, and directing them to the bottom of the slope” as adopted in Europe, and MN’s installation enables running costs to be reduced. This method does not require very strong materials. Combining a metal net whose thickness is appropriate to follow the natural) geological formations, sub anchors to secure it to the ground, anchors closely arranged at 2-meter intervals vertically and horizontally, and wires arranged at 2-meter intervals vertically and horizontally in the same way to prevent the rocks from falling from the installation zone. The characteristics of MN and the main roles of its components are described below.

Fig. 2-1 MN installations

- Stabilizes loose rocks on the slope. Flexible but very strong special metal netting (thick net) is secured to the slope to hold loose rocks that are scattered. This method prevents loose rocks from breaking free, and stabilizes the slope.
- Maintenance management is easy. Existing nets to protect against rock falls direct the rocks to fall down between the slope and rock net and prevent those rocks from directly hitting a road or structure below, so any rocks that accumulate at the bottom of the wire net need to be removed, but with MN method, there is no need to do that.
- Good for greenery. The thick netting closely installed on the slope reduces erosion of soil and sand, and also promotes restoration of nature on the slope by steadily encouraging seeds and roots, plant stocks, etc. to grow because soil and mulch readily accumulate within the thick netting.
- Suitable as groundwork for slope reinforcement. Can be used directly as groundwork materials, such as soil dressing and seeds spraying, mortar/concrete spraying, etc.
- Suitable for a wide range of conditions. Suitable for a variety of outdoor conditions as it can easily be installed.

Table 2-1 List of primary materials for MN

No.	Name	Role	Photo
1	Thick netting	Closely secured to the slope.	
2	Pin anchor	Fits thick netting and ropes into the slope.	
3	Band coil	Unifies thick netting and rope.	
4	Cement anchor	Fixes thick netting and rope.	
5	Cross-shaped anchor grip Cross-shaped grip	Unifies anchor and rope.	
6	Rope grip	Unifies rope and anchor.	

- Sales in Japan and overseas

  - Japan : About 17 million m^2 in total
  - Russia (Sochi) : 170,000 m^2
  - Russia (Vladivostok) : 10,000 m^2
  - Kazakhstan (Almaty) : 20,000 m^2

  Domestic share : 70%

(Two countries, namely Russia and Kazakhstan, are shown for overseas sales.)

- Technological safety

  - As regards the MN installation method, firstly select the unit weight of the target rock at risk of falling, slope inclination, and ground conditions to secure the anchors, conduct a structural calculation, and create the calculation sheet. Also select the model, anchor type and length, decide on the materials, and do the installation work as per the manual. There has never been an accident.

  - However, if the calculation sheet conditions are not followed, or installation is not performed appropriately, it may not be able to prevent rock slippage. When erosion of materials is likely due to salt damage near a coast or due to volcanic gas, the materials have shorter lifespans. In such cases, weather-resistant materials must be used.

- Comparison with competitive technologies in the target countries

  The competitor is Maccaferri (Italy). Nets to protect against rock falls manufactured by Maccaferri have been installed in Georgia, but maintenance, such as removing rocks, is required a number of times a year after suffering rock falls, which causes congestion due to traffic restrictions for such maintenance work. As mentioned earlier, the products delivered by Maccaferri "hold and guide fallen rocks to the bottom of the slope", so rocks accumulate at the bottom of the slope, damaging the metal nets, which then need to be replaced. On the other hand, MN installation prevents rock falls, which diminishes maintenance costs associated with the competitor's products and affects economic activities caused by congestion and environmental factors.

Fig. 2-2 Damage status of competitor's products

2.2.2. Contribution prospects to development issues

According to a survey by the Ministry of Environment and Natural Resources Protection, Georgia suffers 2.3 billion ~ 3.7 billion yen of direct damage a year from rock falls and landslides, and the subsequent affects on economic activities due to the resultant traffic problems in some areas. Also, although the numbers are small, some people lose their lives due to such damage every year. The purpose of MN as proposed by the Joint Venture is to prevent rock falls, as mentioned earlier, and it is expected this technology can reduce the human fatalities and injuries and indirect economic losses, such as property damage, that have been suffered by the country.

Chapter 3 Project Outline

3.1. Purpose and objectives of this project

3.1.1. Purpose of this project

① Promoting understanding of Tokyo Rope's unique technology "to prevent risks" and the utility of the product, typified by its maintenance-free characteristics.

② Promotion of MN and its technology.

③ Contribution to disaster-prevention and infrastructure business in Georgia.

3.1.2. Objectives of this project (Contribution to development issues in target countries, regions, and cities)

① Bolster safety awareness.

② Revision of bidding conditions based on the specification criteria for preventative construction work.

③ Minimizing scale and frequency of disasters through expansion of measures for rock-fall risk areas.

3.1.3. Objectives of this project (business phase)

① Promote discussions to amend the C/P bidding condition criteria by bolstering understanding of relevant city officials of the target country regarding the technology and product characteristics proposed by the Joint Venture through providing training programs in Japan and promotional activities in Georgia.

② Clarify differences in performance in comparison with European manufacturers' products by actually installing the netting system , prompting the officials to understand its utility and LCC, including management costs, thus leading to installation.

3.2. Implementation details of this project

3.2.1. Implementation system

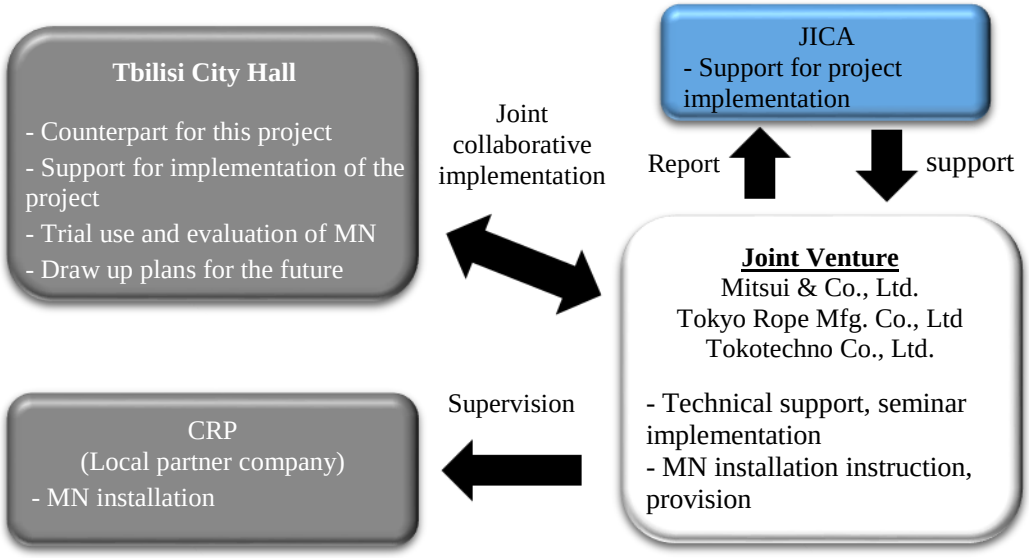


Fig. 3-1 Implementation system

3.2.2. Implementation details

Implementation details for this project are presented in Table 3-1.

Table 3-1. Outline of Implementation Details

#	Task	Implementation details	Objective
1	Confirmation of local needs	・Interviews with TCH, CRP, etc.	・Find out what type of installation needs currently exist. ・Select sites where benefits can be expected. ・Acquisition of new projects.
2	Promote understanding about the method	・Presentation based on track record and data about the construction method ・Training at Tokyo Rope's Head Office and Tsuchiura Plant ・Practical installation training	・Understand the benefits of MN installations. ・Learn about roles and the ways to use the materials and equipment. ・Output installation method through practical experience.
3	Selection of the construction company	・Confirm equipment owned	・Check whether the equipment owned by the selected construction company is sufficient for installation. ・Identify equipment that needs to be procured by the Joint Venture.
4	Understanding the importance of safety	・Training at Tokyo Rope's Head Office and Tsuchiura Plant	・Introduce rock fall cases in Japan to increase understanding about the necessity for preventive countermeasures.
5	Actual installation	・Lectures, actual installation work based on prior practical installation training.	・Successfully install MN within the deadline as per the procedures and manual. ・Understand the benefits of MN through practical installation.
6	Verification of superiority	・Conduct four follow-ups within this project period.	・Through comparison with competitor's products, verify superiority of MN's installation and improve C/P's understanding.
7	Report project results to C/P	・Report the results of this project to C/P. ・Presentation on LCC and new products	・Bolster C/P's understanding of technologies introduced ・Support for change of the bidding conditions (Disclosure of technical information for technology introduction.)
8	Change of bidding conditions	・Continue discussions on changing of the bidding conditions based on technical information about new products.	・(Outstanding issue) Future business development will be restricted if bidding conditions remain unchanged. ・(Solution) Disclose technical information needed for changes to bidding conditions. (Participate in bidding based on new conditions at earlier stage, and determine whether business can be developed or not.)

Chapter 4 Results of this project

4.1. 1st Promotional activities in Georgia

① Trial period: February 8~11, 2016 (actual operational days)

② Implementation details:

<Meeting with TCH>

- Conclusion of MOU to gain mutual understanding concerning installation through this project.

<Meeting with CRP>

- The products and MN method were explained prior to the second promotional activities in Georgia.
- Confirmation of conditions (Whether estimates were changed or not, whether approval for installation was acquired or not, equipment held and warehousing, were confirmed.)
- Negotiation for Construction and Service Agreement concluded between the Joint Venture and CRP.

<On-site Measurements>

- Collection of information to create schedule and drawings for the installation through measurements at the site.

<Meeting with RDMRDI>

- Promotion was implemented for RDMRDI to be awarded the project outside Tbilisi.

Fig. 4-1 Equipment held

Fig. 4-2 Taking measurements

4.2. 1st Training program in Japan

(1) Outline

① Program period: April 18~21, 2016 (Actual operational days)

② Implementation details: Introduction of countermeasures against rock falls in Japan, and bolstering understanding about the MN method through actual installation

③ List of participants:

Table 4-2. List of participants

No.	Division	Name (title)
1	Tbilisi City Hall	Ms. Irina Tcheishvili (First Deputy Head of Department)
2	Tbilisi City Hall	Mr. Giorgi Khuroshvili (Senior Officer)
3	Caucasus Road Project LTD	Mr. Levan Trap aidze (Director)
4	Caucasus Road Project LTD	Mr. Ramaz Erikashvili (Project Manager)

④ Curriculum, schedule

Table 4-1. Curriculum, schedule

Date	Hour	Location	Description
2016/4/17	AM	Haneda Airport	Arrive in Japan
2016/4/18	AM	Head office of Tokyo Rope Manufacturing Co., Ltd.	Corporate explanation of Tokyo Rope Manufacturing Co., Ltd. Introduction of countermeasures against rock falls in Japan
	PM	Head office of Tokyo Rope Manufacturing Co., Ltd.	Explanation of the MN method Explanation of the installation machinery
2016/4/19	AM	Meeting room, Tsuchiura Plant, Tokyo Rope Manufacturing Co., Ltd.	Introduction to the plant, lecture explanation of components
	PM	Tsuchiura Plant, Tokyo Rope Manufacturing Co., Ltd.	On-site inspection of wire rope manufacturing Confirmation of actual MN components and storage conditions
		Wire netting manufacturing company	Inspection of the wire netting manufacturing site
2016/4/20	AM	Unidentified quarry	MN installation inspection
	PM	Unidentified quarry	MN installation training
2016/4/21	AM	Embassy of Georgia in Japan	Meeting with H. E. Mr. Levan Tsintsadze (Ambassador Extraordinary and Plenipotentiary of Georgia)
2016/4/22	AM	Haneda Airport	Departure from Japan

(2) Details

① Introduction of countermeasures against rock falls in Japan

[About rock falls] This refers to the “phenomenon whereby boulders or stones break away from the base rock, or rocks and pebbles in the gravel layer are loosened and fall.” Also, if the number (scale) of rocks is small enough to be expressed numerically, it is described as a “rockfall”, whereas larger amounts expressed by volume are called “bedrock collapse”. Rock falls are categorized as “fall-off, peel, and other types” in Japan, and accurate categorization is important when considering preventative countermeasures. The site at which MN is installed on Tamarashvili Street for this project is categorized as a peel type. There is a tendency for rockfall disasters to occur due to overlapping factors, such as rain, storms, and earthquakes. Also, forecasting an occurrence is rather difficult due to a lack of numeric standards (e.g., rainfall, river flow rates), and the risk of material damage or failure is high.

[Types of countermeasures to prevent rockfalls] There are the following two types of facility-based countermeasures.

- Stand-by installation (Protection): Installed by the road or mid slope. Maintenance is required for this method.
- Preventative construction: Installed at the source of the risk. Maintenance is not required for this method.

* This measure can ease the need for traffic restrictions. For example, it eliminates the need to impose traffic restrictions due to rainfall, or detours/alternate routes.

[Requirements for rockfall countermeasure work] The following three points are required for countermeasures.

- Rockfall prevention: The installation should be sufficiently strong to retain rockfalls, even when they occur repeatedly.
- Economical: The strength and retention values should be neither too weak nor too strong.
- Must not damage the landscape.

[Countermeasures]

- Investigation and analysis of the current status
  Investigate the factors, frequency, and scale based on existing documentation (e.g., measurement data) and on-site investigations (slope surveys). Primary investigation items are "slope status, inclination, rockfall size, rockfall position, stability, countermeasure range, and extent to which existing installation is under stress."
- Discussion and determination of objective policy
  Confirm targets to be protected (e.g., human life, houses, vehicles, railways, etc.), and select suitable countermeasures after calculating the assumed external force received and held by the structure based on the geographical formation.
- Maintenance after installation of countermeasures
  It is assumed that slope and rockfall countermeasures may change over time, such as due to weathering and vegetation, which may impose additional risks to road safety. Therefore, post-installation maintenance is crucial. In particular, care must be taken during extreme weather.
- The peripheral areas around the countermeasure installation site were investigated and analyzed (Return to procedure No. 2.)

Fig. 4-3 Lecture explanations (1)

② Explanation of MN components, inspection of Tsuchiura plant

MN components were explained following an explanatory overview of the Tsuchiura plant of Tokyo Rope Manufacturing Co., Ltd. The wire rope manufacturing site was viewed at the Tsuchiura plant. Tokyo Rope Manufacturing Co., Ltd. boasts a high share in Japan, notably for elevators, construction machines, and the fishery and steel industries, thanks to its high technical capabilities. At the Tsuchiura plant, wire rope is manufactured by drawing, heat treatment and twisting of steel wire, etc. Products are inspected, and only products that satisfy the quality standards are shipped to the Japanese market and for export. There is a research facilities within the Tsuchiura plant. Highly functional and added-value products have been developed at the research facilities. The warehouse for storing MN components before shipping was also checked, and its storage condition maintained in an orderly manner was confirmed.

Fig. 4-4 Lecture explanations (2)

③ Inspection of an wire netting manufacturing company

A wire netting manufacturing company subcontracted by Tokyo Rope Manufacturing Co., Ltd. was visited, and a plant tour at the manufacturing plant was conducted. Thick netting for MN is manufactured by this company.

④ MN installation training

In order to confirm what was learned about the characteristics and functions of the MN components through the lecture explanations and plant tour on 18th and 19th, a two-meter by two-meter installation was actually performed at the model site.

Fig. 4-5 Installation training

⑤ Meeting with H. E. Mr. Levan Tsintsadze, Ambassador of Georgia in Japan

The Embassy of Georgia in Japan was visited to provide details on the project's progress. The Joint Venture explained that four people from Georgia have been studying Tokyo Rope's technologies and products, including on-site inspections in Japan under the Collaboration Program with the Private Sector for

Disseminating Japanese Technologies, and MN has been installed since May, and after periodic follow-ups, the program is expected to be completed at the end of April 2017. The Ambassador expressed his hope that Japanese companies' disaster countermeasures would actively be promoted, and the Joint Venture advised about the ongoing policy to promote the program in the disaster-prevention field.

Fig. 4-6 Meeting with H. E. Ambassador Tsintsadze

4.3. 2nd Promotional activity in Georgia

① Travel period: May 23~27, 2016 (actual operational days)

② Implementation details: Support of MN installation for Caucasus Road Project Ltd. (hereinafter "CRP") by Tokyo Rope Manufacturing Co., Ltd. and Tokotechno Co., Ltd.

Fig. 4-7 Installation

4.4. 3rd Promotional activity in Georgia

(1) Outline

① Travel period: July 6~12, 2016 (actual operational days)

② Implementation details:

- Site investigation prior to follow-up.
- Participation in the completion ceremony
- Deliberations on the Amendment Agreement with CRP

(2) Details

① Confirmation of articles

- CRP warehouse was visited and articles used for installation were confirmed. Details of the remaining MN components after installation were also confirmed. All articles and components were tidily stored.

Fig. 4-8 Storage status of the materials/equipment procured

② Follow-up

- Current status was confirmed upon completion of the installation. Additionally, plates with a Japanese flag and JICA logo were attached to the MN.
- The first follow-up was conducted in accordance with the prescribed method.

③ Completion ceremony

- The ceremony was completed successfully by building consensus in advance with TCH/Protocol service. Not only did the Mayor of Tbilisi and RDMRDI participate in the completion ceremony, but it was also attended by H.E., The Ambassador of Japan in Georgia and parties involved with JICA, making this the perfect opportunity to promote the project. The Mayor of Tbilisi expressed his interest in the environmental technology of Tokyo Rope Manufacturing Co., Ltd., and so the Joint Venture plans to submit additional proposals.


Fig. 4-9 Completion ceremony

④ Meeting with CRP

- Through the prior deliberations with CRP/Mr. Levan (Director) the Amendment Agreement was signed with him, which involves the amendment to the previously agreed amount stipulated in the Construction and Service Agreement.

4.5. Follow-up

(1) Objective

The main competitor, Maccaferri, has already been making inroads into Georgia. We sought to prove the superiority of MN through this project by comparing it with the Maccaferri product.

(2) Observation period and method

① The observation period is as follows.

1st follow-up: July 7, 2016

2nd follow-up: September 12, 2016

3rd follow-up: December 9, 2016

4th follow-up: January 23, 2017

② Observation method:

[MN method]

Specify measurement points at the four corners and center for this installation method (Width: 20 m x Height: 42 m). See Fig. 4-10 for the measurement points. Measure the distance for each of the two sides in the width direction (X1, X2), the two sides in the height direction (Y1, Y2), and the four lines to the center on the diagonal from the four corners (Z1~Z4), and the distance between the ground and wire netting at the five clipping points on the diagonal lines (C1~C5).

Significant displacement on each side, or any expansion of the distance between each of the points and the ground indicates that rocks have dislodged and accumulated under the netting. It is forecast that this requires maintenance, so no expansion is better.

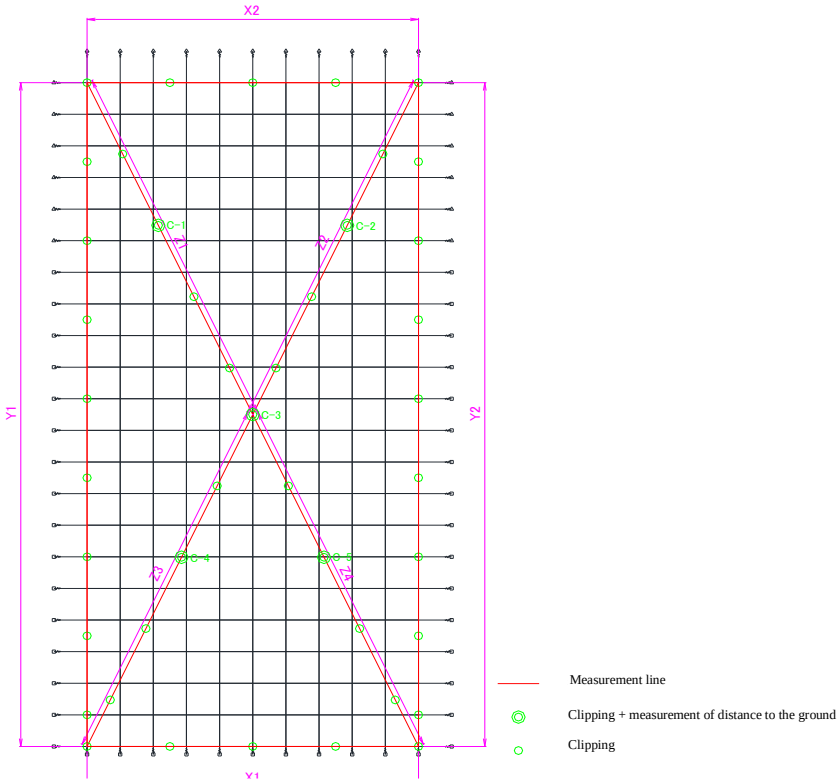


Fig. 4-10 Measurement points for MN method

[Existing method (Maccaferri)]

Whereas the objective of MN is to prevent any rockfall, the characteristic of this method is to allow the rocks to fall, but catch them in the wire netting before they hit the road, and to direct any fallen rocks to the bottom of the slope. However, in Maccaferri method, the fallen rocks accumulate in the middle or bottom of the wire netting or at the bottom of the slope. This necessitates maintenance work to remove the fallen rocks and/or replace the netting due to damage to the component due to the force felt when the rocks fell.

This has already been installed next to the MN installed by the Joint Venture, and measurement points numbered 1-48 were specified. (See Fig. 4-11) Follow-up is required to check the amount of rocks/stones accumulated at the bottom of the slope, and to assess whether rocks have fallen, and whether maintenance is required.

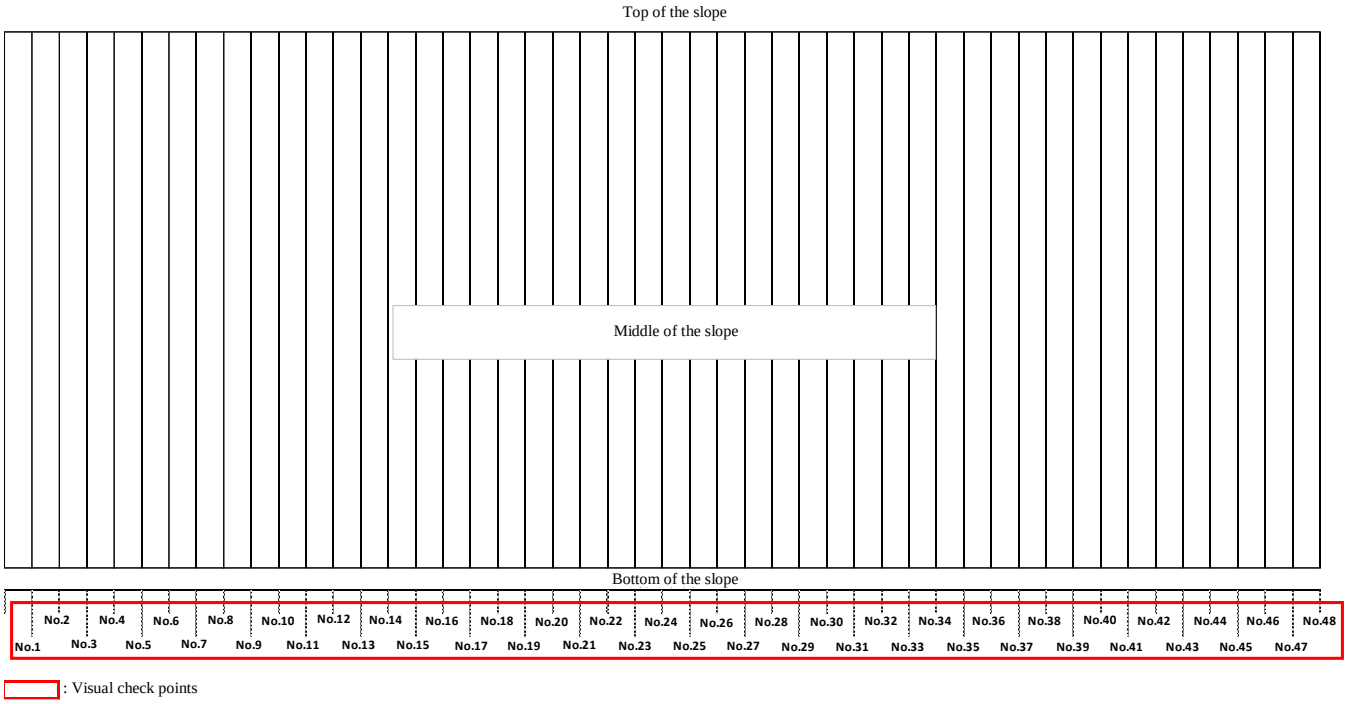


Fig. 4-11 Measurement points for existing method

(3) Results

Measurements were taken four times in total from July 7, 2016 to January 23, 2017. Based on this data, although the measurement tolerance is within 30 mm at each point, no change in thick netting (change of 500 mm or more in terms of distance, or 100 mm or larger in terms of displacement) or broken netting was observed due to dislodging of loose rocks, and so on.

Also, for the Maccafferri method that was adopted, rocks did not accumulate at the bottom inside the net from measurement points numbered 4 to 13 when the first follow-up was held (on July 9), but when the third follow-up was conducted (December 7), rocks mainly the size of a fist had accumulated inside the wire netting; and a number of rocks up to about the size of a human head were seen below the net, and it was observed that multiple boulders had passed through the netting. This may be the result of rocks that had

fallen from higher up the slope before becoming temporarily trapped inside the net, or escaped from the bottom of the net due to the inertia of their fall. Also, for measurement points numbered 14 to 35, stones were seen at the bottom inside the net when the first follow-up was conducted (on July 9), but at the second follow-up (September 12), there were none found, and when the third follow-up was conducted (December 7), fresh stones had accumulated, and there were some larger rocks below the net; upon the fourth follow-up (January 23) the number of stones further increased. This indicates that the stones and rocks that accumulated below the net as of July 9 were removed and part of the wire net was replaced before September 12, but on/after September 12, rockfalls started accumulating again inside the net, and some rocks escaped below the net. It was also confirmed that some anchors that hold the bottom of the net were turned around at measurement point No. 1 as of September 12 compared with its position as of February 8, prior to installation.

On the other hand, in the case of MN, it was confirmed that no stones accumulated inside the net, and no rocks escaped from the bottom of the net at all throughout the follow-up period.

Additionally, the site (except for the foot of the slope) is a steep slope, so basically, rocks cannot be artificially placed or removed.

(4) Consideration and conclusion

The existing method of simply installing a wire net as cover is insufficient if loose rocks of between 50 centimeters to one meter fall, and the protective netting itself is damaged. In fact, the accumulation of rocks negatively affected the transport facilities, and the risk of causing a serious disaster for the protection target is also high. As demonstrated through this installation, MN prevented rockfalls by trapping a similar size of loose rocks on the slope using the thick netting, wire ropes, and anchors. This verified the following differences in concepts.

① Thirteen anchors are used for MN compared with one anchor used for the existing method.

② Anchors are only positioned at the upper part for the existing method, but for MN, they are arranged every two meters vertically and horizontally.

③ As regards countermeasure scheme for rockfalls, loose rocks are directed to the foot of the slope in the existing method, but MN secures them in their original position by closely attaching anchors and ropes.

As a result, it was confirmed that MN prevents disasters caused by rockfalls.

Furthermore, in Georgia, there are many unconsolidated lime-rich rock layers that are comprised of fine grains of carbonate and clay particles known as maar, and numerous weathered rock strata can be seen from the road. When they break up, a number of weathered pieces get dislodged together rather than a single piece falling. In Georgia, only the existing method that simply covers the slope with a wire net has been used as a countermeasure, but when rockfalls of weathered rock accumulate, the wire net swells significantly, and the load on each part of the net increases, leading to increased damage.

In other words, multiple instances of maintenance are required each year for the existing method, and considerable labor and running costs are needed to clear away stones and rocks that accumulate within and below the net, as well as maintenance to replace any wire netting that has been damaged. If maintenance is insufficient, more fallen rocks accumulate, gradually reducing the net's functionality. Eventually, the structure itself will collapse, causing a major disaster that can affect passengers or vehicles travelling along the bypass adjacent to the slope. When the status of the displaced anchors that were found in the recent follow-up is analyzed, it seems they were displaced due to the impact of rocks that had fallen from further up the slope. If loose rocks or boulders are large, there are concerns about whether the structure itself would survive or not.

It was observed from these follow-ups that that MN is reliably stable on the ground, because the structure itself and surface of the slope were not displaced at all. Thus, we assert that maintenance is not required after an MN installation, and it is superior to the existing method in terms of economy and safety.

4.6. 4th Promotional activity in Georgia

(1) Outline

① Travel period: May 9~14, 2017 (actual operational days)

② Implementation details:

- Feedback on follow-up results
- Promotion of new product (High Strength Net)
- Explanation on superiority of life-cycle costs ("LCC")
- Understanding the national and municipal budgets of Georgia
- Conclusion of the certificate of handover

(2) Details

① Meeting with TCH; May 10, 2017 (Wednesday)

Meeting with: TCH Municipal Improvement Department/Mr. Givi Kublashvili (Head), Mr. Giorgi, and two others

<Feedback on follow-up>

- Observation results were explained by the Joint Venture. TCH's reactions were as follows.
  - We understand that Japanese (Tokyo Rope Manufacturing Co., Ltd.) technologies are effective. However, the price is high, which is a concern. It was good that the recent installation was within JICA's budget, but TCH's budget is quite limited. Therefore, we look forward to the launch of new products.
  - We are planning to invite bids for two 3,000 m^2 projects following this project (based on the city's own budget.) We hope to secure a budget of about 18 million yen. (This amount is estimated as the budget per 3,000 m^2 project.)

<Introduction of new product (High Strength Net)>

- Tokyo Rope Manufacturing Co., Ltd. used some samples to explain about their new product. TCH's comments are as follows.
  - The fact that the new product enables the LCC to be reduced, that initial cost is low, and that it can easily be installed is highly evaluated.
  - We (C/P and Joint Venture) stepped forward. As a city, we consider setting future bidding conditions based on the presentation of the new product from the Japan side. We are continuously updating the bidding conditions. Although Tokyo Rope's product name cannot be included, bidding conditions are being prepared such that the adopted products must be equivalent to the superior Japanese items. We request the Joint Venture to provide us with more technological specifications about the new product for us to prepare the bidding conditions.
  - Any decision on adoption will not to be made solely on the bidding price. It is intended that the decision will be made from multiple perspectives, including product life and maintenance requirements.
  - Companies outside of Georgia can bid, but it would be better if you could partner with a local Georgian company for the application. (Background: Local companies understand Georgian commercial customs and culture.) Once a partnership is established, it is recommended to negotiate the installation costs to be as low as possible.
  - We will also consider the possibility of customs duty exemptions for future bidding. (Any tax exemption would have a considerable effect on the Joint Venture.)

<About National and Municipal Budgets>

- The 2017 national budget for Georgia is about 419.6 billion yen. Of which, RDMRDI's budget is about 57.9 billion yen.
- TCH's 2017 budget is about 36.8 billion yen. The budget of the Municipal Improvement Department, which acts as the C/P, is about 13.8 billion yen.
- Although the C/P has some budget, the amount allocated for preventative measures is not specified. The reason for that is the long-established mindset in Georgia of taking measures after a disaster has occurred. Unfortunately, there is no budget for preventative measures.

<Areas requiring countermeasures against rockfalls>

- The National Environmental Agency (NEA), and the Ministry of Environment and Natural Resources Protection of Georgia (MOE), were introduced by the C/P as organizations that draft reports regarding rockfalls, landslides, etc. Ms. Irina has a friendship with a representative from the NEA. We plan to visit both the NEA and MOE with her support the next time we visit Georgia.

<Possibilities for Japanese ODA>

- Although the C/P has expressed interest, support is likely to be provided in the form of an ODA loan, which is financial assistance with a repayment obligation (not government grants), and that seems to have become a bottleneck. Currently, past loans still remain, so C/P is reluctant to have new loans.

<Certificate of hand over>

- Original signed by Mr. Kublashvili has been obtained.

Fig. 4-12 Meeting

<Others>

- Rockfalls along the Tamarashivili Street are cleared by Maccaferri. (Cost is not paid by TCH.) However, the costs for some other places are paid by the city. Who covers the cost depends on the contract details.

Fig. 4-13 Status of installed measures

② Meeting with CRP (May 11, 2017 (Thursday))

Meeting with: CRP Mr. Levan (Owner), Mr. Ramaz (Project Manager)

<Feedback from follow-ups and introduction of new product (High Strength Net)>

- Observation results were explained by the Joint Venture. CRP commented, "We are pleased to be able to demonstrate the superiority of Tokyo Rope's products, thanks to the appropriate supervision."
- Tokyo Rope Manufacturing Co., Ltd. used samples to explain the new product. CRP's comments are as follows.
  - The main benefits of the new product is that its wire is five times as strong, but only half the weight. These benefits can be taken advantage of anywhere.
  - The anchor diameter is changed from 22 mm to 25 mm, but the number of anchors required can be reduced, which is another benefit (because the spacing can be changed from 2x2 to 4x4 meters.)

<About LCC>

- The Joint Venture explained the superiority in terms of LCC compared with Maccaferri. CRP's comments are as follows.
  - Municipal governments in Georgia tend to select measures from a short-term perspective, but we hope they will adopt a longer-term perspective.

- From an LCC perspective, advantages compared with Maccaferri's product will become evident from the 13th year, but bearing in mind that the former administration was in place for nine years, it is unclear whether the current government takes a longer-term perspective.
- (Regarding our question, "If the new product is launched, can it be competitive in Georgia?") The response was, "If a long-term perspective would be taken, it could be, but it all depends on the municipal governments' concept and policy.

Chapter 5 Summary of this project (Evaluation for implementation results)

5.1. Results of this project (Contribution to the target country, region, and city)

① Through the training program in Japan and promotional activities in Georgia, the superiority of Japanese technologies was explained, and we increased their awareness that disasters can be prevented by implementing safety measures.

② Based on the above experiences, the C/P understood the characteristics and necessity for preventative installation, and decided to revise the current bidding conditions accordingly.

5.2. Results of this project (business phase), outstanding issues, and solution policy

The results of this project, outstanding issues, and how to resolve them are presented in Table 5-1.

Table 5-1 Results of this project, outstanding issues, and solutions

#	Tasks	Activity plan and results					Achievement status and evaluation		Outstanding issues and solution policy
		1st (activity in Georgia)	1st (Training in Japan)	2nd (activity in Georgia)	3rd (activity in Georgia)	4th (activity in Georgia)			
1	Confirmation of needs in Georgia						Outstanding issues	・C/P's current status was understood, and a relationship that allows smooth communicate was built.	・(Outstanding issue (1)) Although C/P enhanced their understanding of the superiority of Japanese technologies and LCC, the national budget remains quite limited, so inexpensive materials tend to be selected. ・(Outstanding issue (2)) Budget is not currently allocated for disaster-prevention measures due to the lack of mindset about such countermeasures. ・(Outstanding issue (3)) Revision of C/P's bidding standards has not been completed. ・(Solution (1)) Winning tender based on national budget of Georgia once revision of C/P's bidding standards is completed. ・(Solution (2)) Use of ODA.
2	Promote understanding regarding the installation method						Completed	・C/P increased its understanding through the training program in Japan and promotional activities in Georgia.	・Nothing in particular

3	Selection of construction company					Completed	・After selection, installation work will commence.	・Nothing in particular
4	Understanding of importance of safety measures					Completed	・Understanding was enhanced by the training program in Japan.	・Nothing in particular
5	Actual installation					Completed	・Installation completed safely.	・Nothing in particular
6	Verification of superiority					Completed	・Follow up four times within the project period.	・Nothing in particular
7	Report results for this project to C/P					Completed	・Presentations on the results of this project, LCC, and new product were made.	・Nothing in particular
8	Change in bidding conditions					Outstanding issues	・Deliberation for change of bidding conditions continues based on the technological information regarding new product.	・(Outstanding issue (4)) If bidding conditions are not changed, future business development will be limited. ・(Solution (3)) Disclose technological information required to change bidding conditions. (Participate in the tender related to new conditions at an earlier stage, and determine whether business can be developed or not.)

5.2.1. Results and issues for this project (business phase)

Through continued explanation about Japanese technology, MN, and the training program in Japan, TCH and RDMRDI increased their understanding of the Japanese technology and features of MN. Also, the MN installation method that was learned through the training program in Japan could be tried out through actual field installations. This result means that the Joint Venture shares information with Georgian officials to promote business and can move on to the next measure, which is a big step forward. Also, the superiority of the MN method in terms of economy and safety was verified through comparison with the existing method (Maccaferri's) through follow-up and estimation of life cycle cost. These efforts helped C/P understand the advantages of adopting Japanese technologies.

Specifically, through this project, the Joint Venture received requests from TCH and RDMRDI for advice, proposals, and estimates regarding countermeasures against rockfalls and landslides. In this regard, this project was appropriately evaluated, which is a great result. However, although the Joint Venture specifically measured the sites for the inquired cases, created designs, and presented cost estimates, eventually for all cases, another proposal (i.e., shotcrete) was selected, or the countermeasure itself was postponed because the budget for countermeasures against rockfalls and landslides was limited. It was found that TCH and RDMRDI tend to select lower cost products and measures due to their limited budget, although they understand the features of Tokyo Rope's products. It is thought that this tendency persists solely because of the lack of a mindset about preventative measures.

What the Joint Venture should do is to continue to explain the superiority of Japanese technologies from the perspective of running costs regarding the advantages of preventative measures to influence them to change their mindset. Fortunately, TCH has started to revise the bidding standards through this project, and it is thought their way of thinking is changing. The Joint Venture is requested by TCH to disclose information about the mechanical characteristics (tensile strength, corrosion resistance, strand diameter) of the new product developed by Tokyo Rope Manufacturing Co., Ltd., and since reflection in the bidding standards is under discussion at TCH, it is important that we keep promoting our product. The Joint Venture is determined to continue providing the necessary information to urge TCH to implement countermeasures against disasters from a long-term perspective.

TCH already has specific field projects to be announced after revising the bidding standards, and the Joint Venture plans to participate in the bid together with CRP, which is anticipated to be the local partner.

However, in promoting the above measures, the issue of Georgia's limited national budget cannot be underestimated. We must be aware of the reality that business development may be setback because of that. In addition to pursuing business development based on the national budget of Georgia, the Joint Venture aims to be awarded the "East-West Highway Improvement Project" Phase 2.

Chapter 6 Business development plan after implementation of this project

6.1. Business objectives and goals

6.1.1. Expected results through business (Contribution to economic development for target country etc.)

As mentioned above, although there are many hazardous areas in Georgia, the process of handling such areas is lagging. The municipal governments in Georgia tried measures using a European manufacturer's safety protective product, but fundamental issues, such as additional maintenance costs and congestion caused by rockfalls are unresolved. We believe that we can contribute to enhancing infrastructural improvements in Georgia by expanding sales of Tokyo Rope's products as C/P now better understands the importance of disaster-preventative installations through this project.

6.1.2. Expected results through business (Business phase)

It was confirmed that about 100,000 m^2 just within the jurisdiction of Tbilisi City is at high risk of rockfalls, as per the following Table 6-1, during discussions with TCH. Capturing this demand is expected to generate nearly 600 million yen in sales for Tokyo Rope products. Additionally, there are about 53,000 sites with a high risk of rockfalls or landslides, etc., totaling some 10,000 km^2 throughout Georgia. Meeting this demand is also within the Joint Venture's ambit. However, it must be noted that no budget has been allocated for preventative measures for areas where a disaster has not yet occurred. In Georgia, the necessity of implementing countermeasures are discussed only after a disaster has taken place, then countermeasures are determined and budget is allocated, and bidding is conducted. We will continuously request the officials of the municipal governments in Georgia to continue their efforts to secure a sufficient allocation of national budget for disaster-preventative measures, and also intend to request municipal governments to implement tenders for replacement of the product for the sites where the European manufacturers' products are not demonstrating its expected efficacy. .

Table 6-1

1	Lado Asatiani	1,250	m^2
2	Saburtalu area	45,000	m^2
3	Around the Queen Tamara Bridge	4,840	m^2
4	Kostava Street	2,500	m^2
5	Tamarashvili Street	6,000	m^2
6	Ponichala area near the airport	35,000	m^2
Total		94,590	m^2

6.2. Business development plan

6.2.1. Business overview

The Joint Venture's business development plan focuses on the following three points.

(1) Development based on the national budget of Georgia

Bidding for countermeasures against rockfalls and landslides is normally announced via a site called Digital Market by the municipal governments. The Joint Venture will prioritize winning the project based on the national budget of Georgia. TCH has not yet completed revision of the bidding standards, but is considering the adoption of new measures bearing in mind not only price – as is done currently – but also the products' mechanical characteristics. The Joint Venture is requested to submit technical data for proposed products and anticipates a greater possibility of being selected through bidding following such revision than before the start of this project.

We would like to receive advice on the limited national budget from officials of the municipal governments of Georgia based on the results of this project. The Joint Venture held a meeting with the Embassy of Georgia in Japan in May 2017, and explained that future business development under the current limited national budget of Georgia is difficult. The project results and the status of the Joint Venture are currently informed from the Embassy of Georgia in Japan to officials in their country. Future actions will be discussed as soon as feedback is received.

(2) Winning JICA's project to which Japanese government-backed yen loan may be provided

The Joint Venture has been considering from the initial stage how to secure the demand related to the "East-West Highway Improvement Project" in Georgia that has been promoted by JICA as a pillar of their business development. It is planned to make another presentation that includes Japanese technologies to the parties concerned based on the results of this project once the "East-West Highway Improvement Project" Phase 2 materializes.

(3) Strengthening competitiveness for newly developed products

In order to develop their business, Tokyo Rope Manufacturing Co., Ltd. developed a new next-generation product (High Strength Net) in order to address the bottleneck for initial investment in Georgia that cheaper products tend to be selected. The new product enables increased strength (high quality), higher durability (economy), and reduced weight (easier installation) compared with the existing MN. Pricing is also under review to be within an affordable range. At this stage, High Strength Net unit price is about US$40 less per square meter than the existing MN.

6.2.2. Business implementation system

The Joint Venture will negotiate with the clients, such as TCH and RDMRDI, and discuss the actual details of the potential projects. It is judged that CRP, which was selected for this project, is the best local private business partner in terms of installation skill, experience, and size. In fact, CRP understands MN through the training program in Japan, and having alpinists with installation experience is advantageous.

It is currently assumed that in terms of value chain, the supply is assumed to be sourced from the Japanese and Russian plants of Tokyo Rope Manufacturing Co., Ltd., and local production will be discussed at a later stage.

(Shifting to local production quickly will be difficult when considering how limited the national budget of Georgia is.)

6.2.3. Business development schedule

<Latter half of Fiscal 2017>

The Joint Venture promoted its new improved yet cheaper next-generation product (High Strength Net) to TCH during its fourth promotional activity in Georgia. TCH is currently revising the bidding standards based on the results of this project. As soon as the revisions are complete, we plan to tender a bid together with CRP. (The specific sites have already been confirmed during the fourth promotional activity in Georgia.) The new next-generation product has not yet been promoted to RDMRDI. We intend to make a report RDMRDI on this project, describe the LCC, and also explain the new product during the next visit to Georgia.

At the same time, the necessity to increase the national budget must still continue to be explained to TCH and RDMRDI, and once the budget is increased, local production can be discussed. In this case, it is planned to strengthen price competitiveness for products by limiting the amount of capital investment by making a leasing contract for equipment via Mitsui & Co., Ltd.

<From Fiscal 2018>

We will continue to participate in the bidding based on the budget of the municipal governments and consider on-site measurements toward being awarded the “East-West Highway Improvement Project” Phase 2.

6.2.4. Status of competition

The competitor is Maccaferri, which is already in the market. Maccaferri stocks semi-finished products in Georgia and sells them after local processing. However, as mentioned already, the product concepts of Maccaferri and Tokyo Rope Manufacturing Co., Ltd. are fundamentally different. There are few components in the coverage currently extensively sold by Maccaferri. As the result, the product is cheaper, while installation is simple, which are its main characteristics. The Joint Venture estimates that MN can reduce overall costs by about 10% compared with the European manufacturer’s product, and the latest product can reduce costs by about 40%, assuming each product has a life of 26 years.

6.2.5. Business development issues and solution policy

The main issue is the limited national budget for countermeasures against rockfalls and landslides. As a result, municipal governments have to select the cheaper product, even though that leads to increased costs overall. Also, there is no mindset for disaster-preventative installations, and thus no budget is allocated for that. No budget is allocated until a disaster occurs, so their mindset needs to be changed.

It is thought that one solution is learning correct safety measures and revising the bidding standards for the selection of appropriate products.

6.2.6. Anticipated risks for business development and their countermeasures

[Business phase] The competitors are developing products copied from Tokyo Rope Manufacturing Co., Ltd.'s. The Joint Venture has already developed business in Russia. Copies of Tokyo Rope Manufacturing Co., Ltd.'s products have recently been increasing. In other words, export of imitations from Russia is another risk. Tokyo Rope Manufacturing Co., Ltd. applied for patents regarding the components of the new product in an effort to eliminate such copying.

[Social phase] One risk that is recognized in the country is that South Ossetia and Abkhazia both claim to be separate and independent. In business development, it is basically planned not to undertake any sales activity in those areas.

6.3. Potential for cooperation with ODA project

6.3.1. Necessity for collaborative project

As stated regarding issues in Georgia, the national budget is quite limited, and appropriate measures that should, under normal circumstances, be taken for areas requiring protective countermeasures against rockfalls and landslides, have not in fact been taken. Old buildings from the former Soviet Union era exist in places, and the effect of a natural disaster cannot be underestimated. Georgia is positioned as an important logistics route. It is certain that Japanese governmental assistance would support the resolution of the above issues, and it is hoped to protect the safety of citizens in Georgia as a result.

6.3.2. Assumed business scheme

The Joint Venture hopes to be part of the "East-West Highway Improvement Project" Phase 2 supported by a Japanese government-backed yen loan that is under consideration by JICA.

6.3.3. Specific details of the collaborative business

The zone between Argveta and Dzirula (17.2 km) (in Imereti Province) under consideration by JICA for the "East-West Highway Improvement Project" Phase 2 is along a narrow corridor in the mountains. We understand that appropriate measures, such as countermeasures against rockfalls and landslides, need to be taken to improve road safety, and will strive hard to promote unique Japanese technology through this project.