Republic of North Macedonia
Crisis Management Center

The Project on Capacity Building for Ecosystem Based Disaster Risk Reduction (Eco-DRR) through Sustainable Forest Management in North Macedonia (Project Eco-DRR in North Macedonia)

Project Completion Report

December 2023

Japan International Cooperation Agency (JICA)

Asia Air Survey Co., Ltd.
Kokusai Kogyo Co., Ltd.

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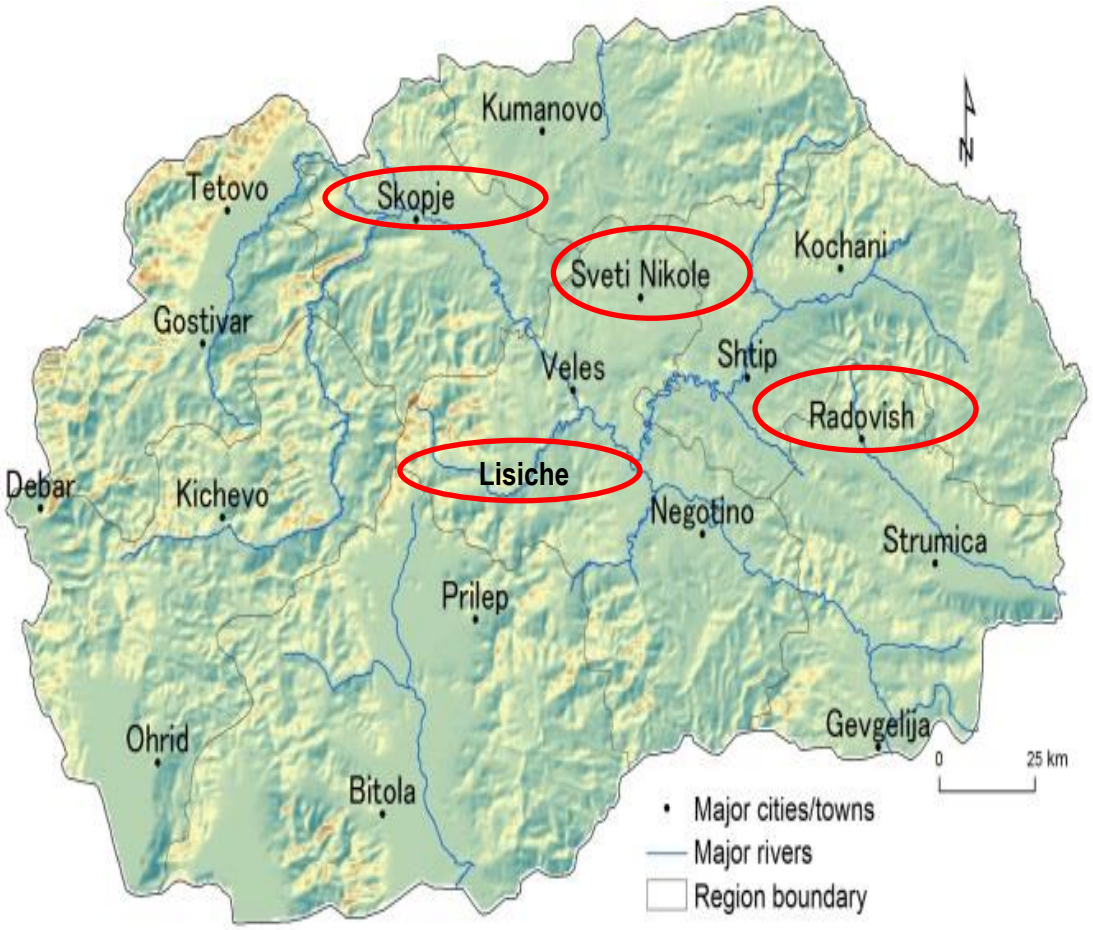
Abbreviations

ADAPT	Nature-based solutions for resilient societies in the Western Balkans
AI	Artificial Intelligence
AREC	Agency For Real Estate Cadastre
AWS	Automatic Weather Station
CMC	Crisis Management Center
CMS	Crisis Management System
COVID-19	Coronavirus Disease 2019
C/P	Counterpart
DB	Database
DEM	Digital Elevation Model
DRAM	Disaster Risk Assessment and Mapping
DTM	Digital Terrain Model
Eco-DRR	Ecosystem-based Disaster Risk Reduction
EPM	Erosion Potential Model
EU	European Union
FA	Forest Agency
FAO	Food and Agriculture Organization
FMU	Forest Management Unit
GCF	Green Climate Fund
GFIS	Geographical Forest Information System
GIS	Geographic Information System
HMS	Hydrometeorological Service
HP	Homepage
ID	Identification
IoU	Intersection over Union
IUCN	International Union for Conservation of Nature
IPA	Instrument for Pre-Accession Assistance
JCC	Joint Coordination Committee
JICA	Japan International Cooperation Agency
MAFWE	Ministry of Agriculture, Forestry and Water Economy
MKFFIS	Macedonian Forest Fire Information System
MOEPP	Ministry of Environment and Physical Planning
MOH	Ministry of Health
MOI	Ministry of Interior
NbS	Nature based Solution
NGO	Non-Governmental Organization
OJT	On the Job Training
PC	Personal Computer
PDM	Project Design Matrix
PENF	Public Enterprise National Forests
PES	Payment for Ecosystem Services
RCMC	Regional Crisis Management Center
R/D	Record of Discussion
RRI	Rainfall-Runoff-Inundation

SDC	Swiss Agency for Development and Cooperation
SFC	State Forests Company
TCG	Technical Coordination Group
TOT	Training of Trainers
WS	Workshop

Map of pilot sites



Activities conducted in the pilot sites;

Radovish: Prevention and reduction of torrential floods, soil erosion, stabilization of land through afforestation, construction works, and ecoengineering,

Lisiche: Protection of water resources and reservoirs from extensive sedimentation (afforestation and construction works),

Skopje, Vodno: Protection of the environment, natural disaster and promotion of the concept of forest function for health and recreational benefits of the citizens.

Sveti Nikole: Modernization of the central Nursery of PENF and strengthening of the capacity for production of seedlings for implementation of field Eco-DRR measures.

Table of Contents

List of Tables

List of Figures

Project Completion Report

Project Title : The Project on Capacity Building for Ecosystem Based Disaster Risk Reduction(Eco-DRR) through Sustainable Forest Management in North Macedonia (Project Eco-DRR in North Macedonia)
（Term: Totally six Years
Phase 1: From December 2017 to December 2018
Phase 2: From February 2019 to December 2023）

Name: Mr. Stojanche Angelov
Title: Project Director
Name: Dr. Toru Inada
Title: Chief Technical Advisor
Submission Date: 12th of December 2023

Note: In this report, all information comes from Phase 1 and 2, unless otherwise specified.

I. Basic Information of the Project

1. Country

Republic of North Macedonia (North Macedonia)

2. Title of the Project

The Project on Capacity Building for Ecosystem Based Disaster Risk Reduction(Eco-DRR) through Sustainable Forest Management in North Macedonia (Project Eco-DRR in North Macedonia)

3. Duration of the Project (Planned and Actual)

Planned> From October 2017 to October 2022

Actual> From December, 2017 to December, 2023

Reason of the extension: Because of COVID-19 pandemic, Experts could not go to North Macedonia from Japan and some of the field activities, such as forest planning and forest conservation works could not be conducted. This situation affected the main outputs of the Project. Therefore, one year extension was determined through the discussions between Macedonian side and Japanese side.

4. Background (from Record of Discussions(R/D))

North Macedonia is a landlocked country having an area of 25,713 sq. km. with approximately 80% of the entire territory in mountainous regions. 96.5% of the total area is under processes of erosion. 1,539 torrents are registered over the whole country territory and their total catchment area is around 18,000 sq. km. (i.e. 70% of the state territory). Annual soil loss represents an annual loss of arable soil layer of 20 cm deep on an area of 8,500 ha. The economic cost of erosion is thus considerable. Torrent flows endanger infrastructural facilities (e.g., roads and bridges) and they cover agricultural land with sterile sediments (e.g. stones, gravel, etc.).

About 37% of total territory of North Macedonia is classified as forest lands. Degraded forests and shrubs area is 27% of the forest land. A substantial proportion of the forest is located on steeply sloping land, where forest cover is necessary for soil conservation and watershed protection purposes. One of the biggest environmental problems in North Macedonia is frequent forest wildfires.

Due to the seriousness of the extent of forest fires in 2007, the Government declared a state of crisis, when CMC takes full national coordination and control of operational activities conducted through the mechanisms of the national system for crisis management. Actually, the situation in 2007 and the need to strengthen the national system for forest fires risk management have triggered the initiative to apply for JICA project cooperation to establish an integrated system of prevention and early warning of forest fires.

This project titled “Project on Development of Integrated System for Prevention and Early Warning of Forest Fires” had been jointly implemented between the Government of North Macedonia through Crisis Management Centre (CMC) and JICA since 2011 until 2014. The purpose of the project was ‘capacity of CMC for transmitting information to domestic relevant institutions for prevention and early warning of forest fire and coordinating them is strengthened’, and ‘Macedonian Forest Fire Information System (MKFFIS)’ was developed through implementation of the project in collaboration with other organizations who have shared responsibilities in managing the risk of forest fires, such as the Ministry of Agriculture, Forestry and Water Economy, Public Enterprise "National Forests" (PENF) and other relevant institutions.

Since the project is highly evaluated by both Governments for its contribution to disaster risk reduction, both parties at higher level agreed to explore possibility of further cooperation on disaster risk reduction and management. Taking this situation into consideration, a JICA mission on Eco-DRR was sent to North Macedonia in May 2016 to collect data and discuss with parties concerned in North Macedonia for formulation of new project on Eco-system based Disaster Risk Reduction (Eco-DRR).

At the end of mission period, a workshop was held in Skopje on 26 May 2016 to share results of

the survey with participation from relevant Macedonian organizations. As a result of the workshop, the mission has confirmed high applicability of Eco-DRR in North Macedonia with focus on improvement of forest management. In particular, the mission has acknowledged nation-wide disaster risk reduction system managed currently focused on forest fire by CMC and needs for further cooperation in improving the situation through sustainable planning in the forestry sector in order to reduce the risks in the environment, with particular focus on reducing the risk of torrential floods, landslides and soil erosion.

Under these circumstances, the Government of the Republic of North Macedonia requested Japan to implement the Project with CMC as a main counterpart.

5. Overall Goal and Project Purpose (from Record of Discussions(R/D))

5-1 Overall Goal

By Eco-system based Disaster Risk Reduction (Eco-DRR) measures and activities in synergy with sustainable forest management, disaster risks of floods, landslides, soil erosion and forest fire on a long-term basis is reduced in North Macedonia.

5-2 Project Purpose

Eco-system based Disaster Risk Reduction (Eco-DRR) model against floods, landslides, soil erosion and forest fire by utilization of multiple forest function is developed.

6. Implementing Agency

Crisis Management Center (CMC) as a main implementing agency

Public Enterprise National Forest (PENF) as a relevant organization

II. Results of the Project

1. Results of the Project

1-1 Input by the Japanese side (Planned and Actual)

(1) Input Budget by the Japanese side： ¥691,616,500（691 million Japanese Yen）

Above budget includes overall input for field activities, equipment, contract works. The detail for input is described in the following table;

Table 1: Input Budget by the Japanese side

	Phase 1	Phase 2	Total
Plan	¥180,200,160	¥407,984,120	¥588,184,280
Actual	¥175,884,480	¥515,732,020	¥691,616,500

(2) Experts：

Planned: 7 in total and no specific Man-Month (MM) planned.

Table 2: The list of Short-term Experts (Plan)

	Role in the Project
1	Forest Management
2	Forest Conservation
3	Database
4	GIS/Remote Sensing
5	Hydrologist
6	Public Awareness
7	Disaster Risk Reduction

Actual: 17 Experts with 131.12 MM in total (36.96 MM in Phase 1 and 94.16 MM in Phase 2).

Table 3: The list of Short-term Experts (Actual)

	Name	Role in the Project
1	Toru Inada, Dr.	Chief Technical Adviser/Eco-DRR
2	Yuta Morikawa, Mr.	Deputy Technical Adviser/Eco-DRR
3	Mitsunobu Onishi, Mr.	Forest Management Plan
4	Thomas Kochert, Mr.	Forest Policy
5	Tomoyuki Ueda, Mr.	Forest Conservation 1 (Planning and Construction)
6	Takaki Toyoda, Dr.	Forest Conservation 2 (Plantation and Construction)
7	Keiji Someya, Mr.	Forest Conservation 3 (Planning and Design, construction)
8	Shiro Makita, Mr.	GIS/Database 1
9	Hiroyuki Kozu, Mr.	GIS/Database 2
10	Toru Furuya, Mr.	GIS/Remote Sensing
11	Hitoshi Takeuchi, Mr.	Hydrologist
12	Makoto Nakata, Mr.	Disaster prevention and risk reduction
13	Masami Sugiura, Mr.	Topographic Assessment
14	Daisuke Yumiyama, Mr.	Forest Monitoring 1

15	Keishi Kudo, Mr.	River Hydrologist
16	Sahori Fujimura, Ms.	Project Coordinator1/Public Awareness/ Forest Monitoring 2
17	Akari Matsumoto, Ms.	Project Coordinator2/Public Relations

(3) Trainings

Training in Japan and in North Macedonia is listed in the following tables;

Table 4: Training in Japan

Phase	Training	Period	Number of trainees
1	Group Training Program	2018.7.22-8.3	5 (CMC3, PENF2)
2	Ecosystem-Based Solutions For Disaster Risk Reduction (Tsukuba, Sendai)	2018.9.17-10.6	1 (Municipality of Radovish)
3	Integrated Lake, River and Coastal Basin Management for Sustainable Use and Preservation of Water Resources	2019.8.18-10.18	1 (Municipality of Radovish, 1)
4	Ecosystem-Based Solutions For Disaster Risk Reduction	2019.10.27-11.15	4 (PENF2, MAFWE1, HMS1)
5	Ecosystem-Based Solutions For Disaster Risk Reduction (Remote)	2021.11.9-12.1	1 (CMC1)
6	Ecosystem-Based Solutions For Disaster Risk Reduction	2023.09.26-10.28	1 (MAFWE1)

Note: Other details such as a name of trainees and main locations of the training are indicated in the Annex I.

Table 5: Training in North Macedonia

No	Training	Period	Number of trainees
1	Hazard Map Work Shop (Radovish)	2022.10.28	5 (Municipality of Radovish, RCMC Radovish)
2	GFIS Training on delivery (Skopje)	2020.12.15	22 (PENF staff)
3	GFIS Users Training (Skopje)	2021.11.23-12.03	25 (PENF MP)
4	MKFFIS TOT Training (Skopje)	2023.3.20-24	30 (CMC HQ, RCMC,

			PENF MP)
5	MKFFIS Regional Training (8 local offices of CMC)	2023.3.30-5/26	199 (RCMCs)
6	MKFFIS Risk Assessment Tool (Skopje)	2023.9.18	7 (CMC HQ)
7	Forest Restoration Plan TOT (online)	2020.12.18-21	6 (PENF MP)
8	Forest Restoration Plan (Radovish)	2022.10.18-19	17 (17 PENF local offices)
9	Forest Restoration Plan (Radovish)	2023.4.27-28	14 (13 PENF local offices)
10	Forest Conservation TOT (Skopje)	2023.5.5	8 (PENF MP)
12	Tree Nursery Training (Sveti Nikole)	2023.5.8	9 (PENF Sveti Nikole and other offices)

(4) Provision of equipment：

Plan and actual cost of equipment is described below;

Table 6: Cost of equipment

	Phase 1	**Phase 2**	**Total**
Plan	¥14,185,000	¥14,893,000	¥29,078,000
Actual	¥15,628,000	¥27,600,000	¥43,228,000

Planned equipment was survey equipment, nursery equipment, PCs and Vehicle.

Actually provided equipment is described in the attached list on the following page;

Table 7: Equipment list

Name of Project : The Project on capacity building for Ecosystem-Based Disaster Risk Reduction through sustainable forest management in North Macedonia
Country : North Macedonia

As of Novemeber 21, 2023

Number	Name of Property	Standard, Part Number	Quantity	Date of Inspection Passed	Location	Current Status	Remarks
1	Transit compass	Ushikata compass LS-25	2	2018/3/15	Planning Department, Public Enterprise National Forests (PENF)	Active	Forest planning and management equipment
2	Surveying instruments (Dendrometer)	Vertex IV	4	2018/3/20	Planning Department, Public Enterprise National Forests (PENF)	Active	ditto
3	Auto level	Leica NA 324 automatic level 360	3	2018/5/14	Planning Department, Public Enterprise National Forests (PENF)	Active	ditto
4	Laser distance measurement	Leica DISTO D2	2	2018/5/14	Planning Department, Public Enterprise National Forests (PENF)	Active	ditto
5	Mini tablet for drone control	Mini tablet	3	2018/5/22	Planning Department, Public Enterprise National Forests (PENF)	Active	ditto
6	Projector	BenQ TH534	1	2018/6/5	Planning Department, Public Enterprise National Forests (PENF)	Active	ditto
7	Laser distance measurement	Nikon Forest Pro rangefinder	2	2018/6/7	Planning Department, Public Enterprise National Forests (PENF)	Active	ditto
8	Surveying instruments (Total station)	Leica, TS06 plus total station	1	2018/6/7	Planning Department, Public Enterprise National Forests (PENF)	Active	ditto
9	UAV/Drone	Phantom 4 Pro (Additional battery is included)	3	2018/6/8	Planning Department, Public Enterprise National Forests (PENF)	Active	ditto
10	Desktop PC	Fujitsu CELISIUS W570	2	2018/8/29	Planning Department, Public Enterprise National Forests (PENF)	Active	ditto
11	Plotter	HP DJ T795 44 in	1	2018/8/29	Planning Department, Public Enterprise National Forests (PENF)	Active	ditto
12	Drafting software	Bricks CAD Pro	1	2018/10/5	Planning Department, Public Enterprise National Forests (PENF)	Active	ditto
13	3D software	PIX 4D	1	2018/10/12	Planning Department, Public Enterprise National Forests (PENF)	Active	ditto
14	GPS	Garmin 64s	9	2018/11/21	Planning Department, Public Enterprise National Forests (PENF)	Active	ditto
15	Stereoscope	MS27	2	2019/3/8	Planning Department, Public Enterprise National Forests (PENF)	Active	ditto
16	Soil penetrometer	Simple dynamic cone penetrometer	1	2022/8/31	Planning Department, Public Enterprise National Forests (PENF)	Active	ditto
17	Vehicle	Dacia DUSTER 4X4(4WD)	1	2021/6/7	Public Enterprise National Forests (PENF)	Active	ditto
18	Water meter	Inversion type water meter	2	2018/10/3	Radovish Office, Public Enterprise National Forests (PENF)	Active	Monitoring equipment
19	Water meter	Inversion type water meter	10	2019/3/26	Radovish Office, Public Enterprise National Forests (PENF)	Active	ditto
38	Signboard		7	2023/10/10	Radovish Office, Public Enterprise National Forests (PENF)	Active	ditto
39	Outdoor Cultivation Equipment	Tractor TAFE 6530 4WD with a cabin	1	2019/8/30	Sveti Nikole Office, Public Enterprise National Forests (PENF)	Active	Delivered to PENF as donated equipment on November, 2019
40		Tractor Trailer FERMAK 4t	1				
41		Milling machine BTD 140 L	1				
42		2-row plow UNLU 14 unch	1				
43		Disc plow 24 discs	1				
44		Mist blower Cifarelli M1200	1				
45		Sprayer AGRINA 16 L	2				
46		Bushcutter Husqvqrna 553 Rs	1				
47		Electric Trimmer Garden PowerCut 650/30	1				
48		Rotary cultivator AGRINA 500	1				
49		Service, training and instruction	1				
50	Automatic soil-filling and seeding machine for containers	TRAYFILLER MOD.RC2-TR3	1	2019/9/15	Sveti Nikole Office, Public Enterprise National Forests (PENF)	Active	Delivered to PENF as donated equipment on November, 2019
51		SEEDER MOD.SEM100	1				
52		Compresor single phase FIAC AB 200/360-10 bar, 2.2 kw	1				
53		Seeding kit for SEM100/LS1 E D=20 MK60TA staggered	1	2019/9/15			
54		Seeding kit for SEM100/LS1 E D=20 MK60Tb staggered	1				
55	Vehicle	Nissan X-Trail 4X4(4WD)	1	2018/6/6	Crisis Management Center	Active	Monitoring equipment
56	Database server	Fujitsu RX2520 M4 8×3.5'	1	2018/8/29	Crisis Management Center	Active	IT
57	Database server	Fujitsu RX2520 M4 16×2.5' NAS	1	2018/8/29	Crisis Management Center	Active	ditto
58	Desktop PC	Fujitsu CELISIUS W570	2	2018/8/29	Crisis Management Center	Active	ditto
59	Drafting software	Bricks CAD Pro	1	2018/10/5	Crisis Management Center	Active	ditto
60	Desktop PC	Fujitsu CELSIUS W580 with DISPLAY	1	2018/12/21	Crisis Management Center	Active	ditto
61	Plotter	HP DesignJet T1700 44-in Printer (W6B55A)	1	2018/12/21	Crisis Management Center	Active	ditto
62	Projector	BenQ TM535	1	2019/5/20	Crisis Management Center	Active	ditto
63	Drone	Drone EVO II PRO	3	2021/8/23	Crisis Management Center	Active	Survey
64	AWS software	Software Loggernet	1	2022/2/22	Crisis Management Center	Active	IT
65	Server	Intel recent Gen. Xeon minimum 8 cores CPU x2, Memory 256GB	1	2022/2/25	Crisis Management Center	Active	ditto
66	Laptop PC	IdeaPad3 15ITL6	10	2022/12/9	Crisis Management Center	Active	ditto
67	Laptop PC	Lenobo IdeaPad3 15ITL6 Grey-i5-1155G7×10	10	2023/11/13	Crisis Management Center	Active	ditto
68		HP ENVY x360 2-in-1 Laptop 15-ew0036nia/CPUI7×2	2	2023/11/13	Crisis Management Center		ditto
69	Automatic weather station	Cambell automatic rain gauge station	1	2018/12/4	Hydrometeorological Service	Active	Monitoring equipment
70	Solar Panel	SP30 30W SOLAR PANEL C/W BRACKET & 5 METRE CABLE	1	2021/5/31	Hydrometeorological Service	Active	Monitoring equipment
71		CH200 12V Charging Regulator, Battery, 12V26 Ah	1				
72		Transportation, instalation and instalation materials	1				

(5) Overseas Activities cost

Plan and actual overseas activities cost is described below;

Table 8: Overseas activities cost

	Phase 1	Phase 2	Total
Plan	¥38,227,000	¥143,377,000	¥181,604,000
Actual	¥37,990,000	¥198,528,000	¥236,518,000

1-2 Input by the North Macedonia side

(1) C/P personnel

Table 9: List of C/P personnel

Organization	Role	Name
CMC	Project Director	Mr. Stojanche Angelov -Director of CMC
CMC	Project manager	Dr. Stevko Stefanoski -Department for Analysis, Assessment and Strategic Planning
CMC	Public relations	Ms. Nadica V'chkova -Public Relations Department
CMC	System development	Mr. Igorce Karafilovski -IT department
PENF	Management for field work	Dr. Dejan Mandzukovski -Department of Forest Management and Planning
PENF	Forest policy and field training	Ms.Mare Basova -Deputy Director of PENF Dr. Dejan Mandzukovski -Department of Forest Management and Planning
PENF	Nursery management in Sveti Nikole	Ms. Mare Basova -Baze Illiev Director of PENF Sveti Nikole office
PENF	Field work in Radovish	Ms. Ivana Bozinova -Director of PENF Radovish office
PENF	Field work in Lisiche	Mr. Ordan Tutundziev

		-Director of PENF Veles office
MAFWE	Forest policy	Mr. Nazif Sefer -Forestry and Hunting Department

(2) Office Space：

Office space was provided by CMC at the main office.

(3) Other Input by North Macedonia Side

- Tax exemption measures for the project equipment imported from Japan and other countries to North Macedonia.
- Information in obtaining medical services for the JICA experts.
- Provision of identification cards for JICA experts who stayed longer than the period of visa exemption, i.e. 90 days in 6 months.
- Expenses necessary for transportation within North Macedonia of the equipment provided by JICA Project.
- Available data including maps and aerial photographs and information related to the Project.

(4) Input budget by North Macedonia side

- None except for ordinal cost such as electricity, water, and salary for counterpart personnel.

1-3 Activities (Planned and Actual)

1-3-0 **General activities**

No	Activities (Planned)	Activities (Actual)
0	Establishing Joint Coordination Committee and Technical Coordination Committee	Joint Coordination Committee and Technical Coordination Committee were established, and the committees were held at least once per six months

1-3-1 **Output 1: System development**

No	Activities (Planned)	Activities (Actual)
1.1	Developing the methodology and concept for expanding MKFFIS as a multi hazard platform for exchange data and information shearing among the relevant institution	Developed the methodology and concept for expanding MKFFIS through the cooperation of local expert. The methodology describes the definition of disasters, the response and system at the event of a disaster, and how MKFFIS contribute to disaster

	within National Crisis Management System, particularly for risk of floods, landslides and soil erosion.	risk reduction.
1.2	Preparing technical documentation and specification, and supplying necessary hardware, software and other equipment for strengthening the existing function and expanding MKFFIS.	In order to outsource the functional expansion of MKFFIS and GFIS, technical materials were organized and specifications were prepared. Replaced aging server for GFIS. Additionally, based on CMC's request, aging servers and their peripherals were replaced.
1.3	Preparing study of hydraulic models for high-risk locations exposed to torrential flooding using the available data and mapping the locations possibly exposed at risk of landslides and soil erosion on some of the target sites of Output 2 and 3.	**I**n the Radovish River watershed, which serves as a pilot site, calculations were performed using the RRI model with rainfall, DEM, land cover, and river cross section as input data and river flow, water level, and inundation as output data. In relation to Output 2, landform interpretation results were mapped for mountain disaster risk (collapse, landslide, etc.) in the upstream area. For soil erosion, the results of the study indicated that the EPM method was suitable.
1.4	Introducing new function, create additional GIS database relevant for floods, landslides and soil erosion hazard.	The following three types of databases were created on CMC's servers. 1. Risk Potential DB Database for assessing the potential of flooding, landslides and soil erosion. MKFFIS can refer to this database. 2. Daily Events DB In addition to floods and landslides, fires (including forest fire, fire in areas other than forests, and fires in buildings, etc.), earthquakes, freezing of rivers and lakes, heavy snow and avalanches, other natural hazards, and artificial and technological disasters, infectious diseases, environmental destruction, disasters

		caused by explosives, and interruptions or suspensions of various services such as communications, transportation, electricity supply, water supply and sewage, and steam supply are included. Since soil erosion is a slow phenomenon, it is not included in this database. 3. Risk Assessment DB This is the database for the Risk Assessment Tool developed in 2023. This DB is accessed via the tool.
1.5	Revising/updating MKFFIS platform to the Open layer 3.0 and reorganization of their user interface.	・Instead of OpenLayers 3.0, OpenLayers 4.0, which was the latest version at the time the new development started was, used and the user interface was reorganized.
1.6	Updating the methodology for damage assessment of floods, landslides and soil erosion.	The current status of damage assessment methods in North Macedonia was reviewed, and the flow of various types of risk information and the content of risk information were organized.
1.7	Preparing hazard maps to the local community for their familiarization with risks that surround them in the selected sites of Output 2 and 3.	After organizing the risks in the Radovish area, discussions and workshops were held with the CMC, R-CMC, Radovish Municipality, and residents to prepare hazard maps showing possible flood inundation results and a manual contributing to their preparation was drafted. In addition, pocketable and large-size maps were prepared, and signboards were installed in the town to raise awareness on disaster prevention.
1.8	Organizing training for selected staff from CMC, PENF and other relevant institutions, for new functions and modules of the MKFFIS.	・Training on delivery. The contract with the developer included a small training program for system administrators and key personnel upon provision of their deliverables. Regarding GFIS, due to the COVID-19 pandemic, training at the time of delivery was held remotely on December 15, 2020. The lecturer was Trinity, the

		GFIS developer, and participants were 22 PENF staff. ・GFIS User Training GFIS User training was conducted for cartographers, forest planners, and administrators at PENF Skopje office, from November 23rd to December 3rd, 2021. Due to the COVID-19 pandemic, the training was limited to a maximum of three people per class. A total of 25 people attended. (Eight cartographer and forest planner training classes, and one administrator training class) ・MKFFIS User Training MKFFIS user training was conducted from March to May 2023. The training was divided into TOT in Skopje and regional training in eight regions. First, TOT was conducted to train instructors for regional trainings. Afterwards, regional trainings were held. Mr. Oliver Ristevski from CMC headquarters, who had taken the TOT was the main instructor. And if there was a staff at the CMC regional office who had taken TOT, that person would assist Mr. Ristevski. A total of 199 people participated in TOT and regional training supported by Mr. Oliver and staff who had taken the TOT once.

1-3-2 **Output 2: Forest management plan and policy**

No	Planned activities	Actual activities
2.1	Developing new sub-components by functional categories of forest ecosystem for protective forest.	Fifteen sub-categories across 4 categories (including protection forests) were developed through discussion with PENF staff, and forest management guidelines were proposed for each sub-category.

No	Planned activities	Actual activities
2.2	Identifying actual and potential high-risk locations exposed to torrents, landslides and erosion processes at the selected sites of 3 forest management units (FMU) and integrating them into MKFFIS.	Geomorphological hazard locations were extensively identified through manual interpretation in “Radovishka-Oraovichka Reka” FMU. A methodology for extending this analysis to other FMUs based on Artificial Intelligence was tested. Since the robustness was insufficient, a simple slope steepness classification was used instead. Data of geomorphological hazard locations in Radovish was integrated to MKFFIS.
2.3	Based on 2.2, formulating forest management plans in pilot sites by using the new sub-components of protective forest including coding system, valuation of ecosystem services, zoning and mapping cadaster and integrating them into MKFFIS (if it is necessary, the new sub-components of forest ecosystem should be revised based on the results of 2.3 activity.)"	Forest categorization plans intended to become part of future forest management plans were formulated in “Radovishka-Oraovichka Reka”, “Topolka-Karabunishte” and “Skopska Crna Gora” FMUs, and the resulting data was digitized and coded. Ecosystem services valuation was studied through a socio-economic survey run around Lisiche site. Data of forest categorization plans will be integrated to GFIS when revision in the next term of forest management plan is conducted
2.4	Planning mid and long term rehabilitation activities of high-risk/affected areas based on 2.3 in pilot sites.	Forest rehabilitation planning was conducted in the “Radovishka-Oraovichka Reka” FMU (Radovish pilot site) and “Topolka-Karabunishte” FMU (Lisiche pilot site). Since rehabilitation planning in Mt.Vodno was not possible, it was conducted in Skopska Crna Gora FMU instead. In Radovish and Lisiche, the prepared forest rehabilitation plans were used as a basis for designing the micro pilot sites.

No	Planned activities	Actual activities
2.5	Developing guidelines/procedure and training manuals for planning forest management plan and rehabilitation plan based on the above activities.	A manual on forest functions categorization and a manual on forest rehabilitation planning were developed in line with the above activities conducted in 3 FMUs
2.6	Organizing training of selected personnel of PENF who work on forest planning based on 2.5.	Classroom, remote and field trainings were organized for PENF staff on the basis of the manuals prepared in 2.5. Various other training materials were produced, and some users were also trained to drone operation.
2.7	Making recommendation(s) about legal regulations that governing forest management by discussion about an action for amendments and adoption of necessary bylaws regulations based on achieved results of the above activities.	Twelve recommendations were provided through a series of 3 workshops on forest policy held in 2019, 2021 and 2023. Six of the amendments identified as necessary were adopted by MAFWE during the Project period, fourout of the six are expected to be implemented through revised laws and policies pending adoption, and two are subject to supplementary studies to be run until 2026. Planning manuals created in 2.5 will need to be revised after these revisions.

1-3-3 **Output 3: Forest conservation activities**

No	Activities (Planned)	Activities (Actual)
3.1	Selecting micro pilot sites within pilot sites for Implementing activities of identified forest conservation technologies for Eco-DRR (i.e., hillside work including planting work, torrent work such as check dams)	Two micro pilot sites were set up in the especially severely degraded middle reaches of the flood prone Radovish River watershed area with the aim of exhibiting Japan's forest conservation technologies that contribute to Eco-DRR. In addition, another micro pilot site was constructed in a small catchment area on the left bank of the water reservoir in Lisiche in order to reduce the sediment flowing into the reservoir and extend the lifespan of the dam.
3.2	Implementing on the ground activities of forest conservation technologies for	1. Radovish Activities combining forest conservation (construction) works and tree planting were carried out in two micro

	Eco-DRR.	pilot sites (Radovish South site and Radovish North site) in Radovish river, which is a flood prone river to the downstream township area, in order to exhibit Eco-DRR activities that reduce downstream flood damage by restoring forests in flood-prone river basins, and to verify their effectiveness. The details of the conservation activities are as follows. ●Radovish South Site (4.3ha) - Torrent (stream) works: Gabion gully plug works: 5 units (212.5 m3) - Hillside works: Sandbag small terracing work (2,650 m) Jute mat covering work (2,600 m2) Boundary fencing (910 m) - Tree planting for soil and water conservation : 11,016 plants (Black Pine (*Pinus nigra*): 2,746, Ash (*Fraxinus excelsior*): 1,097, Oak (*Quercus robur*) 2,581, Robinia (*Robinia pseudoacacia*): 4,593) - Tree planting with terracing work: Robinia: 450 - Supplemental planting: 660 (Black Pine: 220, Ash: 220, Oak: 2,581, Robinia: 220) - Tree planting for live fence: Robinia: 360, seedlings of wild shrubs: 180 ●Radovish North Site (6.0ha) - Torrent work Gabion gully plug work: 1 unit (86.9 m3) - Hillside works: Wet stone masonry retaining wall work: 6 units (Total 66.6 m3) Sandbag small terracing work (925 m) Jute mat covering work (1,202 m2) Stone masonry hillside channel work (94 m) Boundary fencing (1,600 m) - Tree planting for soil and water conservation : 15,000 plants (Black Pine: 5,000, Ash: 5,000, Oak: 5,000) - Tree planting with terracing work: Robinia: 900, Black

		Pine: 1,750 - Tree planting for live fence: Robinia: 640, seedlings of wild shrubs: 300 2. Lisiche - Forest conservation activities combined with construction works and tree planting were conducted in a microsite in order to exhibit an Eco-DRR model, that reduces the sediment flowing into the water supplying and multipurpose dam reservoir and to conserve the dam. Contents of the activities are as follows: - Torrent work: Gabion gully plug: 1 unit (93.5 m3) Channel work for the gully plug (11.5 m) - Hillside works: Stone masonry small terracing work (84 m) Scarification work (84 m) - Tree planting for soil and water conservation: Robinia: 200 plants - Tree planting with terracing work: 160 plants (Robinia: 80, Mix planting of Black Pine, Oak, and Ash: 80） - Tree planting with micro water catchment (fish scale): Robinia: 20 plants - Tree planting for live fence: Robinia: 100 plants 3. Mount Vodno A new gazette concerning Mt. Vodno was issued by the Government in August 2021. This made the planned pilot activity area inaccessible to new activities until the completion of the protected area management plan, which is scheduled to be developed from 2023. For this reason, a demonstration of hydro-seeding was conducted instead as part of the existing Mt. Vodno management activities.
3.3	Identifying and developing methods to utilize forest functions against	In Sveti Nikole, it was observed that windbreak forests were planted in the 1950s, however these were later felled down and their function as a windbreak

	disasters/damages such as wind break in addition to hillside works.	decreased. From that situation, the importance of windbreak forests was promoted to PENF counterparts, and a draft plan for the (re-)establishment of windbreak forests in Sveti Nikole was developed by the Project. Further, PENF prepared a forest management plan for windbreak forests in the Sveti Nikole FMU based on experience received during the training. The Project also prepared a compendium of windbreak forest case studies and held a seminar on windbreaks with stakeholders in Sveti Nikole to raise awareness of the usefulness and importance of windbreaks, and to exchange views on the future use of windbreaks and challenges in their utilization.
3.4	Motivating and involving the local population in pilot sites for implementation of selected Eco-DRR activities and measures.	Before starting field activities in June 2018, the outline of the Project was explained to the villagers of Kodzhalija village. Additionally, during a socio-economic survey conducted from May to September 2018, residents were asked about their favorite trees, and Robinia was identified because their flowers would become a source of honey. JICA Project had no objection for their opinion and therefore, Robinia were planted in the hope that residents would be motivated to protect the forest in the future.
3.5	Conducting a study on monitoring method to quantitatively evaluate forest conservation technologies for Eco-DRR.	1. Monitoring of water and soil runoff Initially, it was planned to monitor water runoff and soil runoff at the Radovish South site using a measuring weir, but this method proved inapplicable because no base runoff was actually observed. Therefore a method of monitoring surface runoff by installing monitoring facilities on the slope was used instead. Additionally, an Automated Weather Station (AWS) was installed near Radovish South Site to measure precipitation data necessary for the analysis of monitoring data. A three-party Memorandum of Understanding (MOU) for monitoring activities is currently being prepared among PENF Headquarters, the University's Faculty of

		Forestry and the Project. 2. Monitoring of planted seedlings Through the monitoring of the planted seedlings at both Radovish sites, the sampling-based monitoring method was summarized. In this method, the number of statistically reliable samples is calculated, permanent plots are set up, and then, survival rates and vigorousness level of living seedling after planting are recorded. Seedling heights and photographs of each seedling for future analysis were recorded as an experiment. However, it was found that monitoring those data in the first two years after planting would require an extensive amount of work, and there was a high possibility that sustainability would not be ensured. Therefore, only the survival rate to determine supplemental planting and vigorousness level are recorded during the first two years after planting. Three years after planting of the 1st plantation activity, we decided to measure the growth (e.g., seedling height and diameter at the ground level) depending on purposes in order to accumulate data that can be used for future analysis and evaluation. 3. Soil Hardness Monitoring The results of a digging test of seedlings at the Radovish site, where seedlings were established at a high rate and those at a low rate, showed a difference in root system growth. This suggested that soil hardness at the planting location is likely to have an effect on the rate of seedling establishment. Based on this, soil hardness monitoring was conducted prior to planting to analyze areas where seedlings could be expected to establish, using soil penetrometer, in which a weight is dropped and soil hardness is measured by the number of centimeters penetrated by a cone attached to the tip of the weight.

		4. Evaluating the effectiveness of erosion control techniques The results of the planting monitoring showed that while Robinia showed more than 70% establishment of seedlings in some plots, Oak, and Ash, which are potential vegetation, and Black Pine, which is used by PENF for planting, showed less than 10% establishment of seedlings in many plots. The rate of establishment of planting seedlings to which the water retention agent was applied, which was tested in 2021, also did not lead to a significant improvement, ranging from 0 to 40%.Based on these monitoring results, it is clear that the Radovish site is difficult to establish even if potential vegetation such as Oak is planted, especially because of the high temperatures and dryness of the site, especially in summer, and the geology, which is dominated by gravels and rocks. Therefore, it was concluded that a planting technique combining terracing work, which loosens the soil and retains water, and Robinia would be appropriate. This method was applied for the last planting in the fall of 2022.
3.6	Developing manuals/guidelines on forest conservation technologies for Eco-DRR (i.e., hillside work including planting work, torrent work such as check dams) based on the pilot activities	A Technical Guideline of Forest Conservation Works in North Macedonia was drafted to standardize theories and methodologies required when planning, designing, and forest conservation works suitable in North Macedonia, based on Japanese forest conservation technical standards. A draft training manual (Manual on Forest Conservation Works in North Macedonia) was also created based on the draft Guideline.
3.7	Conducting training with the manuals/guidelines to strengthen capacities of PENF to autonomically carry out processes of forest conservation technologies and planting work.	A draft manual on forest conservation techniques (Manual on Forest Conservation Works in North Macedonia) was created, and training based on the manual was conducted in May 2023 for seven staff members of PENF's Planning and Management Department. Site visits were conducted several times to enhance capacity of CMC and PENF about afforestation

		and reforestation activities at the Radovish and Lisiche sites, and to disseminate information on afforestation and reforestation techniques. In addition, at TCG meetings held twice a year in spring and fall, the planning, progress, and results of afforestation and reforestation projects, as well as findings and lessons learned from these projects, were shared in order to strengthen the capacity of the counterparts.
3.8	Strengthening capacities of PENF nursery staff of Sv. Nikole to make a seedling production plan based on the PENF's management plan, rehabilitation plan and demands from outside PENF.	The status of seedling production in the Sveti Nikole nursery was studied, and an improvement plan was developed and shared with its staff to facilitate the production of highly mobile container seedlings, bearing in mind PENF's future plan to consolidate nursery production in five locations, including Sveti Nikole. In addition, training was provided to nursery staff at three other locations besides the Sveti Nikole nursery to promote and spread understanding of the advantages of introducing containerized seedlings.
3.9	Improving facilities of the existing nursery (Sv. Nikole) in order to support newly applied forest management plan based on the forest function classification and rehabilitation plan.	Based on the plan for improvement of the Sveti Nikole nursery described in 3.8 above, a greenhouse, an automatic soil filling machine, an automatic sowing machine, and other equipment for container seedling production were provided, as well as equipment to promote the production of Robinia seedlings, which are important tree species for soil and water conservation work. The new greenhouses made it possible to produce 1.2 million containerized seedlings.
3.10	Developing manuals/guidelines on nursery technologies and planning based on the activity in Sv. Nikole	Manuals/guidelines for the introduction and utilization of containerized seedlings were developed to inform PENF staff of the importance and usefulness of containerized seedling production.

1-3-4 Output 4: Public Awareness

No	Activities (Planned)	Activities (Actual)
4.1	Preparing brochures, and other informative material for Eco-DRR concept popularization to the government personnel, public and other interested parties.	1. Publication of Newsletters Newsletters featuring information on project activities were published every six months. Twelve issues numbered from 0 to 11 were drafted in Japanese, English and Macedonian languages, and published between the beginning and the end of the Project. 2. Social Networks A Facebook page for the Project was set up, and activities were posted regularly. 3. Eco-DRR video creation In order to deepen understanding of the Eco-DRR concept among government officials in the West Balkans region, a video on Eco-DRR was created. The concept of Eco-DRR was introduced along with examples of its implementation in Japan and through JICA activities around the World and in the West Balkans region. The video was completed in October 2022 and distributed to the C/Ps and other relevant organizations in North Macedonia. It was shown at various seminars and training sessions. In August 2023, subtitles in Macedonian language were added so that Macedonian nationals who do not understand English be able to view it as well.
4.2	Designing and launching of the public awareness campaign about the importance and necessity of introducing the Eco-DRR concept.	In May 2018, Eco-DRR awareness campaigns were held in the cities of Skopje and Radovish to explain the Eco-DRR concept and the Project's plan of operation. Another Eco-DRR awareness campaign was conducted for Radovish residents at a Hazard Map Workshop held on October 28th, 2022. By explaining the Eco-DRR concept and project activities in Radovish in connection with hazard maps, residents were able to understand the importance and necessity of Eco-DRR as a matter that connects them.

		In addition, a Project Expert gave a lecture on the Eco-DRR concept and Project activities to 25 teachers and students at the forestry high school in Kabadarchi, located in the southeastern part of the country, on April 6th, 2023.
4.3	Distributing hazard maps to the local community for their familiarization with risks that surround them around the pilot sites of Output 2 and 3.	Workshops on hazard maps were held on 28th Oct, 2022 and 3rd May, 2023 in Radovish for officials from the Radovish branch of CMC, Radovish municipality and residents. These workshops were organized by dividing participants in two groups, one dedicated to government officials and another dedicated to residents, so that each participant could express his opinions casually. The finalized hazard maps were prepared as a pocketable A3 leaflet that could be folded and carried by residents, and 2,500 copies were distributed to the Radovish municipality. In addition, two information boards showing the hazard map were installed in the city of Radovish so that the hazard map be disseminated to the Radovish community.
4.4	Consolidating results of the pilot activities and deliverables under Output 1, 2 and 3 for developing material(s) to explain Eco-DRR model in North Macedonia.	Progress reports were prepared in December each year from 2019 to 2022(February 2022 for 2021), and results of activities of Outputs 1 to 4 were reported. The Eco-DRR models applying the forest conservation method in the pilot sites of Radovish and Lisiche were also summarized. These reports cover each project site's issues, installed works, effects, future scenarios, and potentials for wider deployment.
4.5	Organizing workshops for Eco-DRR concept popularization to the government personnel.	A domestic seminar was held on October 27th, 2023, convening government officials in North Macedonia. The project activities and implementation at the pilot sites were explained, followed by a visit to the pilot site in Radovish. Through in-room lectures and a visit to the Eco-DRR model site where the forest conservation method was applied, awareness of the Eco-DRR concept were promoted.
4.6	Organizing seminars for the	Regional seminars were held twice in Skopje by

	promotion of project results inside and outside North Macedonia.	inviting government officials from North Macedonia and other countries from the West Balkans region. In the first reginal seminar, the Eco-DRR concept and the project's activities were introduced along with a visit to the pilot site of Radovish. Also, the possibility of Eco-DRR deployment in each country was discussed. In the second regional seminar, the results of the Project were presented. Also, the activities of the JICA Eco-DRR project in Kosovo and Montenegro as well as those of international organizations such as IUCN "ADAPT" project and FAO "Philippine project" were shared among the participants from other countries in Balkan region. Dr. Tamai of Forestry and Forest Products Research Institute presented functions of forest from the extensive studies in Japan. Based on the shared information, the feasibility of expanding the Eco-DRR method to the whole West Balkans region as well as and each country's challenges were discussed.

2. Achievements of the Project

2-1 Outputs and indicators

(Target values and actual values achieved at completion)

Narrative Summary of Outputs	Objectively Verifiable Indicators	Actual values achieved at completion
1. National Crisis management coordination mechanism among domestic relevant institutions for prevention, early warning and rehabilitation against floods, landslides, soil erosion, and forest fire is enhanced by strengthening and expanding of MKFFIS function through introduction of new modules for torrents, landslides, erosions.	1: At least 3 modules are added to MKFISS. 2: More than 80% of participants of MKFFIS training understand new function and modules of MKFFIS which related their works.	1: 100% achieved. 1-1 MKFFIS development work was completed which includes data input and detail disaster repot forms in January, 2021. 1-2 GFIS development/expansion work was also completed in November, 2021. 1-3 The module for the risk assessment tool was completed in June, 2023. 1-4 The module for the demographic data of the statistical office was completed in October, 2023. 2: 100% achieved. 2-1: Trainings for GFIS and MKFFIS were conducted. MKFFIS training covered 30 staff in TOT and 199 in regional, 229 in total. 98% of participants mentioned that they understand the new functions and modules of MKFFIS related to their work.

2. National forest management and planning capacities for promotion of Eco-DRR are enhanced through introduction of new sub-components of protective forest, such as soil erosion prevention, water conservation, and public health forests, by functional categories of forest ecosystem.	1: Procedures for formulating forest management plans and rehabilitation plans based on the new sub-components of protective forest are established. 2: More than 80% of PENF staff who participate in the training courses understand the procedures for formulating forest management plans and rehabilitation plans.	1. 100% achieved. Procedures for formulating forest management plans and rehabilitation plans based on the new sub-components of protective forest were proposed. Manuals were drafted based on the proposed procedures. 2: 100% achieved. 2-1: Theoretical training for PENF forest planners was conducted in 2020, followed by field training in 2021, and 100% of the participants indicated that they understood the procedure. 2-2 Field training for 17 PENF branch offices staff was conducted in October, 2022, and 100% of the participants indicated that they understood the procedures. 2-3: Field training for 11 PENF branch offices staff was conducted in April, 2023 and 100% of the participants indicated that they understood the procedures.

3. Execution Capacity to carry out Eco-DRR related activities is enhanced through introduction of Eco-DRR technology and improvement of seedling capacity.	1: Manuals/guidelines on forest conservation technologies for Eco-DRR are authorized by PENF. 2: More than 80% of participants of the technical training courses understand at least 80 % of Eco-DRR technologies introduced in the courses. 3: The nursery has the capacity to produce 2M seedlings to satisfy the requirement of the nursery/PENF managers.	1: 100% achieved. Manuals/guidelines on forest conservation technologies for Eco-DRR were developed based on the experience gained during field activities. PENF Department of Forest Management and Planning reviewed and confirmed this manual would be utilized for their future activities. 2: 100% achieved. The training on forest conservation work was conducted in May, 2023 and 100% of the participants said they understood the forest conservation technologies. 3: 60% achieved. Three greenhouses were renovated with new sprinklers, and other equipment such as a tractor was procured. This made it possible to produce 1.2 million containerized seedlings at PENF Sveti Nikole branch. Because PENF did not provide rehabilitation nor maintenance plans of their nursery, although it had been agreed in 2019, further procurement after the 1st batch was not conducted. This agreement was made because there was not enough explanation on

		the budget and capacity for the maintenance of procured nursery equipment.
4. Capacity of government personnel and public awareness of local community about the Eco-DRR are improved.	1: More than 80 % of government staff who participated in the seminars are able to explain the concept of Eco-DRR. 2: More than 80 % of people who participated in the seminars understand the concept of Eco-DRR and activities which should be taken.	1. 100% achieved. Eco-DRR concept was always explained in the seminars and had discussions based on the concept. And government staff who participated in the seminars were able to explain the concept. 2. More than 80% of people who participated in the final domestic seminar and 100% of people who participated in the 2nd regional seminar answered they understood the concept of Eco-DRR and activities through the questionnaire.

2-2 Project Purpose and indicators

(Target values and actual values achieved at completion)

Project Purpose	Indicators (Target values)	Actual values achieved at completion
Eco-system based Disaster Risk Reduction (Eco-DRR) model against floods, landslides, soil erosion and forest fire by utilization of multiple forest function is developed.	1: Responsibilities of relevant organizations for implementation of the Eco-DRR model are agreed among related organizations.	1. 100% achieved. CMC, MAFWE, and PENF are considered related organizations, and they agreed with responsibilities for implementing the Eco-DRR model.
	2: More than six (6) governmental organizations initiate disaster prevention or risk-reduction activities based on the information of MKFFIS revised by the Project.	2. 100% achieved. Thirty CMC branch offices have already started using the data entry function of MKFFIS developed by the Project. Through the collected data in MKFFIS, other governmental organizations included in the National Platform initiated disaster prevention or risk-reduction activities, i.e., MOI, MAFWE, MOEPP, MOH, CMC, PENF, Municipalities, etc.
	3: Procedures for forest planning and implementing Eco-DRR related activities are determined in PENF.	3: 100 achieved. Procedures for forest planning and implementing Eco-DRR were developed, and submitted to PENF and MAFWE. Some changes in forest regulations that happened in 2019 and 2020 are in line with the propositions of the Project. In PENF, those procedures were determined.

3. History of PDM Modification

On the 1st of November, 2021, the original version of PDM has been modified mainly because the project extended one year and the name of the country was changed from the Republic of Macedonia to the Republic of North Macedonia in February, 2019. There is only one revision for PDM throughout the Project period.

3-1 Overall: Name of the country

Before	Amended Version
MACEDONIA	NORTH MACEDONIA
Reason: Officially, the name of the country was changed from the Republic of Macedonia to the Republic of North Macedonia in February, 2019.	

3-2 Overall: Name of the Organization

Before	Amended Version
Public Enterprise Macedonia Forest	Public Enterprise National Forest
Reason: Officially, the name of the organization was changed from Public Enterprise Macedonia Forest to Public Enterprise National Forest in 2019.	

3-3 Title of the Project

Before	Amended Version
The Project on Capacity Building for Ecosystem Based Disaster Risk Reduction (Eco-DRR) though Sustainable Forest Management in Macedonia (Project Eco-DRR in Macedonia)	The Project on Capacity Building for Ecosystem Based Disaster Risk Reduction (Eco-DRR) though Sustainable Forest Management in North Macedonia (Project Eco-DRR in North Macedonia)
Reason: Officially, the name of the country was changed from the Republic of Macedonia to the Republic of North Macedonia in February 2019.	

3-4 Duration

Before	Amended Version
The duration of the Project will be five (5) years from the arrival date of the first JICA expert for the project.	The duration of the Project will be six (6) years from the arrival date of the first JICA expert for the project.
Reason: Because the pandemic of Coronavirus disease 2019 (COVID-19) affected the progress of project activities, it became tangible that planned activities should be	

completed in six years, instead of five years.

3-5 Project Design Matrix (PDM): Objectively Verifiable Indicator in the overall goal of PDM

Before	Amended Version
1. By 2025, CMC increases and revises the contents of MKFFIS which is related to floods, landslides, soil erosion and forest fire and continuously provides the information to relevant organizations.	1. By 2027, CMC increases and revises the contents of MKFFIS which is related to floods, landslides, soil erosion and forest fire and continuously provides the information to relevant organizations.
2. By 2025, CMC makes a hazard map for at least one site using the same techniques which are introduced by the Project.	2. By 2027, CMC supervises and supports the preparation of a hazard map by relevant institutions such as Municipalities for at least one site using the same techniques which are introduced by the Project.
3. By 2025, PEMF applies silvicultural methods which are introduced by the Project more than three (3) locations.	3. By 2027, PENF applies silvicultural methods which are introduced by the Project more than three (3) locations.
Reason: Target year should be revised based on the Project Period Extension. The amendment on Indicator 2. was confirmed on the 3rd JCC meeting because CMC doesn't have authority to make a hazard map but municipalities have..	

4. Others

4-1 Results of Environmental and Social Considerations (if applicable)

Not applicable

4-2 Results of Considerations on Gender/Peace Building/Poverty Reduction, Disability, Disease infection, Social System, Human Wellbeing, Human Right, and Gender Equality (if applicable)

For the construction of forest conservation facilities and plantation at Radovish North Site, villagers around the construction sites participated in the work. Through this participation in these activities, it is assumed that villagers could increase their income.

During the socio-economic survey conducted from May to September 2018, residents of Kodzhalija were asked about their favorite trees, and Robinia was identified. Considering the poverty reduction also, Robinia was planted in the hope that residents would use the flower for collection of honey for sale.

Figure 1: Village meeting in Kodzhalija when the socio-economic survey was conducted (June 2018)

III. Results of Joint Review

1. Results of Review based on DAC Evaluation Criteria

(1) Relevance

Relevance of the Project is judged as "Very High".

North Macedonia issued the Strategy for Sustainable Development of Forestry in 2006. The main objective of the Strategy is to increase the contribution of the forestry sector to the national economy and rural development through sustainable forest management, ensuring renewable resources and protection of local and global environment, and providing products and services for improving the quality of life of all citizens. In the terms of disaster prevention, the strategy provides an approach to establish an efficient system for early warning system and suppression of forest fires and envisages formulation of criteria for management of erosion protective forest and erosive lands as one of its measures in this area. Since then, the government has carried out activities in line with this strategy.

This Project has promoted measures that aim at identifying the forests and their functions to be enhanced. In addition, the Project also aims to introduce and propose methods to enhance the forest functions, especially flood mitigation function and soil prevention function. These methods proposed by Project would contribute sustainable forest management and accordingly supported the above policy of the Government in North Macedonia, and they are actual concrete measures to realize the issues.

In North Macedonia, the Law on Crisis Management regulates all risks management approach from local to national level in crisis management. The crisis management system in the

Republic of North Macedonia has been established due to needs for continuous monitoring and assessment of the security risks and dangers. The Crisis Management Center plays a key role in this crisis management system in terms of risk assessment, risk management and planning, risk communication and awareness raising. In order to fulfill their responsibilities, the National Crisis Management Coordination Mechanism among domestic relevant institutions was enhanced by updating and expanding Macedonia Forest Fire Information System (MKFFIS) through the Project activities.

(2) Coherence

Coherence of the Project is judged as "High".

【Coherence with the development cooperation policy of the Japanese Government and JICA】

The Government of Japan has expressed in G7 summit that between 2021 and 2025, public and private sectors would provide approximately 6.5 trillion yen in support for climate change and strengthen support in the area of adaptation to countries vulnerable to the impacts of climate change.

Further, former Prime Minister, Shinzo ABE, launched "The Western Balkans Cooperation Initiative" (hereafter referred to as "Western Balkan Initiative") during his visit to Southeastern Europe in January 2018. Its aim is to support socio-economic reforms in the Western Balkan countries toward EU accession, as well as to facilitate cooperation in the region. This Project could be positioned as one of main activities of this initiative.

Further, JICA issued five Global Agendas for global environment issues, namely i) environment management, ii) nature conservation, iii) disaster risk reduction, iv) water management and supply and v) climate change. As ones of the main adaptation measures related to agendas of ii), iii) and v), JICA has been focusing on Eco-DRR and Nature Based Solutions (NbS).

【Coherence with global trend on measure for climate change, NbS】

The term "Nature-based Solutions" (NbS) was introduced by the World Bank in the late 2000s and was subsequently disseminated and conceptually developed by the International Union for Conservation of Nature (IUCN) to further emphasize the importance of nature in general and biodiversity in particular for climate change mitigation and adaptation. One NbS approach that specifically addresses risk reduction is Ecosystem-based Disaster Risk Reduction (Eco-DRR).

A conceptual diagram of the overall approach to DRR with ecosystems is shown below.

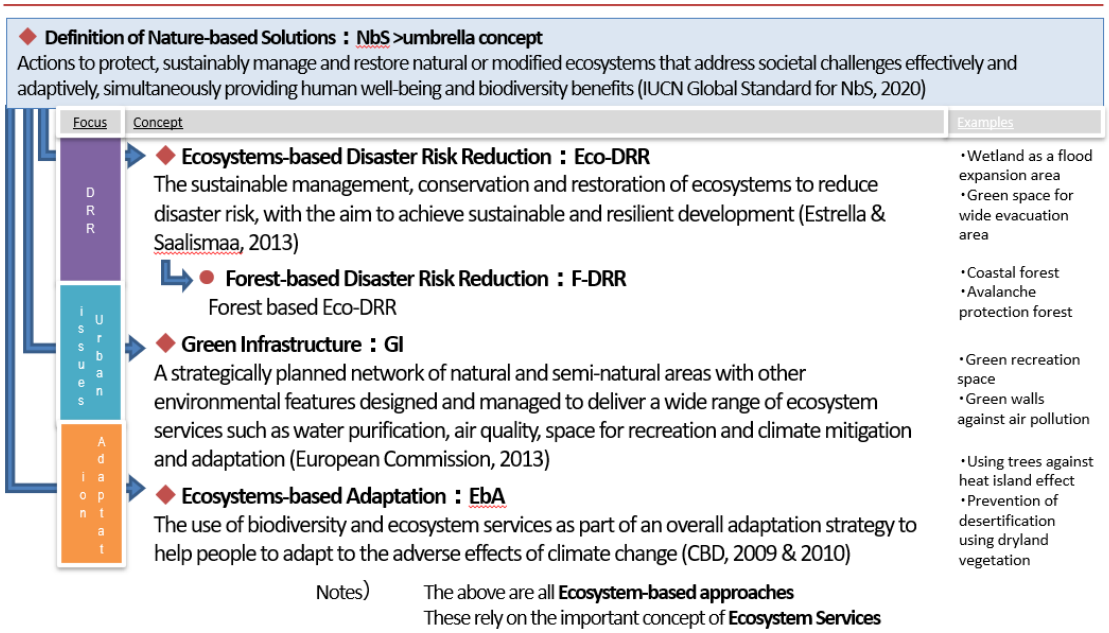


Figure 2: A conceptual diagram of the overall approach to DRR

Therefore, the objective of this Eco-DRR Project is coherent with the international trends.

【Cooperation with IUCN】

As mentioned above, IUCN is a leading organization in the field of NbS in general and Eco-DRR in particular. IUCN has undertaken an initiative in Radovish when launching the ADAPT project (Nature-based Solutions for Resilient Societies in the Western Balkans). The period was originally from November 2019 to October 2022, but it was extended by one year until 2023. Two meetings were held with Radovish Municipality, and Eco-DRR activities will be planned on the mountain side of Radovish.

【Cooperation with SDC】

The Swiss Agency for Development and Cooperation (SDC) implemented its "Nature Conservation Programme" from January, 2017 to June, 2021 with the objective that "Bregalnica region safeguards its natural values and promotes socio-economic development that is sustainable and inclusive". Bregalnica region is located to the north of Radovish and it is connected to Vardar river. This programme has conducted planification activities over several FMUs. They have supported capacity development at national, regional and local levels. This Project has had several discussions with SDC and its consultant on topics such as forest management and Payments for Ecosystem Services (PES).

Also, SDC initiated "Landscape Fire Management in the Western Balkans" Project in 2022. The

overall goal of this project is to Increase resilience of Western Balkan forests and landscapes against fires, benefit the people who depend on these landscapes for their livelihoods and socioeconomic development. In terms of fire management, this project has similar direction with this Project and the achievements, lessons learnt and recommendations of JICA Eco-DRR project was shared in the 2nd regional seminar.

(3) Effectiveness

Effectiveness of the Project is judged as “High”.

The Project purpose “Eco-system based Disaster Risk Reduction (Eco-DRR) model against floods, landslides, soil erosion and forest fire by utilization of multiple forest function is developed” has been achieved by the four outputs of the Project, i.e. 1. Enhanced National Crisis management coordination mechanism, 2. Enhanced National forest management and planning capacities, 3. Enhance Execution Capacity to carry out Eco-DRR related activities, and 4. Improved Capacity of government personnel and public awareness of local community about the Eco-DRR.

Overall, the Project conducted several trainings and seminars related to the outputs which were contributed to the achievement of respective outputs as well as the Project purpose.

Specifically for Output 2, National forest management and planning capacities, procedures for formulating forest management plans and rehabilitation plans were enhanced and partly reflected into the new rulebook (regulation) on forest planning and the draft new law on forests, as well as in planning of future policy measures which is on-going discussion under the support of EU transition.

Also, several trainings, on-the-job trainings and seminars were conducted and enhanced the understanding of PENF and MAFWE.

The reform of the forest sector in preparation to EU accession is one of the main external factors why Eco-DRR function was recognized in the stakeholders of forest sector and some elements could be reflected in the proposal of forest law and regulations.

(4) Efficiency

Efficiency of the Project is judged as “High”.

Because of COVID-19 pandemic, Experts could not come to North Macedonia from Japan and some of the field activities, such as forest planning and forest conservation works could not be implemented. This situation affected the main outputs of the Project. Therefore, one year extension was determined through the discussions between Macedonian and Japanese sides.

However, for the further improvement of the outputs, during this pandemic time, Experts have conducted following six new activities;

1. Preparation of guidelines for reading landslide feature
2. Legal and regulatory recommendations to Rule Book of Forest Management
3. Preparation of a collection of wind-break forest: Case studies
4. Manuals and guidelines on civil engineering information technology
5. Survey training
6. Video imaging of Eco-DRR cases in Japan and Balkans

In each new activity, manuals, reports and a video were created. During the project period, those deliverables were used effectively; e.g. Eco-DRR video was shown in each training conducted after COVID-19 pandemic period.

As indicated in Section 1-1: Input by the Japanese side, equipment has been procured by this Project, some of which is related to system development and other is related to forest conservation activities. Such equipment is indispensable for system development and forest conservation activities respectively. Most of the pieces of equipment were procured from North Macedonia because it was thought that these would need to be maintained after Project completion. The timing of procurement is thought to have been appropriate, except for 12 laptop PCs. In total, 22 Laptop PCs were procured, 10 of which in 2022 and 12 of which in October, 2023. Those 12 latest ones could not be used within the Project period, and are intended to be used for MKFFIS training after Project completion in 2024 or later and in regional offices of CMC.

(5) Impact

Impact of the Project is judged as “High”.

It is understood that some of the implemented changes in regulations were inspired by discussions that occurred between JICA experts and Macedonian participants to the first and second forest policy workshops. According to MAFWE, the training received in Japan was similarly a source of inspiration. Proposed future legal changes such as the introduction of a forest environment tax are also in line with the discussions held.

In 2019, EU granted a budget line to North Macedonia under the IPA II Program, with the aim to contribute to the reform of the forestry sector. Under this budget, studies supporting legal and institutional reforms have already been conducted, and actions relevant to Eco-DRR have been included in the “NMK-Forestry” project that started in April 2023. These include revising the

forest planning methodology in 2024 to incorporate the zoning of forest functions, among others. The draft manuals produced under Output 2 have been explained to NMK-Forestry Project Manager during the third forest policy workshop, to ensure that they become part of the work of NMK-Forestry.

In 2021, following the progress of this Project, JICA initiated two similar projects centered on Eco-DRR and prevention of forest fire , one in Kosovo and another in Montenegro. Outlines, objectives and activities were developed based on the results and progress of activities in North Macedonia. JICA is also preparing an Eco-DRR Project covering both of Albania and Bosnia Herzegovina, building on the results and outputs achieved in North Macedonia.

(6) Sustainability

Sustainability of the Project is judged as “High”.

It is expected that national forest management and planning capacities, as well as procedures for formulating forest management plans and rehabilitation plans will be further improved if the draft new Law on forests is passed and the related strategy for sustainable development of forests and forestry, and its Action plan, are approved by the Government of North Macedonia. In such case, further studies on the management of protective functions of forests are expected to take place in 2025 and 2026.

In terms of forest conservation activities, manuals and guidelines have been developed and the capacity of PENF personnel has been enhanced through several trainings and OJTs. However, , it is deemed that their capacity is not yet fully sufficient to implement forest conservation activities in a sustainable manner, especially in the field of surveying and designing.

To sustain forest conservation activities, an overall framework needs to be established. For example, PENF may take up a role in supervising the work, while other missions including surveying and designing would be subcontracted to private entities. The Government of North Macedonia shall also consider how to secure financial support to such activities.

Through the reform of forestry, it is expected that PENF will be transformed into a “State Forests Company” (SFC), divided into eight subsidiaries. It will be necessary to allocate once a certain level of profit is generated, and also to consider PES and environmental taxes as other options for financing forest conservation activities.

2. Key Factors Affecting Implementation and Outcomes

In terms of implementation arrangements, it may have been more efficient to have a single counterpart organization rather than two. This project had two main counterpart organizations, CMC and PENF. CMC had the role of leading the project, while PENF was responsible for forest conservation activities. While CMC occasionally provided crucial leadership even in the

area of forest conservation, it was not in position to fully support the foresters because, as an organization, it is also bound by its own agenda. In such a dual counterpart system, both entities tend to focus on training and procurement that serve their priorities, which have effected efficient and effective project management and technical transfer.

3. Evaluation on the results of the Project Risk Management

(1) Results of the Project Risk Management

【Forest monitoring activity】

Data collection at Radovish South Site was not conducted regularly by PENF Radovish. This activity was originally planned to be conducted every month or each time after a certain amount of rainfall has been detected by the AWS, but it was not the case in practice. Further, after the first person in charge of monitoring resigned, there were some data breaks until the next person was assigned. Also, data processing was not conducted regularly by the Forest Management and Planning Department of PENF, and was only completed when JICA expert visited the office. Towards the end of the Project, Minutes of Understanding for overall structure of this monitoring was eventually concluded among PENF, the Faculty of Forestry of The Ss. Cyril and Methodius University in Skopje, and the Project. Based on this MOU, monitoring activity is expected to continue after the Project completion.

【Survival rate of seedlings】

The pilot site in Radovish was previously used for grazing and was in a dry environment with little fertile soil and an average annual rainfall of approximately 500 mm. Although carrying out pilot afforestation activities in such a harsh environment in the eastern part of North Macedonia involves certain risks to the success or failure of afforestation, it is considered to be meaningful in order to learn lessons that can be disseminated in similar areas in the future. Four tree species were planted in 2019, but the survival rate for three of them, Oak, Black pine and Ash, was low, ranging from 0% to 16.8%. Conversely, the survival rate of Robinia was relatively high, ranging from 22.4% to 75.0%. Based on these results, the second plantation cycle was conducted using mainly Robinia. Robinia would become expand rapidly once it is established and monoculture forest is not recommendable for the perspective of enhancement of biodiversity. Therefore, for the aim of establishing a native trees forest, the following “Recommendation for restoration of vegetation” were made to PENF Radovish and they have accepted.

<u>“Recommendation for restoration of vegetation”: Early vegetation establishment → forest phase conversion:</u>

1. Plant Robinia on terraces. Robinia is capable of growing in degraded drylands. By planting it

along contour lines an environment will be formed in which native tree species are more likely to invade.

2. After Robinia are established (5-6 years after planting), plant native tree species between the terraces.

3. Promote the protection and growth of native tree species while cutting down and utilizing Robinia, in order to both control its proliferation and secure wood for firewood, charcoal and agricultural uses.

4. Forests composed of native tree species will be formed. As native tree species grow larger, it is expected that the less shade-tolerant Robinia will decline naturally.

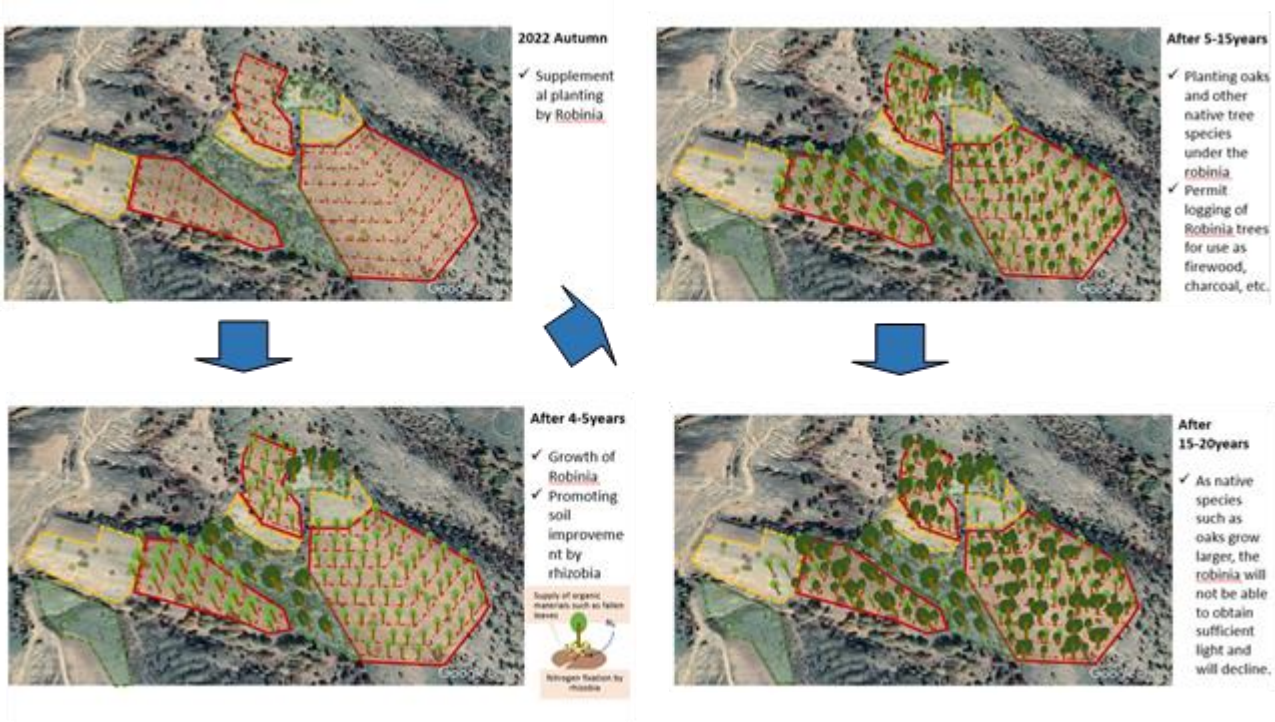


Figure 3: Forest phase conversion

(2) Results of evaluation of similar projects and Lessons learned (utilization) for this project

The lessons learned from the 2014 thematic evaluation (JICA, 2014) "Cross-sectional analysis of evaluation results: Extracting practical knowledge lessons in the field of forestry and natural environment conservation" are as follows.

① **Knowledge Lesson Sheet 5**

(Dissemination and Development of Model Projects and Mechanisms)

The risk that the implementation structure (necessary personnel, budget, commitment) will not be in place after the project is completed, and as a result, dissemination to other regions will not progress, shall be assumed.

Lessons for this Project

Based on the results of the "Information Collection and Current Situation Analysis Survey on Disaster Prevention and Reduction (Eco-DRR) Utilizing Forests and Other Ecosystems" conducted from April 2016 to March 2017, it is necessary to demonstrate the effectiveness of the model project regarding its various benefits and functions. From the planning stage of the project, it is necessary to work on demonstrating the model project's effectiveness and securing the necessary personnel, budget, and commitment to demonstrate the model and proceed to its subsequent dissemination.

Response in this Project

As part of the implementation structure for the model project, we recognized from the beginning that it was essential to strengthen the capacity of PENF's planning and management department to create forest restoration plans and forest conservation plans, and worked on training and OJT in line with the PDM. However, although the staff members of this department are graduates of the Faculty of Forestry, they did not receive classes related to structures, so they have little basic knowledge about surveying and designing, and if they wish to construct forest structures in the future, they will need to contract an outside organization. It is necessary to either delegate this or hire new personnel in the same department.

Even when outsourcing work to an external organization, as a supervisor it is necessary to acquire basic knowledge of architecture and civil engineering in order to prepare design and construction commission documents. Training for this purpose was also provided in this project, but it cannot be said that the participants will be able to prepare design and construction commission documents Because it is difficult to enhance human capacity rapidly and provide enough budget, for the time being, it is necessary to implement activities by hiring knowledgeable and experienced personnel from construction companies or by receiving advice from external experts such as university professors.

On the other hand, regarding forest policy, the Ministry of Agriculture, Forestry and Water Economy is working on promoting Eco-DRR in policy revision work in preparation for the country's accession to the EU. Therefore, in the near future, we can expect additional measures and budget allocation to implement Eco-DRR, such as establishing conservation areas within forests, constructing terraces to prevent sediment runoff, or restoring windbreak forests, which have not been implemented to date.

② **Knowledge Lesson Sheet 12**

("Multi-agency" involvement in projects): Measures involving multiple sectors and multiple administrative levels are required, and a decision-making venue/platform that allows for consultation and coordination with multiple related agencies is required.

Lessons for this Project

In implementing this Project, in addition to the involvement of multiple ministries and agencies such as CMC, which is in charge of matters related to disaster prevention and mitigation, and MAFWE and PENF, which are in charge of forest administration, cooperation and collaboration between central and provincial level governments was deemed essential. Therefore, it was agreed that CMC would play a central role, and that the JCC (Joint Coordination Committee) would also be utilized to create a platform for decision-making among multiple stakeholders. In addition, at the project planning stage, the authority, functions, and role sharing of the organizations responsible for implementing the project in local areas should be thoroughly confirmed, and the agreement on the content of the project should be obtained from local administrative agencies.

Response in this Project

A Technical Coordination Group "TCG" was established as a forum for coordination among related organizations, and was held every six months before the JCC.
System development related discussions regarding Output 1 were conducted ad hoc with CMC's project manager and system staff. Forest policy and forest management related discussions related to Outputs 3 and 4 were conducted ad hoc with PENF's Planning and Management Department Director and MAFWE. These meetings were held to coordinate each activity.

As a result, although consultation and coordination sometimes took time, explanations from project experts and local personnel facilitated communication and enabled smooth operation of the activities. However, as seems to be the custom in North Macedonia, once the responsible organization (CMC) for a project is decided, the staff of other organizations tend to take a step back, therefore it was difficult for PENF and MAFWE to gain strong control over the Project.

③ **Knowledge Lessons Sheet 12**

(Actual status of application of existing forest-related laws and systems)
In order to ensure the sustainability of activities, it is important to understand what specific types of related laws and systems are already in place. Thoroughly whether the project is practical and effective shall be investigated, and then from the beginning of the project, an activity and input

plan to develop an effective implementation system (including a dissemination system) at the local and field level must be included in the design.

Lessons for the Project

This Project also planned to provide cooperation on forest management plans formulation, including the forest zoning principle. Based on the information collection and current situation analysis survey regarding Disaster Risk Reduction, it was understood the actual state of existing laws and systems, and then made recommendations on effective planning methods and systems.

Response in this Project

The main forest-related laws and regulations in North Macedonia are the Law on Forests and the Forest Regulations (Rulebooks). As mentioned in ① "Knowledge Lesson Sheet 5", the Ministry of Agriculture, Forestry and Water Economy (MAFWE), which has jurisdiction over the country, is currently working on a policy reform in preparation for accessing the EU, policies likely to promote Eco-DRR are also being promoted. A spread of Eco-DRR and budget allocation can be expected in the near future, because of the new polices.

List of changes to the relevant laws, regulations and policies:

- Revision of the Rulebook on forest planning. Two revisions were implemented in December 2019 and August 2020 respectively. The main relevant changes are the following:
  - Clarification and implementation of the notion of protection forests. These can now be designated according to several purposes, and are recorded in the forest management plans,
  - Restriction of regeneration cuts in protection forests, now limited to 20% in volume over a 10 years period. A similar restriction is introduced in forests in protected areas.
- Proposal for a new Law on Forests, a new Strategy on the sustainable development of forestry, and a new Action Plan. These proposals were submitted in September 2022, and are pending adoption at the time of Project closure. The main relevant changes envisaged are the following:
  - Definition of windbreak forests (Article 6)
  - Clarification of the entity responsible for protection forests designation and of the general modalities of designation (Article 11)
  - Ban on clearcuts in protection forests and forests in protected areas, discouragement of large clear cuts in all forests (Article 18)
  - Introduction of a forest environment tax levied on private businesses, and earmarked to the future Forests Agency, part of which will be available to fund the public interest

functions of forests, including protection functions (Article 21)

- The forest management planning system shall be updated to include multifunctionality and zoning (Article 29).
- Planned funding for measures relevant to Eco-DRR (Action Plan)

	Addressed or planned	Partly or not addressed	Unclear
Recommendations issues by the Project Team	① Introduce multifunctional planning and forest functions zoning (listed in the Programme) ② Ban clear cuts in Protection Forests (foreseen in the new Law) ③ Establish management guidelines for protective stands (listed in the programme) ④ Introduce Payments for Ecosystem Services (foreseen in the new Law) ⑤ Ensure financing of Protection Forests through other sources than wood sales (foreseen in the new Law and the Strategy)	⑦ Introduce measures for Protection Forests in Protected Areas (impossibility of forest management in some PAs is recognized as an important issue, but whether this can be actually solved is unclear) ⑧ Introduce measures for Protection Forests in Private Forests (not addressed) ⑨ Simplify Forest Planning in Protection Forests (not addressed)	⑪ Clarify the Protection Forests system (at the moment, we have not fully understood the procedure for designation) ⑫ Institutionalize Eco-DRR piloting and implementation (some functions are expected to be created at the Forests Agency and the Forest Institute after the reform, therefore carefully consider the division of roles)
Suggestions of 2nd workshop participants	⑥ Create a Forest Institute (foreseen in the Strategy)	⑩ Consolidate public forest land around critical Protection Forests (consolidation is mentioned as a challenge in the Strategy, it will be done "if possible")	

Figure 4: List of progress of changes of New Forest Law and regulations

4. Lessons Learnt

Lessons learnt in North Macedonia Eco-DRR project are indicated as follows;

Subject	Lessons Learnt
4-1 Institutionalization of the disaster risk management system	MKFFIS is acknowledged as an important result of the forest sector (EU consultants' report). Replication in other countries, i.e. Kosovo, Montenegro, Albania and Bosnia Herzegovina, have started. Through this project activities, MKFFIS has become a system that can respond

	not only to fires but also to other types of disasters, and it is planned that the name will be changed to National Risk Information System (NRIS). For further enhancement on active utilization in the country, i.e. among ministries and citizens, the guidelines/ standard operation procedure “SOP” should be created.
4-2 Introduction of new policies and regulations	During the Project, Eco-DRR has been partially reflected in a new regulation, and well reflected in draft law, regulations, strategy, and action plan. Although protected forests theoretically existed under the existing Forest Law, the method for designation was not stipulated, and protected forests have never been designated. In 2019, the designation of protected forests was established through the revision of the rulebook for forest planning, and MAFWE began designating them (4,912 ha as of December 2022). A similar system is scheduled to be introduced into legislation by the end of 2026 under the North Macedonian government's "Draft Forest Action Plan." Although there was an impact due to the EU transition activity, these results were due to the fact that input about Japanese examples was made effectively in regular workshops and training sessions with stakeholders (MAFWE, PENF, Faculty of Forestry). Institutionalizing of activities related to designation of protected forests and forest conservation activities under the new law is expected to be realized.
4-3 Clarification of responsibilities on forest conservation works	At this stage, it is difficult for the organization to design and construct check dams but can carry out tree planting using simple methods, so they need to improve their technical capabilities by starting with relatively simple techniques such as terrace construction. Following three issues can be indicated as lessons learnt in this Project; 1. <u>Clarify responsibilities on forest conservation works</u> During the reform of forestry, clarify whether SFC (the reformed PENF) shall become a designer and/or supervisor and/or operator of forest conservation works. If that is the case, organize the acquisition of necessary licenses and personnel (e.g. land surveyor), and organize a system of subcontracting. It is recommended to pursue the improvement of competences in this field. It is assumed that the main client will be the Forests Agency (FA), and that long-term budget visibility will be provided through forest

	planning. It is needed to clarify whether this field shall be an exclusive competence of SFC. If yes, in which conditions (e.g. limited to public forests, or limited to public protection forests), or whether it shall be subject to an open market. 2. <u>Clarify responsibilities on erosion control</u> During the reform of forestry, clarify whether SFC (the reformed PENF) shall become a designer and/or supervisor and/or operator of erosion control works in addition to forest conservation. If this is the case, organize the acquisition of the necessary licenses and personnel (e.g. registered civil engineers). It is needed to clarify which entities (Municipalities, MAFWE, MOEPP, Forests Agency, Water Organizations, Operator of public services such as highways, etc.) may contract SFC for such works, and ensure that these entities develop a long-term budget vision, allowing SFC to invest in this new technical field. Also, it is needed to clarify whether this field shall be an exclusive competence of SFC or whether it shall be subject to an open market. <u>3. Adapt the structures to explicitly include Eco-DRR</u> After the future missions of FA and SFC have been clarified, consider the creation of a specific unit in charge of forest conservation (and erosion control as relevant) in both organizations. The unit at FA would be in charge of piloting, planning and securing budgets, while the unit at SFC would be in charge of responding to the orders and managing the related works. Therefore, specific training on contract and supervision of forest conservation activities should target the personnel affected to both units.
4.4 Awareness raising among communities	1. Awareness raising In this Project, awareness on Eco-DRR was raised towards communities in both the upper parts and lower parts of the watersheds. It is important to encourage both communities to communicate with each other to find out effective measures together through discussion and negotiation. 2. Encompass local benefit It is important to develop additional ways of providing local benefits to

	communities impacted by forest conservation activities (honey, fruits and nuts production, small grant for equipment, etc.) 3.Clear boundaries Unclear boundaries between FMUs and private lands in the mountains is one of the reasons for encroachment. Install boundary markers and communicate towards residents. Establishing public land around protective forests where possible should be considered to prevent encroachment.

5 Performance

Coordination provided by JICA Balkan office made it possible that the Embassy of Japan in North Macedonia actively participated in Project meetings an seminars, such as JCC meetings and regional seminars. Specifically, the participation of the Ambassadors in the 1st and 2nd regional seminars has made the seminars more valuable.

6. Additionality

Artificial Intelligence "AI" of high risk areas of landslides has been tried in this Project, but under the condition that limited examples of land slides are available in the country, the applied method of AI could not produce successful results. Therefore, the ordinal method with four evaluation items, 1. Amount of relief, 2. Ground opening, 3. Valley order, 4. Slop degree, was applied. When more examples of landslides with its locations are available, it should be worth trying with AI method.

IV. For the Achievement of Overall Goals after the Project Completion

1. Prospects to achieve Overall Goal

Overall goal

By Eco-system based Disaster Risk Reduction (Eco-DRR) measures and activities in synergy with sustainable forest management, disaster risks of floods, landslides, soil erosion and forest fire on a long-term basis is reduced in North Macedonia.

Objectively Verifiable Indicators

1: By 2027, CMC increases and revises the contents of MKFFIS which is related to floods, landslides, soil erosion and forest fire and continuously provides the information to relevant organizations.

2: CMC supervises and supports of the preparation of a hazard map by relevant institutions such as Municipalities for at least one site using the same techniques which are introduced by the

Project.
3: By 2027, PENF applies silvicultural methods which are introduced by the Project more than three (3) locations.

1-1 Status or achievement of Objectively Verifiable Indicator 1

Since an input function was added when developing MKFFIS, each CMC office will use this function to input disaster-related information, increasing the amount of information.

Prediction of achievement in 2027

As shown on the above, the functions and systems to put this into practice have been established, and the possibility of achieving this goal is extremely high.

1-2 Status or achievement of Objectively Verifiable Indicator 2

During the project period, training on creating a flood disaster range using a hydraulic model was conducted. It is assumed that certain data (rainfall data, DEM data) are available for the target area.

On the other hand, if a simulation cannot be carried out due to data issues, a hazard map displaying information on past disasters will be created, and a manual has been created to make this possible.

Prediction of achievement in 2027

Achievability is unclear

It depends on the status of data preparation. (Example: Nationwide maintenance of 10mDEM based on aerial laser measurement data, etc.) In the future, using DEM;

・Estimation of flood area should be carried out nationwide (10m grid size) and using the RRI model.

・It will also be possible to extract locations where steep slopes are or have collapsed (in Japan, 30 degrees or more and 5 meters or more).

It the data are not available, it is recommendable to make a hazard map manually by finding the flooded locations by walk and mapping.

1-3 Status or achievement of Objectively Verifiable Indicator 3

Manuals were created and trainings were conducted on the forest management and afforestation methods introduced by the Project to encourage their reuse. With the help of PENF, MAFWE has started designating protection forests in several locations (more than 3 sites) during the Project, on bases that are partially consistent with categories defined in the manual for forest

functions categorization. However, due to the impossibility to revise ongoing forest plans without serious grounds such as fire or similar devastation, it is not possible for PENF to immediately take up and apply the results of pilot implementation of the manuals in “Radovishka-Oraovichka Reka” FMU and “Topolka-Karabunishte” FMU, hence said methods cannot be applied in these locations before 2028 and 2032, respectively. In “Skopska Crna Gora” FMU, the Project has suggested adoption of some forest rehabilitation measures (afforestation and terracing), but the status of adoption is unknown at the moment. If some measures are adopted for planning, they will be included in the forest management plan starting in 2024.

Prediction of achievement in 2027

It may be possible to achieve the goal by 2027, mainly thanks to the training received by the planning and field personnel of PENF. Especially, “Skopska Crna Gora” FMU is deemed to be a possible site if some measures proposed by the Project are adopted for planning until the end of 2023.

Also, designations of protection forests by MAFWE have become routine and are expected to continue in various other sites.

On the other hand, in light of PENF's implementation capacity (human resources and funds) at the time of project completion, it is unlikely that forest conservation activities will be expanded across a wide area in the country until 2027. Further support from MAFWE, which is the Ministry in charge of PENF, needs to continue strengthening PENF’s implementation capacity and secure internal and external government funds.

The ongoing reform of forestry also entails a certain level of uncertainty. On one hand, contributing actions such as officially revising the forest planning methodology are planned between 2024 and 2026, and dedicated funding for forest conservation is also foreseen, on the other hand adoption of the Strategy and Action Plan by the Government may be delayed, and adoption of the new Law on Forests is likely to be delayed. During the reform, the various stakeholders including PENF may become cautious and prevented from taking initiatives such as applying new methods, until the final image of the reform appears clearly to all. Eventually, managers may also be quite busy due to additional workload to conduct the reform, and may be less available to promote new methods.

2. Plan of Operation and Implementation Structure of the Macedonian side to achieve Overall Goal

Overall goal

By Eco-system based Disaster Risk Reduction (Eco-DRR) measures and activities in synergy

with sustainable forest management, disaster risks of floods, landslides, soil erosion and forest fire on a long-term basis is reduced in North Macedonia.

Objectively Verifiable Indicators	Mid-term plan by 2025	Long term plan by 2027
1: By 2027, CMC increases and revises the contents of MKFFIS which is related to floods, landslides, soil erosion and forest fire and continuously provides the information to relevant organizations.	- Disaster data currently collected from local offices and integrated to MKFFIS, will be accumulated.	- Budget for the system management and development shall be secured by the Government of North Macedonia..
2: CMC supervises and supports of the preparation of a hazard map by relevant institutions such as Municipalities for at least one site using the same techniques which are introduced by the Project.	- Necessary data for hazard map creation such as elevation data and rainfall data will be provided. - Based on the above data, CMC will provide the basic map for hazard map creation.	- If the necessary data are provided, CMC will continue provide the basic map for hazard map as indicted in the prediction in 2025. - If the necessary data cannot be provided, a hazard map displaying information on past disasters will be created, base on a manual created by the Project.
3: By 2027, PENF applies silvicultural methods which are introduced by the Project more than three (3) locations.	- Protection forests will continue to be designated in line with the revised Rulebook, and their area will increase. - Future studies will	- Capacity of forest staff on forest conservation activities will be improved through internal trainings and the recruitment of new staff. - Budget for the above

	be run as expected.	activities will be secured by the Government of North Macedonia.

The implementation structure of CMC for Objectively Verifiable Indicator 1 & 2 of the Overall goal is shown below;

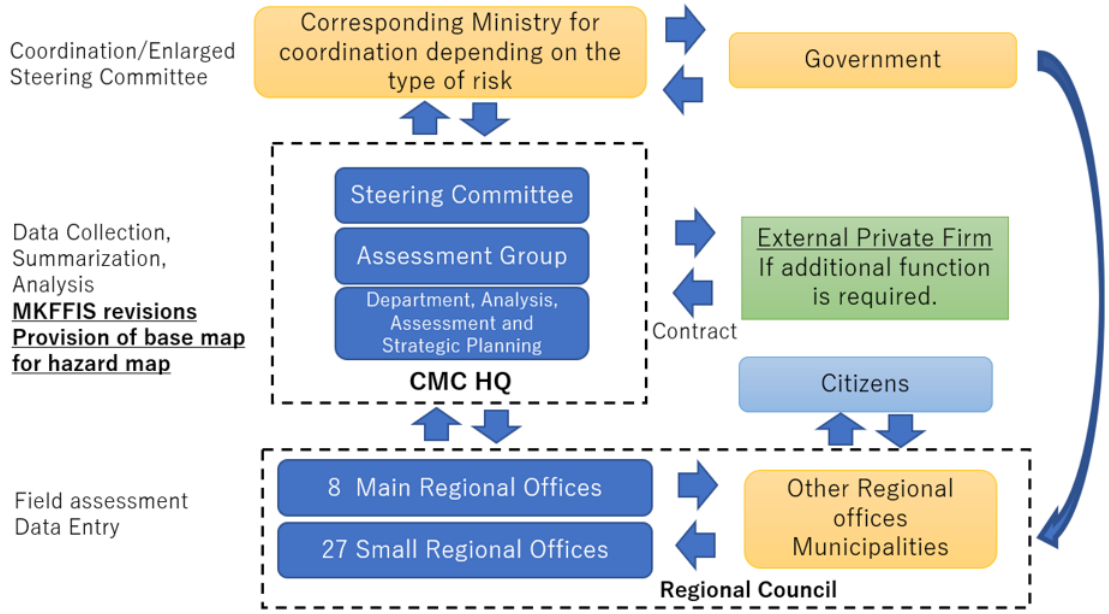


Figure 5: Implementation Structure of CMC for Objectively Verifiable Indicator 1 & 2

For the creation of hazard maps, CMC needs the support from several organizations, such as the Hydrometeorological Service (HMS) for rainfall fata and the Agency for Real Estate Cadastre (AREC) for topographic data. If the necessary data cannot be provided, a hazard map displaying information on past disasters is proposed as an option. It can be created following the dedicated procedure mentioned in the Hazard Maps Creation Manual drafted by the Project. Additionally, open data may be use instead of public topographic data, as was the case in the pilot Hazard Map conducted in Radovish. The figures below summarize the overall creation process and a conceptual diagram of MKFFIS respectively.

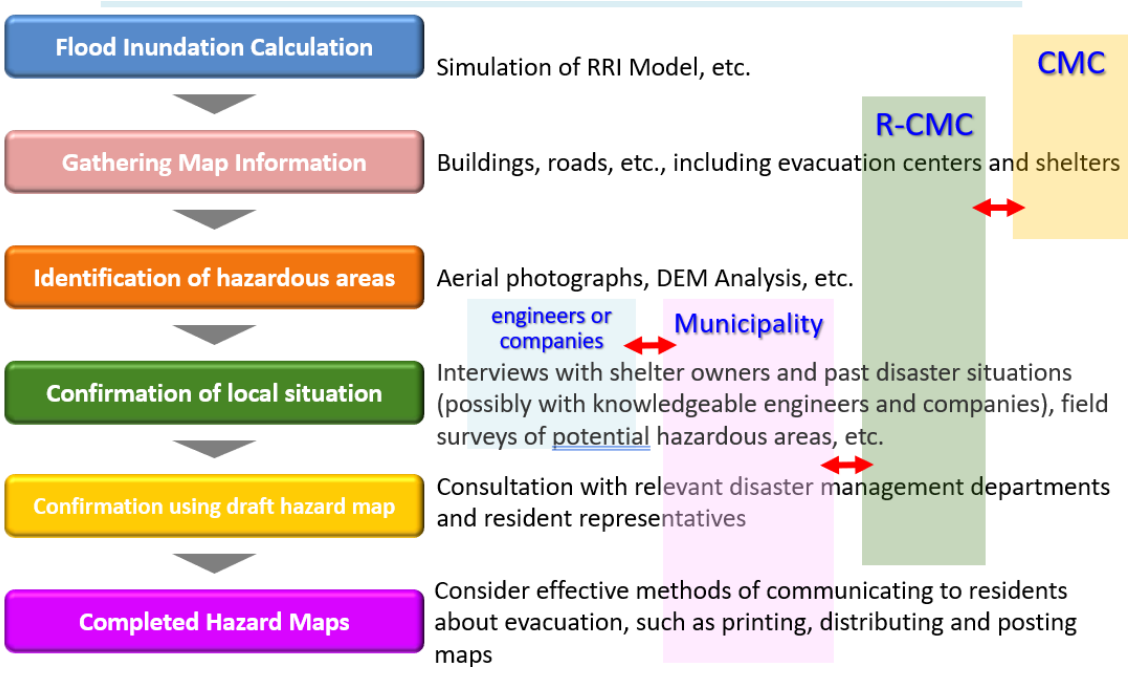


Figure 6: Flow of hazard map preparation and the roles of government agencies

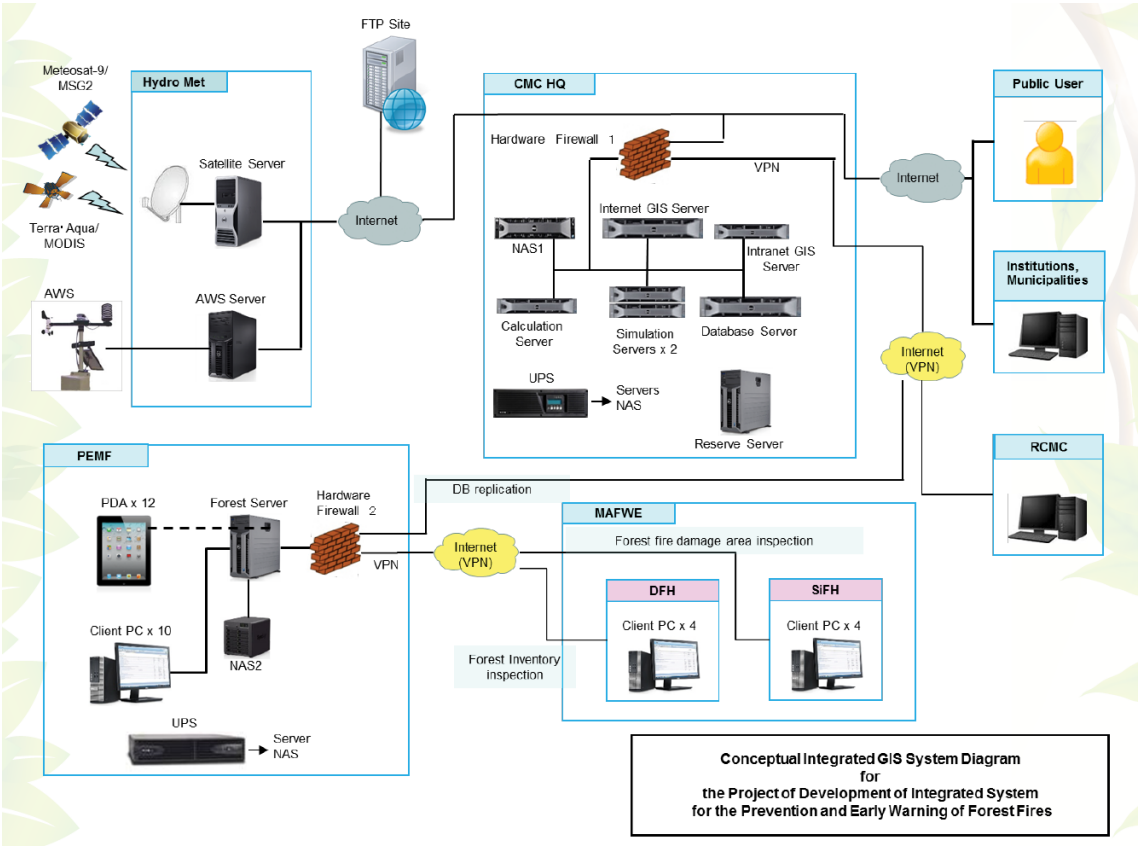


Figure 7: Conceptual Diagram of MKFFIS

The Implementation Structure of PENF for Objectively Verifiable Indicator 3 of the Overall goal is shown below.

Note) PENF is expected to be renamed “State Forest Company” (SFC) during the reform of forestry. Also, forest research institute will be established probably in 2025. This institution will work on scientific aspects including Eco-DRR and for promoting this action external support such as JICA will be essential.

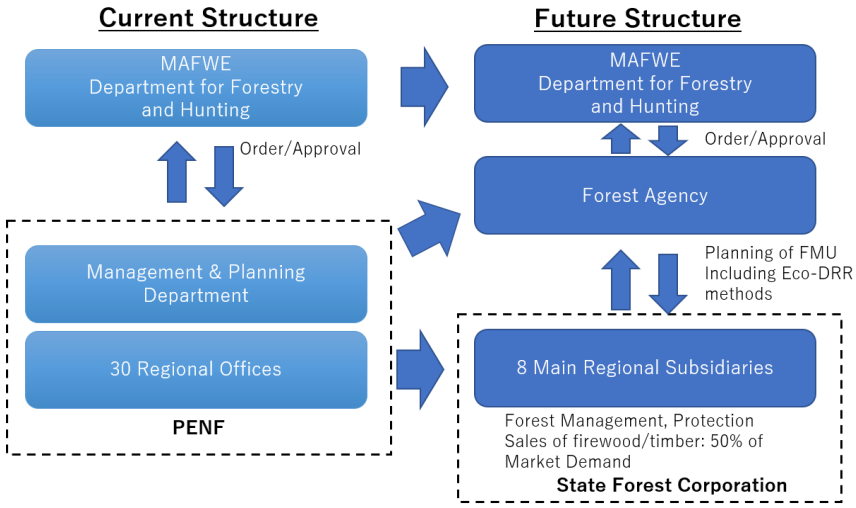


Figure 8: Idea of transformation of forest sector in North Macedonia

3.Recommendations for North Macedonian side

Recommendations for North Macedonian side are hereby indicated for the sustainability of the Project outputs and activities as well as the disaster risk reduction in the future.

Subject	Issues raised in this Project	Recommendations
3-1 Technical barriers encountered	1. Unclear status of Robinia (invasive or not?) sparked hesitation. Limited diversity of variety of seedlings for plantation restricted options for afforestation in difficult terrain. There seems to be potentially many more suitable species. Further study is required.	1. The unclear status of Robinia in North Macedonia sparked hesitation regarding the possibility of using it as a plantation species, which led to delays. Although it is considered invasive in Japan, its use for afforestation is widespread in North Macedonia, where it is not officially classified as invasive, while some local studies also mention risks. Depending on the point of view of each stakeholder, a tree species may be identified

		invasive or not, and hence it is necessary to devise a management policy after collecting local information (legal, technical and sociological), and carefully hearing various opinions reflecting the local context. Ideally, such discussions shall be held as early as possible in the project plan. The result of the discussions may not be applicable in another country or region. Appropriate management practices may even differ among pilot sites of the same country depending on local factors such as growth potential of the species and surrounding ecosystems. (Undertake early efforts for seedling diversification) 2. The limited number of available seedling species for plantation restricted options for afforestation in difficult terrain such as Radovish Pilot Sites. Mainly four species only were available from PENF nurseries, of which only one proved vigorous in Radovish, but this was a controversial species (Robinia). Later in the Project, it turned out that there would many more local species would be suitable for mountain afforestation including difficult terrain, but these were simply not available in PENF nurseries. As establishing a seedling production system takes time, related studies and discussions shall be undertaken as early as possible in the Project Plan, and efforts shall be made to diversify species available in practice, either by encouraging production in public nurseries, or by mobilizing private nurseries. (Early reinforcement of PDCA efforts in case of

		difficult afforestation terrain) 3. Although the edaphic conditions in Radovish were judged extremely difficult for afforestation by PENF due to altitude, wind, dryness and soil thickness, planting succeeded to a significant extent. This notably resulted from coordinated efforts for plantation monitoring, soil hardness measurement and meteorological monitoring, so that it was possible to understand the most appropriate species and techniques in each area and to quickly remedy to issues through supplementary plantation and occasional watering. Thorough efforts may pay well off. Monitoring shall be started as early as possible in future projects to allow time for corrective actions.
3-2 Institutional issues	1. MKFFIS is acknowledged as a serious result of the forest sector (EU consultants' report). Replication in other countries, i.e. Kosovo, Montenegro, Albania and Bosnia Herzegovina, have started. Through this project activities, MKFFIS has become a system that can respond not only to fires but also to other types of disasters, and it is planned that the name will be changed to National Risk Information System (NRIS). 2. During the Project, Eco-DRR has been partially reflected in a new regulation, and well reflected in draft law, regulations, strategy, and action	1. Enlarge cooperation around MKFFIS With MKFFIS being enhanced and becoming the National Risk Information System (NRIS), it is important to cooperate with more stakeholders and to incorporate it into a wide variety of laws and regulations. It is recommended for Macedonian side to continue efforts after the project ends, including the development of guidelines and SOPs 2. Institutionalizing of activities related to designation of protected forests and forest conservation activities Protected forests will likely expand through the new forest law and regulations. Regarding forest

	plan. There are very positive prospects if the forest environment tax is adopted. Institutionalizing of activities related to designation of protected forests and forest conservation activities under the new law is expected to be realized.	conservation, implementation methods shall be formalized in the new organizations of forest sector. Although it is unclear how their responsibilities will be divided as the PENF planning management department becomes Forest Agency (FA), it is recommended to establish a structure that can promote forest conservation in FA, e.g. setting a new section for forest conservation activities for Eco-DRR.
	3. There is no legal obligation for implementation of erosion control for PENF.	3. Clear responsibility on erosion control for PENF or new organizations In the process of formulation of new organizations of PENF, it is advisable to include soil erosion control in PENF obligation. Also, since it is unlikely that the government in North Macedonia has ample budget near future, PENF, which will be re-organized for the effective management in the future, should allocate the budget for forest conservation activities once a certain level of profit is generated. Payment for Eco-system Services (PES) and environmental taxes should be also options. Under the condition of increasing natural disasters, those options could also be agreeable among Macedonian citizens.
	4. Foresters learn erosion control at school but cannot implement it in practice.	4. Enhancement of capacity on erosion control Regarding forest management, it will be difficult for PENF staff to actually conduct surveying and designing for a while, so PENF (Planning and Management Department, which will become FA in the future) should take a responsibility for supervision and will acquire the minimum knowledge and other works for Eco-DRR

		activities should be contracted out. For the purpose of the contract for Eco-DRR activities, certain amount of budget should be secured.
3-3 Support from people	1. Lack of support from people affected forest conservation works as they are not the beneficiaries of forest protection (Kodzhalija).	1. Awareness on Eco-DRR Awareness should be raised for the people in the upper parts of the watersheds, and also for those in the lower parts. It is expected that the people will communicate each other to find out the effective measures for erosion control. Kodzalija will be maintained as an erosion control and research site and will not undergo quick destruction due to the residents' conduct or animal intrusion. The residents will understand the value of Robinia and live fence species. They will collect the fruits from the live fence, and in cooperation with PENF, they maintain and control the planted Robinia by using their wood in a sustainable manner for tobacco drying site construction, fencing poles, and heating. There is ambiguity or unclear boundaries between FMU and private lands in the mountain, which is one of the reasons for encroachment. Boundary markers such as stone markers should be installed by the government authorities.
3-4 Research needs	1. "Lisiche Model" intends to reinforce resilience to droughts by protecting the capacity of dam reservoirs and stabilizing the water flow, but this comes at the expense of additional evapotranspiration ("green water"), which reduces the available water flowing to the dam and intended for human uses ("blue water"). The discussion arose whether Lisiche model is effective or not in this regard, in the current	1. Lisiche model When developing drought prevention function-related forest projects, plan local data collection (climate, weather, water and sediment flow to the dam, dam water level, etc.), and encourage academic organizations to regionalize data such as evapotranspiration model by each one of tree species, age and soil type. Based on the collected data, clarify the conditions for effectiveness of this Eco-DRR model, across both spatial and temporal dimensions.

	situation (already dry climate) and in the future (predicted impacts of climate change). However, it was impossible to conclude, as there was not enough local data to precisely and quantitively assess such aspects.	
3-5 Hazard map creation	1. For the creation of hazard maps, CMC needs the support from several organizations, such as Hydrometeorological service for rainfall data and Agency for Real Estate Cadastre for topographic data.	1. Hazard map creation If the necessary data cannot be provided, a hazard map which displaying information on past disasters can be proposed as an option. The LiDAR survey has been conducted in the nation already. So, it is advisable that the national LiDAR coverage will be used for the creation high resolution hydrologic modelling, preparation of next generation hazard maps, preparation of high-resolution slope maps, and performance of various analyses linked to Eco-DRR.

4. Monitoring Plan from the end of the Project to Ex-post Evaluation

It is advisable for JICA or JICA Liaison staff in North Macedonia to monitor the following items after the completion of the Project at least until the ex-post evaluation by JICA in 2027.

MKFFIS

- How CMC institutionalizes expanded MKFFIS and budget for the system management and development shall be monitored.
- It should be monitored if CMC supervises and supports of the preparation of a hazard map by relevant institutions such as municipalities.

Forest policy and management

- Progress of new forest law and regulations should be monitored.
- Based on the new forest law and regulations, the progress of expansion of forest protective areas should be monitored.

The following figure explains the planned schedule related to the forest sector reform and new laws and regulations. This figure can be used for the monitoring of above activities.

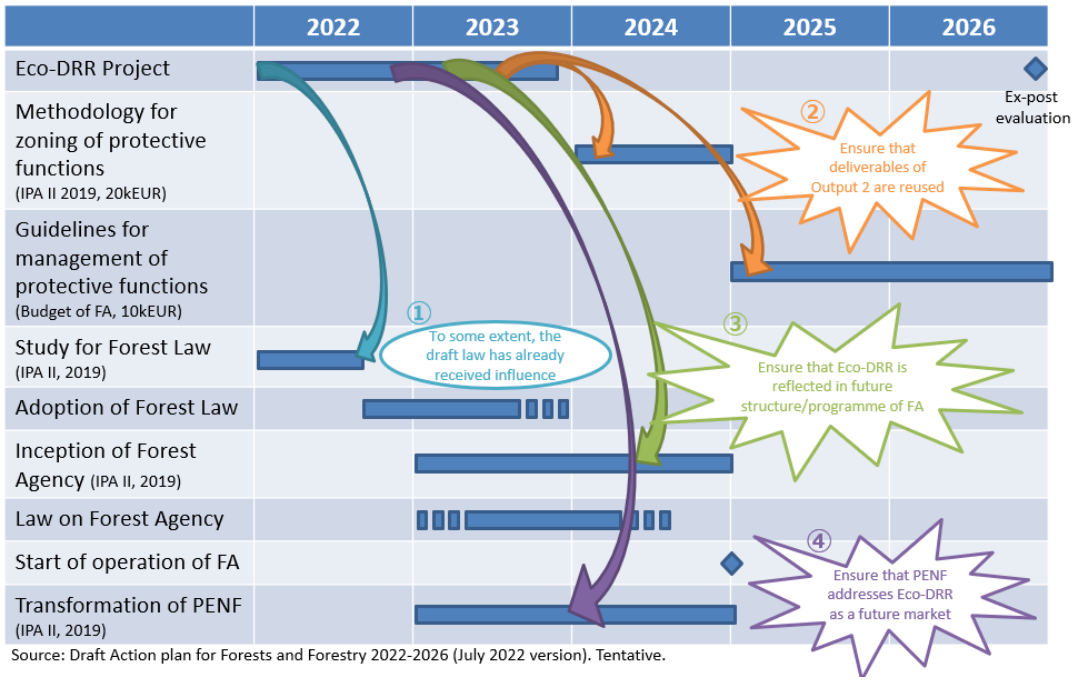


Figure 9: Planned schedule related to the forest sector reform and new laws and regulations

Forest conservation

- The maintenance of nursery equipment provided by the Project should be monitored.
- Data collection from forest monitoring sites should be continued based on the roles indicated in the MoU among PENF, Faculty of Forest and the Project.
- For the forest conservation activities, capacity of human resources e.g. through staff recruitment or trainings and budget allocated for the activities should be monitored.

Republic of North Macedonia
Crisis Management Center

The Project on Capacity Building for Ecosystem Based Disaster Risk Reduction (Eco-DRR) through Sustainable Forest Management in North Macedonia (Project Eco-DRR in North Macedonia)

Project Completion Report
Annex 1
Results of the Project

December 2023

Japan International Cooperation Agency
Asia Air Survey Co., Ltd.
Kokusai Kogyo Co., Ltd.

Abbreviations

ADAPT	Nature-based solutions for resilient societies in the Western Balkans
AI	Artificial Intelligence
AREC	Agency For Real Estate Cadastre
AWS	Automatic Weather Station
CMC	Crisis Management Center
CMS	Crisis Management System
COVID-19	Coronavirus Disease 2019
C/P	Counterpart
DB	Database
DEM	Digital Elevation Model
DRAM	Disaster Risk Assessment and Mapping
DTM	Digital Terrain Model
Eco-DRR	Ecosystem-based Disaster Risk Reduction
EPM	Erosion Potential Model
EU	European Union
FA	Forest Agency
FAO	Food and Agriculture Organization
FMU	Forest Management Unit
GCF	Green Climate Fund
GFIS	Geographical Forest Information System
GIS	Geographic Information System
HMS	Hydrometeorological Service
HP	Homepage
ID	Identification
IoU	Intersection over Union
IPA	Instrument for Pre-Accession Assistance
IUCN	International Union for Conservation of Nature
JCC	Joint Coordination Committee
JICA	Japan International Cooperation Agency
MAFWE	Ministry of Agriculture, Forestry and Water Economy
MKFFIS	Macedonian Forest Fire Information System
MOEPP	Ministry of Environment and Physical Planning
MOH	Ministry of Health
MOI	Ministry of Interior
NbS	Nature based Solution
NGO	Non-Governmental Organization
OJT	On the Job Training
PC	Personal Computer
PDM	Project Design Matrix
PENF	Public Enterprise National Forests
PES	Payment for Ecosystem Services
RCMC	Regional Crisis Management Center
R/D	Record of Discussion

RRI	Rainfall-Runoff-Inundation
SDC	Swiss Agency for Development and Cooperation
SFC	State Forests Company
TCG	Technical Coordination Group
TOT	Training of Trainers
WS	Workshop

Table of Contents

List of Tables

List of Figures

List of Photos

1. List of Dispatched Experts

Planned: Totally seven experts were planned.

Table 1: List of Short-term Experts (Plan)

	Role in the Project
1	Forest Management
2	Forest Conservation
3	Database
4	GIS/Remote Sensing
5	Hydrologist
6	Public Awareness
7	Disaster Risk Reduction

Actual: Totally 17 experts were dispatched.

Table 2: List of Short-term Experts (Actual)

	Name	Role in the Project
1	Dr. Toru Inada	Chief Technical Adviser/Eco-DRR
2	Mr. Yuta Morikawa.	Deputy Technical Adviser/Eco-DRR
3	Mr. Mitsunobu Onishi.	Forest Management Plan
4	Mr. Thomas Kochert	Forest Policy
5	Mr. Tomoyuki Ueda	Forest Conservation 1 (Planning and Construction)
6	Dr. Takaki Toyoda	Forest Conservation 2 (Plantation and Construction)
7	Mr. Keiji Someya	Forest Conservation 3(Planning and Design, construction)
8	Mr. Shiro Makita	GIS/Database 1
9	Mr. Hiroyuki Kozu	GIS/Database 2
10	Mr. Toru Furuya	GIS/Remote Sensing
11	Mr. Hitoshi Takeuchi	Hydrologist
12	Mr. Makoto Nakata	Disaster prevention and risk reduction
13	Mr. Masami Sugiura	Topographic Assessment
14	Mr. Daisuke Yumiyama	Forest Monitoring 1
15	Mr. Keishi Kudo	River Hydrologist
16	Ms. Sahori Fujimura	Project Coordinator1/Public Awareness/ Forest Monitoring 2
17	Ms. Akari Matsumoto	Project Coordinator2/Public Relations

Dispatched schedule of experts was attached in the following pages;

Phase I

	Name	Role		Disp athc	FY 2017 11	12	1	2	3	FY 2018 4	5	6	7	8	9	10	11	12	1	Total Days	MM
現地業務	Toru Inada	Chief Technical Adviser/Eco-DRR	Plan	3	(13)	(15)			(5)		(30)	(15)			(25)	(31)	(8)			142.00	4.73
			Actual	3	11/30 (1)	12/24 (24)			3/21 (11)		(30)	6/12 (31) (12)		8/28 (4)	9/29 (18)	10/31 (1)	11/30			132.00	4.40
	Yuta Morikawa	Deputy Technical Adviser/Eco-DRR	Plan	3	(13)	(15)					(31)	(15)				(15)	(30)			119.00	3.97
			Actual	2	11/30 (1)	12/24 (24)				4/23 (8)	5/5	5/17 (20)	6/16 (16)			10/22 (10)	12/1			79.00	2.63
	Mitsunobu Onishi	Forest Management Plan	Plan	3	(13)	(15)				(25)		(15)			(25)	(25)				118.00	3.93
			Actual	2	12/2	12/24 (23)				4/14 (17)	5/24 (24)					10/2 (30)	11/24			94.00	3.13
	Tomoyuki Ueda	Forest Conservation 1 (Planning and Construction)	Plan	3	(13)	(15)				(30)		(30)				(15)	(30)	(15)		148.00	4.93
			Actual	2	12/3	12/24 (22)				4/10 (21)	5/3	5/11 (24)	5/31		9/23 (8)	10/4	10/23 (27)	12/11		102.00	3.40
	Takaki Toyoda	Forest Conservation 2 (Plantation and Construction)	Plan	2						(15)	(30)	(15)			(30)	(30)				120.00	4.00
			Actual	1						4/21 (10)	(31)	6/16 (16)				10/1 (31)	12/2			88.00	2.93
	Shiro Makita	GIS/Database 1	Plan	2						(30)						(30)				60.00	2.00
			Actual	2						4/20 (11)	5/19 (19)			8/15 (17)	9/6 (6)					53.00	1.77
	Hiroyuki Kozu	GIS/Database 2	Plan	2						(30)						(30)	(15)			75.00	2.50
			Actual	1					3/13 (19)	4/26 (26)						10/22 (10)	11/19			55.00	1.83
	Toru Furuya	GIS/Remote Sensing	Plan	2						(15)	(15)					(30)				60.00	2.00
			Actual	1						4/14 (17)	5/24 (24)					10/10 (21)	10/30			62.00	2.07
	Hitoshi Takeuchi	Hydrologist	Plan	2							(30)	(30)					(30)			90.00	3.00
			Actual	1						4/23 (8)	(31)	6/16 (16)								55.00	1.83
	Makoto Nakata	Disaster prevention and risk reduction	Plan	1						(15)	(15)									30.00	1.00
			Actual	1						4/21 (10)	5/21 (21)									31.00	1.03
	Masami Sugiura	Topographic Assessment	Plan	1						(15)	(15)									30.00	1.00
			Actual	1						4/21 (10)	5/21 (21)									31.00	1.03
	Daiuke Yumiyama	Forest Monitoring 1	Plan	0																0.00	0.00
			Actual	1						4/23 (8)	(31)	6/6 (6)				10/22 (10)	11/12			55.00	1.83
	Keishi Kudo	River Hydrologist	Plan	0																0.00	0.00
			Actual	1							5/28	6/16								20.00	0.67
	Shingo Yoshino	Project Coordinator1/Public Awareness/ Forest Monitoring 2	Plan	3	(13)	(15)			(5)	(30)					(30)					93.00	3.10
			Actual	2	12/2	12/24 (23)			3/21 (11)	4/7 (7)					9/25 (6)	11/6 (31)				78.00	2.60
	Akari Matsumoto	Project Coordinator2/Public Relations	Plan	0																0.00	0.00
			Actual	0												10/27 (5)	11/17			5.00	0.17
	Keiji Someya	Forest Conservation 3 (Planning and Design, construction)	Plan	0																0.00	0.00
			Actual	0												10/23	11/16			0.00	0.00
			Plan	27					Total											1085.00	36.16
			Actual	21																915.00	30.48
			Plan	0					Total (Company own expense)											(120.00)	(4.00)
			Actual	0																(20.00)	(0.67)

Figure 1: Dispatched schedule of experts in Phase I

Phase II

No	Name	Role	Plan/Results	Dispatch	第2期契約期間	Days	MM
					FY 2018 2 3 / FY 2019 4 5 6 7 8 9 10 11 12 / FY 2020 4 5 6 7 8 9 10 11 12 1 2 3 / FY 2021 4 5 6 7 8 9 10 11 12 1 2 3 / FY 2022 4 5 6 7 8 9 10 11 12 1 2 3 / FY 2023 4 5 6 7 8 9 10 11 12		
1	Toru Inada, Dr.	Chief Technical Adviser/Eco-DRR	Plan	9	(15日) (25日) (31日) (9日) (13日) (31日) (16日) (22日) (11日) (31日) (16日) (26日) (4日) (13日) (31日) (16日) (26日) (4日) (18日) (27日)	385	12.83
			Revision	12	(16日) (21日) (18日) (8日) (12日) (19日) (28日) (28日) (12日) (16日) (17日) (21日) (10日) (30日) (16日) (31日) (13日) (30日) (9日) (20日) (10日)	385	12.83
			Result	11	2/12 2/27 (16日) 4/10 5/18 (21日) (18日) 8/24 9/12 10/13 11/28 (8日) (12日) (19日) (28日) 5/4 6/12 (28日) (12日) 8/16 9/17 (16日) (17日) 10/23 11/16 (9日) (16日) 3/27 - 5/17 (5日) (30日) (17日) 10/19-11/30 (13日) (30日) 4/15-5/24 (16日) (24日) 8/19-9/3 (13日) (3日) 10/19-10/31 (13日) (30日)	414	13.80
2	Yuta Morikawa, Mr.	Deputy Technical Adviser/Eco-DRR	Plan	8	(25日) (11日) (14日) (25日) (28日) (1日) (13日) (17日) (28日) (2日) (25日)	214	7.13
			Revision	13	(20日) (7日) (20日) (1日) (7日) (16日) (2日) (20日) (6日) (30日) (11日) (5日)	175	5.83
			Result	12	6/4 6/23 (20日) 9/24 10/16 10/28 11/1 (7日) (20日) (1日) 5/23 5/29 (7日) 9/12 9/17 11/3-9 11/11-12 (6日) (9日) 4/25-5/5 (6日) (5日) 9/8-11, 13-18 11/5～11/12 (10日) (6日) 3/27-29 4/5-4/8 5/1-5/14, 5/25 (3日) (4日) (15日) 9/26 10/23-10/11 7-4, 9-12 (1日) (9日) (8日)	139	4.63
3	Mitsunobu Onishi, Mr.	Forest Management Plan	Plan	6	(30日) (25日) (31日) (14日) (16日) (10日) (17日) (13日) (11日) (19日) (17日) (5日)	208	6.93
			Revision	6	(22日) (25日) (29日) (3日) (15日) (15日) (20日) (15日) (20日) (6日)	202	6.73
			Result	6	4/9 5/25 (22日) (25日) 10/3 11/3 (29日) (3日) 10/5 11/5 (27日) (5日) 4/13-5/14 (18日) (14日) 10/1-10/30 (30日) 4/16-5/14 (15日) (14日)	202	6.73
4	Thomas Kochert, Mr.	Forest Policy	Plan	2	(14日) (14日)	28	0.93
			Revision	6	(11日) (3日) (14日) (30日)	58	1.93
			Result	5	4/20 5/3 (11日) (3日) 10/26 11/12 (6日) (12日) 9/9-9/17 10/8～10/30 (9日) (23日) 4/22-5/5 (9日) (5日) 10/28-11/5 (0日)	78	2.60
5	Tomoyuki Ueda, Mr.	Forest Conservation 1 (Planning and Construction)	Plan	6	(16日) (31日) (8日) (15日) (31日) (4日) (5日) (30日) (15日) (30日) (16日) (11日) (15日)	227	7.57
			Revision	9	(28日) (8日) (22日) (2日) (31日) (2日) (8日) (21日) (23日) (21日) (4日) (20日) (10日) (30日) (10日) (2日)	242	8.07
			Result	9	5/4 6/8 (28日) (8日) 7/9 7/30 (22日) 9/29 11/2 (2日) (31日) (2日) 7/24 8/20 9/12-17 10/30 11/5 12/1-8 (8日) (20日) (6日) (2日) (5日) (8日) 3/1-3/15 3/17-3/22 5/26-5/27 6/16-6/19 8/24-8/29 9/9-9/14 11/5～11/12 (21日) (2日) (4日) (6日) (6日) (6日)	189	6.30
6	Takaki Toyoda, Dr.□	Forest Conservation 2 (Plantation and Construction)	Plan	7	(30日) (10日) (10日) (30日) (32日) (30日) (20日) (30日) (15日)	207	6.90
			Revision	9	(21日) (14日) (15日) (5日) (30日) (1日) (10日) (10日) (20日) (10日) (20日) (21日) (30日) (5日) (30日) (6日) (4日)	252	8.40
			Result	8	4/10 5/14 (21日) (14日) 9/7 9/21 10/27 12/1 (15日) (5日) (30日) (1日) 10/5 12/1 (27日) (30日) (1日) 4/6-5/5 (25日) (5日) 9/4-9/19 (16日) 11/1～12/4 (30日) (4日) 5/3-5/21 (19日) 10/25-11/11 (7日) (11日)	261	8.70
7	Keiji Someya, Mr.	Forest Conservation 3 (Planning and Design, construction)	Plan	1	(1日) (20日)	21	0.70
			Revision	2	(21日) (5日) (13日)	39	1.30
			Result	2	10/7 10/27 (21日) 7/27 8/13 (5日) (13日)	39	1.30
8	Shiro Makita, Mr.	GIS/Database 1	Plan	1	(15日) (15日)	30	1.00
			Revision	1	(15日) (15日)	30	1.00
			Result	1	2/14 3/15 (15日) (15日)	30	1.00
9	Hiroyuki Kozu, Mr.	GIS/Database 2	Plan	4	(28日) (2日) (30日) (30日) (30日)	120	4.00
			Revision	4	(22日) (9日) (6日) (25日) (30日) (28日)	120	4.00
			Result	4	3/10 4/9 (22日) (9日) 9/25 10/25 (6日) (25日) 11/6 12/4 (25日) (4日) 3/12～4/9 (20日) (9日)	120	4.00
10	Toru Furuya, Mr.	GIS/Remote Sensing	Plan	3	(15日) (30日) (15日) (30日) (21日)	111	3.70
			Revision	3	(15日) (30日) (15日) (30日) (21日)	111	3.70
			Result	3	4/16 5/30 (15日) (30日) 10/22 11/23 (10日) (23日) 10/15-11/4 (17日) (4日)	99	3.30
11	Hitoshi Takeuchi, Mr.	Hydrologist	Plan	1	(30日)	30	1.00
			Revision	1	(6日) (24日)	30	1.00
			Result	1	5/26 6/24 (6日) (24日)	30	1.00
12	Keishi Kudo, Mr.	River Hydrologist	Plan	1	(28日)	28	0.93
			Revision	2	(14日) (7日) (7日)	28	0.93
			Result	2	6/10 6/23 (14日) 9/24 10/7 (7日) (7日)	28	0.93
13	Daisuke Yumiyama, Mr.	Forest Monitoring 1	Plan	4	(28日) (10日) (14日) (20日)	72	2.40
			Revision	8	(26日) (3日) (9日) (5日) (18日) (16日) (9日) (10日)	96	3.20
			Result	7	5/6 6/3 (26日) (3日) 5/23 6/5 (9日) (5日) 11/11-15 (2日) 5/1-5/9 5/22-5/29 (17日) 11/5～11/7 (3日) 5/7-5/21, 5/25 (16日) 9/24-9/25 10/23-11/6 (2日) (9日) (6日)	98	3.27
14	Makoto Nakata, Mr.	Disaster prevention and risk reduction	Plan	4	(11日) (10日) (30日) (25日) (5日) (25日) (5日)	111	3.70
			Revision	4	(11日) (10日) (14日) (16日) (25日) (5日) (15日)	96	3.20
			Result	4	4/20 5/10 (11日) (10日) 4/15-5/14 (16日) (14日) 10/23-11/21 (9日) (21日) 4/24-5/8 (7日) (8日)	96	3.20
15	Masami Sugiura, Mr.	Topographic Assessment	Plan	2	(25日) (2日) (25日) (5日)	57	1.90
			Revision	2	(11日) (16日) (13日) (16日)	56	1.87
			Result	2	4/20 5/16 (11日) (16日) 10/19 11/16 (13日) (16日)	56	1.87
16	Sahori Fujimura, Ms.	Project Coordinator1/Public Awareness/ Forest Monitoring 2	Plan	8	(13日) (17日) (30日) (30日) (15日) (25日) (15日) (15日) (24日) (1日) (10日) (20日)	215	7.17
			Revision	8	(7日) (21日) (16日) (5日) (15日) (15日) (24日) (1日) (16日) (35日) (30日) (9日) (15日)	209	6.97
			Result	7	5/25 6/21 (7日) (21日) 9/15 10/5 (16日) (5日) 9/11 10/12 (20日) (12日) 5/24-6/18 (8日) (18日) 10/2-11/5 (30日) (5日) 3/26 4/8 (6日) (8日) 5/10-6/6 (22日) (6日) 10/5-10/29 (25日)	209	6.97
17	Akari Matsumoto, Ms.	Project Coordinator2/Public Relations	Plan	5	(18日) (31日) (1日) (20日) (10日) (25日) (30日) (15日)	150	5.00
			Revision	8	(18日) (31日) (1日) (19日) (12日) (36日) (14日) (5日) (14日) (6日) (20日) (4日)	180	6.00
			Result	7	4/13 6/1 (18日) (31日) (1日) 10/13 11/12 (19日) (12日) 5/4 6/8 (28日) (8日) 10/30 11/16 (2日) (16日) 4/24-5/15 (7日) (15日) 11/5～11/21 (17日) 4/25-5/10 (6日) (10日) 10/23-11/19 (9日) (19日)	218	7.27
			In NMK Plan			2214	73.79
			In NMK Revision			2309	76.96
			In NMK Result			2306	76.87

Figure 2: Dispatched schedule of experts in Phase II

2. List of Counterparts

(1) Personnel :

- CMC: One for Project Director, one for Project Manager, one for public relations, and one for system development respectively, totally four.
- PENF : One for overall management, one for forest policy and field training, one for nursery at Sveti Nikole, one for field work at Radovish and Lisiche (from Veles office) respectively, totally five.
- MAFWE: One for overall management and forest policy

Table 3: List of C/P personnel

Organization	Role	Name
CMC	Project director	Mr. Stojanche Angelov -Director of CMC
CMC	Project manager	Dr. Stevko Stefanoski -Department for Analysis, Assessment and Strategic Planning
CMC	Public relations	Ms. Nadica V'chkova -Public Relations Department
CMC	System development	Mr. Igorce Karafilovski -IT department
PENF	Management for field work	Dr. Dejan Mandzukovski -Department of Forest Management and Planning
PENF	Forest policy and field training	Ms. Mare Basova -Deputy Director of PENF Dr. Dejan Mandzukovski -Department of Forest Management and Planning
PENF	Nursery management in Sveti Nikole	Ms. Mare Basova -Baze Illiev Director of PENF Sveti Nikole office
PENF	Field work in Radovish	Ms. Ivana Bozinova -Director of PENF Radovish office
PENF	Field work in Lisiche	Mr. Ordan Tutundziev -Director of PENF Veles office
MAFWE	Forest policy	Mr. Nazif Sefer -Forestry and Hunting Department

3. List of Trainings

Table 4: Training in Japan

No	Training	Period	Number of trainees	Name of trainees
1	Group Training Program (JICA, Forest Agency, FFPRI, Univ. of Kyoto, Mt. Rokko, ADRC)	2018.7.22-8.3	5 (CMC3, PENF2)	CMC: Mr. Agron Buxhaku Dr. Stevko Stefanoski Mr. Milaim Aliev PENF: Mr. Zoran Gjorgjiev, Mr. Mile Traynovic
2	Ecosystem-Based Solutions For Disaster Risk Reduction (Tsukuba, Sendai)	2018.9.17-10.6	1 (Municipality of Radovish)	Municipality: Mr. Ile Gorgiev
3	Integrated Lake, River and Coastal Basin Management for Sustainable Use and Preservation of Water Resources(JICA Kansai, Biwa lake, Kyoto)	2019.8.18-10.18	1 (Municipality of Radovish, 1)	Municipality: Mr. Todorche Spasov
4	Ecosystem-Based Solutions For Disaster Risk Reduction (Tsukuba, Sendai)	2019.10.27-11.15	4 (PENF2, MAFWE1, HMS1)	PENF: Mr. Goran Sakaliev Mr. Blagoja Razmoski MAFWE: Mr. Nazif Sefer HMS: Mr. Goran Basovski
5	Ecosystem-Based Solutions For Disaster Risk Reduction (Remote)	2021.11.9-12.1	1 (CMC1)	CMC: Mr. Ivica Dodevski
6	Ecosystem-Based Solutions For Disaster Risk Reduction	2023.09.26-10.28	1 (MAFWE1)	MAFWE: Ms. Mihaela Mihajlovska Jovevska

Table 5: Training in North Macedonia

No	Training	Period	Number of trainees
1	Hazard Map Workshop (Radovish)	2022.10.28	5 (Municipality of Radovish, RCMC Radovish)
2	GFFIS Training on delivery (Skopje)	2020.12.15	22 (PENF staff)
3	GFFIS Users Training (Skopje)	2021.11.23-12.03	25 (PENF MP)
4	MKFFIS TOT Training (Skopje)	2023.3.20-24	30 (CMC HQ, RCMC, PENF MP)
5	MKFFIS Regional Training (8 local offices of CMC)	2023.3.30-5/26	199 (RCMCs)
6	MKFFIS Risk Assessment Tool (Skopje)	2023.9.18	7 (CMC HQ)
7	Forest Restoration Plan TOT (online)	2020.12.18-21	6 (PENF MP)
8	Forest Restoration Plan (Radovish)	2022.10.18-19	17 (17 PENF local offices)
9	Forest Restoration Plan (Radovish)	2023.4.27-28	11 (13 PENF local offices)
10	Forest Conservation TOT (Skopje)	2023.5.5	8 (PENF MP)
11	Tree Nursery Training (Sveti Nikole)	2023.5.8	9 (PENF Sveti Nikole and other offices)

4. Activities (Planned and Actual)

4-1 Output 1: MKFFIS development and related activities

Planned

1.1 Developing the methodology and concept for expanding MKFFIS as a multi hazard platform for exchange data and information shearing among the relevant institution within National Crisis Management System, particularly for risk of floods, landslides and soil erosion.

Actual

Developed the methodology and concept for expanding MKFFIS as a multi hazard platform for exchange data and information sharing among the relevant institution within National Crisis Management System, particularly for risk of floods, landslides and soil erosion.

Methodology was summarized as document by North Macedonia expert under the supervision

of Japanese expert.

The methodology shows the laws and master plans related to disaster risk reduction, including a definition of disaster, the operation order of risk management, risk evaluation and resources in the first part. Then, concept of updated MKFFIS, the detail contents of each module, data structure were summarized while describing the contribution to disaster risk reduction as multi hazard platform.

Planned

1.2 Preparing technical documentation and specification, and supplying necessary hardware, software and other equipment for strengthening the existing function and expanding MKFFIS.

Actual

In order to outsource the functional expansion of MKFFIS and GFIS, technical materials were organized and specifications for functional expansions were prepared. The old server for GFIS was replaced as initially scheduled in 2020. Additionally, based on CMC's request, old servers and their supporting materials for MKFFIS were replaced in 2022.

Photo 1: Servers for MKFFIS at CMC Headquarters
Left: GFIS (29 October, 2020, PENF), Right: MKFFIS (10 February, 2022, CMC)

Planned

1.3 Preparing study of hydraulic models for high-risk locations exposed to torrential flooding using the available data and mapping the locations possibly exposed at risk of landslides and soil erosion on some of the target sites of Output 2 and 3.

Actual

In the model area, the Radovish River Basin, the calculations were performed using the Rainfall-Runoff-Inundation (RRI) model, which is a "two-dimensional model capable of simulating rainfall-runoff and flood inundation simultaneously. A two-dimensional model that can simulate rainfall runoff and flood inundation simultaneously, this model treats slopes and river channels separately, for example, in catchments it calculates them with two-dimensional diffusion and in rivers it calculates them with one-dimensional diffusion. In grid cells where the river channel is present, the calculations assume that the slope and the river are in the same grid cell. In this model, rainfall, DEM, land cover, and river cross section can be calculated as input data, and river discharge, water level, and inundation as output data.

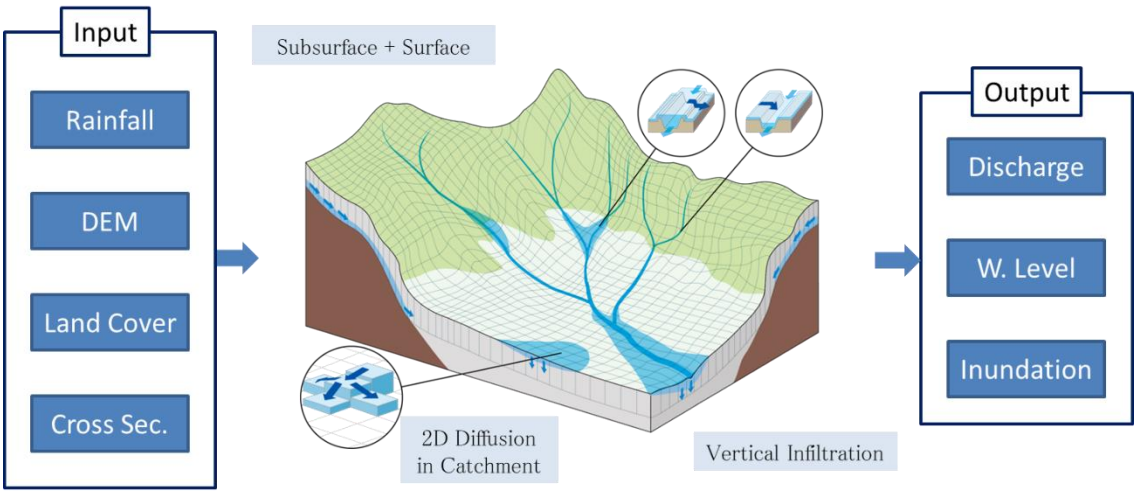
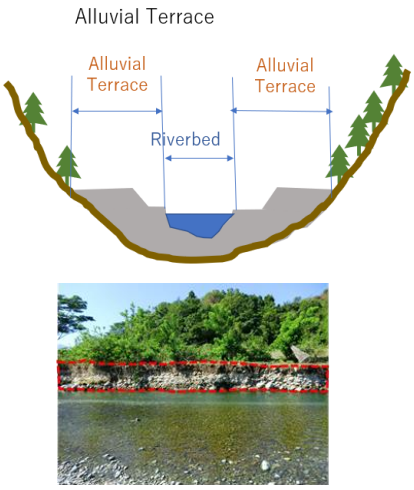
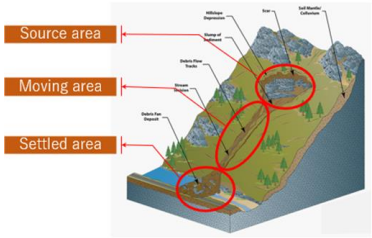
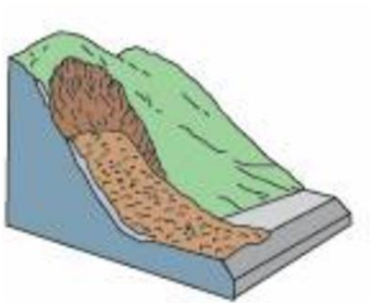
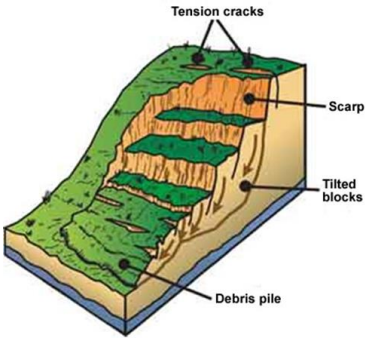
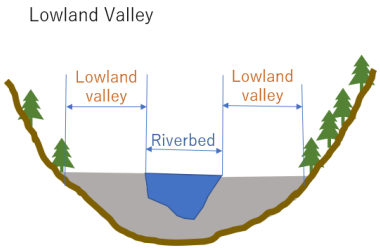
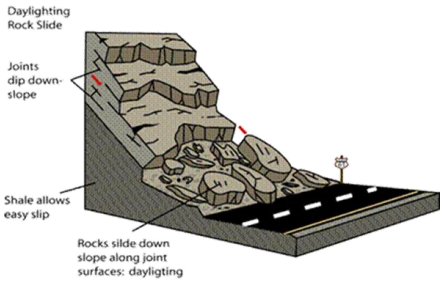


Figure 3: Overview of the RRI model

Related to Output 2, the mountain disaster risk (collapse, landslide, etc.) in the upper Radovish River Basin was determined from the visual interpretation results using aerial photographs. Following hazard types were identified in the Radovish River Basin.

Table 6: Geomorphic hazard types identified in the Radovish River Basin

Type	Explanation	Figure
Alluvial terrace (Deposited terrace)	Terrain that has accumulated due to past floods and then stepped due to subsequent erosion. Riverbed sediments are not directly produced by mass movement. Unstable sediments in river channels that were transported and formed by past floods. These change in appearance depending on the scale of the River Basin and the geological conditions. These are important factors that will cause damage downstream during future floods.	
Debris flow	Mass of debris that was abundant in steep slopes or slopes contains water, and it becomes a viscous fluid with water as a lubricant, and it shows a phenomenon that it moves downward at high speed according to gravity.	
Failure	The slope material becomes unstable due to some cause, and it falls sharply below the slope as a group of soil and rock at the boundary of shear surface or geological discontinuity by gravity alone. And they show the phenomenon that it settles on the gentle slope land of the slope base, riverbed and flat ground.	

Type	Explanation	Figure
Landslide	Generally, it shows a phenomenon that the slope material slides at a low speed according to gravity at the boundary of a clear shear surface. In landslide phenomena, there are two types of phenomena: one in which the moving and immobile areas are clearly demarcated and the movement speed can be captured visually, and the other in which the boundary between the two areas is unclear and the movement is slow and difficult to identify, including continuous or intermittent. The former phenomenon correspond to a kind of large-scale collapse or landslide collapse. The latter phenomenon is sometimes referred to as creeping slide, or land creep.	 
Lowland valley (Valley plains)	Lowland valley (Valley plains) is among alluvial plains formed by rivers, it refers to a long, narrow, low-lying area between mountains and plateaus. A type of small landform of fluvial landform. The lowland part of the valley plain, excluding the river terraces, is called the valley floor lowland.	
Rockfall	The debris that makes up the top of the slope loses stability due to some cause. They leave the surface only by gravity. Each piece of rock falls free and falls sharply in the form of free fall or movement close to it. They stop and settle on a gentle slope or plateau (Talus) This series of phenomena will end within a few seconds.	

As for soil erosion, after discussion and examination with C/P, it was decided that the Erosion Potential Method (EPM) was suitable for the identification of soil erosion. There was available map of soil erosion in the nation wide, which was created by Dr. Ivan Blinkov and Dr. Ivica

Mincev, professors of Faculty of Forest. Their map was made by EPM method and referred for identification of excessiveness of soil erosion, although it was not used for RRI model.

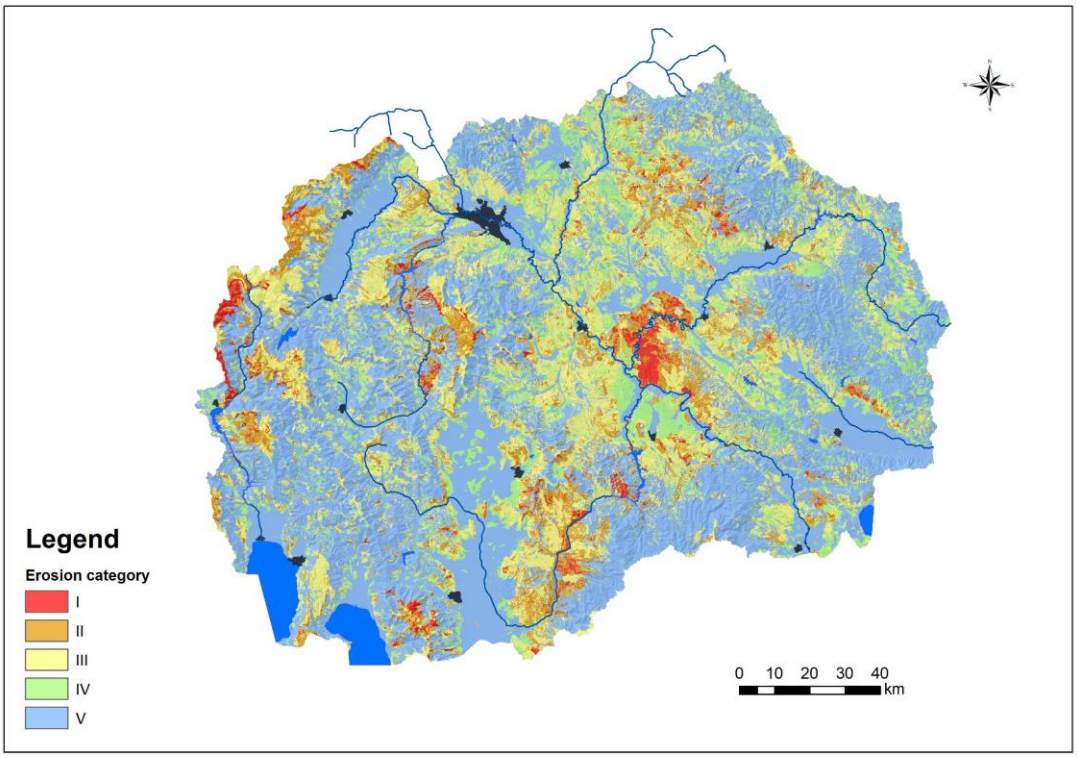


Figure 4: Erosion Map in North Macedonia

(Blinkov *et al*., 2021. Atlas on erosion, drought and desertification in North Macedonia)

Planned

1.4 Introducing new function, create additional GIS database relevant for floods, landslides and soil erosion hazard.

Actual

For both MKFFIS and GFIS, user interfaces were reorganized for multiple devices.

In terms of the databases of MKFFIS, the following three types of databases were created in the CMC's servers.

- Risk Potential DB

This is the database for assessing the potential of flooding, landslides and soil erosion. This database is accessed mainly from the Risk Potential Assessment Tool. And MKFFIS can refer to this database.

- Daily Events DB

This is the database for reporting and recording events that have actually occurred, and for trucking ongoing events. This database covers all the disasters/hazards in the CMC's rulebook.

In addition to floods and landslides, fires (including forest fire, fire in areas other than forests, and fires in buildings, etc.), earthquakes, freezing of rivers and lakes, heavy snow and avalanches, other natural hazards, and artificial and technological disasters, infectious diseases, environmental destruction, disasters caused by explosives, and interruptions or suspensions of various services such as communications, transportation, electricity supply, water supply and sewage, and steam supply were included. Since soil erosion is a slow phenomenon that can lead to future hazards, it was not included in this database.

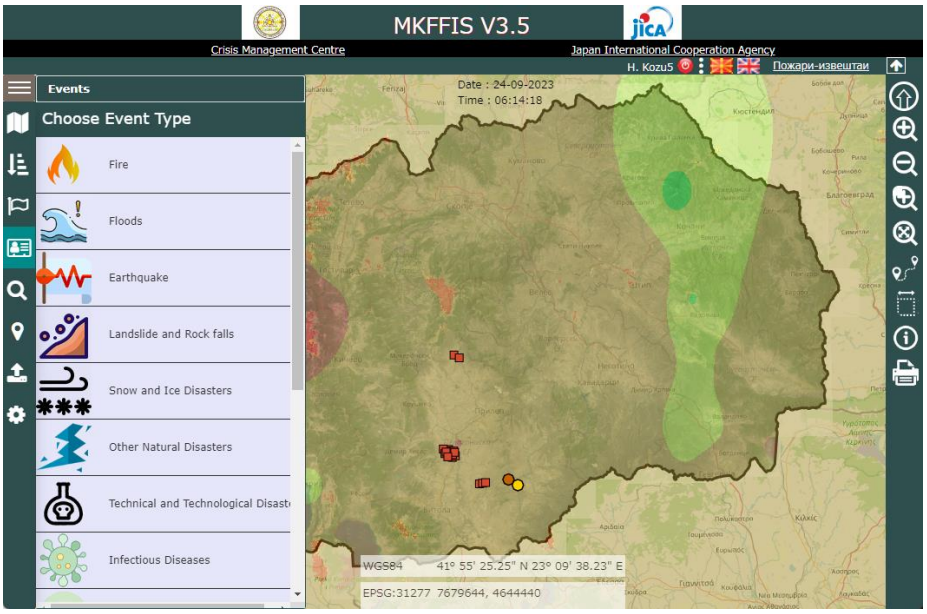


Figure 5: Entrance of Daily Events Database

- Risk Assessment DB

This is the database for the Risk Assessment Tool developed in 2023 and is accessed via only this tool. MKFFIS cannot refer to this database directly, however outputs of the tool can be shared using MKFFIS.

Planned

1.5 Revising/updating MKFFIS platform to the OpenLayers 3.0 and reorganization of their user interface.

Actual

Instead of OpenLayers 3.0, OpenLayers 4.0 which was the latest version at the time development started was used, and reorganized user interfaces.

・OpenLayers is a group of scripts for displaying map, and MKFFIS uses only a small part of OpenLayers' functions. And most of these functions are available in older versions. By updating OpenLayers, slight improvement of map rendering speed was observed but the bottleneck was

not there but in other part of the code. Therefore, there was almost no benefit to updating OpenLayers. Rather, there was the disadvantage that the number of modifications to the client-side scripts was increased, due to changes in OpenLayers' specifications associated with its version upgrades.

The latest version of OpenLayers as of September 2023 is v8.1.0 but OpenLayers should not always be kept up to date for the reasons mentioned above. When an opportunity arises to update it, carefully consider the necessity with the help of IT (Web) engineers of private companies.

Planned

1.6 Updating the methodology for damage assessment of floods, landslides and soil erosion.

Actual

The current status of damage assessment methods in North Macedonia was reviewed, and the flow of various types of risk information and the content of risk information were organized.

Photo 2: Discussion with staff of Radovish Municipality

During the survey associated with the establishment of the MKFFIS system and the creation of hazard maps, the damage assessment status of the post-disaster response situation was ascertained. The target population was CMCs, RCMCs and municipalities, and information was collected mainly on the following two points.

- Risk Information Flow
- Disaster Information Content

Most of the disaster management information in North Macedonia was communicated and collected in various systems related to the MKFFIS. Damage information was collected in the municipalities, entered into the system by RCMC staff, and the information was integrated into the CMC headquarters.

1) Risk Information Flow

Due to the development of the national infrastructure in North Macedonia, information on all

risks is centrally managed at the CMC. Early warning information is also quickly transmitted to the CMC.

2) Content of Risk Information

Currently, the acquisition of information at the site of a disaster is at the discretion of the municipality. The following six items of information are provided, in addition to satellite images of the disaster area.

(1) Name of the area where the disaster occurred
(2) Name of the district where the disaster occurred
(3) Date of disaster
(4) Name of the disaster
(5) Extent of damage
(6) Description of the situation

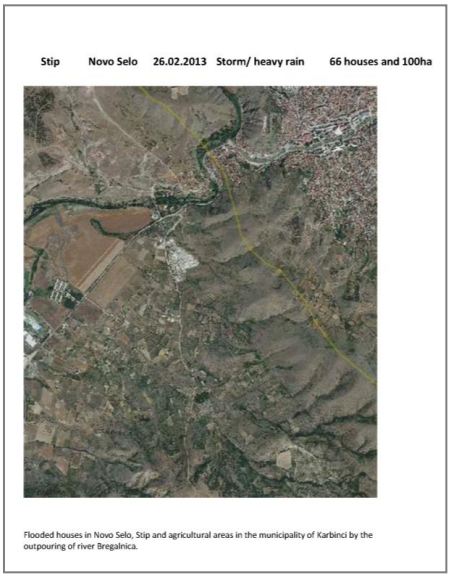


Figure 6: Examples of Disaster Reporting

According to some cases, there was either no accurate information on the location of the occurrence or the time of the occurrence, or there were differences in the amount of information reported on the situation. These issues can be improved by internal supervision of CMC managers.

Planned

1.7 Preparing hazard maps to the local community for their familiarization with risks that surround them in the selected sites of Output 2 and 3.

Actual

After organizing the risks in the Radovish area, discussions and workshops were held with the CMC, RCMC, Radovish Municipality, and local residents to develop hazard maps showing possible flood inundation results and a manual that would contribute to their preparation. Initially, the risk of topsoil runoff and falling rocks were also considered for sediment transport phenomena, etc., but during the development of the model area, the items to be represented in the maps were narrowed down to the assumed inundation area and areas of risk due to sediment in the residential areas.

In the actual creation of hazard maps, simulation results of RRI model were used for the assumed inundation area, and aerial photo-reading results, field survey results, and interview results were used for the sediment risk areas.

It is expected that CMC and R-CMC will take the lead in developing a manual for hazard map preparation, which allow the municipalities to prepare hazard maps that are appropriate for their region by organizing the process of printing hazard maps, how they should be prepared, and points to keep in mind when preparing and utilizing them. The report also includes a list of the main features of the map.

In addition, for the purpose of raising awareness of disaster preparedness, a small portable version for residents to carry, and a large type of map that can be posted in places where people gather, were prepared, and arrangements were made for signboards to be placed near the Municipality.

Large A1 size hazard map

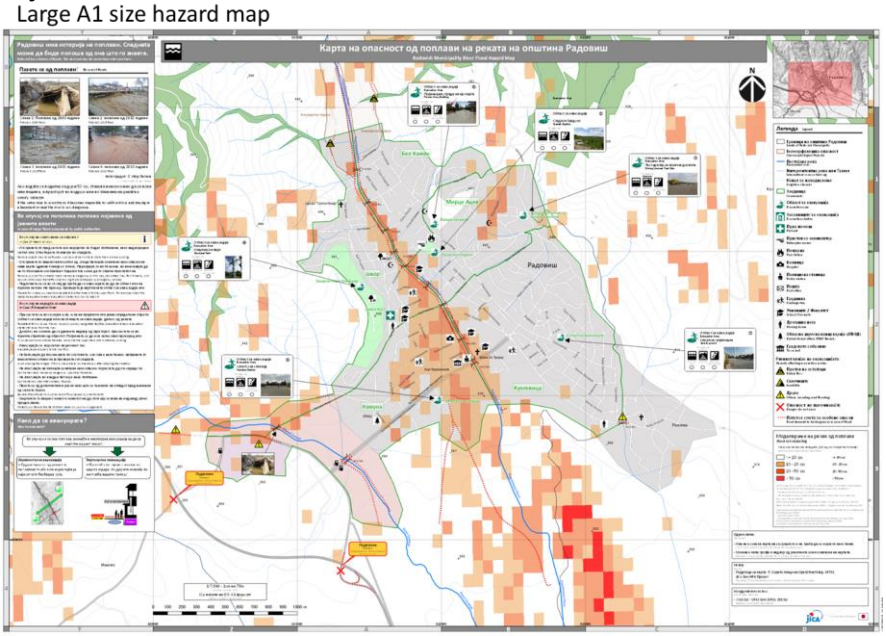


Figure 7: Hazard map in poster format, A1 size

Planned

1.8 Organizing training for selected staff from CMC, PEMF and other relevant institutions, for new functions and modules of the MKFFIS.

Actual

・GFIS training on delivery

The contract with the developer was made for the training of GFIS, which included a small training program for system administrators and key personnel upon delivery of their deliverables. Regarding GFIS, due to the COVID-19, training at the time of delivery was held remotely on December 15, 2020. The lecturer was a staff of Trinity Systems, the GFIS/MKFFIS

developer, and participants were 22 PENF staff.

・GFIS User Training

GFIS User training was conducted for cartographers, forest planners, and administrators at PENF Skopje office, from November 23rd to December 3rd, 2021.

Due to the COVID-19, the training was limited to a maximum three people per class, and there was a break every 50 minutes for ventilation. A total of 25 people attended. (Eight cartographer and forest planner training classes, and one administrator training class)

・MKFFIS User Training

MKFFIS user training was conducted from March to May 2023.

The training was divided into TOT in Skopje and regional training in eight regions.

First, TOT was conducted to thirty train instructors for regional trainings. Afterwards, regional trainings were held.

In the regional trainings, Mr. Oliver Ristevski from CMC headquarters, who had taken the TOT was the main instructor. And if there was any staff at the CMC regional office who had taken TOT, that person assisted Mr. Ristevski.

Mr. Savevski, a Macedonian staff member employed by the Project, who was in charge of logistics, assisted also, due to the knowledge he gained from being involved in all the trainings.

A total of 199 people from CMC, RCMC, PENF, MAFWE, and other relevant institutions participated in the regional training.

TOT, 20 March, 2023, Skopje
Instructor: Trinity Systems
Logistics: Mr. Savevski (Project)

Regional training, 05 April, 2023, Kumanovo
Instructor: Mr. Ristevski (CMC HQ)
Logistics/assistant: Mr. Savevski (Project)
Supervisor: Trinity systems (only 1st day in Skopje and Kumanovo regional trainings)

Photo 3: MKFFIS trainings in 2023

4-2 Output 2: Forest policy and management

Planned

2.1 Developing new sub-components by functional categories of forest ecosystem for protective forest.

Actual

First, the forestry and forestry policies of North Macedonia were analyzed, including the system of protected forests and the forest planning system, based on the Forest Law of Macedonia, and explained the forest planning system and the protection forests system of Japan to the PENF counterparts, in order to mutually understand the forestry and forestry situation in each country.

Next, discussions were held between the Japanese experts and PENF counterparts.

The purpose of protection forests is disaster prevention, which is important for people's livelihoods, and the treatment of forests to fulfill the function of flood prevention and erosion prevention is very different, so they were separated as forest function category types.

Based on the functional classifications in the Forest Law of Macedonia, the proposed forest functions categories for North Macedonia, the following four forest function categories were identified, and the expected forest functions for each category were organized as follows.

(1) Headwaters maintenance and recharge functions (Forests for protection purpose): Flood mitigation, drought mitigation
(2) Land-related disasters and soil conservation functions (Forests for protection purpose): Prevention of soil erosion, prevention of landslides, wind protection, prevention of avalanches, prevention of rockfall
(3) Environment conservation functions (Forests for special purpose):
Oxygen production and air purification, Noise control, Conservation of natural values and biodiversity, Health, Recovery, Relaxation, Sports and recreation, Tourism and hunting, Landscape conservation
(4) Production functions (Forests for economic purpose): Timber and other wood products production function

*The forest function categories in parentheses are the categories of forest types under the Forest Law of Macedonia.

**The “forests in protected areas” are included in (3) because the expected function of those forests is environmental conservation.

In addition, an order of priority was determined in the case of overlapping functions categories, and management rules were determined for each forest functions category.

Planned

2.2 Identifying actual and potential high-risk locations exposed to torrents, landslides and erosion processes at the selected sites of 3 forest management units (FMU) and integrating them into MKFFIS.

Actual

Identification of geomorphological hazards based on aerial photographs borrowed from MAFWE was conducted manually for the whole of the "Radovishka-Oraovichka Reka" FMU, and the resulting data were digitized.

Additionally, PENF personnel was trained to the identification method through four sessions held on 27 October, 2, 4 and 8 November 2021.

In order to efficiently expand such identification to 2 other FMUs and potentially to the whole of North Macedonia, a method based on Artificial Intelligence (AI) was conducted and the use of aerial laser data was tested near Tetovo while using the results of "Radovishka-Oraovichka Reka" FMU for algorithm training. The idea was to leverage the aerial laser data being acquired with the support of Norway. However, as the results did not prove robust, the method was abandoned. Instead, data based on visual interpretation of aerial photographs were provided. The following map by visual interpretation was integrated to MKFFIS.

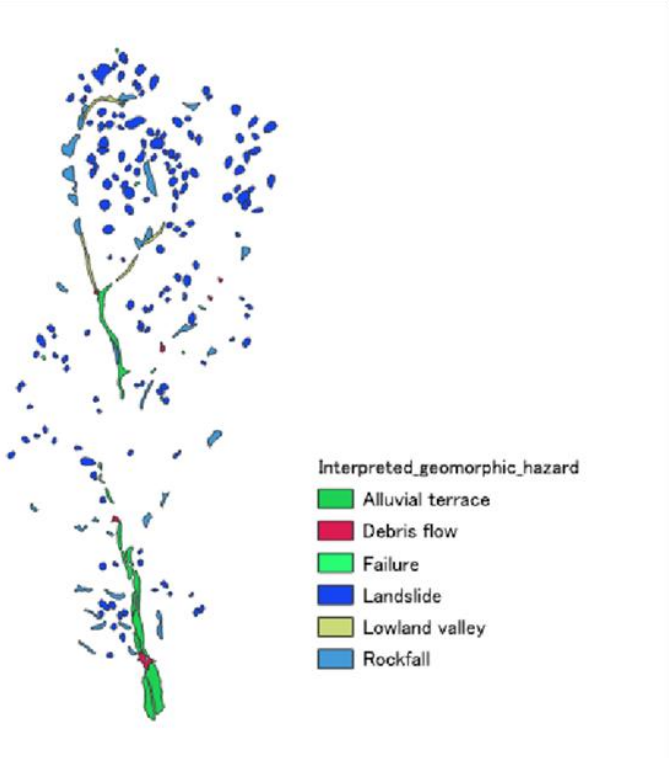


Figure 8: Geomorphological hazards based on aerial photographs identified by visual interpretation for Radovish River Basin

Planned

2.3 Based on 2.2, formulating forest management plans in pilot sites by using the new sub-components of protective forest including coding system, valuation of ecosystem services, zoning and mapping cadaster and integrating them into MKFFIS.

(If it is necessary, the new sub-components of forest ecosystem should be revised based on the results of 2.3 activity.)"

Actual

As regards the selection of one additional pilot site, North Macedonia and Japan jointly conducted a field visit of the two candidate sites proposed by the North Macedonian side. Based on the same criteria previously used for the selection of Radovish and Mount Vodno, the "Topolka-Karabunishte" FMU located upstream of the Lisiche Dam in the municipality of Chaška was selected.

A forest management plan could not be developed for Vodno Mountain, as was originally planned, because it is not under the jurisdiction of PENF and did not have a FMU. Therefore, it was agreed with PENF to replace it by planning in the "Skopska Crna Gora" FMU, which is located upstream of the area near the city of Skopje where a flood disaster occurred in 2016.

A field survey was conducted for the above two FMUs and the "Radovishka-Oraovishka Reka" FMU, and a forest functions categorization plan was prepared in the 3 FMUs, indicating the location of each forest functions on the respective forest planning maps.

The contents of the field surveys were as follows:

(1) Forest conditions

- Natural forests, planted forests,
- Forests to be logged, forests to be renewed,
- Status of encroachment on bare land,
- Condition of roads (public roads and forest roads),

(2) Situation of the FMU and its surroundings

- Floods and droughts (location, size, etc.) and landslides (location, size, etc.) in the past 10 years
- Conservation targets in the FMU, e.g., houses, villas, etc. (location, type, etc.)
- Drinking water usage (location of water intake facilities, usage status, etc.)
- Check for rockfall hazards, high wind hazards, etc.
- Recreational use of forests (trails, boardwalks, campsites, hunting, etc.)
- Production status of forest products such as mushrooms and wild plants (location, quantity, collectors, etc.)

The results of the plans were recorded in a geospatial database that includes the new coding

system corresponding to the forest functions categorization manual developed by the Project.
The results were mapped for the use of future FMUs plan. Ecosystem services valuation could not be performed directly on the field for each area, but instead a study on payments for ecosystem services around Lisiche Dam was entrusted to a local expert, and the results thereof were also used in 2.7, i.e. “Making recommendations about legal regulations”.
It was not necessary to update the functions classification since no problem was encountered during practical implementation on the field.

Planned

2.4 Planning mid- and long-term rehabilitation activities of high-risk/affected areas based on 2.3 in pilot sites.

Actual

In the above 3 FMUs, mid- to long-term forest rehabilitation plans were prepared according to the following procedure:
(1) The forests identified as having land-related disaster prevention or soil conservation functions in the forest functions categorization plans were used as the planning scope.
(2) Aerial drone photography was acquired at the above sites, and orthoimages, detailed topographic maps, and slope classification maps were produced.
(3) Based on this data, a field survey was conducted, and items to be planned were reported on the detailed topographic maps: gully plugs construction sites, terracing and planting sites, and sites for tree plantation only.
Erosion control facilities and terracing and planting sites were planned based on a simple decision tree.

A. Gully plugs shall be planned for the following streams:
   a. Streams with unstable sediment deposits,
   b. Streams with severe bed erosion and associated stream bank collapse,
   c. Streams where streambank erosion is causing streambank collapse.

B. Fencing work, terracing work, and planting work shall be planned for the following slopes:
   a. Collapse areas on the slopes
   b. Bare land with a slope of 30 degrees or more (excluding rocky areas)
   c. Bare land with a slope of less than 30 degrees where rills and other erosion marks have occurred.

C. Bare land other than the above shall undergo tree planting only.

(4) A forest restoration plan including erosion control facilities and planting plan was prepared.

The planning period of each forest restoration plan was set for 10 years, assuming that it is more efficient if synchronized with the duration of special forest management plans being prepared under the laws and regulations of North Macedonia, which is 10 years.

Planned

2.5 Developing guidelines/procedure and training manuals for planning forest management plan and rehabilitation plan based on the above activities.

Actual

(1) For the development of forest functions categorization plans, a "Manual for Forest Functions Categorization" was developed, which includes the contents of forest functions, the management guidelines for each forest functions category, and the methodology to prepare a forest functions categorization plan.

(2) For the development of mid- to long-term forest rehabilitation plans, a "Manual on Forest Rehabilitation Planning" was developed, which includes information on the sites to be covered by the plan, drone photography methods, field survey methods, and methods for planning flood control facilities and plantation.

(3) A training curriculum was developed, composed of the following presentation materials:

- Introduction on Eco-DRR
- Introduction on Forests in Japan
- Explanation of the "Manual for Implementing Forest Functions Categorization "
- Explanation of the contents of a Forest Functions Categorization Plan, using "Radovishka-Oraovichka Reka" FMU as an example
- Explanation of the "Manual for Formulating a Forest Rehabilitation Plan"
- Explanation of the contents of a forest Rehabilitation Plan using "Radovishka-Oraovichka Reka" FMU as an example.

(4) Drone training materials were prepared.

Planned

2.6 Organizing training of selected personnel of PENF who work on forest planning based on 2.5.

Actual

The following trainings were conducted for PENF staff:

(1) In October 2019, training on forest functions categorization was conducted for PENF forest planners and MAFWE headquarters staff, and opinions were exchanged.

(2) On 18 and 21 December 2020, the following sessions were conducted for the forest planners of PENF headquarters (delivered online due to the impossibility to travel amid the COVID-19 pandemics):

- Introduction on Eco-DRR
- Introduction on Forests in Japan
- Forest functions categorization based on the “Manual for Implementing Forest Functions Categorization" and on an example of Forest Functions Categorization Plan in "Radovishka-Oraovichka Reka" FMU
- Forest rehabilitation planning based on the "Manual for Formulating a Forest Rehabilitation Plan" and an example of Forest Rehabilitation Plan in "Radovishka-Oraovichka Reka" FMU.

(3) In November 2021, a one-day field training on forest functions categorization and on forest rehabilitation planning was conducted in "Radovishka-Oraovichka Reka” FMU for the above-mentioned trainees in order to supplement the sessions delivered online.

(4) Training on Introduction of Eco-DRR, Forest Functions Categorization, and Forest Rehabilitation Planning was conducted for the staff of 35 PENF branches on two separate occasions in October 2022 and May 2023 at the "Radovishka-Oraovishka Reka" FMU. Each session lasted two days.

(5) Training on Drone photography for forest rehabilitation planning was also conducted two times, from 17th to 26th of October, 2018, and from 2nd to 28th of May, 2019.

Photo 4: Drone flight survey training

Planned

2.7 Making recommendation(s) about legal regulations that governing forest management by discussion about an action for amendments and adoption of necessary bylaws regulations based on achieved results of the above activities.

Actual

The process of making recommendations was mainly organized around a series of 3 workshops on forest policy, which were held on 6th May 2019, 9th November 2021 and 25th April 2023 respectively. Workshops were complemented by a desk review of the current regulations and occasionally exchanged information with MAFWE and EU consultants in charge of legal

reforms in the field of forestry.

The first workshop was centered on sharing general understanding on relevant laws and regulations in North Macedonia and Japan, also featuring examples from other countries. Especially, the system of protection forests and the forest planning system of Japan were presented in detail, and the possibility to adapt some elements in the context of North Macedonia was discussed with the participants.

The second workshop was intended to present and discuss findings and recommendations from the Project Team, and some general issues such as considering new sources of financing for Eco-DRR in anticipation to the future economic conditions after accessing the EU (e.g. introduction of a forest environment tax similar to Japan, introduction of Payment for Ecosystem Services scheme). More specifically list of articles of the forest law that need to be amended and the procedure for designating protection forests were clarified. Ideas devised by participants were also collected.

During the third workshop, participants reviewed the changes in laws and regulations which were achieved during the Project. The outline of the Manual on forest functions categorization, the Manual on forest rehabilitation planning, and their pilot implementations in 3 FMUs were presented, and a roadmap for implementing additional changes in laws and regulations was discussed.

During the Project period, the Government of North Macedonia updated its “Rulebook on Forest Planning” twice and prepared a draft new Law on Forests, a draft new Strategy on the Sustainable Development of Forests and Forestry, and a draft Action Plan on Forestry. Some recommendations could not be finalized nor adopted, but the necessary actions to implement this were planned and financed (e.g., Study to introduce zoning in the forest planning system by the end of 2026), subject to validation of the action plan on forestry by the Government. Until these actions are implemented, the manuals produced by the Project would be only partly applicable (e.g., forest functions categorization is not yet enforceable by law, and some information items from forest zoning and forest rehabilitation planning cannot be inserted into the current forms and databases of special Forest Management Plans).

In addition, the Project Team had desired to participate in the working group for legal reform set up by MAFWE, but because the meetings thereof happened to take place right after the start of the COVID-19 pandemics, it was impossible to participate and hence opportunities for detailed discussions were limited. As a result, it was judged that some recommendations lacked concreteness.

It was mentioned by MAFWE staff that the major contribution of the Project was to provide a source of inspiration for the update of laws and regulations during a window of opportunity in which North Macedonia was receiving support from the EU in this regard. Among the most

visible changes, provisions on protection forests including a limitation of clearcutting and a recording in the Special Forest Management Plans were introduced in the revised “Rulebook for forest planning” in 2019, and the draft new Law on Forests (still Parliament has been pending approval as of December 2023) now defines windbreak forests and includes provisions such as a forest environment tax and a ban on clearcutting in protection forests. Based on the revised “Rulebook for forest planning”, MAFWE started to designate protection forests during the Project using some of the categories listed in the “Manual for forest functions categorization”, and by the end of 2022, 4,912ha of such forests had already been designated.

Note) Designations for 2023 will be confirmed by MAFWE in December 2023; as a result, these cannot appear in the final report.

4-3 Output 3: Forest conservation activities

Planned

3.1 Selecting micro pilot sites within pilot sites for Implementing activities of identified forest conservation technologies for Eco-DRR (i.e., hillside work including planting work, torrent work such as check dams)

Actual

Three micro pilot sites were selected for demonstrating forest conservation activities that have an Eco-DRR effects and that include forest conservation construction work and planting. Two of the microsites are located in the Radovish River watershed (approximately 5,300 Ha), which flows into the Radovish municipality (southern North Macedonia, population approximately 29,000), where floods occur frequently once every a few years to ten years. The microsites were set in the middle part in the watershed where deteriorations of forests are significantly harder. These microsites served as demonstrations of the Eco-DRR model, which aimed to reduce sediment runoff and peak flow by combining hillside works and torrent works (stream works) with tree planting. The third micro pilot site was established in the upstream area of the Lisiche water supplying dam, which are located in the upstream of the village of Lisiche in Chaska city (central North Macedonia, population approximately 7,900). The micro pilot site in Lisiche was established in one of the small subsidiary catchment area on the left bank of the reservoir lake of the dam as one type of Eco-DRR models that reduces the amount of sediment flowing into the dam by increasing forest and vegetation covers through forest conservation works and planting activities.

In addition to these micro pilot sites, a demonstration of hydro-seeding as an early greening method was carried out at Mt. Vodno in the city of Skopje.

Planned

3.2 Implementing on the ground activities of forest conservation technologies for Eco-DRR.

Actual

In two micro pilot sites in Radovish, which are namely the Radovish south site and the Radovish north site, and another micro pilot site in Lisiche, forest conservation activities were carried out by combining constructing forest conservation works and planting works. At these three micro pilot sites, it was tried to introduce suitable forest conservation works and methods at each location depending on the purposes of forest conservation activities as part of each Eco-DRR activity, the environment, topography, devastating condition in each microsite. It was also considered to combine hillside works, torrent works and tree planting. Furthermore, in order to demonstrate forest conservation works and methods in Japan which can be applied to North Macedonia, consideration was given to using as many construction methods as possible by using locally procured materials.

(1) Radovish

1) Radovish South Site (4.3ha)

Hillsides in the South site had been mainly occupied with grassy slopes, as results of past burning and wildfires, as well as subsequent overgrazing, which cannot be expected to naturally regenerate into forests if left as it was. In addition, there were streams formed below the hillside slopes that allowed the soil and sand and surface water to flow to the downstream, and gully erosions there were also significantly developed. To prevent further development of the gully erosions, five (5) gabion gully plugs (structurally regarded as check dams of one of stream works) were installed. In addition, jute cover was installed on the degraded slopes (bare land) that had developed on the steep slopes on the side of the gullies in order to restore herbaceous vegetation.

Photo 5. Forest Conservation works

Although it was difficult to realize effects of prevention topsoil runoff by trees with their understory vegetation and litters planted after the trees grow during the Project period, significant growth of grasses on the slopes were observed rapidly. It was because by suppressing disturbing by grazing livestock and the hoof pressure erosion of those grazing livestock and promoting the growth of grasses. In addition, sandbag small terracing work was constructed to suppress the movement of surface soil on slopes. Apart from the effect to the surface soil, it was observed that the survival rates of seedlings planted on the terracing work was better than that of

seedlings planted directly on slopes. On the other hand, with regard to jute mat covering work, the growths of grasses of the covering work were not seen good results.

Table 7: Forest conservation activities in Radovish South site

Work item		Number	Unit
Torrent work	Gabion gully plug work	5	items
Hillside work	Sandbag small terracing work	2,650	m
	Jute mat covering work	2,600	m^2
Boundary work	Fence construction	910	m

The reforestation activities which were carried out to restore the disaster prevention function of forests was shown as below.

Table 8: Tree planting for soil and water conservation in Radovish South site

Plantation type	Species	Number	Planted year
Tree planting for soil and water conservation	Black Pine（*Pinus nigra*）	2,746 trees	2019
	Ash（*Fraxinus excelsior*）	1,097 trees	2019
	Oak（*Quercus robur*）	2,581 trees	2019
	Robinia （*Robinia pseudoacacia*）	4,593 trees	2019
Supplemental planting	Black Pine	220 trees	2021
	Ash	220 trees	2021
	Oak	220 trees	2021
Tree planting with terracing work	Robinia	450 trees	2022
Tree planting for live fence	Robinia	360 trees	2023
	wilding seedling of shrub	180 trees	2023
Total		12,667 trees	-

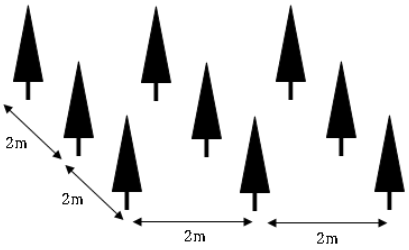


Figure 9: Planting spacing for Black pine, Oak, and Ash

Photo 6: Planted Oak, Black pine and Ash in Radovish South site

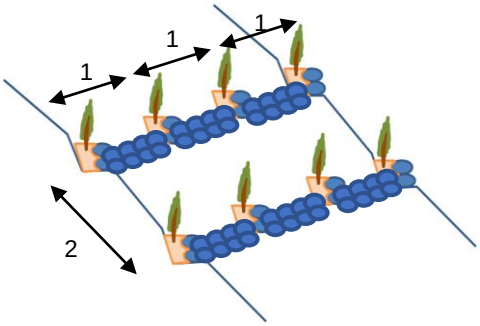


Figure 10: Tree planting design for terracing work

Photo 7: Robinia planting with terracing work

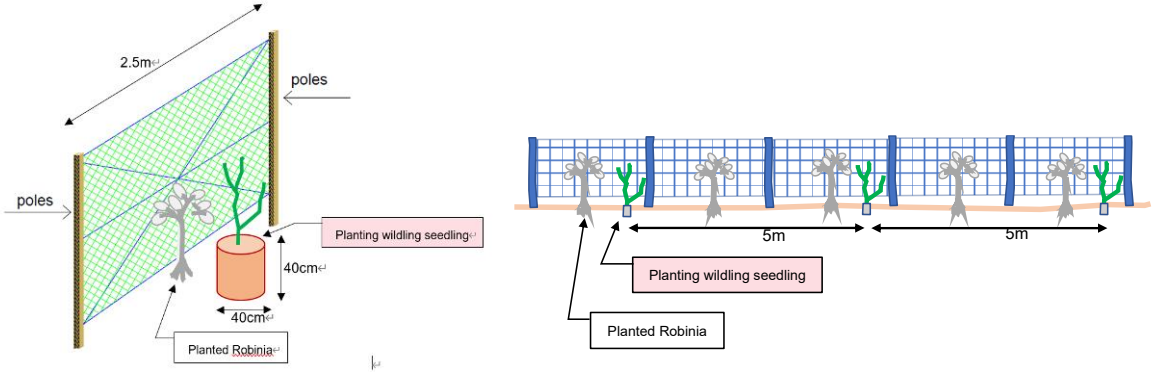


Figure 11: Planting design for live fence

2) Radovish North site (6.0ha)

Photo 8: Gully plug

Photo 9: Stone-lined channel works and jute mat covering work

Similar to the Radovish south site, slopes of the Radovish North Site had long been covered with grassland due to burning and overgrazing and it made difficult for the slopes to naturally restore themselves into forests without human interventions. The site consists of two slopes, east and west, with a stream in between. Hillside slopes in the western site was located below the Municipality Road that extends from Kodzalija village. The hillsides in the other site wre extended to the east across the stream. On the hillside slopes below the road, the drain water from the road was mainly concentrated and flowed down on the hillside slopes. So that gullies have developed in two places in the water collection depressions on the slopes. These gullies merged and flowed into the stream below the slope. In order to prevent further gully erosions, a gully plug (or check dam) was installed at the point where the two gullies meet. and the gully developed slopes was reshaped and six retaining wall works made of stones were installed on the slopes. In order to allow drain water from the road to flow down these hillsides safely, stone-masonry channel work was constructed to connect the retaining walls from the upstream to the down. On both sides of the stone-lined channel works, jute mat covering work was carried to prevent the development of rills or gullies on the slopes and to ensure that the slopes were covered with herbaceous plants. In addition, on slopes that were severely degraded and the topsoil was exposed, small terracing work with stones were constructed on the slopes on the east and west sites.

Table 9: Forest conservation activities in Radovish North site

Work item		Number	Unit
Torrent work	Gabion gully plug work	1	-
Hillside work	Stone wet masonry retaining wall work	6	-
	Sandbag small terracing work	925	M
	Jute mat covering work	1,202	m^2
	Stone masonry hillside channel work	94	M
Boundary work	Fence construction	1,600	M

The reforestation activities which were carried out to restore the disaster prevention function of forests was shown as below.

Table 10: Tree planting for soil and water conservation in Radovish North site

Plantation type	Species	Number	Planted year
Tree planting for soil and water conservation	Black Pine	5,000 trees	2020
	Ash	5,000 trees	2020
	Oak	5,000 trees	2020
Tree planting with terracing work	Robinia	900 trees	2022
	Black Pine	1,750 trees	2022
Tree planting for live fence	Robinia	640 trees	2023
	wilding seedling of shrub	300 trees	2023
Total		18,590 trees	-

Photo 10: Black pine planting with terracing work in North Kodzalija

Photo 11: Robinia planting with terracing work in North Kodzalija

(2) Lisiche

A micro pilot site was set up in a small branch watershed with poor forest cover on the left bank of the Lisiche Dam Reservoir. Gabion gully plug work (Check dam) was constructed near the

outlet of the flow path to the reservoir in the site in order to prevent sediment from flowing into the reservoir. Then, masonry small terracing work was constructed on the hillside slopes. Regarding the masonry small terracing work, one of the main purposes was to mitigate the surface soil erosions and moving down on slopes. At the same time, it was expected to have a function to secure a space for soil to accumulate in areas where there was little topsoil and encourage the growth of planted seedlings.

In addition, in order to preserve the Project area, the existing fence was repaired and saplings were planted along the fence to serve as a hedge for a long time as same as the fence operation in Radovish. As the access road for construction, a present operation road was repaired and maintained. At the same time, it was expected to serve as a firebreak for forest fire prevention and control.

Table 11: Forest conservation activities in Lisiche site

Work item		Number	Unit
Torrent work	Gabion gully plug work	1	-
	Channel work for the gully plug	1	-
Hillside work	Stone masonry small terracing work	84	m
	Scarification work	84	m

Photo 12: Gabion gully plug and terracing work in Lisiche site

A tree planting for soil and water conservation was conducted. The contents of the Project are as follows.

Table 12: Tree planting for soil and water conservation in Lisiche site

Plantation type	Species	Number	Planted year
Tree planting for soil and water conservation	Robinia	200 trees	2022
Tree planting with terracing	Robinia	80 trees	2022
	Mix planting of Black Pine, Oak and Ash	80 trees	2022
Tree planting with micro water catchment	Robinia	20 trees	2022
Tree planting for live fence	Robinia	100 trees	2022
Total		200 trees	-


Photo 13: Tree planting with terracing work and micro water catchment work in Lisiche

(3) Vodno

The development of a Hydro-seeding with materials and equipment from North Macedonia was carried out with Parks & Greenery, under the city of Skopje, which manages Mt.Vodno. The demonstration of hydro-seeding was conducted in May 2023. In addition, signs were placed in the Mt. Vodno area to promote understanding of Eco-DRR, including hydro-seeding.

Photo 14: Demonstration of Hydro-seeding

Photo 15: Eco-DRR Information board

<u>Planned</u>

3.3 Identifying and developing methods to utilize forest functions against disasters/damages such as wind break in addition to hillside works.

Actual

In Sveti Nikole, it was observed that the windbreak introduced in the 1950s, however it was felled down and its function as a windbreak was reducing. From that situation, the importance of windbreak forests was promoted to C/P's PENF. PENF in cooperation with the Project prepared a forest management plan for windbreak forests in the Sveti Nikole FMU through the training experience.

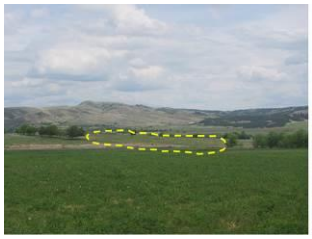


Photo 16: Candidate place for windbreak forest rehabilitation in Sv.Nikole selected through the study by the Project

The Project also prepared a examples of windbreak forest case studies and held a seminar on windbreaks with stakeholders in Sveti Nikole to raise awareness of the usefulness and importance of windbreaks and to exchange views on the future use of windbreaks and challenges in their utilization.

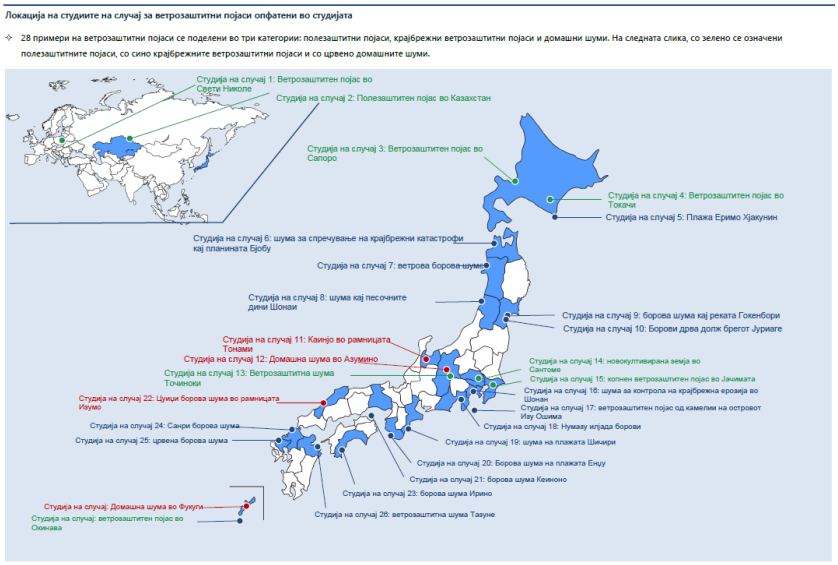


Figure 12: Map for windbreak forest case studies prepared by the Project

Figure 13: Seminar on windbreak forest held by the Project

Planned

3.4 Motivating and involving the local population in pilot sites for implementation of selected Eco-DRR activities and measures.

Actual

Before starting field activities in June 2018, the outline of the Project was explained to the villagers of Kodzalija village.

Additionally, during the socio-economic survey conducted from May to September 2018, local residents were asked about their favorite trees, and Robinia was identified. Therefore, Robinia were planted in the hope that local residents would be motivated to protect the forest in the future.

Photo 17: Village meeting at Kodzalija when socio-economic survey was conducted (June, 2018)

Planned

3.5 Conducting a study on monitoring method to quantitatively evaluate forest conservation technologies for Eco-DRR.

Actual

(1) Monitoring of water and soil runoff

The original plan to use a concrete weir to monitor

Photo 18: A monitoring facility installed in Radovish South site

water and soil runoff was changed to monitor surface runoff because the weir proved impractical due to no base flow at the Radovish South site. In addition, an Automated Weather Station (AWS) was installed nearby to collect precipitation data needed to analyze the monitoring data. Memorandum of Understanding (MOU) for monitoring activities between PENF Headquarters, the University's Faculty of Forestry, and the Project was completed in November, 2023. With this MOU, it is expected that monitoring activities will be continued by PENF and Faculty of Forest even after the end of the Project.

(2) Monitoring of planted seedlings

The sampling-based monitoring approach for supplemental planting, which includes assessing survival rates and vigorousness, was summarized through the monitoring activities. Because measuring growth during the initial two years was challenging in terms of workload, and there was a significant risk of inconsistency, it was abandoned. However, after three years of planting, growth parameters such as seedling height and ground-level diameter were recorded.

Photo 19: Seedlings under monitoring

(3) Soil Hardness Monitoring

Root digging survey was conducted to find soil hardness likely restricted root growth and affected seedling survival rate. Based on this, soil hardness monitoring was conducted to analyze areas where seedlings could be expected to establish, using soil penetrometer.

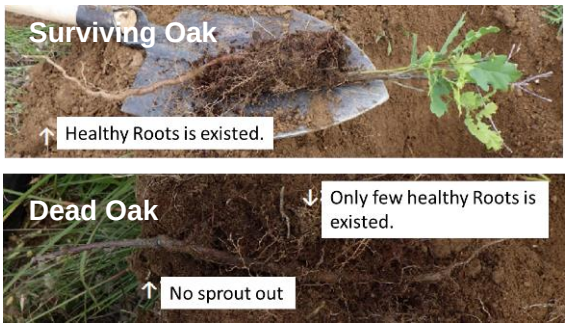


Photo 20: Digging test of Oak root system in June 2022

Photo 21: Soil penetration test by Soil penetrometer

(4) Evaluating the effectiveness of erosion control techniques

Based on the result of monitoring of planted seedlings, it was concluded that Robinia was the most appropriate species and terracing work, which loosens the soil and retains water should be conducted. This method was applied for the last planting in the fall of 2022.

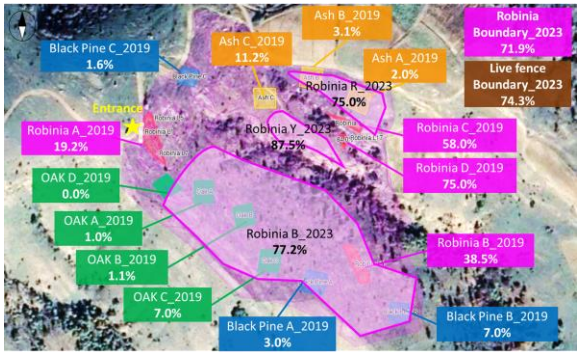


Figure 14: Survival rate of Radovish South site

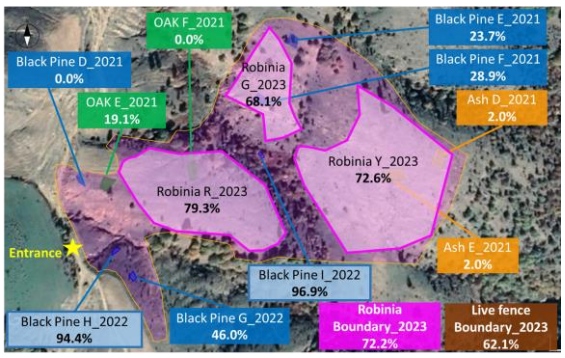


Figure 15: Survival rate of Radovish North site

Planned

3.6 Developing manuals/guidelines on forest conservation technologies for Eco-DRR (i.e., hillside work including planting work, torrent work such as check dams) based on the pilot activities.

Actual

When classifying slope disasters, in Japan there is a certain tendency for countermeasures to be considered based on the recognition that surface erosion is one of processes that cause mass movement on slopes (collapses and landslides), rather than being treated as an independent disaster. On the other hand, in North Macedonia, even in the case of surface erosion, there were many locations of the surface erosions that was not linked to mass movement due to grassland conversion, caused by forest fires and hoof pressure erosion because of overgrazing. So, these surface erosions themselves can be regarded as a hazard or disaster. It is necessary to consider countermeasures. Although there seems to be a difference in the positioning of the disaster categories in North Macedonia and Japan, there are certain Japanese forest conservation construction works and methods that can be suitably adapted in North Macedonia. In project activities, such forest conservation construction works were demonstrated through actual construction in the microsite during this Project. Therefore, based on conservation technical standards Japan's Forest Conservation works, points to keep in mind when planning, designing, and constructing hillside works and torrent (stream) works were presented as the guideline for Forest Conservation methods in North Macedonia.

Planned

3.7 Conducting training with the manuals/guidelines to strengthen capacities of PENF to autonomically carry out processes of forest conservation technologies and planting work.

Actual

(1) Forest conservation techniques

A draft manual on forest conservation techniques (Manual on Forest Conservation Work in North Macedonia) was created, and training based on the manual was conducted in May 2023 for seven staff members of the PENF Planning and Management Department.

Photo 22: Training on forest conservation technologies (May/2013)

(2) Tree planting

Site visits were conducted several times to inform C/Ps of CMC and PENF about the activities of afforestation and reforestation at the Radovish and Lisiche sites, and to disseminate information on afforestation and reforestation techniques.

Photo 23: Observation of seedling growth during site visits

In addition, at TCG meetings held twice a year in spring and fall, the planning, progress, and results of afforestation and reforestation projects, as well as findings and lessons learnt from these projects, were shared to strengthen C/P capacity.

Planned

3.8 Strengthening capacities of PENF nursery staff of Sveti Nikole to make a seedling production plan based on the PENF's management plan, rehabilitation plan and demands from outside PENF.

Actual

The status of seedling production in the Sveti Nikole nursery was studied, and an improvement plan for the Sveti Nikole nursery was developed and shared with the Sveti Nikole nursery staff to facilitate the production of highly mobile container seedlings, bearing in mind PENF's future plan to consolidate nursery production in five locations, including Sveti Nikole.

In addition, training was provided to nursery staff at three other locations at the Sveti Nikole nursery to promote and spread understanding of the advantages of introducing containerized

seedlings.

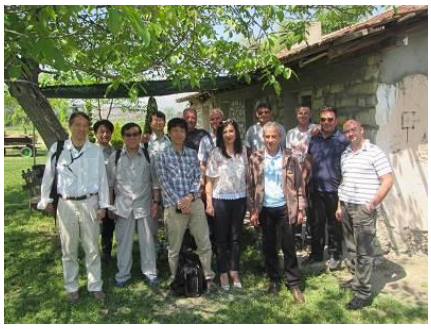



Photo 24: Study for the capacity of Sveti Nikole nursery

Planned

3.9 Improving facilities of the existing nursery (Sveti Nikole) in order to support newly applied forest management plan based on the forest function classification and rehabilitation plan.

Actual

Based on the plan for improvement of the Sveti Nikole nursery as described in 3.8 above, a greenhouse, an automatic soil filling machine, an automatic sowing machine, and other equipment for container seedling production were provided, as well as equipment to promote the production of Robinia seedlings, since Robia was considered as the most appropriate species for soil and water conservation works. The new greenhouses made it possible to produce 1.2 million containerized seedlings.


Photo 25: Green house with irrigation system

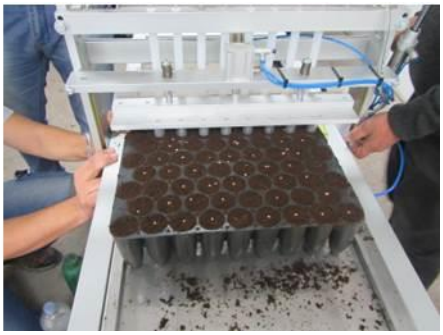



Photo 26: Automatic soil filling machine and sowing machine

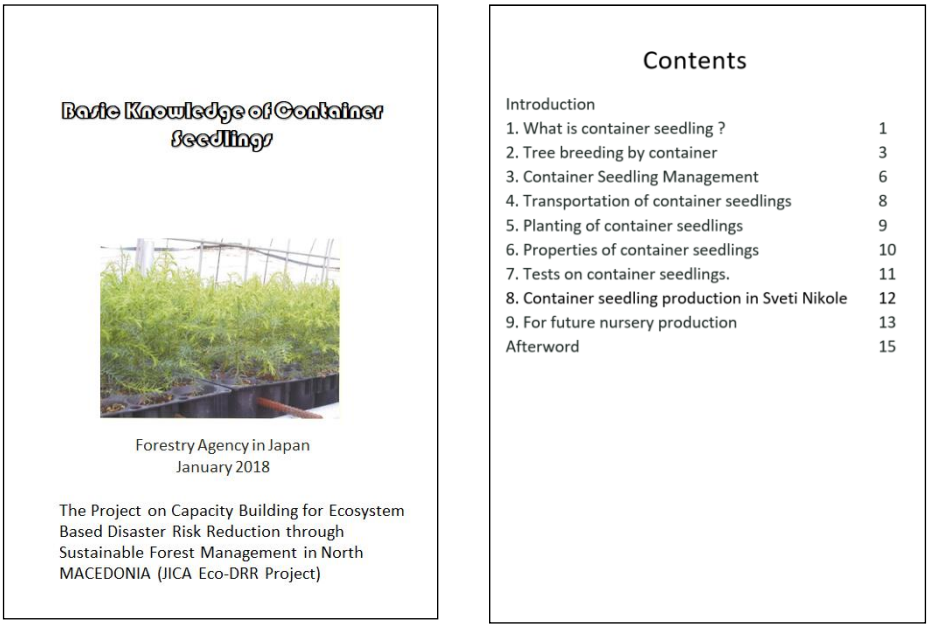
Photo 27: Container for broad leaf tree seedling (left) and for conifer tree seedling (right)

Planned

3.10 Developing manuals/guidelines on nursery technologies and planning based on the activity in Sveti Nikole

Actual

Manuals/guidelines for the introduction and utilization of containerized seedlings were developed to make PENF staff recognize the importance and usefulness of containerized seedling production. Contents of Manuals/guidelines for the introduction and utilization of containerized seedlings described in the following figures;



Basic Knowledge of Container Seedling

Forestry Agency in Japan
January 2018

The Project on Capacity Building for Ecosystem Based Disaster Risk Reduction through Sustainable Forest Management in North MACEDONIA (JICA Eco-DRR Project)

Contents

Figure 16: Manuals for the introduction and utilization of containerized seedlings

4-4 Output 4: Public Awareness and Relations

Planned

4.1 Preparing brochures, electronic and other informative material for Eco-DRR concept popularization to the government personnel, public and other interested parties.

Actual

(1) Publication of Newsletters

Newsletters which contain information of project activities have been published every six months. From ver.0 to ver.11 of Newsletters (created in Japanese, English and Macedonian) were published from the beginning to the end of the Project.

(2) Publication through a project Facebook page

A Facebook page for the Project was set up and activities were posted regularly.

Figure 17: Newsletter Vol. 11

North Macedonia Eco-DRR Project

https://www.facebook.com/MacedoniaEcoDRR/

Figure 18: Link for the Project Facebook site

(3) Eco-DRR video creation

In order to deepen understanding of Eco-DRR concept among government officials in West Balkans regions, Eco-DRR video was created. The concept of Eco-DRR was introduced along with examples of its implementation in Japan and JICA activities related to Eco-DRR in the world and Balkan region.

This video was completed in October 2022 and distributed to C/Ps and relevant organizations in North Macedonia. Also, this video has been shown at various seminars and training sessions to disseminate Eco-DRR concept to the government officials and stakeholders. In August 2023, subtitle of Macedonian language was also created so that local Macedonian who do not understand English would be able to view the video as well.

Figure 19: Link for Eco-DRR Video

Eco-DRR Video (full-version) – YouTube

Planned

4.2 Designing and launching of the public awareness campaign about the importance and necessity of introducing the Eco-DRR concept.

Actual

In May 2018, Eco-DRR Awareness Campaigns were held in the cities of Skopje and Radovish to explain on the Eco-DRR concept and project activity plans.

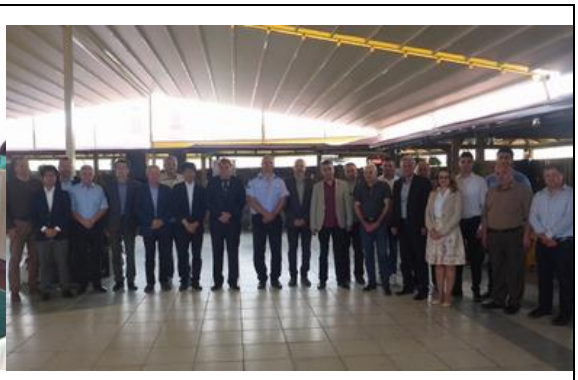
Also, another Eco-DRR Awareness Campaigns were conducted for Radovish residents at a Hazard Map Workshop held on October 28th, 2022. By explaining the Eco-DRR concept and project activities in Radovish in connection with hazard maps, residents were able to understand the importance and necessity of Eco-DRR as a matter that connects them.

In addition, a lecture on Eco-DRR concept and Project activities was provided for 25 of teachers and students at forestry high school in Kabadarchi, located in the southeastern part of the country, on April 6, 2023.

Table 13: Awareness Campaigns

No	Name of the Event	Date	Venue	Participants
1	Eco-DRR Awareness Campaign	8th May, 2018	Skopje	27 from C/Ps and related organizations
2	Eco-DRR Awareness Campaign	15th May, 2018	Radovish	35 from C/Ps and related organizations
3	Eco-DRR Awareness Campaign/ 1st Hazard Workshop	28th Oct, 2022	Radovish municipality	7 from Radovish residents and NGO group
4	Eco-DRR Lecture at a forest high school in Kabadarchi	6th Apr, 2023	High school in Kabadarchi	25 of teachers and students

Eco-DRR Awareness Campaign in Skopje



Eco-DRR Awareness Campaign in Radovish

	
Eco-DRR Awareness Campaign at 1st Hazard Map Workshop	Lecture at a high school in Kabadarchi

Photo 28: Awareness campaigns and lecture at a high school

Planned

4.3 Distributing hazard maps to the local community for their familiarization with risks that surround them around the pilot sites of Output 2 and 3.

Actual

Hazard Map Workshops were held two times in Radovish city for officials of the Radovish branch of CMC, Radovish municipality and residents. This Hazard Map Workshops were organized by dividing in two groups, one was for government officials and one another was for residents so that each participant could express their opinions casually.

The finalized hazard maps were made in A3 size that could be folded and carried by residents, and 3,000 copies were distributed to the Radovish municipality. In addition, two signboards showing the hazard map were installed in the city of Radovish. They were made in Macedonian and English so that the hazard map would be recognized by the Radovish citizens and foreigners.

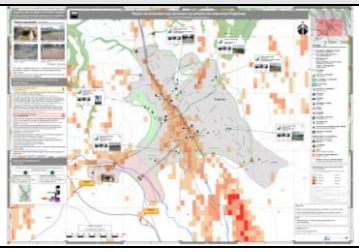
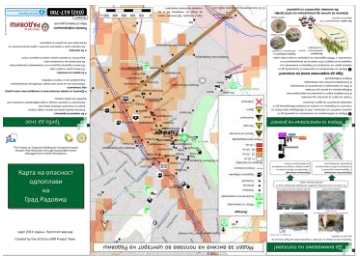
Table 14: Hazard map workshops conducted in Radovish

No.	Name of the Event	Date	Venue	Participants
1	1st Hazard map workshop	28th Oct, 2022	Radovish municipality	Morning Session 6 from government officials Afternoon Session 7 from Radovish residents and NGO group
2	2nd Hazard map workshop	3rd May, 2023	Radovish municipality	Morning Session 18 from government officials Afternoon Session 15 from Radovish residents and NGO group

	
1st Hazard map workshop	2nd Hazard map workshop

Photo 29: Hazard map workshops

Table 15: Deliverables of hazard maps

No.	Deliverables	Purpose	Quantity	Image
1	Hazard Map (A1 size)	Disseminate hazard maps by distributing them to residents and schools	50	
2	Hazard Map (A3 size)	Disseminate hazard maps by distributing them to residents and schools	3,000	
3	Hazard Map Signboard (A0 size)	Disseminate hazard maps by having passerby see the signs.	2	

Planned

4.4 Consolidating results of the pilot activities and deliverables under Output 1, 2 and 3 for developing material(s) to explain Eco-DRR model in North Macedonia.

Actual

Progress reports were prepared in December each year from 2019 to 2022(February 2022 for 2021), and results of activities of outputs 1-4 were reported.

The Eco-DRR Model applying the forest conservation method in the pilot sites in Radovish and Lisiche were also summarized. These reports contain about each project site's issues, installed works, effects, future scenarios, and potentials for watershed deployment.

Table 16: Eco-DRR models

No.	Name of the Document	Model
1	Eco-DRR Model of Radovish	Typical erosion control type Eco-DRR model
2	Eco-DRR Model of Lisiche	- Improve water source recharge function and prevent drought. - Raise awareness of surrounding municipality and residents

Planned

4.5 Organizing workshops for Eco-DRR concept popularization to the government personnel.

Actual

A domestic seminar was held on October 27, 2023, inviting government officials in North Macedonia. During the seminar, project activities and implementation in the pilot site were explained, followed by a visit to the pilot site in Radovish. Through in-room lectures and a visit to the Eco-DRR model site where the forest conservation method was applied, awareness of the Eco-DRR concept were raised.

Table 17: Domestic seminars

No.	Name of the Event	Date	Venue	Participants
1	Eco-DRR Domestic Seminar	8th May, 2018	Skopje	24 of government officials of North Macedonia.
2	Eco-DRR Domestic Seminar	27th Oct, 2023	Radovish	37 of government officials of North Macedonia, High school students from Kabadarchi, JICA Expart

	
1st domestic seminar	2nd domestic seminar

Photo 30: Domestic Seminars

Planned

4.6 Organizing seminars for the promotion of project results inside and outside North Macedonia.

Actual

The regional seminars were held two times in Skopje by inviting government officials from North Macedonia and West Balkan regions.

In the first reginal seminar, Eco-DRR concept and project activities were introduced along with a site visit to the pilot site of Radovish. Also, the possibility of Eco-DRR deployment in each country was discussed.

In the second seminar, the results of the Project in North Macedonia were presented. Also, the activities of JICA Eco-DRR project in Kosovo and Montenegro as well as project activities of IUCN, FAO and SDC were shared. Based on the shared information, the possibility of developing Eco-DRR method to other Balkan regions and each country's challenges were discussed.

Table 18: Regional seminars

No.	Name of the Event	Date	Venue	Participants
1	1st Eco-DRR Regional Seminar	30th Oct to 3rd Nov, 2019 (4days)	Skopje, Radovish	68 in total. Government Officials from West Balkan regions, Project CPs, Embassy of Japan, JICA HQ, JICA Balkan office, JICA Experts
2	2nd Eco-DRR Regional Seminar	30th Oct to	Skopje,	60 in total.

		3rd Nov, 2023 (4days)	Radovish	Government Officials from West Balkan regions, IUCN, FAO, UNDP, SDC, Project CPs, Embassy of Japan, JICA HQ, JICA Skopje office, JICA Experts

	
Eco-DRR 1st Regional Seminar	Eco-DRR 2nd Regional Seminar

Photo 31: Regional seminars

5. Revised plan of operations

Project Monitoring Sheet II (Plan of Operation)

Version PDM 2.0
Dated: July 28, 2023

Project Title: Project on Capacity Building for Ecosystem-Based Disaster Risk Reduction through Sustainable Forest Management in North Macedonia

Inputs	Year	2017	2018	2019	2020	2021	2022	2023	Remarks
		Ⅲ	Ⅳ Ⅰ Ⅱ Ⅲ	Ⅳ Ⅰ Ⅱ Ⅲ	Ⅳ Ⅰ Ⅱ Ⅲ	Ⅳ Ⅰ Ⅱ Ⅲ	Ⅳ Ⅰ Ⅱ Ⅲ	Ⅳ Ⅰ Ⅱ Ⅲ	
Expert		10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	
Chief Technical Adviser/Eco-DRR (CTA)	Plan								
	Actual								
Deputy Technical Adviser/Eco-DRR (DTA)	Plan								
	Actual								
Forest Management (FM)	Plan								
	Actual								
Forest Policy (FP)	Plan								
	Actual								
Forest Conservation 1 (FC1)	Plan								
	Actual								
Forest Conservation 2 (FC2)	Plan								
	Actual								
Forest Conservation 3 (FC3)	Plan								
	Actual								
GIS/Database 1 (DB1)	Plan								
	Actual								
GIS/Database 2 (DB2)	Plan								
	Actual								
GIS/Remote Sensing (RS)	Plan								
	Actual								
Hydrologist (HL)	Plan								
	Actual								
Disaster Risk Reduction (DRR)	Plan								
	Actual								
Topographic Assessment (TA)	Plan								
	Actual								
Forest Monitoring 1 (FMo)	Plan								
	Actual								
River Hydrologist (RH)	Plan								
	Actual								
Project Coordinator/Public Awareness/ Forest Monitoring 2 (PA)	Plan								
	Actual								
Project Coordinator/Public Relations (PR)	Plan								
	Actual								

Activities	Year	2017	2018	2019	2020	2021	2022	2023	Responsible Organization	
Sub-Activities		10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	Japan	GOM
Output1. National Crisis management coordination mechanism among domestic relevant institutions for prevention, early warning and rehabilitation against floods, landslides, soil erosion, and forest fire is enhanced by strengthening and expanding of MKFFIS function through introduction of new modules for torrents, landslides, erosions.										
0. Establishing Joint Coordination Committee and Technical Coordination Committee	Plan								CTA/DTA	CMC
	Actual									
1.1. Developing the methodology and concept for expanding MKFFIS as a multi hazard platform for exchange data and information shearing among the relevant institution within National Crisis Management System, particularly for risk of floods, landslides and soil erosion.	Plan								DB1&2 /DRR	CMC
	Actual									
1.2. Preparing technical documentation and specification, and supplying necessary hardware, software and other equipment for strengthening the existing function and expanding MKFFIS.	Plan								CTA/DTA /DB1&2	CMC
	Actual									
1.3. Preparing study of hydraulic models for high-risk locations exposed to torrential flooding using the available data and mapping the locations possibly exposed at risk of landslides and soil erosion on some of the target sites of Output 2 and 3.	Plan								HL/DRR/ DB1&2 /RS/TA	CMC
	Actual									
1.4. Introducing new function, create additional GIS database relevant for floods, landslides and soil erosion hazard.	Plan								DB1&2 /DRR	CMC
	Actual									
1.5. Revising/updating MKFFIS platform to the Open layer 3.0 and reorganization of their user interface.	Plan								DB1&2	CMC
	Actual									
1.6. Updating the methodology for damage assessment of floods, landslides and soil erosion.	Plan								RS/TA /DRR	CMC
	Actual									
1.7. Preparing hazard maps to the local community for their familiarization with risks that surround them in the selected sites of Output 2 and 3.	Plan								DRR/RS /PA	CMC
	Actual									
1.8. Organizing training for selected staff from CMC, PENF and other relevant institutions, for new functions and modules of the MKFFIS.	Plan								DB1&2	CMC
	Actual									

Output2. National forest management and planning capacities for promotion of Eco-DRR are enhanced through introduction of new sub-components of protective forest, such as soil erosion prevention, water conservation, and public health forests, by functional categories of forest ecosystem.				
2.1. Developing new sub-components by functional categories of forest ecosystem for protective forest.	**Plan**		FM/FP	PENF /MAFWE
	Actual			
2.2. Identifying actual and potential high-risk locations exposed to torrents, landslides and erosion processes at the selected sites of 3 forest management units (FMU) and integrating them into MKFFIS.	**Plan**		FM/RS/ DB/DRR	PENF
	Actual			
2.3. Based on 2.2, formulating forest management plans in pilot sites by using the new sub-components of protective forest including coding system, valuation of ecosystem services, zoning and mapping cadaster and integrating them into MKFFIS (if it is necessary, the new sub-components of forest ecosystem should be revised based on the results of 2.3 activity.)	**Plan**		FM/FP	PENF
	Actual			
2.4. Planning mid and long term rehabilitation activities of high-risk/affected areas based on 2.3 in pilot sites.	**Plan**		FM/FP/ FC1	PENF
	Actual			
2.5. Developing guidelines/procedure and training manuals for planning forest management plan and rehabilitation plan based on the above activities.	**Plan**		CTA/FM	PENF
	Actual			
2.6. Organizing training of selected personnel of PENF who work on forest planning based on 2.5.	**Plan**		CTA/FM	PENF
	Actual			
2.7. Making recommendation(s) about legal regulations that governing forest management by discussion about an action for amendments and adoption of necessary bylaws regulations based on achieved results of the above activities.	**Plan**		CTA/FM/F P	PENF /MAFWE
	Actual			

Output3. Execution Capacity to carry out Eco-DRR related activities is enhanced through introduction of Eco-DRR technology and improvement of seedling capacity.				
3.1. Selecting micro pilot sites within pilot sites for Implementing activities of identified forest conservation technologies for Eco-DRR (i.e. hillside work including planting work, torrent work such as check dams)	Plan	FC1	PENF	
	Actual			
3.2. Implementing on the ground activities of forest conservation technologies for Eco-DRR.	Plan	FC1/FC2/ FC3	PENF	
	Actual			
3.3. Identifying and developing methods to utilize forest functions against disasters/damages such as wind break in addition to hillside works.	Plan	FC1/FC2/ FC3	PENF	
	Actual			
3.4. Motivating and involving the local population in pilot sites for implementation of selected Eco-DRR activities and measures.	Plan	FC1/FC2/ FC3	PENF	
	Actual			
3.5. Conducting a study on monitoring method to quantitatively evaluate forest conservation technologies for Eco-DRR.	Plan	FC1/Fmo	PENF	
	Actual			
3.6. Developing manuals/guidelines on forest conservation technologies for Eco-DRR (i.e. hillside work including planting work, torrent work such as check dams) based on the pilot activities	Plan	DTA/FC1	PENF	
	Actual			
3.7.Conducting training with the manuals/guidelines to strengthen capacities of PENF to autonomic ally carry out processes of forest conservation technologies and planting work.	Plan	DTA/FC1	PENF	
	Actual			
3.8. Strengthening capacities of PENF nursery staff of Sv. Nikole to make a seedling production plan based on the PENF's management plan, rehabilitation plan and demands from outside PENF.	Plan	FC1&2	PENF	
	Actual			
3.9. Improving facilities of the existing nursery (Sv. Nikole) in order to support newly applied forest management plan based on the forest function classification and rehabilitation plan.	Plan	FC1&2	PENF	
	Actual			
3.10. Developing manuals/guidelines on nursery technologies and planning based on the activity in Sv. Nikole.	Plan	DTA /FC1&2	PENF	
	Actual			

Output 4. Capacity of government personnel and public awareness of local community about the Eco-DRR are improved.

4.1. Preparing brochures, electronic and other informative material for Eco-DRR concept popularization to the government personnel, public and other interested parties.	Plan		PA/PR	CMC
	Actual			
4.2. Designing and launching of the public awareness campaign about the importance and necessity of introducing the Eco-DRR concept.	Plan		PA/DRR	CMC
	Actual			
4.3. Distributing hazard maps to the local community for their familiarization with risks that surround them around the pilot sites of Output 2 and 3.	Plan		PA/DRR	CMC
	Actual			
4.4. Consolidating results of the pilot activities and deliverables under Output 1, 2 and 3 for developing material(s) to explain Eco-DRR model in North Macedonia.	Plan		PA/PR/FM /FC1&2	CMC
	Actual			
4.5 Organizing workshops for Eco-DRR concept popularization to the government personnel.	Plan		TCA/PA/ PR	CMC
	Actual			
4.6. Organizing seminars for the promotion of project results inside and outside North Macedonia.	Plan		TCA/PA/ PR	CMC
	Actual			
Duration / Phasing	Plan			
	Actual			

Monitoring Plan	Year	2017	2018	2019	2020	2021	2022	2023	Remarks
		10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	
Monitoring									
Joint Coordinating Committee	Plan								
	Actual								
Technical Coordination Group	Plan								
	Actual								
Submission of Monitoring Sheet	Plan								
	Actual								
Reports/Documents									
Progress report	Plan								
	Actual								
Project Completion Report	Plan							Draft	
	Actual								
Public Relations									
Domestic seminar	Plan								
	Actual								
International seminar	Plan								
	Actual								

Plan

Actual

Added based one year extension of the project period

Table1: List of the products produced by the Project

No	Sub-No	Lang-uage	Title	Report, Manuals, Handbooks, Leaflet, others	Output
1		EN	Topographic interpretation training using aerial photographs	M	1
2		EN	Assessment of Landslide Disasters Using Digital Topographic Information	M	1
3		EN	Rainfall-Runoff-Inundation (RRI) Model Usage Guidelines	M	1
4	1	EN	Manual of UAV Flight Plan for Mountainous Area and Aerial Photo	M	1
4	2	MK	Manual of UAV Flight Plan for Mountainous Area and Aerial Photo	M	1
5		EN	Manual for Civil Engineering Information Model	M	1
6	1	EN	Manual for preparing North Macedonia Eco-DRR Hazard Map	M	1
6	2	MK	Manual for preparing North Macedonia Eco-DRR Hazard Map		
7	1	EN	FIELD SURVEY ON SOCIO-ECONOMIC AND OTHER ISSUES (Radovish)	R	1
7	2	MK	FIELD SURVEY ON SOCIO-ECONOMIC AND OTHER ISSUES (Radovish)	R	1
8	1	EN	SOCIO-ECONOMIC SURVEY ON ECO-DRR RELATED INFORMATION FOCUSING IN CHASKA AND VELES	R	1
8	2	EN	SOCIO-ECONOMIC SURVEY ON ECO-DRR RELATED INFORMATION FOCUSING IN CHASKA AND VELES (Payment for ecosystem services)	R	1
9		MK	MKFFIS Administer manual	M	1
10		EN	MKFFIS user manual	M	1
11	1	EN	User Manual for PE Makedonski sumi (GFIS)	M	1
11	2	MK	User Manual for PE Makedonski sumi (GFIS)	M	1
12	1	EN	Monitoring Manual	M	1
12	2	MK	Monitoring Manual	M	2
13	1	EN	Method for implementing forest functions categorization	M	2
13	2	MK	Method for implementing forest functions categorization	M	2
14	1	EN	Method for formulating a forest rehabilitation plan	M	2
14	2	MK	Method for formulating a forest rehabilitation plan	M	2

No	Sub-No	Lang-uage	Title	Report, Manuals, Handbooks, Leaflet, others	Output
15	1	EN	Windbreak case studies	M	3
15	2	MK	Windbreak case studies	M	3
16	1	EN	Windbreak Belts	L	3
16	2	MK	Windbreak Belts	L	3
17	1	EN	Manual on Forest Conservation Works in North Macedonia	M	3
17	2	MK	Manual on Forest Conservation Works in North Macedonia	M	3
18		EN	Forest Conservation	L	3
19	1	EN	Basic Knowledge of Container Seedlings	M	3
19	2	MK	Basic Knowledge of Container Seedlings	M	3
20		EN	Introduced container seedling and improved nursery technique	L	3
21	1	EN	Hydro-seeding Manual	M	3
21	2	MK	Hydro-seeding Manual	M	3
22	1	EN	Eco-DRR leaflet	L	4
22	1	MK	Eco-DRR leaflet	L	4
23		EN/MK/JP	News letters	O	4
24		EN/MK	Hazard maps	O	4
25		EN/MK	Information board	O	4

Project Design Matrix (PDM)

Project Title: Project on Capacity Building for Ecosystem-Based Disaster Risk Reduction (Eco-DRR) through Sustainable Forest Management in Macedonia Version 0

Implementing Agency: Crisis Management Center as the main implementing agency Dated April 20, 2017

Target Group: Relevant personnel in charge of disaster risk reduction in CMC, PEMF and other relevant organizations in Macedonia

Period of Project: 5 years from the date of the first dispatch of expert(s)

Project Site: Skopje, Mt. Vodno, Radovish, Sv. Nikole and Another Site to be confirmed

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption	Achievement	Remarks
Overall Goal By Eco-system based Disaster Risk Reduction (Eco-DRR) measures and activities in synergy with sustainable forest management, disaster risks of floods, landslides, soil erosion and forest fire on a long-term basis is reduced in Macedonia.	1: By 2025, CMC increases and revises the contents of MKFFIS which is related to floods, landslides, soil erosion and forest fire and continuously provides the information to relevant organizations. 2: By 2025, CMC makes hazard a map for at least one site using the same techniques which are introduced by the Project. 3: By 2025, PEMF applies silvicultural methods which are introduced by the Project more than three (3) locations.	Reports of CMC and the Government of Macedonia	1. Significant change on crisis management and forest management policy will not occur. 2. Significant number of unexpected extreme weather will not occur.		
Project Purpose					
Eco-system based Disaster Risk Reduction (Eco-DRR) model against floods, landslides, soil erosion and forest fire by utilization of multiple forest function is developed.	1: Responsibilities of relevant organizations for implementation of the Eco-DRR model are agreed among related organizations. 2: More than six (6) governmental organizations initiate disaster prevention or risk-reduction activities based on the information of MKFFIS revised by the Project. 3: Procedures for forest planning and implementing Eco-DRR related activities	1. Records of the Project activities. 2. Questionnaire/Interview Survey	1. Majority of staff of CMC and relevant organizations who are trained by the Project will not change the area of the expertise in the governmental organizations. 2. The budget on crisis management		

	are determined in PEMF. .		and forest management will not be significantly decreased. 3. Significant change on crisis management and forest management policy will not occur.		
Outputs					
1. National Crisis management coordination mechanism among domestic relevant institutions for prevention, early warning and rehabilitation against floods, landslides, soil erosion, and forest fire is enhanced by strengthening and expanding of MKFFIS function through introduction of new modules for torrents, landslides, erosions.	1: At least 3 modules are added to MKFISS. 2: More than 80% of participants of MKFFIS training understand new function and modules of MKFFIS which related their works.	1. Records of the Project activities. 2.Questionnaire/Interview Survey	More devastating natural disasters than assumed will not occur in the pilot sites		
2. National forest management and planning capacities for promotion of Eco-DRR are enhanced through introduction of new sub-components of protective forest, such as soil erosion prevention, water conservation, and public health forests, by functional categories of forest ecosystem.	1: Procedures for formulating forest management plans and rehabilitation plans based on the new sub-components of protective forest are established. 2: More than 80% of PEMF staff who participate in the training courses understand the procedures for formulating forest management plans and rehabilitation plans.	1. forest management plans and rehabilitation plans of PEMF 2.Questionnaire/Interview Survey			
3. Execution Capacity to carry out Eco-DRR related activities is enhanced through introduction of Eco-DRR technology and improvement of seedling capacity.	1: Manuals/guidelines on forest conservation technologies for Eco-DRR are authorized by PEMF. 2: More than 80% of participants of the technical training courses understand at least 80 % of Eco-DRR technologies introduced in the courses. 3: The nursery has the capacity to produce two (2) million seedlings to satisfy the requirement of the nursery/PEMF managers.	1. Manuals/guidelines for Eco-DRR 2.Questionnaire/Interview Survey 3. Records of the nursery			
4. Capacity of government personnel and public awareness of local community about the Eco-DRR are improved	1: More than 80 % of government staff who participated in the seminars are able to explain the concept of Eco-DRR. 2: More than 80 % of people who	1. Questionnaire/Interview Survey 2.			

	participated in the seminars understand the concept of Eco-DRR and activities which should be taken..	Questionnaire/Interview Survey			
Activities	**Inputs**		**Pre-Conditions**		
	The Japanese Side	**The Macedonian Side**	Cooperation from related organizations including local governments of pilot sites are obtained and micro pilot sites for Eco-DRR related execution are provided.		
0. Establishing Joint Coordination Committee and Technical Coordination Committee 1.1. Developing the methodology and concept for expanding MKFFIS as a multi hazard platform for exchange data and information shearing among the relevant institution within National Crisis Management System, particularly for risk of floods, landslides and soil erosion. 1.2. Preparing technical documentation and specification, and supplying necessary hardware, software and other equipment for strengthening the existing function and expanding MKFFIS. 1.3. Preparing study of hydraulic models for high-risk locations exposed to torrential flooding using the available data and mapping the locations possibly exposed at risk of landslides and soil erosion on some of the target sites of Output 2 and 3. 1.4. Introducing new function, create additional GIS database relevant for floods, landslides and soil erosion hazard. 1.5. Revising/updating MKFFIS platform to the Open layer 3.0 and reorganization of their user interface. 1.6. Updating the methodology for damage assessment of floods, landslides and soil erosion. 1.7. Preparing hazard maps to the local community for their familiarization with risks that surround them in the selected sites of Output 2 and 3. 1.8. Organizing training for selected staff from CMC, PEMF and other relevant institutions, for	1. Experts - Forest Management - Forest Conservation - Database - GIS/Remote Sensing - Hydrologist - Public Awareness - DRR 2. Training of counterpart personnel in Japan 3. Equipment for the project activities as follows; - Vehicle - GIS system/Database - Survey equipment - Nursery equipment - Other equipment 4. Project operational cost	1. Government Staff as counterpart personnel and Project staff as needed for the Project (1) Project Director (2) Project Manager (3)Counterpart personnel (4) Supporting staff 2. Administrative and operational costs 3. Provision of land, building, facilities and equipment for the Project.	 **<Issues and countermeasures>**		

new functions and modules of the MKFFIS.					
2.1. Developing new sub-components by functional categories of forest ecosystem for protective forest.					
2.2. Identifying actual and potential high-risk locations exposed to torrents, landslides and erosion processes at the selected sites of 3 forest management units (FMU) and integrating them into MKFFIS.					
2.3. Based on 2.2, formulating forest management plans in pilot sites by using the new sub-components of protective forest including coding system, valuation of ecosystem services, zoning and mapping cadaster and integrating them into MKFFIS (if it is necessary, the new sub-components of forest ecosystem should be revised based on the results of 2.3 activity.)					
2.4. Planning mid and long term rehabilitation activities of high-risk/affected areas based on 2.3 in pilot sites,					
2.5. Developing guidelines/procedure and training manuals for planning forest management plan and rehabilitation plan based on the above activities					
2.6. Organizing training of selected personnel of PEMF who work on forest planning based on 2.5.					
2.7. Making recommendation(s) about legal regulations that governing forest management by discussion about an action for amendments and adoption of necessary bylaws regulations based on achieved results of the above activities.					
3.1. Selecting micro pilot sites within pilot sites for Implementing activities of identified forest conservation technologies for Eco-DRR (i.e. hillside work including planting work, torrent work such as check dams)					
3.2. Implementing on the ground activities of forest conservation technologies for Eco-DRR					

3.3. Identifying and developing methods to utilize forest functions against disasters/damages such as wind break in addition to hillside works					
3.4. Motivating and involving the local population in pilot sites for implementation of selected Eco-DRR activities and measures.					
3.5. Conducting a study on monitoring method to quantitatively evaluate forest conservation technologies for Eco-DRR.					
3.6. Developing manuals/guidelines on forest conservation technologies for Eco-DRR (i.e. hillside work including planting work, torrent work such as check dams) based on the pilot activities					
3.7.Conducting training with the manuals/guidelines to strengthen capacities of PEMF to autonomically carry out processes of forest conservation technologies and planting work.					
3.8. Strengthening capacities of PEMF nursery staff of Sv. Nikole to make a seedling production plan based on the PEMF's management plan, rehabilitation plan and demands from outside PEMF.					
3.9. Improving facilities of the existing nursery (Sv. Nikole) in order to support newly applied forest management plan based on the forest function classification and rehabilitation plan.					
3.10. Developing manuals/guidelines on nursery technologies and planning based on the activity in Sv. Nikole					
4.1. Preparing brochures, electronic and other informative material for Eco-DRR concept popularization to the government personnel, public and other interested parties.					
4.2. Designing and launching of the public awareness campaign about the importance and necessity of introducing the Eco-DRR concept.					
4.3. Distributing hazard maps to the local community for their familiarization with risks					

that surround them around the pilot sites of Output 2 and 3.					
4.4. Consolidating results of the pilot activities and deliverables under Output 1, 2 and 3 for developing material(s) to explain Eco-DRR model in Macedonia.					
4.5 Organizing workshops for Eco-DRR concept popularization to the government personnel.					
4.6. Organizing seminars for the promotion of project results inside and outside Macedonia.					

Project Design Matrix (PDM)

Project Title: Project on Capacity Building for Ecosystem-Based Disaster Risk Reduction (Eco-DRR) through Sustainable Forest Management in Macedonia Version 1

Implementing Agency: Crisis Management Center as the main implementing agency Dated December 20, 2017

Target Group: Relevant personnel in charge of disaster risk reduction in CMC, PEMF and other relevant organizations in Macedonia

Period of Project: 5 years from the date of the first dispatch of expert(s)

Project Site: Skopje, Mt. Vodno, Radovish, Sv. Nikole and Another Site to be confirmed

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption	Achievement	Remarks
Overall Goal By Eco-system based Disaster Risk Reduction (Eco-DRR) measures and activities in synergy with sustainable forest management, disaster risks of floods, landslides, soil erosion and forest fire on a long-term basis is reduced in Macedonia.	1: By 2025, CMC increases and revises the contents of MKFFIS which is related to floods, landslides, soil erosion and forest fire and continuously provides the information to relevant organizations. 2: By 2025, CMC makes hazard a map for at least one site using the same techniques which are introduced by the Project. 3: By 2025, PEMF applies silvicultural methods which are introduced by the Project more than three (3) locations.	Reports of CMC and the Government of Macedonia	1. Significant change on crisis management and forest management policy will not occur. 2. Significant number of unexpected extreme weather will not occur.		
Project Purpose					
Eco-system based Disaster Risk Reduction (Eco-DRR) model against floods, landslides, soil erosion and forest fire by utilization of multiple forest function is developed.	1: Responsibilities of relevant organizations for implementation of the Eco-DRR model are agreed among related organizations. 2: More than six (6) governmental organizations initiate disaster prevention or risk-reduction activities based on the information of MKFFIS revised by the Project. 3: Procedures for forest planning and implementing Eco-DRR related activities	1. Records of the Project activities. 2. Questionnaire/Interview Survey	1. Majority of staff of CMC and relevant organizations who are trained by the Project will not change the area of the expertise in the governmental organizations. 2. The budget on crisis management		

	are determined in PEMF. .		and forest management will not be significantly decreased. 3. Significant change on crisis management and forest management policy will not occur.		
Outputs					
1. National Crisis management coordination mechanism among domestic relevant institutions for prevention, early warning and rehabilitation against floods, landslides, soil erosion, and forest fire is enhanced by strengthening and expanding of MKFFIS function through introduction of new modules for torrents, landslides, erosions.	1: At least 3 modules are added to MKFISS. 2: More than 80% of participants of MKFFIS training understand new function and modules of MKFFIS which related their works.	1. Records of the Project activities. 2.Questionnaire/Interview Survey	More devastating natural disasters than assumed will not occur in the pilot sites		
2. National forest management and planning capacities for promotion of Eco-DRR are enhanced through introduction of new sub-components of protective forest, such as soil erosion prevention, water conservation, and public health forests, by functional categories of forest ecosystem.	1: Procedures for formulating forest management plans and rehabilitation plans based on the new sub-components of protective forest are established. 2: More than 80% of PEMF staff who participate in the training courses understand the procedures for formulating forest management plans and rehabilitation plans.	1. forest management plans and rehabilitation plans of PEMF 2.Questionnaire/Interview Survey			
3. Execution Capacity to carry out Eco-DRR related activities is enhanced through introduction of Eco-DRR technology and improvement of seedling capacity.	1: Manuals/guidelines on forest conservation technologies for Eco-DRR are authorized by PEMF. 2: More than 80% of participants of the technical training courses understand at least 80 % of Eco-DRR technologies introduced in the courses. 3: The nursery has the capacity to produce two (2) million seedlings to satisfy the requirement of the nursery/PEMF managers.	1. Manuals/guidelines for Eco-DRR 2.Questionnaire/Interview Survey 3. Records of the nursery			
4. Capacity of government personnel and public awareness of local community about the Eco-DRR are improved	1: More than 80 % of government staff who participated in the seminars are able to explain the concept of Eco-DRR. 2: More than 80 % of people who	1. Questionnaire/Interview Survey 2.			

	participated in the seminars understand the concept of Eco-DRR and activities which should be taken.	Questionnaire/Interview Survey			
Activities	**Inputs**		**Pre-Conditions**		
	The Japanese Side	**The Macedonian Side**	Cooperation from related organizations including local governments of pilot sites are obtained and micro pilot sites for Eco-DRR related execution are provided.		
0. Establishing Joint Coordination Committee and Technical Coordination Committee 1.1. Developing the methodology and concept for expanding MKFFIS as a multi hazard platform for exchange data and information shearing among the relevant institution within National Crisis Management System, particularly for risk of floods, landslides and soil erosion. 1.2. Preparing technical documentation and specification, and supplying necessary hardware, software and other equipment for strengthening the existing function and expanding MKFFIS. 1.3. Preparing study of hydraulic models for high-risk locations exposed to torrential flooding using the available data and mapping the locations possibly exposed at risk of landslides and soil erosion on some of the target sites of Output 2 and 3. 1.4. Introducing new function, create additional GIS database relevant for floods, landslides and soil erosion hazard. 1.5. Revising/updating MKFFIS platform to the Open layer 3.0 and reorganization of their user interface. 1.6. Updating the methodology for damage assessment of floods, landslides and soil erosion. 1.7. Preparing hazard maps to the local community for their familiarization with risks that surround them in the selected sites of Output 2 and 3. 1.8. Organizing training for selected staff from CMC, PEMF and other relevant institutions, for	1. Experts - Forest Management - Forest Conservation - Database - GIS/Remote Sensing - Hydrologist - Public Awareness - DRR 2. Training of counterpart personnel in Japan 3. Equipment for the project activities as follows; - Vehicle - GIS system/Database - Survey equipment - Nursery equipment - Other equipment 4. Project operational cost	1. Government Staff as counterpart personnel and Project staff as needed for the Project (1) Project Director (2) Project Manager (3)Counterpart personnel (4) Supporting staff 2. Administrative and operational costs 3. Provision of land, building, facilities and equipment for the Project.	 **<Issues and countermeasures>**		

new functions and modules of the MKFFIS.					
2.1. Developing new sub-components by functional categories of forest ecosystem for protective forest.					
2.2. Identifying actual and potential high-risk locations exposed to torrents, landslides and erosion processes at the selected sites of 3 forest management units (FMU) and integrating them into MKFFIS.					
2.3. Based on 2.2, formulating forest management plans in pilot sites by using the new sub-components of protective forest including coding system, valuation of ecosystem services, zoning and mapping cadaster and integrating them into MKFFIS (if it is necessary, the new sub-components of forest ecosystem should be revised based on the results of 2.3 activity.)					
2.4. Planning mid and long term rehabilitation activities of high-risk/affected areas based on 2.3 in pilot sites,					
2.5. Developing guidelines/procedure and training manuals for planning forest management plan and rehabilitation plan based on the above activities					
2.6. Organizing training of selected personnel of PEMF who work on forest planning based on 2.5.					
2.7. Making recommendation(s) about legal regulations that governing forest management by discussion about an action for amendments and adoption of necessary bylaws regulations based on achieved results of the above activities.					
3.1. Selecting micro pilot sites within pilot sites for Implementing activities of identified forest conservation technologies for Eco-DRR (i.e. hillside work including planting work, torrent work such as check dams)					
3.2. Implementing on the ground activities of forest conservation technologies for Eco-DRR					

3.3. Identifying and developing methods to utilize forest functions against disasters/damages such as wind break in addition to hillside works					
3.4. Motivating and involving the local population in pilot sites for implementation of selected Eco-DRR activities and measures.					
3.5. Conducting a study on monitoring method to quantitatively evaluate forest conservation technologies for Eco-DRR.					
3.6. Developing manuals/guidelines on forest conservation technologies for Eco-DRR (i.e. hillside work including planting work, torrent work such as check dams) based on the pilot activities					
3.7.Conducting training with the manuals/guidelines to strengthen capacities of PEMF to autonomically carry out processes of forest conservation technologies and planting work.					
3.8. Strengthening capacities of PEMF nursery staff of Sv. Nikole to make a seedling production plan based on the PEMF's management plan, rehabilitation plan and demands from outside PEMF.					
3.9. Improving facilities of the existing nursery (Sv. Nikole) in order to support newly applied forest management plan based on the forest function classification and rehabilitation plan.					
3.10. Developing manuals/guidelines on nursery technologies and planning based on the activity in Sv. Nikole					
4.1. Preparing brochures, electronic and other informative material for Eco-DRR concept popularization to the government personnel, public and other interested parties.					
4.2. Designing and launching of the public awareness campaign about the importance and necessity of introducing the Eco-DRR concept.					
4.3. Distributing hazard maps to the local community for their familiarization with risks					

that surround them around the pilot sites of Output 2 and 3.					
4.4. Consolidating results of the pilot activities and deliverables under Output 1, 2 and 3 for developing material(s) to explain Eco-DRR model in Macedonia.					
4.5 Organizing workshops for Eco-DRR concept popularization to the government personnel.					
4.6. Organizing seminars for the promotion of project results inside and outside Macedonia.					

Amended Project Design Matrix (PDM)

Project Title: Project on Capacity Building for Ecosystem-Based Disaster Risk Reduction through Sustainable Forest Management in North Macedonia (Project Eco-DRR in North Macedonia)

Version PDM 2.0

Implementing Agency: Crisis Management Center as the main implementing agency

Dated: XXXX, 2021

Target Group:Relevant personnel in charge of disaster risk reduction in CMC, PENF and other relevant organizations in North Macedonia

Period of Project: 6 years from the date of the first dispatch of expert(s)

Project Site: Skopje, Mt. Vodno, Radvish, Sv. Nikole and another to be confirmed towards signing of R/D **Model Site:**

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption	Achievement	Remarks
Overall Goal By Eco-system based Disaster Risk Reduction (Eco-DRR) measures and activities in synergy with sustainable forest management, disaster risks of floods, landslides, soil erosion and forest fire on a long-term basis is reduced in North Macedonia.	1: By 2027, CMC increases and revises the contents of MKFFIS which is related to floods, landslides, soil erosion and forest fire and continuously provides the information to relevant organizations. 2: CMC supervises and supports ofthe preparation of a hazard map by relevant institutions such as Municipalitiesy for at least one site using the same techniques which are introduced by the Project. 3: By 2027, PENF applies silvicultural methods which are introduced by the Project more than three (3) locations.	Reports of CMC and the Government of North Macedonia	1. Significant change on crisis management and forest management policy will not occur. 2. Significant number of unexpected extreme weather will not occur.		
Project Purpose Eco-system based Disaster Risk Reduction (Eco-DRR) model against floods, landslides, soil erosion and forest fire by utilization of multiple forest function is developed.	1: Responsibilities of relevant organizations for implementation of the Eco-DRR model are agreed among related organizations. 2: More than six (6) governmental organizations initiate disaster prevention or risk-reduction activities based on the information of MKFFIS revised by the Project. 3: Procedures for forest planning and implementing Eco-DRR related activities are determined in PENF.	1. Records of the Project activities. 2. Questionnaire/Interview Survey	1. Majority of staff of CMC and relevant organizations who are trained by the Project will not change the area of the expertise in the governmental organizations. 2. The budget on crisis management and forest management will not be significantly decreased. 3. Significant change on crisis management and forest management policy will not occur.		
Outputs 1. National Crisis management coordination mechanism among domestic relevant institutions for prevention, early warning and rehabilitation against floods, landslides, soil erosion, and forest fire is enhanced by strengthening and expanding of MKFFIS function through introduction of new modules for torrents, landslides, erosions.	1: At least 3 modules are added to MKFISS. 2: More than 80% of participants of MKFFIS training understand new function and modules of MKFFIS which related their works.	1. Records of the Project activities. 2. Questionnaire/Interview Survey	Necessary staff and budget for the project activities will be allocated according to the plan.		
2. National forest management and planning capacities for promotion of Eco-DRR are enhanced through introduction of new sub-components of protective forest, such as soil erosion prevention, water conservation, and public health forests, by functional categories of forest ecosystem.	1: Procedures for formulating forest management plans and rehabilitation plans based on the new sub-components of protective forest are established. 2: More than 80% of PENF staff who participate in the training courses understand the procedures for formulating forest management plans and rehabilitation plans.	1. Records of the Project activities. Questionnaire/Interview Survey 2. Progress report/record of the Rehabilitation plan of PENF,			
3. Execution Capacity to carry out Eco-DRR related activities is enhanced through introduction of Eco-DRR technology and improvement of seedling capacity.	1: Manuals/guidelines on forest conservation technologies for Eco-DRR are authorized by PENF. 2: More than 80% of participants of the technical training courses understand at least 80 % of Eco-DRR technologies introduced in the courses. 3: The nursery has the capacity to produce 2M seedlings to satisfy the requirement of the nursery/PENF managers.	1. Records of the Project activities. 2. Questionnaire/Interview 3. Survey, Practice examinations.			
4. Capacity of government personnel and public awareness of local community about the Eco-DRR are improved.	1: More than 80 % of government staff who participated in the seminars are able to explain the concept of Eco-DRR. 2: More than 80 % of people who participated in the seminars understand the concept of Eco-DRR and activities which should be taken.	1. Records of the Project activities. 2. Questionnaire/Interview Survey			

Activities	Inputs		Pre-Conditions
	The Japanese Side	**The North Macedonian Side**	Commitment and willingness of CMC and PENF do not change.
0. Establishing Joint Coordination Committee and Technical Coordination Committee 1.1. Developing the methodology and concept for expanding MKFFIS as a multi hazard platform for exchange data and information shearing among the relevant institution within National Crisis Management System, particularly for risk of floods, landslides and soil erosion. 1.2. Preparing technical documentation and specification, and supplying necessary hardware, software and other equipment for strengthening the existing function and expanding MKFFIS. 1.3. Preparing study of hydraulic models for high-risk locations exposed to torrential flooding using the available data and mapping the locations possibly exposed at risk of landslides and soil erosion on some of the target sites of Output 2 and 3. 1.4. Introducing new function, create additional GIS database relevant for floods, landslides and soil erosion hazard.	1. Experts - Forest Management - Forest Conservation - Database - GIS/Remote Sensing - Hydrologist - Public Awareness - DRR 2. Training of counterpart personnel in Japan 3. Equipment for the project activities as follows; - Vehicle - GIS system/Database - Survey equipment - Nursery equipment - Other equipment 4. Project operational cost	1. Government Staff as counterpart personnel and Project staff as needed for the Project (1) Project Director (2) Project Manager (3) Counterpart personnel (4) Supporting staff 2. Administrative and operational costs 3. Provision of land, building, facilities and equipment for the Project.	**<Issues and countermeasures>**

1.5. Revising/updating MKFFIS platform to the Open layer 3.0 and reorganization of their user interface. 1.6. Updating the methodology for damage assessment of floods, landslides and soil erosion. 1.7. Preparing hazard maps to the local community for their familiarization with risks that surround them in the selected sites of Output 2 and 3. 1.8. Organizing training for selected staff from CMC, PENF and other relevant institutions, for new functions and modules of the MKFFIS.				
2.1. Developing new sub-components by functional categories of forest ecosystem for protective forest. 2.2. Identifying actual and potential high-risk locations exposed to torrents, landslides and erosion processes at the selected sites of 3 forest management units (FMU) and integrating them into MKFFIS. 2.3. Based on 2.2, formulating forest management plans in pilot sites by using the new sub-components of protective forest including coding system, valuation of ecosystem services, zoning and mapping cadaster and integrating them into MKFFIS (if it is necessary, the new sub-components of forest ecosystem should be revised based on the results of 2.3 activity.) 2.4. Planning mid and long term rehabilitation activities of high-risk/affected areas based on 2.3 in pilot sites. 2.5. Developing guidelines/procedure and training manuals for planning forest management plan and rehabilitation plan based on the above activities. 2.6. Organizing training of selected personnel of PENF who work on forest planning based on 2.5. 2.7. Making recommendation(s) about legal regulations that governing forest management by discussion about an action for amendments and adoption of necessary bylaws regulations based on achieved results of the above activities.				
3.1. Selecting micro pilot sites within pilot sites for Implementing activities of identified forest conservation technologies for Eco-DRR (i.e. hillside work including planting work, torrent work such as check dams) 3.2. Implementing on the ground activities of forest conservation technologies for Eco-DRR. 3.3. Identifying and developing methods to utilize forest functions against disasters/damages such as wind break in addition to hillside works. 3.4. Motivating and involving the local population in pilot sites for implementation of selected Eco-DRR activities and measures. 3.5. Conducting a study on monitoring method to quantitatively evaluate forest conservation technologies for Eco-DRR. 3.6. Developing manuals/guidelines on forest conservation technologies for Eco-DRR (i.e. hillside work including planting work, torrent work such as check dams) based on the pilot activities 3.7.Conducting training with the manuals/guidelines to strengthen capacities of PENF to autonomically carry out processes of forest conservation technologies and planting work. 3.8. Strengthening capacities of PENF nursery staff of Sv. Nikole to make a seedling production plan based on the PENF's management plan, rehabilitation plan and demands from outside PENF. 3.9. Improving facilities of the existing nursery (Sv. Nikole) in order to support newly applied forest management plan based on the forest function classification and rehabilitation plan. 3.10. Developing manuals/guidelines on nursery technologies and planning based on the activity in Sv. Nikole				
4.1. Preparing brochures, electronic and other informative material for Eco-DRR concept popularization to the government personnel, public and other interested parties. 4.2. Designing and launching of the public awareness campaign about the importance and necessity of introducing the Eco-DRR concept. 4.3. Distributing hazard maps to the local community for their familiarization with risks that surround them around the pilot sites of Output 2 and 3. 4.4. Consolidating results of the pilot activities and deliverables under Output 1, 2 and 3 for developing material(s) to explain Eco-DRR model in North Macedonia. 4.5 Organizing workshops for Eco-DRR concept popularization to the government personnel. 4.6. Organizing seminars for the promotion of project results inside and outside North Macedonia.				