Project Completion Report

Republic of India

The project for Natural Disaster Management in Forest Areas in Uttarakhand

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March 2024

GE
JR
24-033

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Acronyms

Acronyms	Description
APCCF	Additional Principal Conservator of Forest
BRO	Border Road Organization
CCF	Chief Conservator of Forest
CF	Conservator of Forest
COVID-19	Coronavirus Infectious Disease, emerged in 2019
CPD	Chief Project Director
DAC	Development Assistance Committee
DFO	District/Divisional Forest Office
GOI	Government of India
GOJ	Government of Japan
GoUK	Government of Uttarakhand
HoFF	Head of Forest Force
HPC	Hyper Committee
HRD	Human Resource Development
ICFRE	Indian Council of Forest Research and Education
IFS	Indian Forest Service
IGNFA	Indira Gandhi National Forest Academy
IMD	India Meteorological Department
JCC	Joint Coordination Committee
JETs	Japanese Experts
JICA	Japan International Cooperation Agency
MoEF&CC	Ministry of Environment, Forest and Climate Change
NDMA	National Disaster Management Authority
ODA	Official Development Assistance
Off-JT/On-JT	Off the job training/On the job training
PCCF	Principal Chief Conservator of Forest
PD	Project Director
PDM	Project Design Matrix
PWD	Public Work Department
R/D	Record of Discussions
RFP	Request for Proposal

SDLM	Slope Disaster Location Map
SOP	Standard Operating/Operational Procedure
TCP/TC project	Technical Cooperation Project
ToE	Team of Engineers
UFRMP	Uttarakhand Forest Resource Management Project
UKFD	Uttarakhand Forest Department
ULMCC	Uttarakhand Landslide Mitigation and Management Center

I. Basic Information of the Project

1. Country:

The Republic of India

2. Title of the Project:

The Project for Natural Disaster Management in Forest Areas in Uttarakhand

3. Duration of the Project (Planned and Actual) :

Planned - From 26 March 2017 to 25 March 2022, Five(5) years

Actual - From 26 March 2027 to 25 March 2024, Seven(7) years

4. Background

In the “Twelfth Five Year Plan (2012-2017)”, GoI set enhancement of forest and tree cover as high priority sector. GoI also expressed that assistance for the forestry sector would be prioritized in the “Country Assistance Program for India (May 2006)”.

In recent resent years, floods and Landslides originate in the forest areas particularly in the mountains.

Especially, the unusual large-scale disaster caused by flood and landslides that occurred in June 2013 in the state of Uttarakhand as result of heavy rains in the Himalayan region caused a humungous calamity. Over 6,000 people were dead and missing in 4,200 villages, mainly in the northern region of the state. This was an unprecedented mountain disaster in India. It is considered that most of land collapse and landslides that occurred in conjunction with flood, originated in the forest areas under the control of the Uttarakhand Forest Department.

The Japanese ODA loan project supported by GoJ through JICA, namely “Uttarakhand Forest Resource Management Project” (hereinafter referred to as “UFRMP”) for which the Loan Agreement was signed in April 2014, not only addressed forest conservation including effective soil and water conservation activities, but also in unique for incorporating sediment disaster mitigation component for prevention and better preparedness to deal with landslide disasters in future.

In order to effectively implement preventive measures of slope disaster in UFRMP, it is also required to develop the capacity and technical experience of UKFD in the field of natural disaster management. Therefore, the Technical Cooperation Project , namely, ‘The Project for Natural Disaster Management in Forest Areas in Uttarakhand’ (hereafter referred to as “TCP” or “the Project”) was requested to GoJ by UKFD.

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

-Overall Goal:

1. Erosion control works for slope disaster management in the forest area are appropriately implemented in Uttarakhand state.
2. Knowledge and technology on erosion control works are disseminated to other Himalayan states.

-Project purpose:

System to appropriately implement erosion control works for slope disaster management in the forest area is established in the Uttarakhand state.

6. Implementing Agency:

Uttarakhand Forest Department

II. Results of the Project

1. Result of the Project

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

1-1-1 Amount of input by the Japanese side: Approx. 735 million Japanese Yen

1-1-2 Dispatch of Experts, Total 300 person-months

As per the Record of Discussions on the project agreed upon UKFD and JICA on 29 August 2016 (hereinafter referred to as “R/D”), JICA dispatched Chief Advisor/Erosion Control Planning and Project Coordinator/Erosion Control Training as Long-term Experts constantly, as well as Field Survey for Erosion Control Works, Design and Estimation Control Works, Supervision of Erosion control works and Others periodically as Short-term Experts. Both Long-term and Short-term Experts worked as per the plan of operation as below. No major security incident occurred during this project period except for the COVID-19 pandemic.

(Long-term Experts, Total 168 person-months)

-Chief Advisor/Erosion Control Planning

-Mr. Shingo KITAURA (from 26 March 2017 to 25 March 2020)

-Mr. Yasuo IIJIMA (from 11 March 2020 to 25 March 2024)

- Project Coordinator/ Erosion Control Training

-Ms. Saori MIYAJIMA (from 26 March 2017 to 25 May 2019)
-Ms. Atsuko GODO (from 13 May 2019 to 25 March 2024)
Note: Due to the COVID-19 pandemic, Long-term Experts returned to Japan and were not stationed in India from March 2020 to March 2021, and from June to August 2021(total 1 year and 2 months).

(Short-term Experts, Total 132 person-months)
The appointment of Short-term Experts began on 10 July, 2017.
-Experts in charge of Field Survey for Erosion Control Works
-Mr. Takashi HARA
-Mr. Kei KISHIMOTO
-Mr. Keiji SOMEYA
-Experts in charge of Design and Cost Estimation for Erosion Control Works
-Mr. Tomoyuki UEDA
-Mr. Hideo SATO
-Experts in charge of Supervision of Erosion Control works
-Mr. Satoshi ISHIDA (Supervision/ Procurement)
-Mr. Hotaka AOKI (Supervision/ Monitoring)
-Mr. Kentaro SEYA (Supervision/ Monitoring)
-Other Experts
-Ms. Miwako ARAKI (Training)
-Ms. Yumika YOSHINAGA (ditto)
-Mr. Makoto TOKUDA (ditto)
Note: Due to the COVID-19 pandemic, Short-term Experts returned to Japan and were not available from March 2020 till August 2021 (total 1 year 5 months). In September 2021, dispatch of the Experts resumed to deliver their services for the Project.

1-1-3 Training

Three trainings in Japan were conducted as planned in the R/D, one training in India and two in Japan were additionally conducted.

(a) Regular training in Japan

As per R/D, training were carried out three(3) times in 2017, 2018, and 2019 respectively as below;

The first training in Japan was conducted for two groups: one was for senior officers, and another was for general staff, from 24 October to 23 November, 2017, as part of capacity building of UKFD and other departments of the state.
This training was attended by the following personnel:

-Mr. Jai Raj (Principal Chief Conservator of Forests & Head of Forest Force, UKFD)
-Mr. Prasana Kumar Patro (Conservator of Forests, UKFD)
-Mr. Vinod Kumar Suman (Additional CEO, Uttarakhand Disaster Management Authority, GoUK)
-Mr. Prakash Chandra (Chief Development Officer, Nainital, Revenue Department)
-Mr. Amit Kanwar (Deputy Conservator of Forests, UKFD)
-Mr. Rahul (Deputy Conservator of Forests, UKFD)
-Mr. Mahipal Singh Sirohi (Assistant Conservator of Forests, UKFD)
-Ms. Garvita Pandey (Assistant Engineer PWD, GoUK)
-Mr. Rohit Srivastava (Deputy Range Officer, UKFD)
-Mr. Jay Kumar Sharma (Chief Engineer, TCP)
-Mr. Vinod Jhinkwan (Field Engineer, TCP)

The second training in Japan was conducted from 11 November to 23 November, 2018, as a part of capacity building exercise for GoUK, UKFD and Project Engineers.
This training was attended by the following personnel:

-Mr. Arvind Singh Hyanki (Secretary, GoUK)
-Mr. Kapil Kumar Joshi (Chief Conservator of Forests, UKFD)
-Mr. Dharam Singh Meena (Deputy Conservator of Forests, UKFD)
-Mr. Umesh Chandra Joshi (Assistant Conservator of Forests, UKFD)
-Mr. Subhash Chandra Nautiyal (Forest Range Officer, UKFD)
-Mr. Mahesh Chandra Joshi (Deputy Range Officer, UKFD)
-Mr. Kundan Singh Bisht (Forester, UKFD)
-Mr. Rakesh Kumar (Forest Beat Officer, UKFD)
-Mr. Prakash Singh Kandari (Forest Guard, UKFD)
-Mr. Kishore Chandra (Forest Guard, UKFD)
-Mr. Jagraj Singh Mehra (Construction Planning/Cost/Procurement Engineer, TCP)

The third training in Japan was conducted from 7 November to 22 November,

2019, as a part of capacity building exercise for UKFD, MoEF&CC and Project Engineers.

This training was attended by the following personnel:

-Mr. Ranjan Kumar Mishra (Chief Conservator of Forests, UKFD)
-Mr. Sandeep Kumar (Divisional Forest Officer, UKFD)
-Mr. Ravindra Pundir (Forest Range Officer, UKFD)
-Mr. Jwala Prasad (Forest Range Officer, UKFD)
-Mr. Uday Nand (Forest Range Officer, UKFD)
-Mr. Sadhu Lal (Forest Range Officer, UKFD)
-Mr. Prem Singh Negi (Field Engineer, TCP)
-Mr. Kuldeep Singh Pundir (Field Engineer, TCP)
-Mr. Hemant Kumar Meena (Assistant Inspector General of Forests, MoEF&CC)
-Mr. Jiju Jairaj Sunil (Technical Officer, MoEF&CC)

(b) Invitation Program

Apart from trainings in Japan and India organized under the Project scheme, JICA invited a high-level delegation to Japan for an invitation program to learn more about disaster management in forest areas, which was led by the Forest Minister of Uttarakhand. This invitation program was from 5 September to 14 September, 2017. This program was expected to help in smooth execution and promotion of TCP in the state.

This program was attended by the following personnel:

-Dr. Harak Singh Rawat (Minister of Forest & Environment, Uttarakhand)
-Mr. S. Ramaswamy (Chief Secretary, Uttarakhand)
-Mr. Anup Malik (Chief Project Director, UFRMP & Project Director of TCP)
-Mr. Monish Mullick (Principal Chief Conservator Forests, HRD)
-Mr. Kishan Chand (Deputy Conservator of Forests, Rajaji National Park)

(c) Other training in Japan

It was conducted from 16 August to 7 September, 2023, as a part of capacity building exercise for forest officers in India. This training was attended by the following personnel:

-Dr. Koko Rose, IFS (Deputy. Project Director, UFRMP/UKFD)

Note: All designations mentioned above are at the time of the trainings.

(d) Other training in India

The training in India was conducted from 22 October to 29 October, 2018, as a part of capacity building of UKFD and Project Engineers.

This training was attended by the following:

-Mr. Kapil Kumar Joshi (Chief Conservator of Forests, UKFD)

-Mr. Dharam Singh Meena (Deputy Conservator of Forests, UKFD)

-Mr. Umesh Chandra Joshi (Assistant Conservator of Forests, UKFD)

-Mr. Subhash Chandra Nautiyal (Forest Range Officer, UKFD)

-Mr. Mahesh Chandra Joshi (Deputy Range Officer, UKFD)

-Mr. Kundan Singh Bisht (Forester, UKFD)

-Mr. Rakesh Kumar (Forest Beat Officer, UKFD)

-Mr. Prakash Singh Kandari (Forest Guard, UKFD)

-Mr. Kishore Chandra (Forest Guard, UKFD)

-Mr. Jagraj Singh Mehra (Construction Planning/Cost/Procurement Engineer, TCP)

-Mr. Prem Singh Negi (Field Engineer, TCP)

-Mr. Kuldeep Singh Pundir (Field Engineer, TCP)

-Mr. Tribhuwan Rana (Field Engineer, TCP)

1-1-4 Machinery and Equipment

・Two vehicles were procured for Project activities and the same were handed over to UKFD in December 2018.

・Three rain gauges were installed at model sites. Parts of one rain gauge were renewed in August 2021.

・Forty helmets and other related items were imported from Japan to be used in the field.

・One drone with a set of RTK GNSS equipment, and one desktop computer for processing drone data were procured in November 2021 and January 2022, respectively.

・One digital photocopier machine was procured in March 2022.

As per the letter dated 22 March 2024," transfer of equipment and assets after completion of The Project for the Natural Disaster Management in Forest Areas in Uttarakhand" Letter No. k-1076/2023-24, all equipment procured and used for the Project were handed over to UKFD on 23 Mach 2024.

1-2 Input by Uttarakhand side (Planned and Actual)

1-2-1 Services of UKFD's counterpart personal and administrative

personal

(a) Project Director (PD)

As per R/D, Chief Project Director of UFRMP had responsibility for overall administration and implementation of the Project as the Project Director.

-Mr. Anup Malik, IFS (from 26 March 2017 to 18 June 2023)

-Dr. Vijay Kumar, IFS (from 19 June 2023 to 25 March 2024)

(b) Additional Project Director

As per R/D, Additional Project Director had responsibility for management and coordination among relevant divisions of the Project. He/she also supported Project Director as Deputy Project Director instead of Additional Project Director. Actuarily the following DPD had assigned throughout the project period instead of Additional Project Director.

-Ms. Neethu Lakshmi, IFS (from December 2017 to December 2021)

-Mr. Amit Kanwar, IFS (from December 2021 to July 2022),

-Mr. B.P. Martolia (from July to October 2022)

-Dr. Koko Rose, IFS (from October 2022 to March 2024)

(c)Task Manager and members of each Task teams

As per R/D, task teams dedicated for each model site, each of which is composed of a Task Manager and three (3) members with science of engineering background, shall be established from the beginning of the Project for the purpose of capacity development of UKFD and implementation of countermeasures at the model sites. Team leaders and members of each Task Team were appointed on 9 April 2018 as follows:

1) Task Team 1 (Nirgad)

-Mr. Rahul (Team Leader, Conservator of Forests, not placed in the Project)

-Mr. Dharm Singh Meena, IFS (Team Leader from July 2018 to January 2022)

-Mr. Mahipal Singh Sirohi (Team Leader from January 2022 to Mach 2024)

-Mr. Rohit Srivastava (Deputy Range Officer, transferred to other forest division)

-Mr. Babu Singh (Forester, not placed in the Project)

-Mr. Rakesh Kumar (Forest Guard)

2) Task Team 2 (Jawadi)

-Mr. Mahipal Singh Sirohi (Team Leader, Assistant Conservator of Forests)

-Mr. Subhash Chandra Nautiyal (Forest Range Officer, retired)

-Mr. Buddhi Prakash Bahuguna (Deputy Range Officer, not placed in the Project)
-Mr. Ganesh Bahuguna (Forester, not placed in the Project)
-Mr. Prakash Singh Kandari (Forest Guard, transferred to other forest division)

3) Task Team 3 (Padli)

-Mr. Umesh Joshi (Team Leader, Assistant Conservator of Forests)
-Mr. Mahesh Chandra Joshi (Deputy Range Officer, transferred to other forest division)
-Mr. Kundan Singh Bisht (Forester)
-Mr. Kishore Chandra (Forest Guard, transferred to other forest division)

(d)Team of Engineers (ToE)

Engineers were recruited in stages. Depending on the progress of Project activities. Assistant Site Engineers were assigned to allocate at candidate sites and model sites for supervision of the construction works.

In total, sixteen Engineers were recruited, however the Project had eleven engineers as of 25 March 2024.

Members of Team of Engineers were as follows:

-Mr. Jay Kumar Sharma (Chief Engineer) (from 1 September 2017)
-Mr. Jagraj Singh Mehra (Construction Planning/Cost/Procurement Engineer) (from 1 September 2017)
-Mr. Prem Singh Negi (Field Engineer) (from 1 September 2017 to 30 April 2023)
-Mr. Vinod Jhinkwan (Field Engineer) (from 21 August 2017 to 17 June 2019)
-Mr. Kuldeep Singh Pundir (Field Engineer) (from 27 July 2018)
-Mr. Tribhuwan Rana (Field Engineer) (from 21 July 2018 to 28 June 2023)
-Mr. Aman Raizada (Construction Planning/ Cost/ Procurement Engineer) (from 16 January 2019)
-Mr. Deepak Bhatt (CAD/Survey Engineer) (from 10 January 2019 to 30 April 2023)
-Mr. Sandeep Singh (Assistant Site Engineer) (from 11 August 2020)
-Mr. Abhishek Panwar (CAD/Assistant Engineer) (from September 2019)
-Mr. Vipin Chandra Benjwal (Assistant Site Engineer) (from November 2022 to February 2023)
-Mr. Himanshu Maithani (Assistant Site Engineer) (from January 2023)
-Mr. Praffull Lingwal (Assistant Site Engineer) (from June 2023)
-Mr. Gaurav Joshi (Assistant Site Engineer) (from June 2023)
-Mr. Anish Kumar (Assistant Site Engineer) (from May 2023)

-Mr. Vikash Singh (Assistant Site Engineer) (from February 2024)

Considering the effective implementation of Chisan works, both at the three model sites and four candidate sites, current deployment of Engineers are as follows:

Nirgad: Mr. Praffull Lingwal
Jawadi: Mr. Kuldeep Singh Pundir
Padli: Mr. Gaurav Joshi
Raipur: Mr. Aman Raizada / Mr. Sandeep Singh
Jokla: Mr. Aman Raizada/ Mr. Himanshu Maithani
Malla: Mr. Jagraj Mehra/ Mr. Vikash Singh
Lakhanpur: Mr. Jagraj Mehra / Anish Kumar

(e)Secretaries

Three support staffs were appointed to help the Experts working in TCP:

-Ms. Anita Panwar (from 22 April 2017 to 14 December 2018)
-Ms. Amita Sharma (from 11 July 2017 to 24 March 2024)
-Ms. Neetu (typist) (from April 2022)

Since Ms. Anita Panwar left at her own convenience, we needed a secretary personnel in her place. However, Ms. Sharma has a degree of experience and can handle a variety of work with the Project coordinator's assistance. From March 2020, JICA has incurred her employment cost.

-Ms. Prerna Raturi worked for the Project mainly from her home on editing and proofreading of the Project documents and their Hindi translation.

1-2-2 Office space

UKFD shared the office space in a part of the JICA Yen Loan Project office from the beginning of the project. In August 2017, UKFD offered TCP a newly rented office. The Project office was moved again to a newly constructed NTFP building in February 2021.

1-3 Activities (Planned and Actual)

Act.1-1 Prepare and update slope disaster location map (SDLM).

SDLMs were prepared through the contract with the Himalayan Surveying Services Pvt Ltd, by the end of September, 2018. Additionally, the Experts and

Engineers prepared a manual for updating GIS data of SDLMs in February 2019. The said SDLMs were shared with Uttarakhand State Disaster Management Authority and distributed to each Divisional Forest Officer (DFO) office as reference for future planning of Chisan works such as selecting sites in future. A training on Quick GIS, free software, for Task members and ToE was conducted in February 2023. The updates of SDLMs were planned however the same was not done due to the time constraint in collecting necessary recent disaster data from DFO offices. It will be done by ToE members, through the assistance by UFRMP.

Act.1-2 Select model sites based on the prescribed selection criteria, in which erosion control model having effect of demonstration are constructed.

The following three (3) model sites were selected based on the selection criteria. The said sites were approved in the 1st Joint Coordination Committee (JCC) meeting held on 11 August 2017.

Model site1: Nirgad
Model site2: Jawadi
Model site3: Padli

These sites were prioritized since they are close to the city areas in Uttarakhand for getting maximum demonstration effect; that are Rishikesh, Rudraprayag and Nainital respectively.

Act.1-3 Implement survey in the model sites and analyze mechanism of occurrence of slope disaster.

Necessary field surveys, for Nirgad, Jawadi, and Padli, were initiated, and causes of disaster were analyzed. The examination process for countermeasure works to be taken up at each site were also completed by January 2019.

Act.1-4 Make design of erosion control works in the model sites.

The surveys and designs for erosion control works for each model site were prepared mainly by Experts.

The design of Nirgad was prepared in June 2018. The timing of the preparation of the Nirgad's design was almost same as originally planned (by Augst 2018, 1 year

and 5 months after the Project started). The design of Padli and Jawadi were prepared in December 2018 and January 2019, respectively. The timings of preparation of the design in Jawadi and Padli were earlier than original schedule (by March 2019 and March 2020). The survey results and designs for each model site were used for bidding document, Request for Proposal (RFP) which was made public on 20 June 2019.

Act.1-5 Select company for erosion control works in model sites and contract with the selected company.

Initially, the plan was to select different contractors for each site in stages. After deliberations, however, it was decided in September 2018 that a contract should be concluded with one construction company for carrying out work at all three sites. UFRMP worked on the process of empaneling a list of construction companies through RFP in June 2019. A construction company, namely BUMI JV, was selected through the fair-bidding procedure in the 4th JCC on 12 December 2019 and the contract was signed on 11 January, 2020.

Act.1-6 Supervise erosion control works in model sites until completion, based on the approved design.

The construction was not completed at any model sites during the Project period, but we put maximum efforts to supervise the popular and critical works, such as new structure in India e.g., double wall check dam (DWCD), mortar crib work, crib work with rock bolts. The contractor has enough skill to conduct the ordinary construction works, and they also got some construction experience of the said works. Therefore, any problem must not be happened on ordinary works and DWCD works as far as they follow the instruction which they trained. Even if there are any problems on the crib work and rock bolt works by chance, UFRMP have already allocated enough budget for Japanese engineers in technical supporting companies. Therefore, they are sure to do the works without JETs.

As of the end of the Project, the construction progress in the sites was:

In Nirgad site, five groundsills, DWCD No.3, cut slope work and channel No. 2-2, and plantation in the groundsills area completed; DWCD No.2 and 1, channel work No. 1-1, 2-1 and culvert work gradually started and yet to be completed.

In Jawadi site, crib work, retaining wall work by the road area, cut slope work,

construction of dumping area No.1 and 2 were carried out, none of which were completed yet.

In Padli site, road realignment work was completed, crib work No.1 with rock bolt work just initiated, crib work No.2 and slope work with laying erosion control mat were not yet started.

Act.1-7 Periodically implement monitoring of facilities in model sites.

As of the end of the Project, none of the model sites was completed. After the construction completes, regular monitoring of facilities at model sites shall be conducted by UFRMP/UKFD. Whereas constructed facilities mentioned in above activities 1-6, were monitored by the Project especially during and after the rainy season and planted some seedlings around them as necessary.

Act.1-8 Prepare the erosion control works guideline.

The erosion control works guidelines was prepared and shared with all concerned stakeholders. (See the attachment 1; Guidelines)

Act. 1-9 Prepare manual on design of erosion control works.

The Chisan manual was prepared in September 2021, and its electronic version was shared among Project members.

The manual includes torrent works and hillside works, which was published in February 2022, as Ver.0 for internal use of the project and further input/update. The same was revised based on comments received from concerned members and published as Ver.1 in June 2023 and Ver. 2 was published in October 2023 for better understanding of Indian personnel and keeping in mind the Indian scenario. (See the attachment 2; Chisan manual ver.2)

Act.1-10 Set a Standard Operating Procedure for erosion control works.

Standard operating procedures (SOP) on each work was explained during monthly/weekly meetings regularly from October 2021. The contents of the SOP were revised and bound as a booklet in December 2022 as Ver. 0, which was shared with Project members and other stakeholders. The SOP was amended in August

2023 as ver.1 and updated as ver.2 in September 2023.
(See the attachment 3; SOP ver.2)

Act.1-11 Implement evaluation of erosion control model constructed in model sites by UKFD staff.

As of the end of the Project, none of the model sites completed. After the construction completes, regular evaluation of erosion control work at model sites shall be conducted by UFRMP/UKFD. Already constructed facilities mentioned in above activities 1-6 and some progressed work such as crib work were evaluated as a tentative evaluation for the Project. Confirmation of evaluation concepts in March 2023, preparation of monitoring sheet and selecting evaluation members in November 2023, site evaluations in December 2023 and January 2024, and reporting in February 2024, were conducted.

Act.2-1 Implement basic study for preparation of technology transfer plan.

After Task Team members were appointed in May 2018 by UKFD, interviews were conducted with them on 21 August 2018, to assess their basic understanding of technical know-how.

Act.2-2 Prepare the technology transfer plan including basic concept for erosion control works, preparation of plan on erosion control works, method of surveys for designing erosion control works, and design and works for erosion control facilities, etc.

The technology transfer plan was made accordingly in January 2019, and shared among the Project members for further inputs.

Act.2-3 Implement off-the-job training (Off-JT) and on-the-job training (OJT) based on technology transfer plan.

Off-JT and OJT were implemented based on current technical skills of Task Team members and ToE. When designing the process, Experts sat with concerned ToE members and looked at their practices and gave feedback and advice. Through

weekly or monthly meetings, Japanese Experts (JETs) provided innumerable technical presentations.

Act.2-4 Evaluate improved level of knowledge and skill of the staff.

The baseline test was conducted on 3 June 2019 as the 1st evaluation of the members. In total, 14 members from Task Teams and ToE took the test. The 2nd test was conducted as the understanding test on 22 November 2021. In total, 12 members took the same. The final understanding test was conducted on 8 January 2024. In total, 10 members took the same. Based on the results of these tests, efforts to improve the knowledge of examinees were made.

Act.3-1 Prepare a plan for information sharing of erosion control works.

To disseminate knowledge regarding Chisan works, the training materials were made in such a way that it is easy for ordinary people to understand the Project activities. We published newsletters at regular intervals from September 2017 to April 2019. Digital files of published materials are available on the JICA Project and UFRMP website for easy access. These were also distributed at workshops and other interactions with stakeholders. Dissemination material of Chisan work was prepared and bound as a booklet in Hindi, English and Japanese in April 2019. The Project Facebook page was launched in June 2018, to make more people aware of the Project activities.

Act.3-2 Organize seminars and workshops for stakeholders within the Uttarakhand state.

The first set of seminar and workshop that was planned in September 2018 was postponed and held on 27 February 2019. The Project invited three Japanese lecturers for a workshop that was focused on “Introducing Japanese Chisan technology into Himalayas”. A total of seventy participants including Project members attended the same.

Act.3-3 Organize seminars and workshops for stakeholders in other Himalayan states, in collaboration with MoEF&CC.

A seminar was planned in March 2020, with the participation of not only Uttarakhand but other Himalayan states, MoEF&CC and several stakeholders; however, it was cancelled due to the spread of COVID-19.

A Technical workshop was held on 15 - 16 December 2023 to disseminate the Project activities among the concerned technical officers in the state departments.

A National workshop was held on 1 - 2 February 2024 to disseminate the Project activities among the other states and stakeholders.

Act.3-4 Prepare policy recommendations for mainstreaming erosion control works for slope disaster management into forest and other key development sectors.

Draft concept of policy recommendation was prepared in January 2022 and discussed among Project members in May and June 2023. Policy recommendation was finalized and the same was briefly reported at the 5th JCC in March 2024.The Chief Secretary, Government of Uttarakhand, suggested JCC members that we shall continue erosion control activities in the state after the Project terminates and utilize/disseminate the Project outputs, such as handbooks, actual sites to concerned authorities.

Act.3-5 Set up policy-level council for erosion control works among UKFD and other related organizations.

A policy-making level council among UKFD members was set up in May 2023. Draft policy recommendation was discussed with related organizations in the workshop held in February 2024 and thorough the presentation given in March 2024 at the 5th JCC meeting.

Act.3-6 Organize periodical meeting of policy-level council for erosion control works.

The meeting of policy-making level council was not organized periodically due to the time shortage, however discussion with Inspector General of Forests (IGF) of MoEF&CC was held on 5 March 2024. MoEF&CC showed its interest for sharing the information through various handbooks which the Project compiled in view of introducing erosion control techniques to disaster-risk Himalayan regions.

Act.3-7 Study the condition and level of the information sharing.

This was conducted after holding workshops through the collection of feedback forms from participants.

Act.4-1 Identify and prioritize candidate sites of erosion control works under UFRMP based on Act.1-1.

Several sites were recommended by DFOs as candidate sites for treatment work under the Project. After field reconnaissance by ToE and JETs, five sites were finalized as candidate sites at the moment. These were:

Site1 Jokla (Chakrata Forest Division)
Site2 Company Garden (Mussoorie Forest Division)
Site3 Malla (Uttarkashi Forest Division)
Site4 Tadikhet (Almora Forest Division)
Site5 Lakhanpur (Pithoragarh Forest Division)

The selection of candidate sites was authorized by the 3rd JCC on 28 February 2019.

It was also decided at the 3rd JCC that field surveys, designs, and supervision of countermeasure works at the Baliyanala landslide site in Nainital should be supported by the Project till the preparation of Detailed Project Report (DPR). The site collapsed in September 2018, and became an additional site apart from model sites and candidate sites.

Due to unfeasibility of treatment at sites, site 2 at Company Garden and the site 4 at Tadikhet were cancelled as candidate sites. Later, Raipur was selected as a candidate site instead. These were reported and approved at the 5th JCC held on 11 March 2024.

Act.4-2 Enhance the capacity of Engineers through Off-JT and OJT in model sites.

Four Engineers joined the Project in September 2017 - two in July 2018, and additional two in January 2019. Two of them attended the training course in Japan as an Off-JT in October 2017, and one of them attended the training in Japan in November 2018. Two of them attended the training in Japan in November 2019. In

addition, all who assigned as Engineers at that time attended the training in India in October 2018.

All Engineers were completely assigned in February 2024. Capacity of those Engineers through the construction activities as OJT in model sites and candidate sites were enhanced after March 2021 and June 2022, respectively.

As for task teams, 3 task leader and task member were assigned in model sites until April 2018 (see 1-2 c). Officers from DFO offices in candidate sites were included to the Project activities but UKFD did not assign new Task Teams for candidate sites. They were to play a crucial role in the technology transfer strategy.

Act. 4-3 Support for field surveys, designs, and supervisions of erosion control works on candidate sites under UFRMP.

Several OJTs were conducted. Surveys through both on-site and online, as well as designing of Malla and Jokla sites were conducted in August 2021 jointly by JETs and ToE. Surveys and designs for Lakhanpur and Raipur sites were prepared by ToE with the support of JETs in August 2022.

Through the process of bidding, M/s Hindustan Builders and Developers was selected and contract was signed with the same in December 2022. The construction works in Raipur and Jokla sites started in June 2023, Lakhanpur in December 2023 and Malla site in March 2024.

Act. 4-4 Support for field surveys, designs, and supervisions of countermeasure works at the landslide site in Baliyanala, Nainital District, which collapsed in September, 2018.

Survey data and report of the landslide were submitted by JETs through UFRMP to share with High Power Committee (HPC) in March 2022.

2. Achievements of the Project

2-1 Outputs and indicators

Output 1 :Technology for erosion control to be adapted in Uttarakhand is developed.

Indicator 1-1. Models of erosion control for slope disaster management, which are adapted at the given sites, are established.

<Partially achieved>

The models of erosion control work were set as torrent works and hillside works. In particular, double wall check dam works as torrent work, and grating crib works as hillside work were found useful for other sites as well. Through construction activities at each model site, Task Team members and ToE could gain this knowledge.

Table 1: Progress of each model sites as on the end of February 2024

Model site	Progress	Typical Works
Nirgad	60%	Ground sills, Double wall check dams, channels, Mat work
Jawadi	30%	Crib work, Mat work, Fence work, Dumping sites construction
Padli	53%	Crib work, Mat work, Road realignment
Total	43%	※ Completed(Blue), On going(Green), Not startedas of end of March 2024(Red)

Indicator 1-2. 80% of staff in charge of erosion control works in UKFD evaluate the models of erosion control high by January 2022.

<Achieved>

The evaluation of the model sites was conducted by joint team of ToE, JETs and officers of UKFD. The evaluation of Padli was done on 29 December 2023, Nirgad on 30 December 2023 and Jawadi on 22 January 2024. As the result of evaluation, most of evaluation items i.e.,331 items out of 336, met the criteria. With the rating on a 5-point scale, e.g., 5: very appropriate, 4: appropriate, 3: neither appropriate nor inappropriate (Median), 2: not very appropriate, 1: not appropriate, were applied on the evaluation items. More than 4 scale regards as high. (See the annex 1: The evaluation result of erosion control model constructed in the model site by UKFD).

Output 2. Knowledge and skills on erosion control of staff in UKFD and another related organization are improved.
Indicator 2-1. 80% of the staff in UKFD who participated in the training planned and implemented based on the technology transfer plan pass an understanding test.

<Achieved>

Task Team members attended the Project monthly meetings periodically. ToE got plenty of experiences through day-to-day work with JETs, such as surveying, designing, and preparing tender documents for the three model sites and four candidate sites. ToE and Task team members supervised the construction work at each site. ToE and Task Team members acquired a basic knowledge of Chisan works. Tests to evaluate the knowledge acquired by them were conducted. Schedule for these tests was as below:

1st test: May 2019

2nd test: October 2021

3rd test: January 2024

The 1st test was conducted on 3 June 2019, as a baseline test. In total, fourteen (14) members from Task Teams and ToE took the test. The 2nd test was conducted on 21 October 2021, as an understanding test. In total, twelve (12) members from Task Teams and ToE took the test. Based on these test results, as well as the abilities confirmed in daily work, various efforts were made to improve the ability of the members. The 3rd test was the final test conducted to gauge the knowledge on erosion control works. Ten (10) numbers of the staff in UKFD participated.

As the result, longer the project-involving members got higher score, and all (16) eventually passed the test by January 2024.

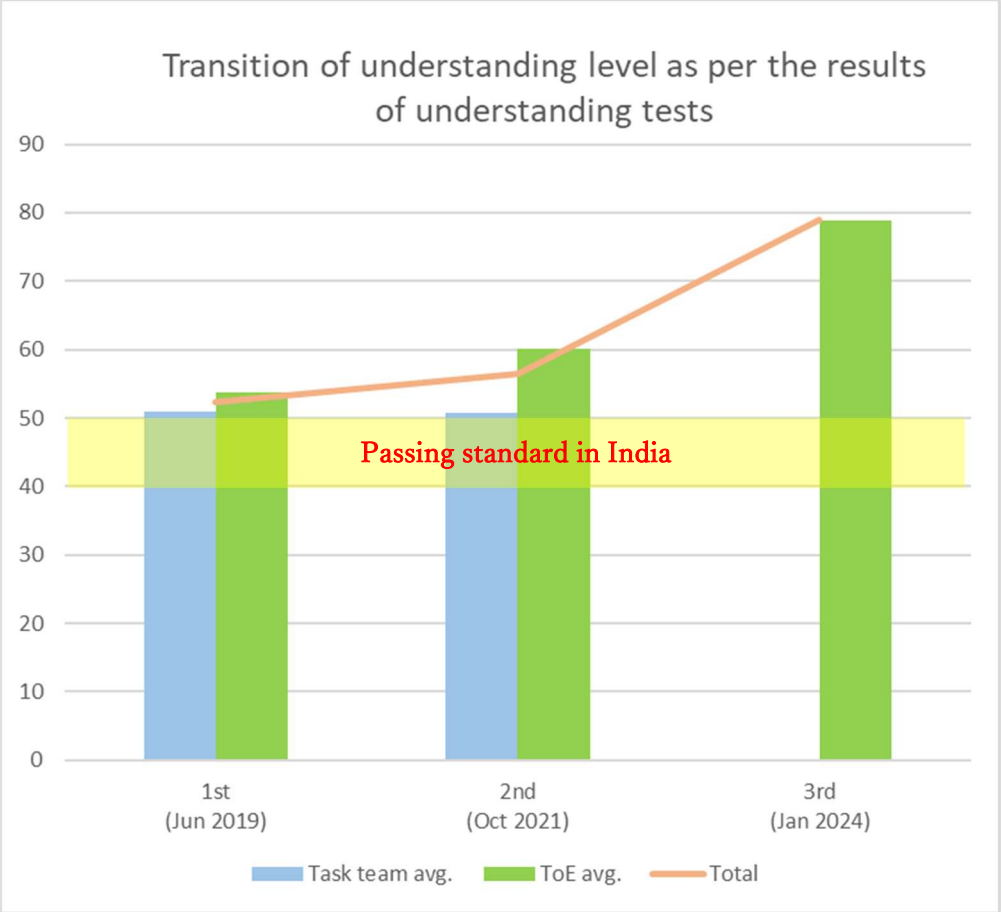

Figure 1: The results of understanding test

Indicator 2-2. Staff in charge of UKFD implements the erosion control works for nine (9) places by January 2022.

<Partially achieved>

The technology transfer plan for Task Team members and ToE was prepared to effectively transfer advanced Chisan work knowledge developed in Japan. The number of target sites was reported as nine, including the Baliyanala site, at the 3rd JCC meeting held on 28 February 2019.

Due to unfeasibility of sites, two (2) sites were cancelled on 21 July 2021, and seven (7) sites and Baliyanala site were set as final target sites. Since all Engineers were assigned in February 2024, the survey, design and supervising work were implemented in full swing. (Note: Based on the Minutes of meeting on 28 February 2022, the timelines in the Project operation were pushed back to 2 years. Deadline was therefore postponed from January 2022 till January 2024. (the same shall apply hereafter.))

Output 3. Appropriate technology developed for erosion control in the forest area is shared in Uttarakhand and with other Himalayan sites in India. Note: Himalayan states are Himachal Pradesh, Sikkim, West Bengal.

Indicator 3-1. Seminars and workshops for other related organizations in Uttarakhand state are organized by October, 2018.

<Achieved>

The first workshop involving officials of other relevant organizations in Uttarakhand, was postponed from September till 27 February 2019, which was attended by seventy participants including Project members.

Indicator 3-2 Recommendation of the policy for mainstreaming erosion control works for slope disaster management is submitted to the state government.

<Achieved>

Concept of the same was discussed in May and June 2023. The recommendation was prepared in March 2024.

Indicator 3-3 Seminars and workshops for the stakeholders in other Himalayan states are organized twice by March, 2022, in collaboration with MoEF&CC.

<Achieved>

The project held two workshops by Mach 2024.

The workshop for stakeholders of Uttarakhand as well as other Himalayan states was planned for March 2020, in Dehradun. Due to the sudden spread of COVID-19 pandemic, however, the planned workshop was cancelled. After the pandemic, the technical workshop for working-level officers was held on 15 - 16 December 2023, which was attended by 48 participants. The National workshop for policy-making level officers was held on 1-2 February 2024, which was attended by 71 participants. Officers from Sikkim, West Bengal, Himachal Pradesh, Jammu & Kashmir, Meghalaya, Tripura, Tamil Nadu, Leh-Ladakh, Rajasthan, NDMA, ULMMC, ICFRE, FRI, IGNFA, BRO, PWD, Irrigation Department, Urban Development Department, NHIDCL, WII, IIT Roorkee, Wadia Institute of Himalayan Geology were joined in these workshops.

Output 4. Collaboration with UFRMP for implementing interventions under erosion control and sediment disaster mitigation component and also including UFRMP's task of completing the DPR for countermeasure works at Baliyanala are achieved.

Indicator 4-1 Inventory of slope disaster in the forest area of the state is implemented.

<Partially achieved>

Inventory of SDLMs in forest areas of the state was prepared by Himalayan Surveying Services Pvt. Ltd,. After preparing SDLMs, ToE prepared a manual for updating GIS data in SDLM. Revised data for all area of the state was requested by the Project to all DFOs for submission to update the same.

Indicator 4-2 Designs of erosion control works on the candidate sites under UFRMP and Baliyanala landslide site are made by March, 2022.

<Achieved>

The following candidate sites were proposed by UFRMP and authorized during the third JCC held on 28 February, 2019.

Site1 Jokla (Chakarata Forest Division)
Site2 Company Garden (Mussoorie Forest Division)
Site3 Malla (Uttarkashi Forest Division)
Site4 Tadikhet (Almora Forest Division)
Site5 Lakhanpur (Pithoragarh Forest Division)

It was authorized at the 3rd JCC that field surveys, designs, and supervision of countermeasure works at the Baliyanala landslide in Nainital should be supported by the Project. It should be noted that the site collapsed in September 2018, and was added to be an additional site, apart from model and candidate sites. As a result, a revision of Record of Discussion (R/D) was made to review the contents to be supported by the Project. The dispatch of Japanese Short-term Experts was also reviewed. The designs of Jokla and Malla sites were prepared in August 2021. However, the tender for the two sites was not complete in February 2022. The designs of Lakhanpur and Raipur sites were also prepared by August 2022. Finally, the contractor for all four sites was selected and contract was signed in December 2022.

Indicator 4-3 Support for the field surveys, designs, and supervisions of erosion control works on the candidate sites under UFRMP.

<Achieved>

Support for the field surveys, designs, and supervisions of erosion control works on the candidate sites were completed. As the result, the contract between UFRMP and the contractor for the candidate sites was signed in December 2022. Construction works in all sites were implemented since March 2024.

Indicator 4-4 Support for field surveys, designs, and supervision of countermeasure works at the landslide site in Baliyanala, Nainital District, which collapsed in September, 2018.

<Partially achieved>

Three (3) plans/designs of countermeasure work for Baliyanala were prepared by JETs and submitted to HPC through UFRMP. Due to the unavailability of JETs during the COVID-19 pandemic, and a strong request for prompt action from the local community, HPC decided to appoint an Indian consultant to prepare the DPR.

All related materials prepared by JETs as Project activity - designs, survey result, equipment - were handed over to HPC in March 2022.

2-2 Project purpose and indicators

Project purpose: System to appropriately implement erosion control works for slope disaster management in the forest area is established in Uttarakhand state.

Indicator 1. Erosion Control Technical Handbook is developed and approved by responsible authorities and put into use by UKFD.

<Achieved>

Erosion control technical handbooks such as guidelines, Chisan manual, Standard operating procedures on erosion control works (SOP) and the other technical manuals were developed (see the anex3; the list of the handbooks). Guidelines, Chisan manual, SOP were approved and shared in the National workshop on 1 February, 2024 organized by the Project and UFRMP.

Indicator 2. Specified functions that sustainably implement erosion control

works is set up in UKFD.

<Partially achieved>

Task Teams and ToE structure were set up in UKFD for the implementation of the UFRMP work including the disaster mitigation component. They will continue the implementation of erosion control work after the Project terminated. However, these are the temporary status/structure and easily affected by retirement and personal shifting. UKFD shall set up specified function cell in UKFD along with the implementation of UFRMP and disseminate the works done in the Project.

3. History of PDM Modification

Since we decided to support countermeasure works through the Project at the Baliyanala landslide that occurred in September 2018, we proposed modifying R/D and PDM in the 3rd JCC meeting held on 28 February, 2019. As a result, R/D was revised in November 2019.

Since the spread of COVID-19 affected the Project activities greatly, two (2) years extension of the Project duration was agreed between UKFD and JICA in February 2022 which was reflected in amending R/D again. The working schedule in the Plan of Operation was pushed back 2 years from March 2022.
(See the annex2: Project Design Matrix)

4. Others

4-1 Important Assumption

Weather and other natural conditions that exceed the design conditions of erosion control facilities (e.g. heavy rain or major earthquakes) does not occur.

There was seasonal rainfall occurred in rainy season every year, especially in 2023, Uttarakhand state faced 68 heavy rain events which killed more than 100 people according to the India Meteorological Department (IMD). These caused additional cost/times due to the expansion of erosion and damage of on-ging construction activities. The risk from rain may continue to increase due to the climate change and urbanization of the state even after the Project.

III. Results of Joint Review

1. Results of Review based on DAC Evaluation Criteria

Based on the Organization for Economic Co-operation and Development (OECD) Development Assistance Committee (DAC)'s evaluation criteria, the results of the project were reviewed and rated by 4 scales: 1) Very high, 2) High, 3) Moderately Low, and 4) Low.

(Relevance) High

Necessary of the system to appropriately implement erosion control works for slope disaster management in the forest area is **High**

As for the need of the Project, Himalayan states included Uttarakhand have suffered from disasters especially in rainy season. What worse, climate change and urbanization (roads and residential area have rapidly expanded) are high in Uttarakhand. But any countermeasures by UKFD, which manages the forest land occupying more than 70% of the state, were not carried out proactively.

As for the approach of the Project, in 5th JCC on 11 March 2024, Chief Secretary of Uttarakhand appreciated the achievements of the Project so far and expressed her expectations for future activities. She also informed that all engineering departments and Disaster Management Authority in the state shall be incorporated to the Project activities, as the slope disaster management techniques and ideas of the Project were found very useful. Committee acknowledged that the state forest training institute which locates in Haldwani needs to have a civil engineering training course to make it possible to continue the erosion control work for the forest department in the forest areas.

(Coherence) High

Alignment with Japan's other initiatives- **High**

As for JICA's strategies, the Project is in the forest conservation programme in JICA's development subject, which meets governmental aid policy and action plan. Japan set up trials for the problems against poverty and environment as a core sector goal in the plan Country Assistance Programme for India on May 2006.

Additionally, the programme also set disaster prevention and support for forest sector as a sub-sector goal.

JICA stated they will support the world-wide issues on climate change and disaster management in South Asia in the medium-term plan. The Project also meets environmental countermeasures and climate change for global issues in the national analysis paper in India (March 2012) as well as disaster management/mitigation by using nature-based solution (NbS) such as forest in the JICA's strategic issues in the conservation of natural environment.

As for the government's policy, Forestry Agency in Japan has set a policy of disseminating the Chisan technology to other countries starting in 2020, and international workshop are held every year by the Agency.

Uttarakhand Forest Resource Management Project(UFRMP) signed in April 2014 under a yen loan also is being implemented by Uttarakhand Forestry Department. UFRMP includes forest conservation activities as well as erosion control and sediment mitigation component to countermeasures for slope failure and landslide prevention. The project activities have been carried out in collaboration with UFRMP through technology transfer and development of various technical standards by supporting a series of processes from field survey, design, ordering, construction management, and monitoring related to countermeasure works at the model site of this project.

Alignment with related organization – **High**

The Project and UFRMP are mutual complementary each other.

The project has contributed to the establishment of a system to carry out erosion control and disaster prevention activities in UFRMP under the leadership of the Forest Department (FD) by developing erosion control techniques, and improving the knowledge and capacity of FD and other relevant organizations. As for the relationship with concerned organizations, NHPWD, BRO, Irrigation Department, NDMA, SDMA, ULMMC, academic organizations paid positive participation to our Technical/National workshops. Officers of MoEF&CC also concerned that the number of incidents of natural disasters such as landslide and erosion is on the rise year by year which requires drastic actions.

The Project showed our activities at other organization events; the WS of NDMA in

September 2022, the world congress for disaster management in November 2023, the training by ICFRE in Mach 2024.

(Efficiency) Low

As the Project's main activities are to establish the system for appropriately implement erosion control works for slope disaster management in the forest areas in Uttarakhand, the inputs are basically workshop/seminar cost, long term experts' travel and administrational staff's cost. Separating from the consultancy component and construction cost by UFRMP can save the operational cost lower. Those are considered appropriate inputs.

As for the project cost, actual cost is 735 million JPY in total and different (114 %) from original one which is approximately 642 million JPY mainly due to the delay of the work.

As for the Project period, the Project was extended for 2 years (140% from the original period) because the COVID-19 pandemic started in 2020.
The duration of the extension was reasonable , because it estimated 1 year and 5 months of the absent of Short-team Experts who were to survey/design/estimate/supervise the sites, i.e., from March 2020 to September 2021.

(Effectiveness) High

Only UKFD manages erosion control work in forest areas -**High**.

Erosion control works in Japan are carried out by governments. For instance, Forestry Agency carries it out in forest areas, Ministry of Agriculture in agriculture lands and around irrigation areas, Ministry of Road around road areas. Each institution has its own territory, which is as same as in India. UKFD manages the state forest (25863.18 sq km, 48%) and revenue department's forest (4768.70 sq km, 14%). Besides, many countermeasures by road, irrigation, river are caried out, but these are only reactive countermeasures. Once debris flow happens on the road, road-related organization constructs retaining walls as a barricade only by the road

not at the disaster-source location, i.e., forest area behind the disaster location. UKFD has started the erosion control works in forest areas proactively, and devastated forests/slopes will regain the vegetation in future. This is what protects the land around forest and itself eternal with lower cost.

Uttarakhand suffers from landslide every rainy season, which would be more serious due to recent climate change and urbanization in the state.

Uttarakhand government positively tries to apply these techniques with using by handbooks, demonstration models, and share the techniques with related agencies such as PWD, BRO, Irrigation Department, other disaster management authorities. Therefore, effectiveness may be maximized in the state.

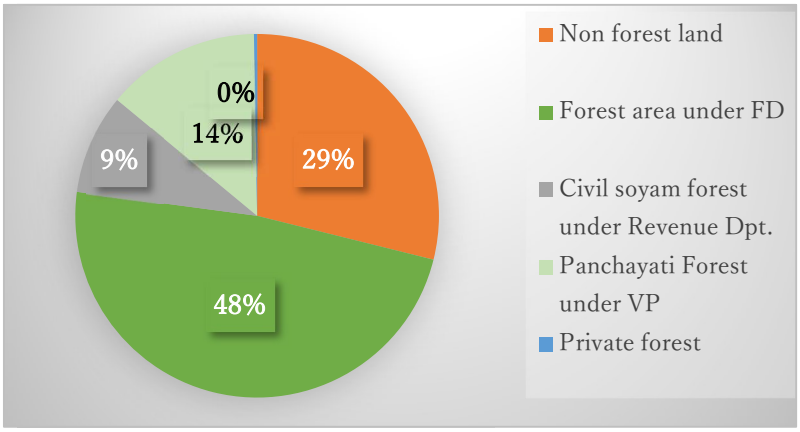

Figure 2: Land use proportion in Uttarakhand state

(Uttarakhand Forest Statistics 2017-18)

(Impact) High

Attractive work affects good promotion to other states- **High**

The overall goals of the Project are 'Erosion control works for slope disaster management in the forest area are appropriately implemented in Uttarakhand state' and 'Knowledge and technology on erosion control works are disseminated to other Himalayan States'. In this regard, the overall goals of the Project are expected to be achieved as planned throughout exposures/introducing of our activities such as workshops, corroboration trainings and related events.

The first workshop of the Project was held on 27 February 2019. A total of seventy participants, including those from other related organizations and Project members, attended above mentioned workshop. The workshop was organized with the aim of

dissemination of Project activities and sharing of knowledge with related organizations.

The second workshop, TCP organized a technical workshop on 15-16 December 2023, after completion of one double wall check dam, one of the common works in Japan. This workshop aimed to share the technical matters in our activities because Principal Secretary (Forests) had also requested to share the project outputs such as handbooks and the other deliverables. As the result, the fifty (50) engineers/researchers/officials from not only UKFD but also related authorities such as PWD, BRO, ULMMC, Wadia Institute of Himalayan Geology, etc. joined.

The third one, TCP organized a National workshop on 1-2 February, 2024. Policy-making level officers from nation-wide scale such as MoEF&CC, NDMA and other statse including Himalayan states were invited in the said workshop. Seventy-two (72) members joined the workshop. Especially, participants from Himalayan states got higher motivations impact in the workshop. Himachal Pradesh state planned to start the similar activities in 2024.

For 3 months, from December 2023 to February 2024, more than 300 visitors, including 60 foreign trainees, came and observed the Project activities.

Table 3: Visitors and accepted trainees in the sites

Date	Titles of field visit	Organization	Visitors		
			Indian	Others	Total
16-Dec-23	Technical workshop	TCP/UFRMP	50	0	50
6-Jan-24	Inspection by additional Secretary UK	UKFD	1	0	1
10-Jan-24	JICA Third-country Training from Nepal	JICA Project in Nepal	0	15	15
17-Jan-24	Assessing Land Degradation Dynamics and Restoration with Remote Sensing Data & Tools	Indian Council of Forestry Research & Education (ICFRE)	9	19	28

30-Jan-24	Introductory Tour for IFS Probationers of 2023-24 Course-reg.	Indira Gandhi National Forest Academy (IGNFA)	142	2	144
2-Feb-24	National Workshop on Landslide Treatment and Erosion Control Works in Hills	TCP/UFRMP	72	0	72
9-Mar-24	International Training on Sustainable Land Management	Indian Council of Forestry Research & Education(ICFRE)	0	20	20
20-Mar-24	The 5th Joint working Group Meeting (Japan and India)	MoEF&CC/Forest Agency Japan	0	4	4
Total			**274**	**60**	**334**

(Sustainability) Moderately Low

- Policy and institutional aspect – Low

Before starting the Project, erosion control works in forest area were carried out but it was done in limited area and by responsive countermeasures, such as installing retaining walls only along the road, riverside, etc. These are the same that other organizations do as reactive countermeasures, not proactive measures against sources of erosion in forest areas. Attempts by UKFD have just started since 2017 and they are not sufficient for showing their effectives yet. Policy and institutional development are awaited.

- Institutional and human resource aspect – Moderately Low

As mentioned, 2-2 Project purpose and indicators 2, to carry out the yen loan project, UKFD organized the PMU, Task Teams and ToE unit. PMU and Task Teams are composed by permanent forest officers and ToE by temporary staff. Uttarakhand government has not mentioned the specific function such as a Chisan cell yet. But the government agreed the importance of the erosion control work in forest areas and suggested to promote the techniques not only forest department but also other related agencies. Specific function in UKFD shall be considered and prepared for

the rest of loan project period.

- Technical aspect– Moderately Low

Erosion control works need the technical knowledge on civil engineering. Some of UKFD officers has its knowledge because they had passed employment test in which there are much portion of civil engineering issues and some regular training opportunities for that subject to IFS and SFS. But even so, there are less chance to get or promote practical skill.

As for dissemination of Chisan ideas, various handbooks (Chisan guidelines, Chisan manual, model sites and candidate sites brochures, and SOP booklet) were prepared and revised, which has helped in disseminating the ideas over Uttarakhand and other Himalayan states. These handbooks are technical text books as self-leaning/skilling up.

- Financial aspect - High

The more serious disaster happens due to the climate change, the more opportunities for financial aid can be achieved, for example, the yen loan, world bank subsidies, carbon trade market, etc. Especially, there is affordable system in India, Compensatory Afforestation Fund by CAMPA (Management and Planning Authority).

2. Key Factors Affecting Implementation and Outcomes

According to Mr. Malik, former CPD and current PCCF & HoFF of UKFD, he showed two important key factors for satisfied works, that is, quality work and punctual work. This was a big challenge for the Project because both are sometimes incompatible. Therefore, balancing is important for the implementation of activities and outcomes.

With much efforts of the Project, TCP and contractors achieved some positive results regarding the quality. If constructions continue the current condition (not fast), quality work can be achieved.

But there remain big challenges for construction activities because of not meeting the committed deadlines. This is quite important for field constructions to avoid expansion site area and re-design/re-input the works after rainy season. Therefore, once contractors commit something on schedule in the review meetings held among employer and contractor, he should give best efforts to follow his commitments. If he

found any difficulties in the above commitments, contractor should report or consult with employer side at the earliest to sort out the problems. While looking punctual, easy promises, disobeying/ignorance, unrealistic reports shall never be allowed between the employer and contractor. Thoughtful discussion is necessary to find actual solutions. Employer side while supervising the works need to ensure both quality and timely completion and at the same time sub-standard quality work need to be dismantled.

3. Evaluation of the results of the Project Risk Management

As mentioned above, the key risk was the COVID-19 pandemic. Against this, the Project took initiatives to shift its service delivery online as much as possible. Regular meetings, study groups or web-inspections were conducted between 2020 and 2022.

Besides, the Project prepared the Standard Operating Procedure as per the state government and JICA regulations, to secure the safe working condition. JICA repatriated JETs and applied special travel regulations on JETs after their returning back in India.

These affected the working schedule. Finally, UKFD and JICA agreed to extend the 2-year-duration of the Project in 2022.

4. Lessons Learnt

(Longer timeline is needed for mainstreaming of Chisan work)

Every rainy season, landslides' disasters are reported in Uttarakhand. Especially, many disasters occurred in 2023, cutting plenty of traffic on roads that were constructed through landslide -prone areas, and having major impact on local communities and economies. Some disaster occurred in forest areas for which forest authorities are solely responsible for their management. Therefore, it is reasonable for UKFD to establish disaster-resilient forests as a fundamental countermeasure.

UKFD started erosion control works in forest areas through the Yen loan project and Technical Cooperation Project in 2017. All model and candidate sites in said both projects have continued construction activities after the TCP terminated. We found that mainstreaming of the erosion control work needs more time and efforts.

Japan also needed for the main streaming the work for long times, e.g., modern chisan works has started since 1911 and the work got legal basis in 1960. We should say that construction work in forest areas has just started in India. Furthermore, there remain many issues to be tackled, including securing appropriate construction quality, using local equipment/materials for reducing cost.

UKFD should continue the erosion control work and keep in touch with JICA India Office for post-monitoring through such as dispatch the review mission regularly.

(Other states appreciated knowledge needed for disaster mitigation)

After holding the National workshop, other Himalayan states showed high motivations for the erosion control works. As the situations are similar to that of Uttarakhand, other Himalayan states could also need the disaster mitigation knowledge in forest areas.

Participants from the Himachal Pradesh Forest Department, who suffered from major rain disaster in 2023, have planned to start the similar project, erosion control work, shortly. A participant from Sikkim inquired a lot regarding low cost slope work and a participant from West Bengal wanted to share their attempt in the said workshop.

(There is higher technical potentials)

The above section III-2, thanks to efforts of the Project, the project and contractors have achieved some positive results regarding the quality construction. If the current construction level is maintained, quality work can be achieved. Best practices and achievements can be accumulated.

(Large scale works cause some difficulties to control contractors)

For the smooth construction procedure, we need more frequent communication such as regular review meetings in both employer and contractor sides. The faulty communication will incur fruitless discussion and waste time and cost. Further, if construction delays, the construction sites may face the rainy season during the construction activities, which may damage or expand the working area. Contractors, especially manager level personnels, did not pay attention for seasonal rains in initial stage.

If close communication between the employer and contractor is not secured, it shall be necessary to reduce the size of the site smaller or divide into a size that can be completed within a year. Selecting contractor from among many is also important.

Small company shall be considered if there are only few large companies. Large companies, which can deal with even large-scale work and we can expect it good work, never always allocate proper input, such as labours, machines, equipment, management personnels. They sometimes disobey agreement/ commitments and carry out the work as they like, once they well know that employer will not have alternative contractor. Finally, contractor gains comparative superiority on implementation works and they request employer to incur more expense and annoyance. To avoid such situations, we shall select contractors from many and various options. If contractor's quality control and resource procurement might not be suspected high or candidate contractors may be too small at the beginning, employer shall support/control on technical issues directly following the contract. Material procurement or supervising by engineer from employer end can be considered with reducing those cost in BOQ basis.

(Structural issues for management of the work)

To avoid delay of the work from structural point of view, sufficient number of permanent staff, who carry out practical construction management such as schedule, have to be involved in the Project and should be given the reasonable tenure posting and not get affected by transfers.

Permanent staff may have higher motivation against delay of work than temporary staff because permanent staff would be pointed out for the delay and given strict sanction against such faulty, resulting slow promotion or career setback. Temporary staff may get job security for longer period of time if the work delays conversely. Temporary staff may have difficulty to be motivated for speeding up the work. UKFD can give ToE some advantages compensated for job security.

But there are still less personnel resources to secure the permanent staff for sufficient tenure. There were 26 persons for training in Japan and 9 persons for training in India (See the 1-1-3 training). It includes officers who already retired or moved to other offices. Therefore, capacity building up for disaster management in forest areas at training organization, for example Uttarakhand state forest training institute, CASFoS, IGNFA, are continuously needed. Fortunately, various handbooks were prepared under the Project which will be useful for the training to assign new Task members, etc.

(Local society needs to understand the importance of the work)

Chisan work is to create forests that are resistant to erosion and landslides in forest area. We usually apply civil engineering technique because ordinally measures except for Chisan works, such as plantation, have only limited effects. People in Japan have regarded that Chisan work is one of reasonable forest conservation activities so that complains about tree cutting for the work will usually not arise. Throughout the Project activities, however, it took plenty of time to get permission on cutting trees and to secure dumping areas. This may be because there has been no such practice showing how forests recover from disasters, and no one knows what Chisan work is. Therefore UFRMP/UKFD shall continue the work and accumulate as many cases as possible (good practices). Dissemination of the information to local community is also necessary for implementing the erosion control work continuously. Besides, if local people are interested in the mechanism of erosion, they can prevent soil erosion in their community caused by overgrazing or setting fire. They may also help with evacuation in the event of disasters.

5. Performance

In the preconditions of the Project design, public security is to be maintained in Uttarakhand state. However, the Covid-19 pandemic from 2020, the central and state governments took the lockdown policy and curfew restriction all over India. At that time, the Project could not perform the work properly.

On the other hand, JICA evacuated all its Experts to Japan in end of March 2020. Thereafter, the Experts returned to India from April 2021, however the site visits by JET should get travel permission by JICA. All conditions returned to normal from December 2022.

UKFD and JICA agreed to extend the Project duration for 2 (two) years in March 2022. All the parties including JICA, UKFD, Contractors incurred some impacts due to the pandemic somehow. During/after this pandemic, most Task Team members retired or shifted to other offices. Performance of contractors appeared to be lower than usual, even though the Project was able to fully be occupied with the construction related works.

Since some design documents had to be modified due to some significant changes of site conditions occurred during the Covid-19 pandemic, the Project needed to revise some strategies from previous ones accordingly.

6. Additionality

If the period of the Yen loan project will extend more, UKFD is able to continue erosion control works after completion of the Project, and it is essential condition to continuously transfer technology know-how to Task Team members, ToE, and officers in-charge of the DFO offices where candidate sites locate. UKFD will continue to keep having priority to implement each activity on schedule, as has been discussed with the above members

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

1. Prospects to achieve Overall Goals

1-1 Overall goals and indicators

Overall goal 1. Erosion control works for slope disaster management in the forest areas are appropriately implemented in Uttarakhand state.

Indicator 1. Erosion control works are implemented more than 13 places based on the technology developed by the Project.

As of the end of the Project, erosion control works were being implemented at 7 places. The technology was developed and structures for the work also were secured by the Project. UKFD may focus on the completion model and candidate sites first. If the Uttarakhand state continues the disaster mitigation policy, treatment work can be implemented in more places.

Overall goal 2. Knowledge and technology on erosion control works are disseminated to other Himalayan states.

Indicator 2. Forest department in other Himalayan states incorporate appropriate technology developed by the Project in their own states.

TCP organized a national workshop on 1-2 February 2024 in collaboration with UFRMP. Policy-making level members from nation-wide attended the same including the participants from Himalayan states. Participants from Himalayan states got higher motivation in the said workshop. Himachal Pradesh has been planning to start the similar erosion control work in forest areas in coming year.

2. Plan of Operation and Implementation Structure of the UKFD side to achieve Overall Goals

UKFD continue its initiative to complete the model and candidate sites. If UKFD gains some findings or achievement, it should coordinate with other states to share them through organizing workshops or giving trainings, receiving visitors, etc.

3. Recommendations for the UKFD

In order to mainstream erosion control works for slope disaster management in forest areas and key development sectors, we recommended the following 5 recommendations to UKFD.

① Continue the work on a small scale or in a direct-managed way.
② Develop skills of technical staff and other related organizations
③ Utilize the Project's outputs.
④ Strengthen collaboration with related organizations.
⑤ Promote awareness among local society.

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

Monitoring of model sites shall be done through the review mission for the yen loan project regularly. The ex-post evaluation would be held in 2027, three (3) years later from the completion of the Project.

The evaluation result of erosion control model constructed in the model sites by UKFD

According to the original project design, 80% of the staff in charge of the erosion control works in UKFD evaluate the models of erosion control high (Project indicator 1-2). Therefore on December 2023 and January 2024, TCP/UFRMP implemented the evaluation by the most of all UKFD staff who have experience joining in Japanese training before. The evaluation carried out following the evaluation sheet which has 336 question issues from the reasonability, effectiveness, impact and sustainability points of view in each sites. The analyzed result was as bellows;

- **331 items out of 336 met the criterion. The average of each survey items are beyond medium value, which meant 'high',**
- **On the survey activities, all (48) issues are beyond the indicator[1],**
- **On the design activities, 143 issues out of 144 are beyond the indicator, only the design/estimation of road realignment work was 71% on the reasonability.**
- **On the construction activities, 140 issues out of 144 are beyond the indicator. Only 4 question issues are below the indicator. i.e. The duration of double wall check dam work was 75% on the reasonability. The duration of road realignment work was 43% on reasonability and 71% on effectiveness. The safety of the same work was 71% on reasonability.**

Evaluation in Jawadi site on 22 January 2024.

[1] The original project design shows indicator for developing the technology, that is, 80% of the staff in charge of the erosion control works in UKFD evaluate the models of erosion control high (Project indicator 1-2)

Actual result of the average score (for reference)

With the rating on a 5-point scale, e.g. 5: very appropriate, 4: appropriate, 3: neither appropriate nor inappropriate (Median), 2: not very appropriate, 1: not appropriate, are conducted on the following work items.

On the survey process, all passed the indicator out of 48 check-issues.

Reasonability:	4.000-4.875,	Effectiveness;	4.571-4.875,
Impact;	4.429-4.875,	Sustainability;	4.429-5.000

On the design process of Double wall check dam(DWCD), Concrete channel, Erosion control mat(ECM), Road realignment works are evaluated

	DWCD	Con. channel	ECM	Rd. realignment
Reasonability:	4.250-4.875,	4.500-4.750,	4.500-4.875	4.000-4.714,
Effectiveness;	4.625-4.750,	4.250-4.750,	4.625-5.000	4.429-4.571,
Impact;	4.625-4.875,	4.625-4.875,	4.750-5.000	4.286-4.714,
Sustainability;	4.250-4.375	4.750-5.000,	4.875-5.000	4.143-4.857
	Crib work	Fence work		
Reasonability:	4.500-4.875	4.625-4.875		
Effectiveness;	4.625-4.750	4.750-4.875		
Impact;	4.750-4.875	4.875		
Sustainability;	4.750	4.750		

On the construction process of DWCD, concrete channel, erosion control mat and Road realignment work are evaluated.

	DWCD	Conc. channel	ECM	Rd, realignment
Reasonability:	3.875-4.750,	4.125-5.000,	4.375-5.000	3.286-4.714,
Effectiveness;	4.500-5.000,	4.750-5.000,	4.750-5.000	4.000-4.714,
Impact;	4.875,	4.750-5.000,	4.750-5.000	4.571-4.857,
Sustainability;	5.000	4.750-5.000,	4.875-5.000	4.571-4.857
	Crib work	fencing work		
Reasonability:	3.875-4.875	4.625-4.875		
Effectiveness;	4.625-4.750	4.750-4.875		
Impact;	4.625-4.750	4.625-4.875		
Sustainability;	4.625-4.750	4.750		

Project Design Matrix

Project Title: The Project for Natural Disaster Management in Forest Areas in Uttarakhand

Implementing Agency: Uttarakhand Forest Department (UKFD)

Target Group: Staff of UKFD

Period of Project: 26/03/2017-25/03/2024 (5 years, plus 2-year extension)

Project Site: Forest Area in the State of Uttarakhand

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
Overall Goal			
1. Erosion control works for slope disaster management in the forest area are appropriately implemented in Uttarakhand state. 2. Knowledge and technology on erosion control works are disseminated to other Himalayan states[1)].	1. Erosion control works are implemented in more than 13 places based on the technology developed by the Project. 2. Forest departments in other Himalayan states incorporate appropriate technology developed by the Project in their own states.	1. Report by UKFD 2. Report by UKFD and Questionaire to other Himalayan States	
Project Purpose			
System to appropriately implement erosion control works for slope disaster management in the forest area is established in Uttarakhand state.	1. Erosion Control Technical Handbook[2)] is developed and approved by responsible authorities and put into use by UKFD. 2. Specified functions that sustainably implement erosion control works, is set up in UKFD.	1. Authorised paper 2. Authorised paper	There is no significant change in Uttarakhand govermment's policies on Natural Disaster Management in Forest Area.
Outputs			
1. Technology for erosion control to be adapted in Uttarakhand is developed.	1-1 Models of erosion control for slope disaster management, which are adapted at the given sites, are established. 1-2 80 % of staff in charge of erosion control works in UKFD evaluate the models of erosion control high by 01, 2022.	1-1 Project Report 1-2 Project Report (Questionnaire to staff in charge of UKFD)	
2. Knowledge and skills on erosion control of staff in UKFD and another related organisation are improved.	2-1 80 % of the staff in UKFD who participated in the training planned and implemented based on the technology transfer plan pass an understanding test. 2-2 Staff in charge of UKFD implements the erosion control works for nine(9) places by 01, 2022.	2-1 Project Report 2-2 Project Report	
3. Appropriate technology developed for erosion control in the forest area is shared in Uttarakhand and with other Himalayan states in India.	3-1 Seminars and workshops for other related organisations in Uttarakhand State are organised by 10, 2018. 3-2 Recommendation to the policy for mainstreaming erosion control works for slope disaster management is submitted to the State Government. 3-3 Seminars and workshops for the stakeholders in other Himalayan States are organised 2 times by 03, 2022 in collaboration with MoEF&CC.	3-1 Project Report 3-2 Project Report 3-3 Project Report	
4. Collaboration with UFRMP for implementing interventions under erosion control and sediment disaster mitigation component and also including UFRMP's task of completing the Detailed Project Report (DPR) for countermeasure works at Baliyanala are achieved.	4-1 Inventory of slope disaster in the forest area of the State is implemented. 4-2 Designs of erosion control works on the candidate sites under UFRMP are made for nine(9) places (including three model sites and Baliyanala landslide) by March, 2022. 4-3 Support for the field surveys, designs and supervisions of erosion control works on the candidate sites under UFRMP. 4-4 Support for field surveys and designs and supervisions of countermeasure works at the landslide site in Baliyanala, Nainital District, which collapsed in September, 2018.	4-1 Project Report 4-2 Report of UFRMP 4-3 Project Report 4-4 Project Report	

1) Himachal Pradesh, West Bengal and Sikkim State are assumed to be "Himalayan States".
2) "Erosion Control Technical Handbook" includes erosion control works guideline, the manual on the design of erosion control works and standard operating procedure for erosion control works.

Activities	Inputs		Important Assumption
	The Japanese Side	**The Indian Side**	
1-1 Prepare and update slope disaster location map in the forest area. 1-2 Select model sites based on the prescribed selection criteria, in which erosion control model having effect of demonstration are constructed. 1-3 Implement survey in the model sites and analyse mechanism of occurrence of slope disaster. 1-4 Make design of erosion control works in model sites. 1-5 Select company for erosion control works in model sites and contract with the selected company. 1-6 Supervise erosion control works in model sites until completion, based on the approved design. 1-7 Periodically implement monitoring of facilities in model sites. 1-8 Prepare erosion control works guideline. 1-9 Prepare manual on design of erosion control works. 1-10 Set a standard operating procedure for erosion control works. 1-11 Implement evaluation of erosion control model constructed in model sites by UKFC staff. 2-1 Implement basic study for preparation of technology transfer plan. 2-2 Prepare the technology transfer plan including basic concept for erosion control works, preparation of plan on erosion control works, method of surveys for designing erosion control works, and design and works for erosion control facilities, etc. 2-3 Implement Off-JT and OJT based on technology transfer plan. 2-4 Evaluate improved level on knowledge and skill of staff. 3-1 Prepare a plan for information sharing of erosion control works. 3-2 Organise seminars and workshops for stakeholders within the Uttarakhand state. 3-3 Organise seminars and workshops for stakeholders in other Himalayan states, in collaboration with MoEF&CC. 3-4 Prepare policy recommendation for mainstreaming erosion control works for slope disaster management into forest and other key development sectors. 3-5 Set up policy-level council for erosion control works among UKFD and other related organisations. 3-6 Organise periodical meeting of policy-level council for erosion control works. 3-7 Study the condition and level of the information sharing. 4-1 Identify and prioritise the candidate sites of erosion control works under UFRMP based on 1-1. 4-2 Enhance the capacity of Engineers through Off-JT and OJT in model sites. 4-3 Support for field surveys, designs and supervisions of erosion control works on candidate sites under UFRMP.	1. Personnel (Long-term Experts) 1-1 Chief Advisor/ Erosion Control Planning 1-2 Coordinator/ Erosion Control Training (Short-term Experts) 1-3 Design and Cost Estimation (Leader of Consultant Team) 1-4 Survey and Design (Sub Leader of Consultant Team) 1-5 Supervision 1/ Procurement (Consultant Team) 1-6 Supervision 2 / Monitoring (Consultant Team) 1-7 Other Short-term Experts upon necessity. 1-8 Supporting Staff 1-8-1 Secretaries for JICA Experts 2. Equipment 2-1 Vehicle(s) 2-2 Equipment, e.g. necessary equipment for field survey 3. Expense for the Project 3-1 Cost for organising Off-JTs 3-2 Supplementary budget for local expenditure 4. Counterpart Training 4-1 Trainings in Japan	1. Personnel 1-1 Project Director 1-2 Additional Project Director 1-3 Task Managers and members of three Task Teams (each Task Team consisting of 4 personnel, total 12 personnel) 1-4 Staff concerned in the Forest Division Offices where model sites are located 1-5 Teams of Engineers which shall be contracted under UFRMP, after receiving 'no objection' from JICA. 1-6 Supporting Staff 1-6-1 Administrative Staff 1-6-2 Secretaries 1-6-3 Drivers 2. Land and Facilities 2-1 Project office with necessary facilities in HQs of UFRMP 2-2 Project office with necessary facilities in local office of UKFD where the model sites are located 2-3 Land of the model sites 3. Counter Budget 3-1 The construction cost of model site 3-2 Administrative and Operational Cost for the Project 3-2-1 Travelling allowance and daily allowance for C/P 3-2-2 Cost of expendable supplies 3-2-3 Cost of communication 3-2-4 Fuel and lighting expenses in the Project offices 3-2-5 Petrol for the project vehicles and motorbikes 3-2-6 Maintenance cost for the Project vehicles and motorbikes 3-2-7 Other necessary administrative and operational cost for the Project	Weather and other natural conditions exceeding the designing condition of erosion control facilities (e.g. much heavier rain and big earthquake) does not occur. **Pre-Conditions** Political stability and public security are maintained in Uttarakhand state. **<Issues and countermeasures>** Through amending the R/D, two (2) years extension of the Project duration was agreed between UKFD and JICA in February 2022.
4-4 Support for field surveys and designs and supervisions of countermeasure works at the landslide site in Baliyanala, Nainital District, which collapsed in			