Republic of India

Uttarakhand Forest Department

SURVEY ON
FOREST DISASTER MANAGEMENT
IN
UTTARAKHAND
OF
THE REPUBLIC OF INDIA

FINAL REPORT

JANUARY 2015

JAPAN INTERNATIONAL COOPERATION AGENCY

JAPAN OVERSEAS FOREST CONSULTANTS ASSOCIATION

NIPPON KOEI., LTD.

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Abbreviations

ACF	Assistant Conservator of Forest
ADB	Asian Development Bank
APCCF	Additional Principal Chief Conservator of Forest
BRO	Border Roads Organisation
CASFOS	Central Academy for State Forest Service
CAT	Catchment Area Treatment
CCF	Chief Conservator of Forest
CDFMPT	Capacity Development for Forest Management and Personnel Training Project
CEO	Chief Executive Officer
CF	Conservator of Forest
CPD	Chief Project Director
CSWCRTI	Central Soil and Water Conservation Research and Training Institute
DCF	Deputy Conservator of Forest
DDMA	District Disaster Management Authority
DFE	Department of Forestry Education
DFO	Divisional Forest Officer
DM	District Magistrate
DMMC	Disaster Management and Mitigation Centre
DRM	Disaster Risk Management
DSS	Decision Support System
Dy.	Deputy
EWS	Early Warning System
FMIS	Forest Management Information System
FSI	Forest Survey of India
FTI	Forest Training Institute
GIS	Geographic Information System
Govt.	Government
GPS	Global Positioning System

GREF	General Reserve Engineer Force
HoFF	Head of Forest Functions
HRD	Human Resource Development
HQ	Headquarters
ID	Irrigation Department
ICT	Information and Communications Technology
IFS	Indian Forest Service
IGNFA	Indira Gandhi International Forest Academy
IIRS	Indian Institute of Remote Sensing
IT	Information Technology
JICA	Japan International Cooperation Agency
JOFCA	Japan Overseas Forestry Consultants Association
LAN	Local Area Network
MIS	Management Information System
MoEF	Ministry of Environment and Forests
NDMA	National Disaster Management Authority
NH	National Highway
NRSC	National Remote Sensing Centre
NTFP	Non Timber Forest Products
ODCH	Owner Driven Construction of Housing
PCCF	Principal Chief Conservator of Forest
PFS	Provincial Forest Service
PIU	Project Implementation Unit
PMU	Project Management Unit
PWD	Public Works Department
RFP	Request for Proposals
RO	Range Officer
RS	Remote Sensing
SDMA	State Disaster Management Authority

SDO	Sub Divisional Officer
SDRF	State Disaster Response Force
SEC	State Executive Committee
SOI	Survey of India
TOR	Terms of Reference
UDRP	Uttarakhand Disaster Recovery Project
UFRMP	Uttarakhand Forest Resource Management Project
UKFD	Uttarakhand Forest Department
USDMA	Uttarakhand State Disaster Management Authority
USRIP	Uttarakhand State Road Investment Programme
VP	Van panchayats
WAN	Wide Area Network
WB	World Bank

Contents

Introduction

This report is the Final Report for “Survey on Forest Disaster Management in Uttarakhand, India” (hereinafter referred to as “the Study”) which was implemented by a joint venture formed by Japan Overseas forestry Consultants Association (hereinafter referred to as “JOFCA”) and NIPPON KOEI CO., LTD. This Report mentions the study implementation for project formulation regarding forest disaster management. It was carried out from August to December 2014.

1. Outline of the Study

1.1 Background of the Study

Forest area in India decreased by about 50% in 1950-1990, then started to increase gradually after 1990. The forest coverage rate of this country is, however, 23.81% in 2011, lower than the world average of 31% in 2010. In India about 100 million people, including those living in poverty, are dependent on the forest for their sources of income and living materials such as firewood, charcoal, and livestock fodder. However, since population growth in recent years, whose rate is 1.4% per year on average, and an increase in the number of livestock has been pressing the forest, the forest degradation has been advancing. Consequently, the ratio of the open forest is 41.59% in 2011, which means that the forest cannot fully demonstrate its functions such as the prevention of soil erosion and water conservation. The shortage of water resources deriving from decrease of water and soil conservation function of forest due to deforestation and forest degradation that have often occurred. In addition, the lives of poverty-stricken people depending on mainly agriculture and forest resources are pressured by shortage of water for daily life and decrease in agricultural productivity. Moreover, the poverty-stricken people cut down trees for securing source of income. These circumstances have fallen into a vicious cycle to accelerate the load on the forest. In view of the circumstances, the Government of India has promoted various measures for reforestation such as tree plantation. As a result, the forest coverage rate had been increased by 5.9% from 1990 to 2005. After that it continued to increase within a range of 0.11% to 0.22% (annual average) between 2005 and 2009, and the rate decreased by 0.05% in 2011. In addition, while the forest coverage rate gradually increased, open forest rates had increased to 42.82% in 2005 from 39.09% in 1991.

In recent years, floods and landslides that derived from the National Forest have occurred in mountainous areas. From the viewpoint of public functions of forest such as disaster prevention, soil erosion control, and water conservation, improving the quality of the forest, which means improvement of open forest rate and the expansion of the forest area, is an important issue of forest management in India. Especially, the unusual large-scale disaster of floods and landslides that occurred in June 2013 in the State of Uttarakhand after heavy rain lasted in the Himalayan Region caused the calamity of over 6,000 missing and dead persons in 4,200 villages, mainly in the northern region of the state. This is an unprecedented mountain disaster in India It is considered that most of land collapse and landslides occurred in conjunction with flood in the National Forest under control of the Forest Department. The Japanese ODA loan project 'Uttarakhand Forest Resource Management Project' signed in April 2014, is for not only forest conservation activities but also effective soil and water conservation activities for prevention of landslide disaster. In order to implement the project, it is necessary to clarify the current situation and needs, and to implement the study to make clear what kind of support will be required in the future.

1.2 Objective of the Study

The objective of the Study is to make necessary recommendations for the formation of cooperation by JICA for the state of Uttarakhand. The study grasps and analyzes cooperation needs in the field of mountain disaster technologies as well as collection and verification of information on the current situation of implementation authorities. Results of the study can be referred to as project findings in the field of mountain disaster management in the future in India.

2. Schedule of the study

Table 2.1 Schedule of the 1st Study

Date	Schedule
4th August, 2014	Departure for INDIA Arrival in New Delhi
5th August, 2014	Meeting with JICA INDIA, Mr. Anup Malik, CPD – UKFRMP, Mr. S.M. Joshi Conservator Forest
6th August, 2014	Arrival in Dehradun from New Delhi Team Meeting at Hotel Aketa
7th August, 2014	Meeting with Mr. Anup Malik, CPD - UKFRMP Meeting with Mr. Rakesh Sharma, Addl. Chief Secretary
8th August, 2014	Meeting with Mr. Amit Negi, Secretary PWD and also officials of World Bank Project Meeting with Mr. Piyoosh Rautela, Executive Director, DMMC Data collection
9th August, 2014	Finalization of programme for field visit to Uttarkashi Preparation for field visit Visit to IT Cell of FD for getting maps for field visit
10th August, 2014	Preparation for Field visit
11th August, 2014	Field visit to Uttarkashi
12th August, 2014	Meeting with District Magistrate, Uttarkashi Field visit to Uttarkashi
13th August, 2014	Field visit to Uttarkashi
14th August, 2014	Field visit to Parori village (near Mussoorie)
15th August,2014	Preparation of 1st Field visit Report
16th August, 2014	Meeting with Mr. Amit Negi, Secretary PWD and also officials of World Bank Project Compilation of field visit report
17th August, 2014	Preparation of 1st Field visit Report
18th August, 2014	Preparation of 1st Field visit Report
19th August, 2014	Meeting with Mr. STS Lepcha, Addl. Principal Chief Conservator Forest Meeting with Mr. Anup Malik, CPD-UKFRMP
20th August, 2014	Field visit to Rudraprayag along with JICA Mission
21st August, 2014	Field visit to Rudraprayag along with JICA Mission
22nd August, 2014	Field visit to Rudraprayag along with JICA Mission
23rd August, 2014	Field visit to Rudraprayag along with JICA Mission
24th August, 2014	Field visit to Parori village (near Mussoorie) along with JICA Mission
25th August, 2014	Meeting with Mr. Anup Malik, CPD-UKFRMP Finalization of Minutes of Discussion Meeting with Mr. Rakesh Sharma, Addl. Chief Secretary and Mr. Amit Negi, Secretary PWD – signing of MOD
26th August, 2014	Preparation of survey report
27th August, 2014	Explain of 1st Survey report to Mr. Anup Malik, CPD-UKFRMP Departure for New Delhi Explain of 1st Survey report to JICA INDIA office Departure for Japan
28th August, 2014	Arrival in japan

Table 2.2 First survey team member list

Name	**Title of Work**	**Farm**
Takaki Toyoda	Leader/Soil and water conservation(1)	JOFCA
Hiroyuki Katsuro	Soil and water conservation(2)	Nippon Koei
Sahori Matsumoto	Own burden	JOFCA

Table 2.3 Schedule of the 2nd Study

	Date		Trip	Activity		Accommodation
				Mr. Toyoda, Mr. Kato, Mr. Fukuchi and Mr. Katsuro (Study Team)	Mr. Jinnai, Mr. Okada, Mr. Tsuneoka, Mr. Kitaura, Ms. Horikawa and Mr. Higashiguchi (JICA Mission)	
1	3-Nov	Mon	Narita→Delhi	Move to Delhi from Tokyo		Delhi
1	3-Nov	Mon	Haneda→Delhi	Move to Delhi from Tokyo		Delhi
2	4-Nov	Tue	Delhi→Dehradun	Move to Dehradun		Dehradun
3	5-Nov	Wed	Dehradun	Preparation for Field survey		Dehradun
4	6-Nov	Thu	ditto	Preparation for Field survey		Dehradun
5	7-Nov	Fri	ditto	Meeting with UKFD (with Mr. Joshi)		Mussorie
6	8-Nov	Sat	ditto	Preparation for Field survey		Dehradun
7	9-Nov	Sun	ditto	Preparation for Field survey		Dehradun
8	10-Nov	Mon	ditto	Meeting with UKFD (with Mr. Malik, IT cell)		Rudraprayag
9	11-Nov	Tue	ditto	Preparation for Field survey		Rudraprayag
10	12-Nov	Wed	Dehradun→ Rudraprayag	Field survey at Parori Village		Rudraprayag
11	13-Nov	Thu	Dehradun→ Rishkesh→Dehradun	Field survey at Nirgad Village		Dehradun
12	14-Nov	Fri	Dehradun	Meeting with UKFD (with Mr. Malik) Meeting with WB		Rishikesh
13	15-Nov	Sat	ditto	Arrangement for result of field survey		Dehradun
14	16-Nov	Sun	ditto	Arrangement for result of field survey	Move to Delhi from Tokyo	Dehradun / Delhi
15	17-Nov	Mon	ditto	Meeting with UKFD	AM: Meeting with MOEF, JICA Office PM: Move to Dehradun	Dehradun
16	18-Nov	Tue	Dehradun→ Mussorie→ Dehradun	AM: Meeting with UKFD, PM:Site visit at Parori Village (P)		Dehradun
17	19-Nov	Wed	Dehradun→ Rudraprayag	AM: Move to Rudraprayag, PM:Site visit at Jawadi Village (P)		Rudraprayag
18	20-Nov	Thu	Rudraprayag→ Dehradun	AM: Move to Rishikesh, PM:Site visit at Nirgad Village (P)		Dehradun
19	21-Nov	Fri	Dehradun	Meeting with UKFD and other relevant organizations		Dehradun
20	22-Nov	Sat	ditto	Meeting with UKFD and other relevant organizations		Dehradun
21	23-Nov	Sun	ditto	Preparation for draft R/D and M/M		Dehradun
22	24-Nov	Mon	ditto	Meeting with UKFD and other relevant organizations		Dehradun
23	25-Nov	Tue	ditto	Agree with R/D draft and signing of M/M	Move to Dehli	Dehradun /
24	26-Nov	Wed	ditto	Meeting with IGNFA and CASFOS		Dehradun /
25	27-Nov	Thu	ditto	Prearation of draft final report		Dehradun/
26	28-Nov	Fri	Dehradun→Delhi	Move to Delhi		
27	29-Nov	Sat	→Narita	Arrive to Japan		

Activity with JICA mission

Table 2.4 Second study team member list

Name	Title of Work	Farm
Takaki Toyoda	Leader/Soil and water conservation(1)	JOFCA
Hiroyuki Katsuro	Soil and water conservation(2)	Nippon Koei
Kazuhisa Kato	Forest Management	JOFCA
Daisuke Fukuchi	Own burden	JOFCA

3. Results of the study

3.1 Results of field survey for mountain disaster area

3.1.1 Field trip to Uttarkashi and Mussoorie

1) Field trip to Dehradun～Uttarkashi

(1) Downstream of Tehli Dam and around Tehli Dam

Downstream of Tehli Dam, there is relatively dense forest, consisting of Sal (*Shorea robusta*), Teak (*Tectona grandis*), *Eucalyputus* spp., *Melia azedarach*, etc. Some forests are artificial.

Close to Tehli Dam, gradual terrace in slope can be identified. Also forest density reduces. Additionally, slope erosion increases.

Terrace in slope which is abandoned

Erosion at steep slope

Terraces were once cultivated with millet and sorghum, but have been converted to grassland for fodder. It seems that terrace contribute somewhat for prevention of soil erosion.

In the Tehli Dam site, slope failure is identified along back water of the dam site. Scale of slope failure is huge, with many slope failures identified.

Backwater of Tehli Dam

Slope failure along the backwater of Tehli Dam

(2) Slope failure investigation near Dharas area

The study team investigated three slope failure sites during Dharas and Dunda along NH 94. Details of investigation are mentioned in 3-2 “Current condition and appropriate countermeasures for mountain disaster.”

2) Field trip around Uttarkashi town

(1) Flood protection works

The study team observed several flood protection works along the Bhagirathi River and Assi Ganga River by the Irrigation Department. Descriptions of observation sites are as follow;

(i) Flood protection work U/S of TILOTH bridge to protect GANGA VIHAR COLONY along right bank of river BHAGIRATHI in Distt. UTTARKASHI

Estimated cost	Rs.355.91 Lacs
Objective	The Abadi of Ganga Vihar will be protected from flood.
Work	Nominal Reinforced Cement Concrete wall 185m in length with C.C. block in front as launching apron.
Condition	The work is ongoing.

(ii) Flood protection work from AGGRAWAL BHAWAN to KAILASH AASHRAM along right bank of river BHAGIRATHI in Distt. UTTARKASHI

Estimated cost	Rs.326.27 Lacs
Objective	Abadi of Uttarkashi town area from aggrawal bhawan to Kailshi Aashram will be protected.
Work	The work is 350m in length as RR Stone masonry wall in 1:5 cement sand mortar with CC blocks in front as launching apron.
Condition	The work is ongoing.

Source: Irrigation Department of Uttarkashi

Disaster situation and flood protection works at the Bhagirathi River

(iii) Flood protection work for GANGORI town along right bank of ASSI GANGA River in Distt. UTTARKASHI

Estimated cost	Rs.671.98 Lacs
Objective	Abadi of Gangori town area from power house to the confluence of Bhagirathi river will be protected.
Work	The work is 900m in length as RR Stone masonry wall in 1:5 cement sand mortar with CC blocks in front as launching apron.
Condition	The work is ongoing.

(iv) Flood protection work of GANGORI town along left bank of ASSI GANGA River in Distt. UTTARKASHI

Estimated cost	Rs.667.79 Lacs
Objective	Gangori town area along left bank of Assi Ganga river will be protected.
Work	The work is 1,000m in length as RR Stone masonry wall in 1:5 cement sand mortar with CC blocks in front as launching apron.
Condition	The work is ongoing.

Source: Irrigation Department of Uttarkashi

Flood protection works at the Assi Ganga River

(2) Damaged hydropower station at Digela

The study team observed the damaged hydropower station at Digela. This hydropower station was damaged on July 2012 by water flood. It will be reconstructed after rehabilitation work for river bank.

(3) Investigation for landslide in Digera Village

The study team investigated two landslide sites in Digera Village. Details of investigation are mentioned in 3-2“Current condition and appropriate countermeasures for mountain disaster.”


Broken Hydropower station in Digera Village

(4) Interview of villagers in Digera Village

Interview of villagers was carried out by the study team in Digera Village. Results of interview are attached as Annex (2) “Result of village interviews.”


Village interview in Chua Village

(5) Meeting with District magistrate of Uttarkashi and person in charge of each relevant sector

The study team had a meeting with Mr. Ravi, who is District magistrate of Uttarkashi, and other persons in charge of the relevant sectors. Mr. Ravi and other persons in charge gave a presentation about damage by disasters in 2012 and 2013. The study team explained the purpose of this field trip. The team requested Mr. Ravi to introduce a reasonable place for a model site for the technical cooperation project.


Meeting with District magistrate and persons in charge of relevant sectors

(6) Stabilization work for slope failure on Mt. Varunawat

The study team observed restoration work for slope failure on Mt. Varunawat. Mt. Varunawat is located just behind Uttarkashi town. On September 2003, slope failure happened from the top part of the mountain, and this slope failure continued thereafter. UKFD conducted treatment work for slope failure stabilization with contract work with THDC. THDC adopted new slope failure stabilization technology such as concrete spraying, net with rock bolts, and anchors. UKFD carried out vegetation work there. As a result of the stabilization works, the slope failure in Mt. Varunawat was stabilized.

Observation of slope failure stabilization work on Mt. Varunawat

3) Field trip around Uttarkashi (Direction toward Gangotri)

(1) Landslide along the Bhagirathi River

Going toward the east along the Bhagirathi River beyond Uttarkashi town, there is one landslide site. It is a large scale and active landslide. Materials of slope consist mainly of clay soil; this seems to be the main reason for landslide.

Landslide site along the Bhagirathi River **Clay soil, the cause of landslide**

(2) In Gawana gad area near Uttarkashi

The study team investigated two landslide sites in the Gawana gad area near Uttarkashi. Details of the investigation are mentioned in 3-2 “Current conditions and appropriate countermeasures for mountain disaster.”

(3) In Hitahun village near Dunda

The study team investigated two landslide sites in Hitahun village near Dunda. Details of investigation are mentioned in 3-2 “Current conditions and appropriate countermeasures for mountain disaster.”

(4) Interview of villagers in Hitahun village

Interview of villagers was carried out by the study team in Hitahun village. Results of interview are attached as Annex (2) “Result of village interview.”

Village interview in Hitahun Village

4) Field trip to Uttarkashi～Mussoorie

(1) In Parori village, near Mussoorie

The study team investigated two landslide sites in Parori village, near Mussoorie. Details of investigation are mentioned in 3-2 “Current conditions and appropriate countermeasures for mountain disaster.”

(2) Interview of villagers in Parori village

Interview of villagers was carried out by the study team in Parori village. Results of interview are attached as Annex (2) “Result of village interview.”


Village interview in Parori Village

(3) Along road site at the Magra River, near Mussoorie

The study team observed civil work by UKFD at the Magra River near Mussoorie. UKFD established a total of 19 check dams along the river in 2010 and 2011. Check dams of upper stream are constructed by masonry works without concrete, Check dams of middle and downstream portion are constructed by masonry works with concrete. Also UKFD introduced technique of vegetation works there. It seems that these civil works are currently the most modernized civil work by UKFD, but it should consider location design of check dams more logically. This is one of point of view for consideration of components of the JICA technical cooperation project.


Civil works along the Magra River by UKFD


Village interview in Parori Village

3.1.2 Field trip to Rudraprayag

1) Field trip to Dehradun～Rudraprayag

(1) Nirgad Village near Rishikesh,

Along NH 58 near Rishikesh, there are many slope failures which occurred this year, in August. The study team investigated one slope failure at a road site; it is one candidate site for model site of the technical cooperation project. Details of the investigation are mentioned in 3-2 “Current conditions and appropriate countermeasures for mountain disaster.”

(2) Sirohbaggar Village

The study team observed a relatively large scale landslide site at Sirohbaggar Village along NH 58. It has continued collapsing over a quarter century. In 1994, WB observed this area, and this landslide already existed. The Alaknanda River erodes the bottom of the landslide slope, which is the main cause of landslide. PWD established a station for removing debris flow on the road of NH 58 near this landslide. It starts working immediately when the slope failure happens.


Landslide at Sirohbaggar Village along NH 58

(3) Nar Kota Village

The study team observed slope failure opposite the Alaknanda River from the road site of NH 58. It is located along the Alaknanda River. There is a small foot pass, across from the slope failure, that collapsed. According to Mr. Joshi, who is a forest engineer of UKFD, such case of forest road collapsing is also a target for the model site of the technical cooperation project.

Slope failure at Nar Kota Village. A small foot pass is collapsed by slope failure.

2) Field trip to Rudraprayag～Sonprayag

(1) Suwari Village

The study team observed landslide at Suwari Village near Rudraprayag. This landslide is located along the Alaknanda River. It is observed that some habitations were collapsed by landslide. Residents have already moved from this place.

Slope failure at Suwari Village. Habitations were collapsed.

(2) Gangtal Village

In Gangtal Village, there is relatively large scale slope failure along NH 58. The Alaknanda River erodes the bottom of the slope by river flow. PWD installed a river bank by Gabion work for protection of the slope.

(3) Silli Village

Silli Village is located along the Alaknanda River. In July 2013, an unbelievably large amount of river water flowed down the Alaknanda River. Huge amounts of debris were deposited in the river bed by the river water transportation in this area. It has accumulated to a depth of approximately 5-6m from original level. At present time, the river and the habitation level of Silli Village are at almost same level. This is relatively dangerous situation.

Slope failure at Gangtal Village. Gabion work is installed.

If big water flow comes from upstream next time, the village will receive very big damage widely. This is a candidate site for collaboration work with Uttarakhand Disaster Recovery Project (UDRP) which is funded by WB (Details are mentioned in 3.6).

Silli Village; Water level and ground level of habitation are almost same.

(4) Vijaynagar Village

Vijaynagar Village is also located along the Alaknanda River. This village also received very big damage by river water flood in 2013. The water level rose up beyond the road site, and many habitations were swept away by the strong river flow. Residents evacuated in advance before the coming water flow, in response to an alert. Fortunately, no sufferers came out in this area at that time. This site is also a candidate site for collaboration work with Uttarakhand Disaster Recovery Project (UDRP) which is funded by WB (Details are mentioned in 3.6).

(5) Bhiri Village

The study team investigated one slope failure along a road site in Bhiri Village. There are relatively large boulders in the stream. The stream flows were not identified at that time; they are probably seasonal or when rain comes. Details of investigation are mentioned in 3-2 “Current conditions and appropriate countermeasures for mountain disaster.”


Damage situation by river water flow at Vijaynagar Village


Slope failure investigation at Bhiri Village

(6) Interview of villagers in Semi Village


Village interview in Semi Village

Interview of villagers was carried out by the study team in Semi Village. About 20 villagers gathered for the interview at a small hotel in the village. Results of village interview are attached as Annex (2) “Result of village interview.”

(7) Investigation of large scale landslide at Semi Village

The study team investigated large scale landslide at Semi Village. Scale of the landslide is about 500m wide and 500m long. Many cracks are found in road across from the landslide. It may move at relatively high speed. Details of investigation are mentioned in 3-2 “Current conditions and appropriate countermeasures for mountain disaster.”

(8) Sonprayag Village

The study team arrived at Sonprayag Village. Asphalted road (meaning that vehicles can pass) ends at this village. Before disaster in 2013, the asphalted road continued until Gaurikund Village, but it was collapsed by the disaster. This road connects to Kedarnath; Kedarnath is a very important and famous place for the Hindu Religion. It is 14 km from Gaurikund Village to Kedarnath; tourists go to Kedarnath by trekking or horse/donkey riding.

In the disaster of 2013, 90% of the buildings in Rambara, which is a village on the way to Kedarnath, were collapsed by flood water. Many residents, pilgrims, and tourists were missing at that time. The exact number of missing is still unknown. After the disaster, numbers of visitors to Sonprayag and Kedarnath area have recovered to only 10% the level before the situation. Touristic business is still receiving very big damage by the disaster so far.

Damage situation of Sonprayag

3) Field trip to Rudraprayag～Guptakashi

(1) Bypass to Kedarnath, near Rudraprayag

The study team observed the present situation of the bypass road to Kedarnath. A bridge across the Alaknanda River was collapsed by river water flood in 2013. PWD constructed a temporary bridge, and a permanent bridge is under construction now. Up and down portions of road site slopes need restoration works for slope stabilization.

(2) Meeting with District magistrate of Rudraprayag

The study team had a meeting with Mr. Raghav Langer, who is District magistrate (DM) of Rudraprayag. The DM told the team that the district had identified various landslides and that technical cooperation should be implemented where there are large populations and/or heavy

traffic so that the greatest number can receive benefits from the project.

The JICA mission explained to the DM the purpose of the visit at Rudraprayag District. The team also intends to visit the district to see the impacts of the 2013 disaster and also to identify potential candidate sites/model sites. Results of the meeting with DM are shown in the Appendix.


Situation of bypass road to Kedarnath near Rudraprayag


Meeting with District magistrate of Rudraprayag

(3) Forest road observation near Uchola Village

The study team observed a forest road near Uchola Village. This forest road links 7 villages around this area, and about 8,000 villagers use this forest road. This forest road was constructed by PWD, but is managed by UKFD. UKFD does not have any heavy equipment for road restoration, so when the road is damaged, UKFD carries out recovery work by themselves or request to PWD. UKFD has responsibility for road maintenance, but it is hard work for them.

4) Field trip around Rudraprayag

(1) In Jawadi village, near Rudraprayag

The study team investigated one big slope failure at Jawadi Village near Rudraprayag. The link road from Rudraprayag to Jawadi Village was cut down by the slope failure. Therefore, villagers have to cross the slope failure on foot. This is a very dangerous situation for them.

Forest road observation near Uchola Village

Elevation lag of top and bottom of this slope failure is about 200m. It needs relatively large scale civil work for restoration.

Details of investigation are mentioned in 3-2 “Current conditions and appropriate countermeasures for mountain disaster.”

Situation of large scale slope failure in Jawadi Village

3.1.3 Supplemental field trip to Parori Village

On the 24th of August, the study team again visited Parori Village for supplemental study with the JICA mission. This time the team observed mainly the upper stream of the Bangar River. The study team identified a small water stream in the river bed, which had not been identified at last observation on the 14th of August. It thinks that it was influenced by heavy rain on the 15-16th of August. The upper stream of the Bangar River continues to Sunao Village, where the team found two middle scale slope failure at that place. These two slope failures are the main supply of debris materials. At the top part of one of the slope failure, there are habitations. Some families still use the habitations. This is a dangerous situation for them. It is necessary that they shift to another place in the near future.

According to the residents, the riverbed of the Bangar River was relatively narrow. It was only about 5m before the disaster in July 2013. After the disaster in July 2013, the riverbed became suddenly wide. A huge amount of debris sediment was on the riverbed at that time.

Situation of upper stream of the Bangar River

3.2 Current conditions and appropriate countermeasures for mountain disaster

3.2.1. Uttarkashi and Mussoorie

Reconnaissance route is shown on following map.

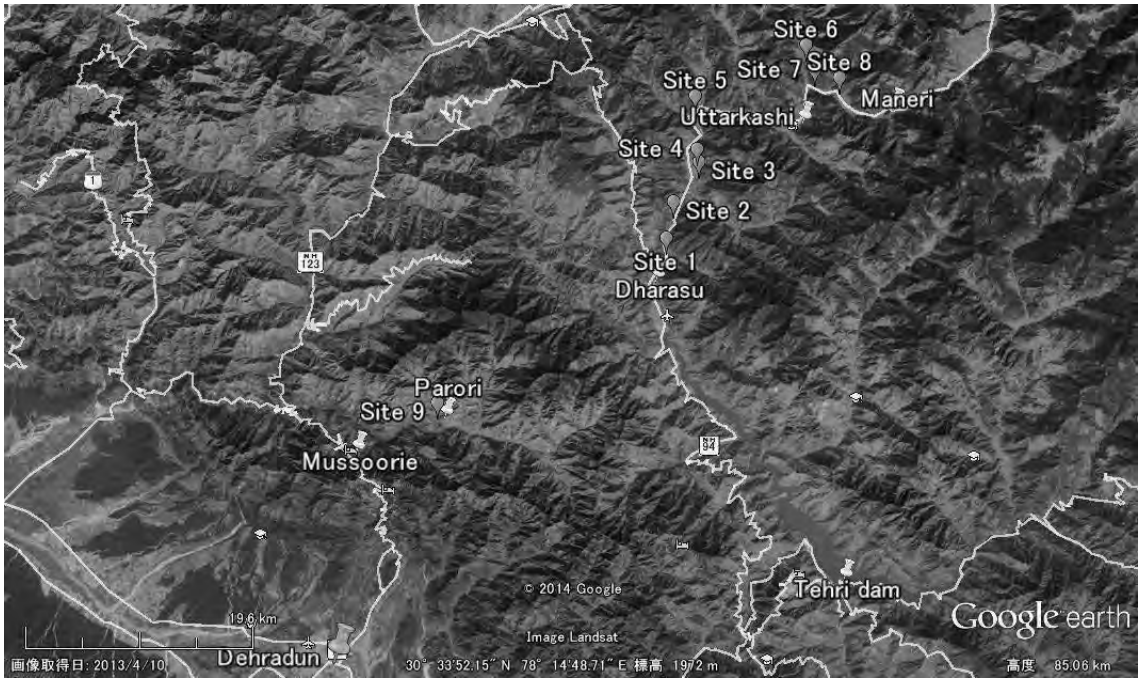


Figure 3.1.1 Reconnaissance map

1) Site 1

i) Outline of Site

This site is a cutting slope. A road runs parallel to the river through the lower part of slopes. The slopes are composed of talus. The talus is distributed mainly from the middle part of the slope to the upper part. The slopes are composed of basement rocks, which are sedimentary rocks from the Neo Proterozoic. Basement rocks, which are cracked rocks, are observed on the cutting surface. Rockfall and talus deposit are observed at the road side.

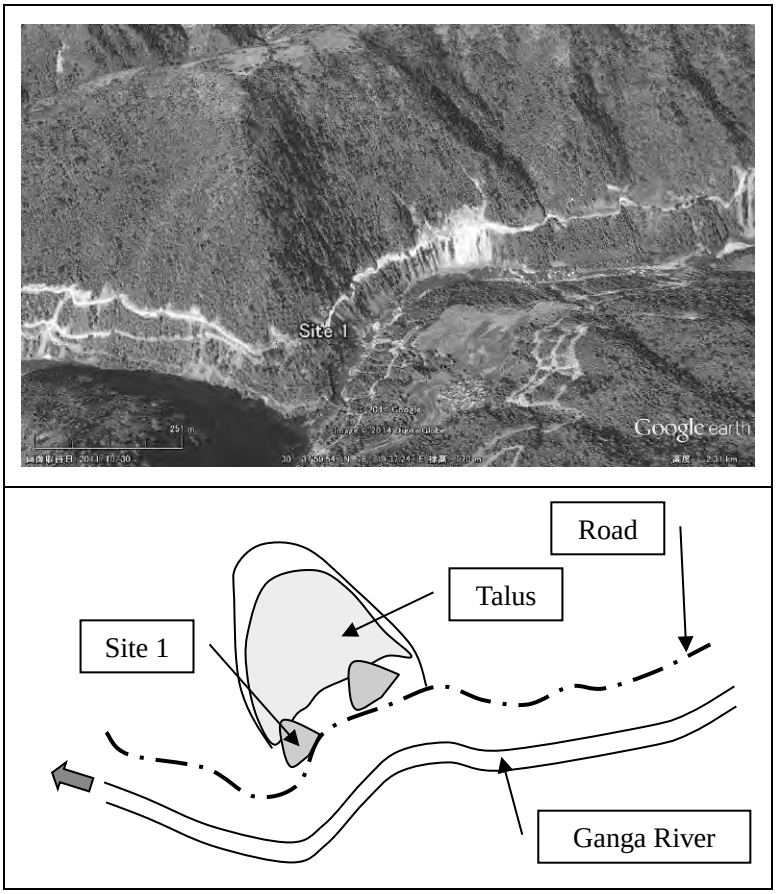


Figure 3.1.2 Site 1 location map

ii) Proposed Countermeasures

Proposed countermeasures are as follows. As shown in the following Table 3.1.1, there are some issues regarding safety measures and temporary works under construction. Consultation with BRO is required regarding these issues and other countermeasures which BRO should conduct at the same time. In practice, implementation of countermeasures is considered to be difficult.

Table 3.1.1 Proposed Counter measures

Countermeasure	Methods	Issues regarding construction
Slope protection works	Grating crib works Rock bolt works Sodding works Rockfall prevention wall	Safety measure, Temporary works Consultation with BRO

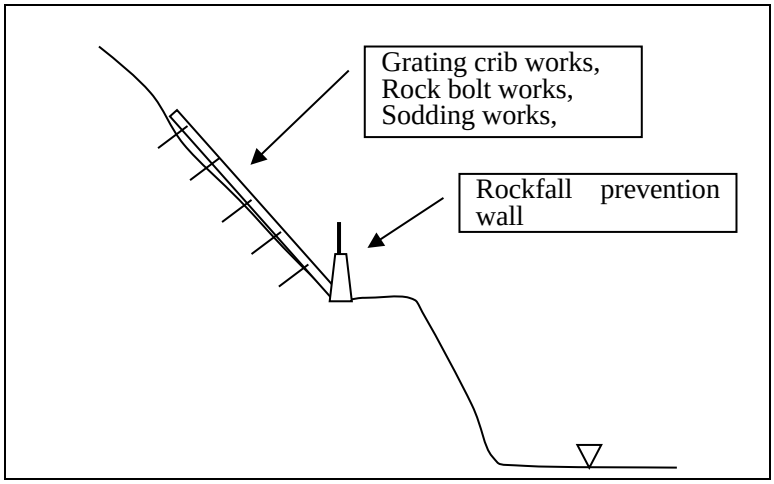


Figure 3.1.3 Proposed Countermeasures

2) Site 2

i) Outline of Site

This site is a cutting slope. A road runs parallel to the river through the lower part of slopes. The slopes are composed of basement rocks, which are sedimentary rock from the Neo Proterozoic. The basement rocks are cracked rocks. Strike and dip are N50° E40° S. Therefore, geological structure is not dip slope against the river. Rockfall deposits are observed at the road side.

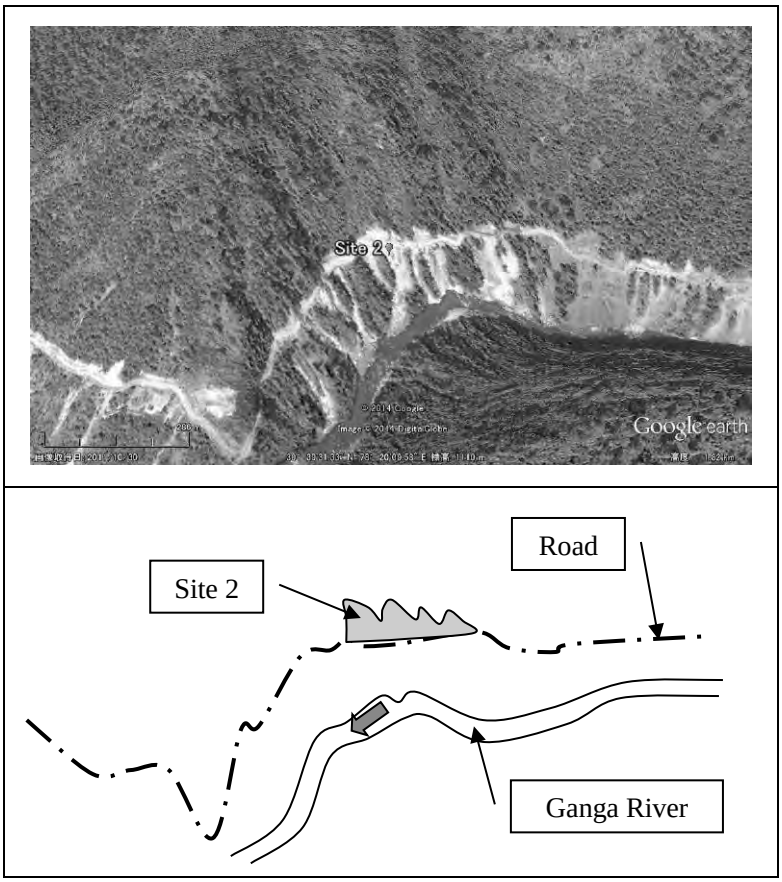


Figure 3.1.4 Site 2 location map

ii) Proposed Countermeasures

Proposed countermeasures are as follows. As shown in the following Table 3.2.1, there are some issues regarding safety measures and temporary works under construction. Consultation with BRO is required regarding these issues and other countermeasures which BRO should conduct at the same time. In practice, implementation of countermeasures is considered to be difficult.

Table 3.1.2 Proposed Countermeasures

Countermeasure	Methods	Issues regarding construction
Slope protection works	Grating crib works Rock bolt works Sodding works Rockfall prevention wall	Safety measure, Temporary works Consultation with BRO

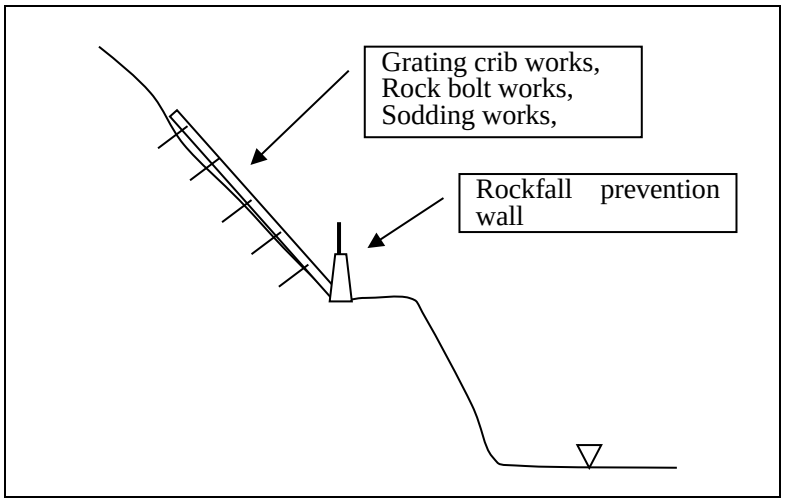


Figure 3.1.5 Proposed Countermeasures

3) Site 3

i) Outline of site

This site is a mountain stream which is the left tributary of the Ganga River. A lot of large, rounded boulders are observed on the riverbed. The large boulders are about 1m to 1.5m in diameter. The riverbed gradient is about 5 degrees, which is said to be the sedimentary degree of debris flow. These boulders are presumed to be materials that compose the terraces of this area. There is cultivated land along the river which meanders in the riverbed. A part of the masonry along the river is damaged by flood. Slope failure which is located at the undercut slope is observed along the river. The slope is composed of weathered rocks which are cracked.

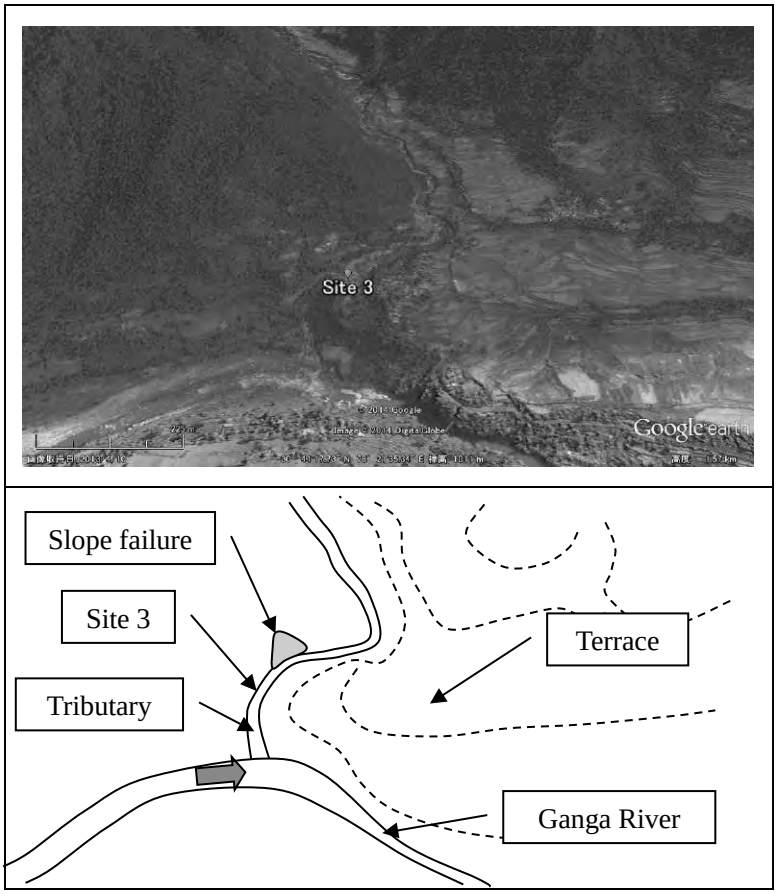


Figure 3.1.6 Site 3 location map

ii) Proposed Countermeasures

Proposed countermeasures are as follows. As shown in the following Table 3.1.3, a series of groundsels is considered to be appropriate for stabilizing the riverbed. At this site, there are many boulders. Therefore, utilization of these materials is appropriate for efficient use of resources and natural landscape.

Table 3.1.3 Proposed Countermeasures

Countermeasure	Methods	Issues regarding construction
Stream prevention works	A series of groundsels Revetment works Bed protection works Hillside works	Utilization of riverbed materials for efficient use of resources and natural landscape

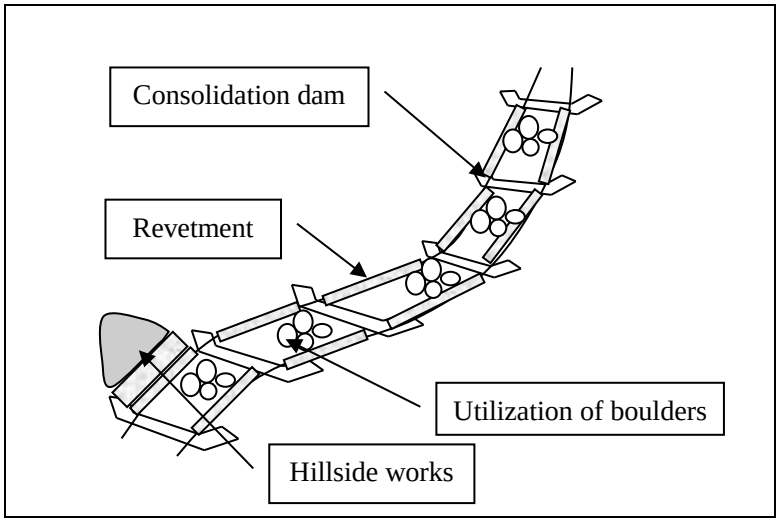
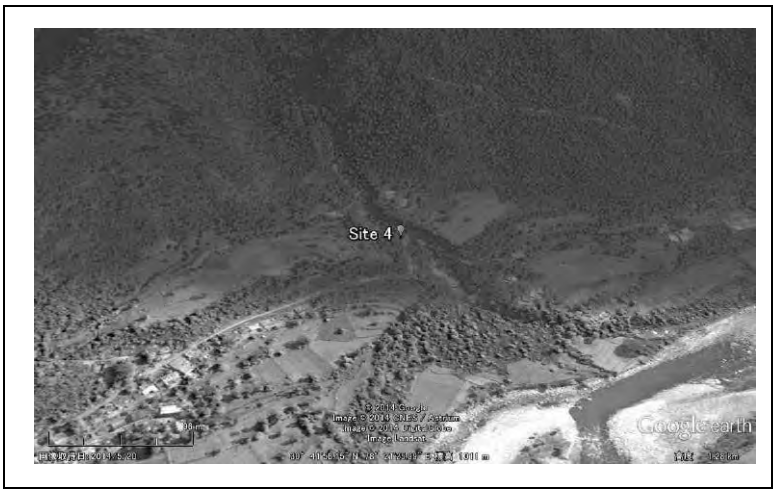


Figure 3.1.7 Proposed Countermeasures

4) Site 4

i) Outline of Site

This site is a mountain stream which is the left tributary of the Ganga River. Boulder deposits are observed on the riverbed. The large boulders are about 1m to 2m in diameter. These boulders are presumed to be material that compose the terraces of this area. Deposit of gravel whose diameter is about 1 cm is observed on the riverbed. The riverbed gradient is about 15 degrees, which is said to cause the occurrence of debris flow. A bridge whose height above the riverbed is about 2.5m is located at the middle part of the river. The bridge is not damaged except a part of its abutment. Therefore, it is presumed that debris flow containing the large boulders has not occurred. Apparent damage of the forest road is not observed.



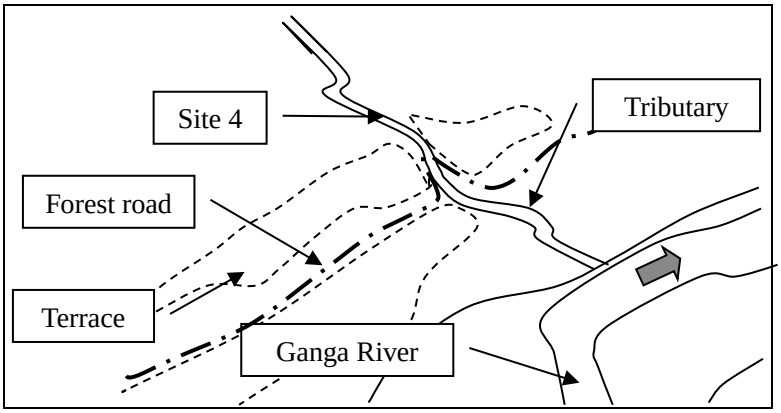


Figure 3.1.8 Site 4 location map

ii) Proposed Countermeasures

Proposed countermeasures are as follows. As shown in the following Table 3.1.4, a series of groundsels is considered to be appropriate for stabilizing the riverbed. At this site, there are many boulders. Therefore, utilization of these materials is appropriate for efficient use of resources and natural landscape.

Table 3.1.4 Proposed Countermeasures

Countermeasure	Methods	Issue regarding construction
Stream prevention works	A series of groundsels Revetment works Bed protection works Retaining wall	Utilization of riverbed materials for efficient use of resources and natural landscape

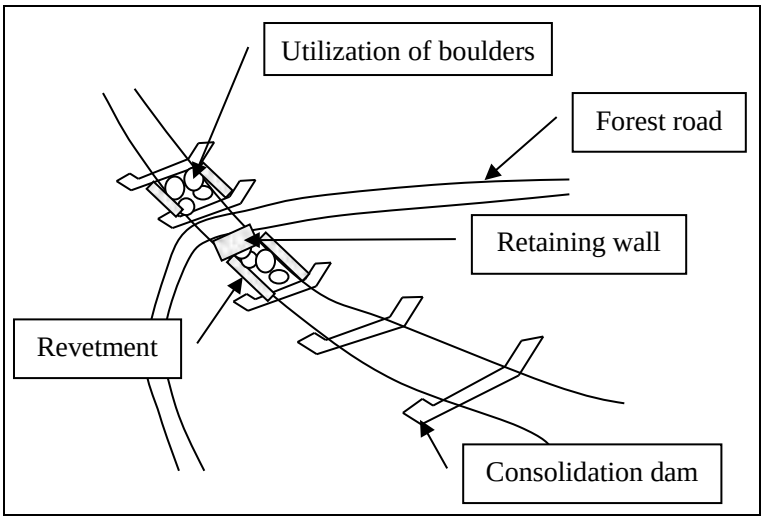


Figure 3.1.9 Proposed Countermeasures

5) Site 5

i) Outline of Site

This site is a cutting slope. A road runs parallel to the river through the lower part of slopes. The slopes are composed of basement rocks, which are sedimentary rocks from the Neo Proterozoic. The basement rocks are cracked rocks. Rockfall deposits are observed at the road side. The slope is located at the undercut slope of the river. Therefore, the toe of the slope is remarkably eroded by the river. The slope figure is a concave slope, so further cutting should be avoided.

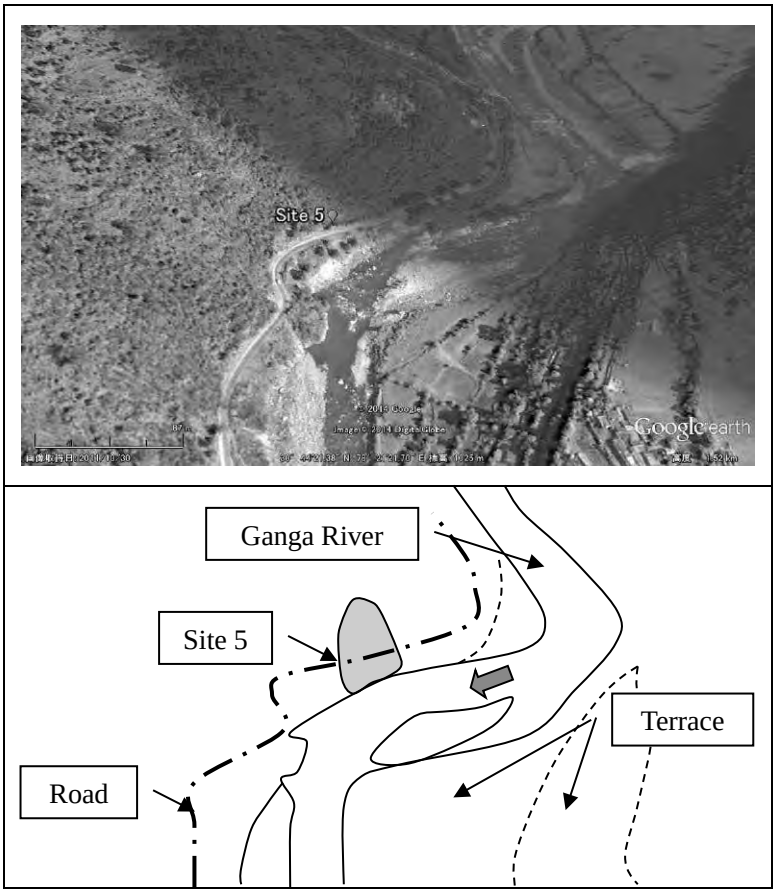


Figure 3.1.10 Site 5 location map

iii) Proposed Countermeasures

Proposed countermeasures are as follows.

As shown in the following Table 3.1.5, there are some issues regarding safety measures and temporary works under construction. Consultation with BRO and the Irrigation Department is required regarding these issues and other countermeasures which BRO and the Irrigation Department should conduct at the same time. In practice, implementation of countermeasures is considered to be difficult.

Table 3.1.5 Proposed Countermeasures

Countermeasure	Methods	Issues regarding construction
Slope protection works	Grating crib works Rock bolt works Sodding works Rockfall prevention wall	Safety measures, Temporary works Consultation with BRO and Irrigation Department. River training (shift of centre line of stream and revetment works)

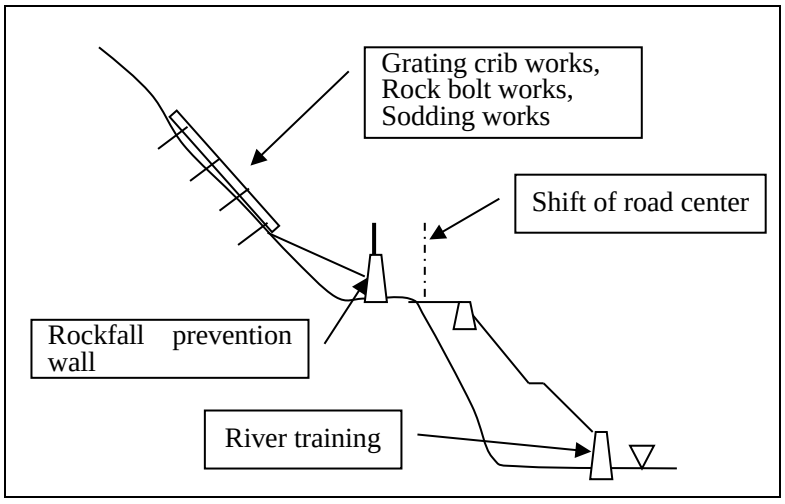
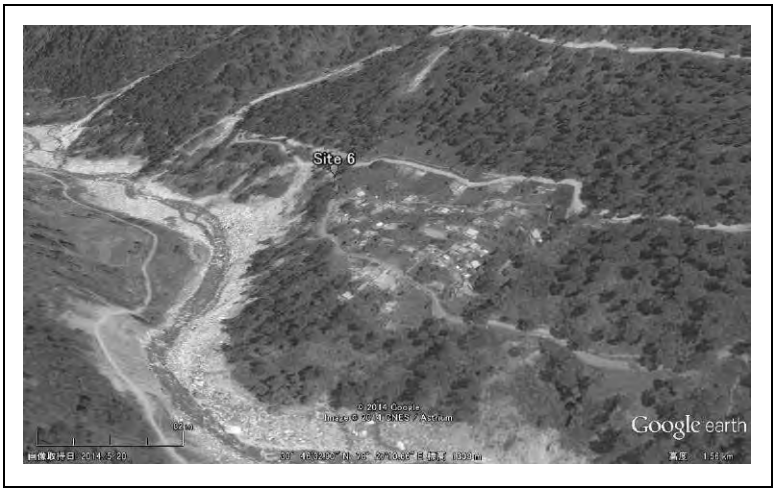


Figure 3.1.11 Proposed Countermeasures

6) Site 6

i) Outline of Site

This site is a large landslide which was formed thousands of years ago. At present, this landslide is in a stable condition as a whole. However, local movements caused by cutting and by river erosion are observed in this site. Generally, large-scale road cutting and banking in the landslide is prone to provoke a local landslide. Therefore, these acts require considerable attention. Also, a toe of the slope is required for river protection.



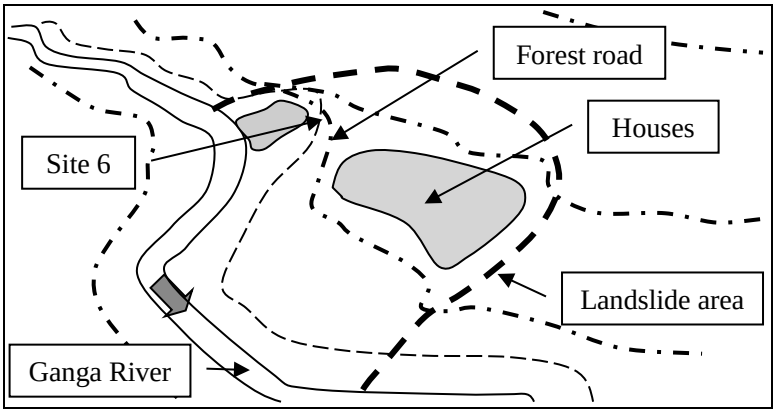


Figure 3.1.12 Site 6 location map

iii) Proposed Countermeasures

Proposed countermeasures are as follows. As shown in the following Table 3.1.6, landslide prevention works are required. Especially, revetment works are required to prevent bank erosion at the undercut slope. Therefore, consultation with the Irrigation Department about river training is required.

Table 3.1.6 Proposed Countermeasures

Countermeasure	Methods	Issues regarding construction
Landslide prevention works	Revetment works Groundwater drainage works (Horizontal boring works) Water channel works Hillside works	Consultation with Irrigation Department River training (Bank protection works)

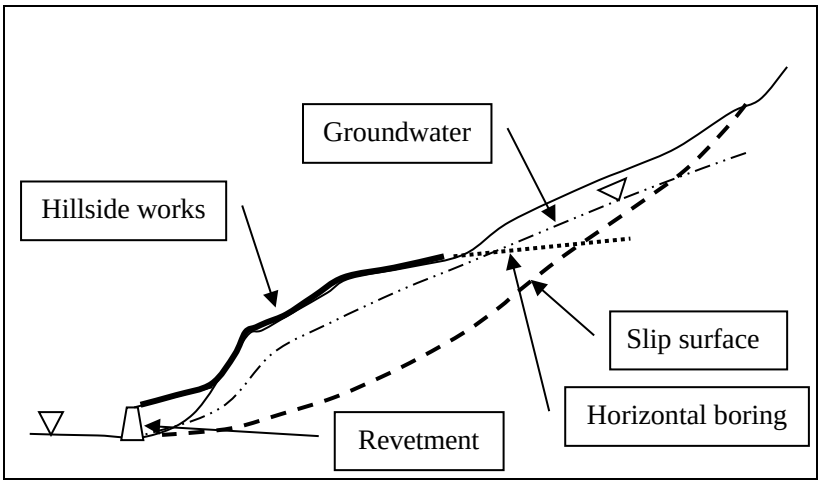


Figure 3.1.13 Proposed Countermeasures

7) Site 7

i) Outline of Site

This site is a mountain stream which is the right tributary of the Ganga River. Countermeasures have already been conducted at this site. The riverbed gradient is about 25 degrees. The countermeasure employed at this site is low check dams which are made of gabion, set on the riverbed without embedment. Therefore, the apron of the dam is deformed by erosion of basement. The width of mesh of gabion is about 15 cm.

ii) Issue of Countermeasures

Depth of embedment of the basement and front apron of dam are inadequate. Gabion structure has inadequate strength against debris flow.

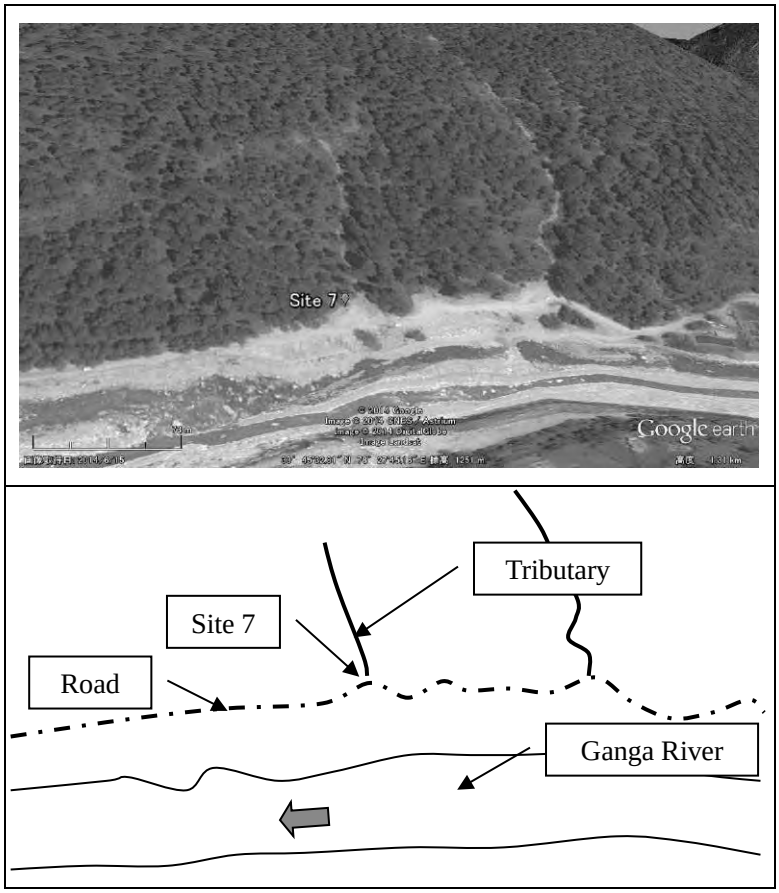


Figure 3.1.14 Site 7 location map

8) Site 8

i) Outline of Site

This site is the right tributary of the Ganga River. The riverbed gradient is 13-20 degrees. The trace of Sediment discharge is observed. Boulder deposits are observed on the riverbed.

Large boulders are about 1m to 1.5m in diameter. These boulders are is presumed to be material that composes the terraces of this area. small landslide caused by bank erosion is observed on the left bank. Houses are located below the road. Channel works are not observed between houses.

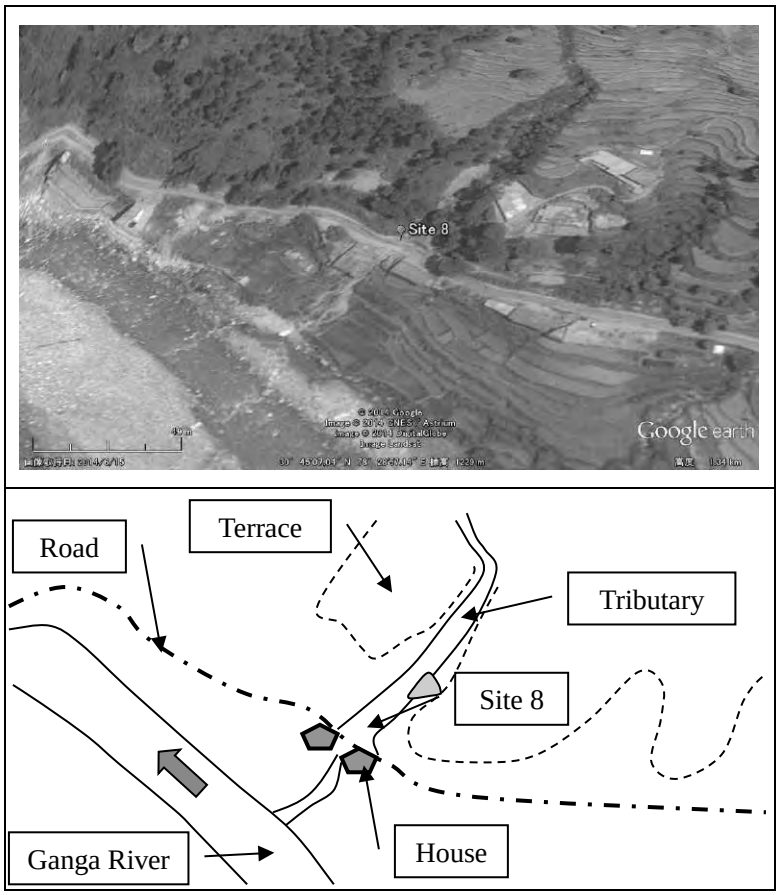


Figure 3.1.15 Site 8 location map

ii) Proposed Countermeasures

Proposed countermeasures are as follows.

As shown in the following Table 3.1.7, a series of groundsels is considered to be appropriate for stabilizing the riverbed. Additionally, channel works are required below the road. As issues regarding construction, consultation with BRO about how to address flow of the river water on the road is required.

Table 3.1.7 Proposed Countermeasures

Countermeasure	Methods	Issues regarding construction
Stream prevention works	A series of groundsels Revetment works Channel works Hillside works	Consultation with BRO about how to address flow of river water on the road

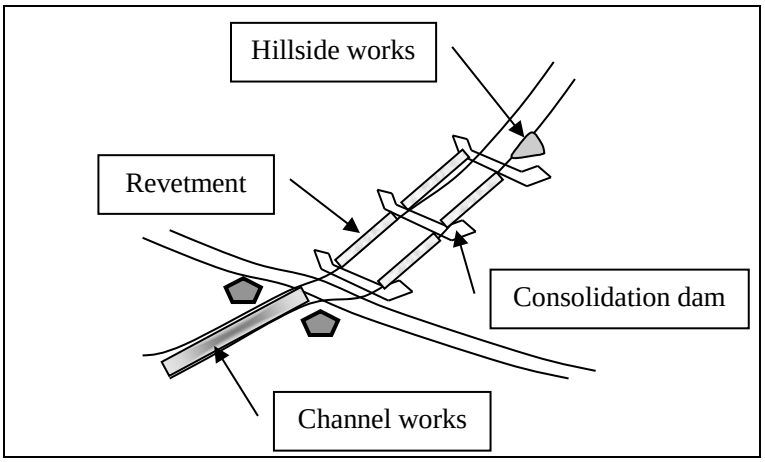


Figure 3.1.16 Proposed Countermeasures

9) Site 9

i) Outline of Site

This site is a mountain stream which is the left tributary of the Ganga River. This village was damaged by debris flow in 2013. The damage was inflicted on houses, livestock, and rice field. There was a small stream before the disaster. The width of the small river was about 2m. Debris flow flowed out through the small stream in the village. The width of the end part of the debris flow deposit is about 40m. The riverbed gradient is 9-13 degrees. Deposits of large boulder whose diameter is about 0.5m to 1.5m are observed around the houses. Deposit of cobble whose diameter is about 10 cm- 20 cm is observed at the end part of the alluvial fan. A lot of boulders are observed on the riverbed of the upper part of the forest road.

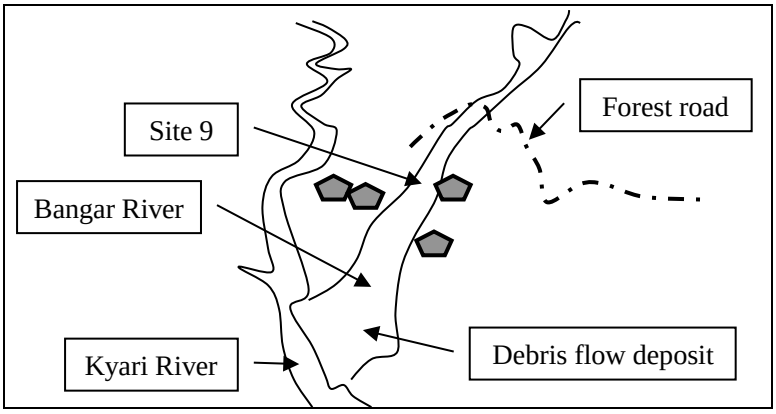


Figure 3.1.17 Site 9 location map

ii) Proposed Countermeasures

The proposed countermeasures are as follows. As shown in the following Table 3.1.8, a series of groundsels is considered to be appropriate for stabilizing the riverbed. A steel slit dam is considered to be useful for sudden debris flow. At this site, there are many boulders. Therefore, utilization of these materials is appropriate for efficient use of resources and natural landscape.

Table 3.1.8 Proposed Countermeasures

Countermeasure	Methods	Issue regarding construction
Stream prevention works	A series of groundsels Revetment works Bed protection works Steel slit dam Hillside works	Utilization of riverbed materials for efficient use of resources and natural landscape
Restoration works	Remove of deposit and restoration of cultivated land	Reduction of cultivated land associated with channel works

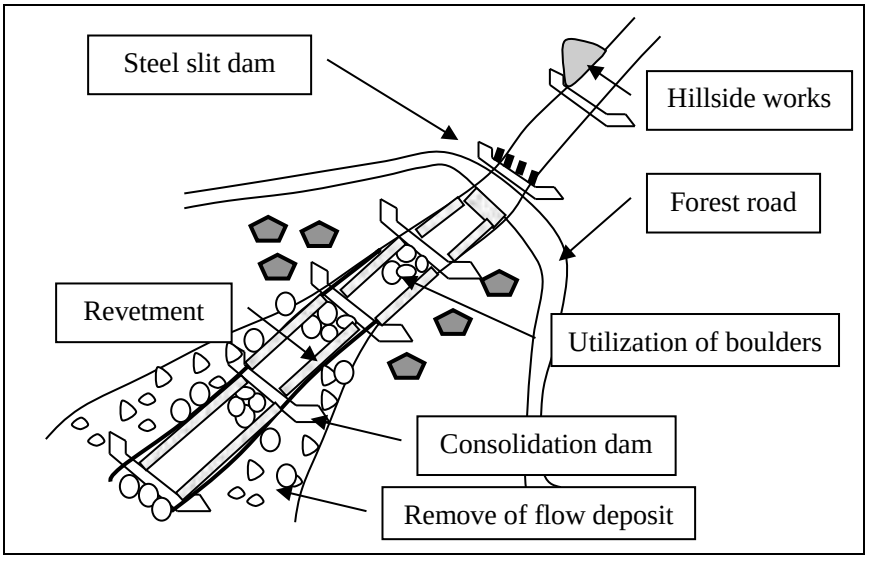


Figure 3.1.18 Proposed Countermeasures

10) Examples of the recommendable Sites and techniques

Table 3.1.9 Examples of the recommendable Sites and technique

Site No	Type	Countermeasure	Related Organisation	
1	Cutting Slope	Slope protection works	UKFD, BRO	
2	Cutting Slope	Slope protection works	UKFD, BRO	
3	Mountain stream	Stream prevention works	UKFD	○
4	Mountain stream	Stream prevention works	UKFD	○
5	Cutting Slope	Slope protection works	UKFD, BRO, ID	
6	Landslide	Landslide prevention works	UKFD, ID	
8	Mountain stream	Stream prevention works	UKFD, BRO	○
9	Mountain stream	Stream prevention works	UKFD	◎

3.2.2 Rishikesh and Rudraprayag

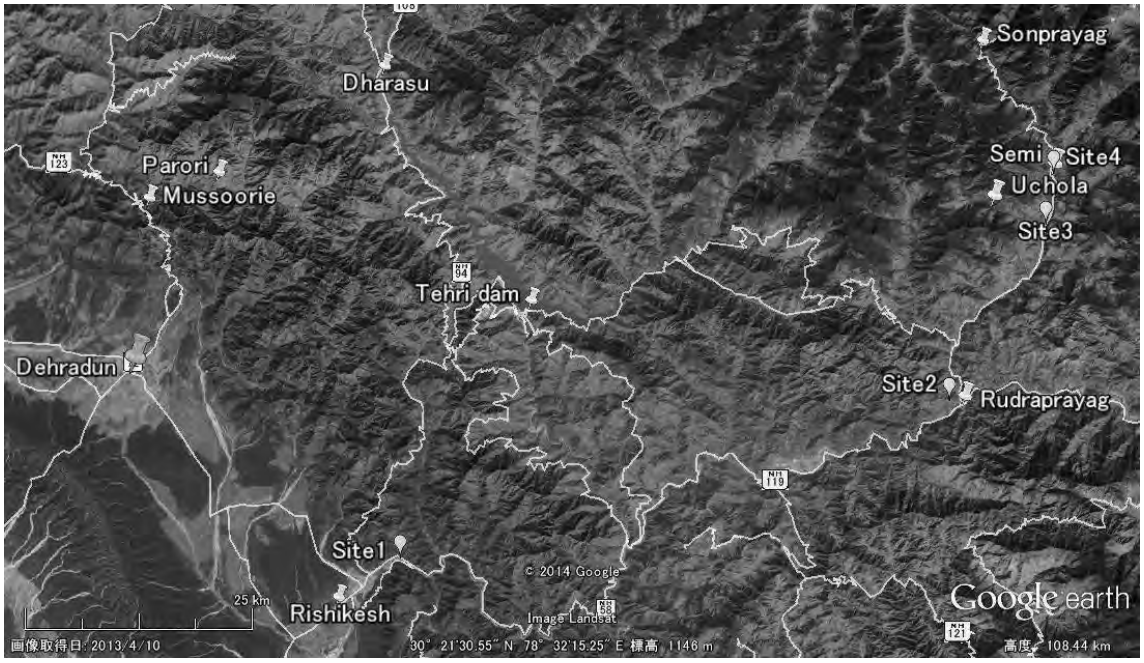


Figure 3.2.1 Reconnaissance map

1) Site 1

i) Outline of Site

This site is a small valley along a road. The slope failure that occurred in the hillside this year is a factor of debris flow. The materials of debris flow consist of pebble size. The slopes are

composed of talus. The talus is distributed mainly in the downward area of the slope. The slopes are composed of basement rocks, which are sedimentary rock of the Paleoproterozoic. Rockfall and talus deposit are observed at the road side.

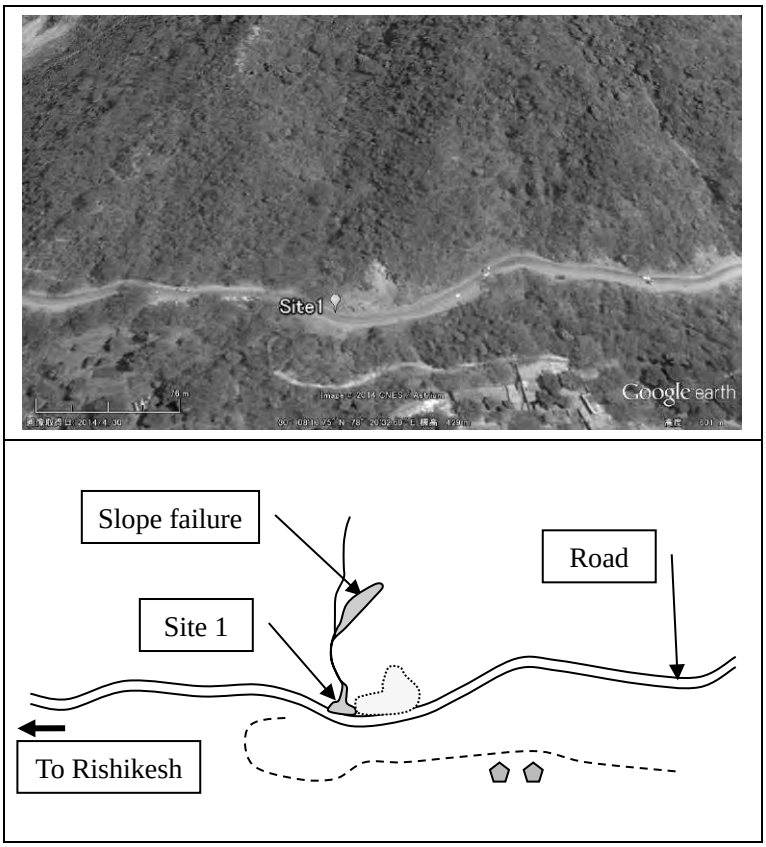


Figure 3.2.2 Site 1 location map

ii) Proposed Countermeasures

Proposed countermeasures are as follows. As shown in the following Table 3.2.1, there are some issues regarding safety measures and temporary works under construction. The foundation works should be decided after investigation of slope condition (geology, weathering).

Table 3.2.1 Proposed Countermeasures

Countermeasure	Methods	Issues regarding construction
Slope protection works Torrent works	Foundation works Sodding works Groundsels	Safety measures, Temporary works

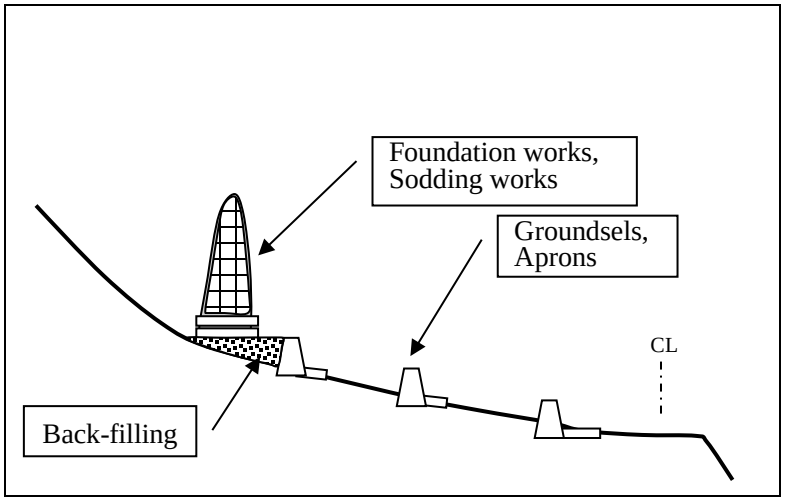


Figure 3.2.3 Proposed Countermeasures

2) Site 2

i) Outline of Site

This site features slope failure. A road runs in the upper part of a hillside. The road which is located at the site of slope failure was washed out. The slopes are composed of basement rocks, which are sedimentary rock of the Paleoproterozoic. The basement rocks are remarkably weathered. Therefore, the weathered rocks change to sediment-like. The relative elevation of slope failure is about 200m. The slope failure sediment is distributed in the downward area of the slope. The slope gradient of the upper slope is 40 degrees to 50 degrees.

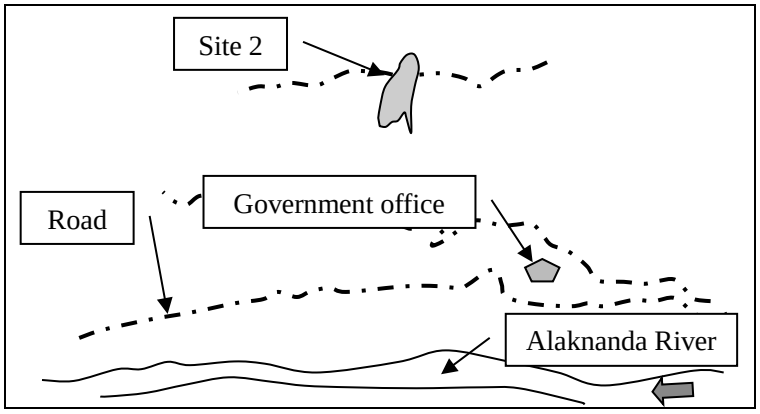


Figure 3.2.4 Site 2 location map

ii) Proposed Countermeasures

Proposed countermeasures are as follows. As shown in the following Table 3.2.2, there are some issues regarding safety measures and temporary works under construction. Especially, sufficient consideration has to be given to the procedure of construction.

Table 3.2.2 Proposed Countermeasures

Countermeasure	Methods	Issues regarding construction
Slope protection works	Earth retaining wall Banking Grating crib works Rock bolt works Sodding works Foundation works L-type retaining wall	Safety measure, Temporary works Procedure of construction

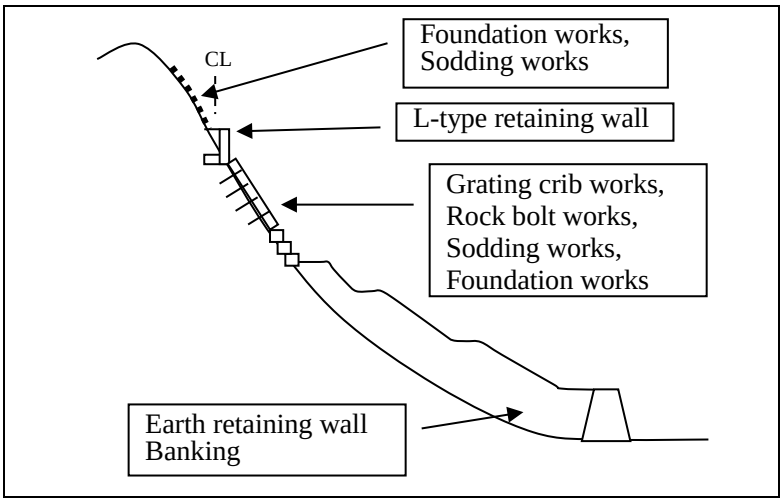


Figure 3.2.5 Proposed Countermeasures

3) Site 3

i) Outline of site

This site is a small valley along a road. Slope failure involving large boulders occurred in the hillside. The slope gradient is 35 degrees to 45 degrees. Large boulders are deposited on the slope. The boulders are about 1.5m to 3.0m in diameter. The slopes are composed of basement rocks which are sedimentary rock of the Paleoproterozoic. The basement rock is composed of the weathered rocks, which are cracked.

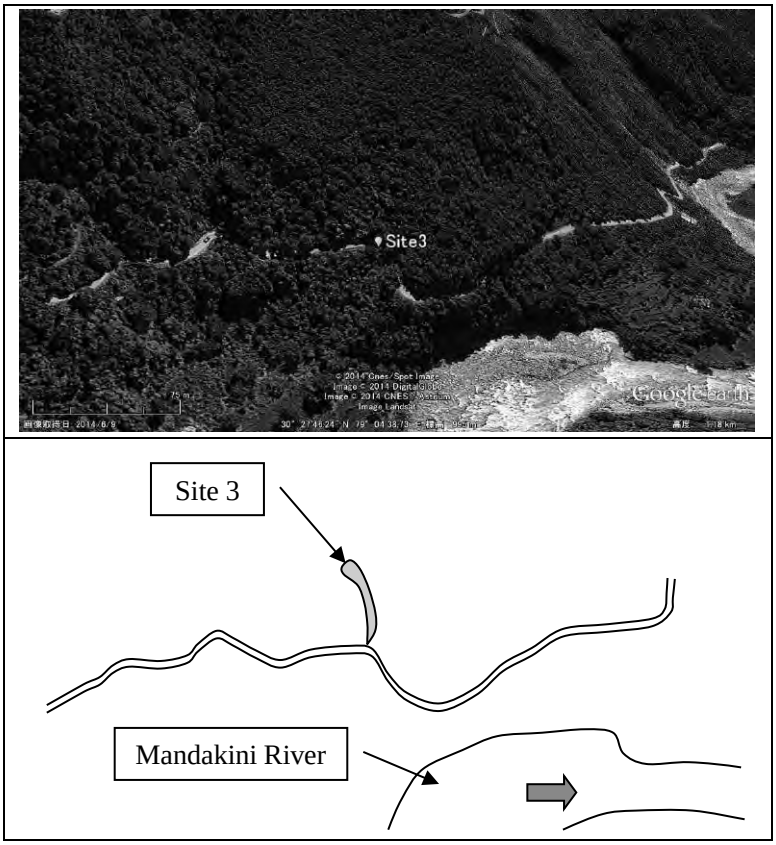


Figure 3.2.6 Site 3 location map

ii) Proposed Countermeasures

Proposed countermeasures are as follows. As shown in the following Table 3.2.3, a slit dam is desired to be constructed in the exit of the valley. The toe of the deposit is desired to be covered by back-filling. Steel slit is considered to be affected at the rockfall.

Table 3.2.3 Proposed Countermeasures

Countermeasure	Methods	Issues regarding construction
Stream prevention works	Slit dam with back-filling (Slit part is steel)	Sufficient consideration should be given to selection of dam site

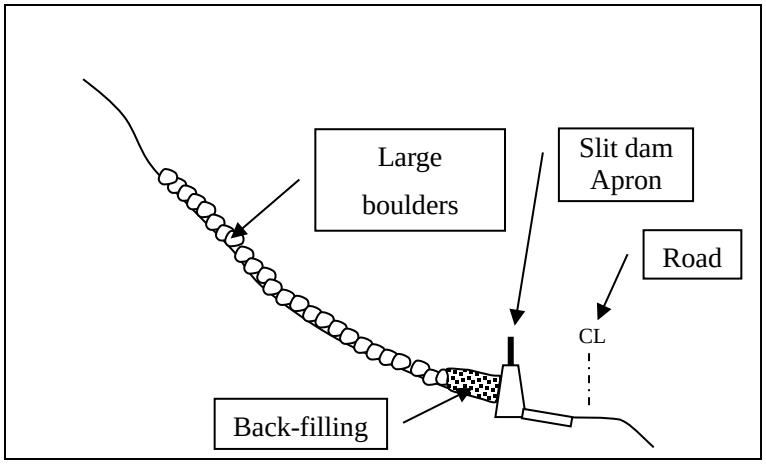


Figure 3.2.7 Proposed Countermeasures

4) Site 4

i) Outline of Site

This site is a large landslide whose scale is about 500m wide and 500m long. Cracks on the road and inclination of houses are observed. Therefore, this landslide is too active. The depth of landslide is presumed to be about 50m empirically. The factor causing activity of landslide is presumed to be high groundwater. River erosion is also thought to account for the landslide activity. Therefore, groundwater drainage works should be conducted immediately. Monitoring of landslide activity and alarm/alert systems for village people are required as soon as possible.

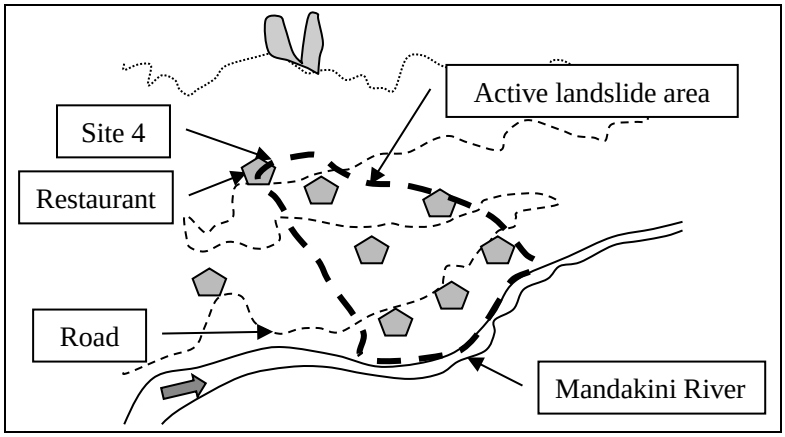


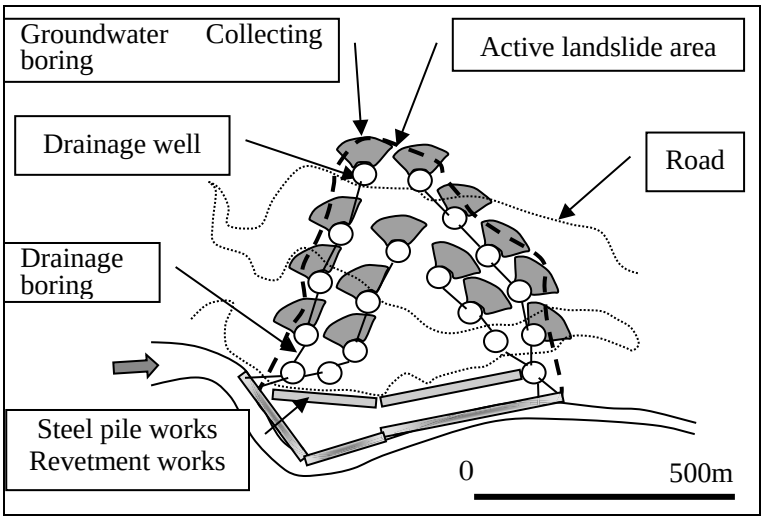
Figure 3.2.8 Site 4 location map (Semi village)

ii) Proposed Countermeasures

Proposed countermeasures are as follows. As shown in the following Table 3.2.4, the main countermeasure is the groundwater drainage works. Actually, a series of landslide countermeasures should be conducted after sufficient investigation (geology by boring, monitoring of activity by measurement, and analysis of landslide mechanism).

Table 3.2.4 Proposed Countermeasures

Countermeasure	Methods	Issues regarding construction
Landslide prevention works River training	Drainage well Groundwater Collecting boring Drainage boring Steel pile works Revetment works	Countermeasures should be conducted with monitoring



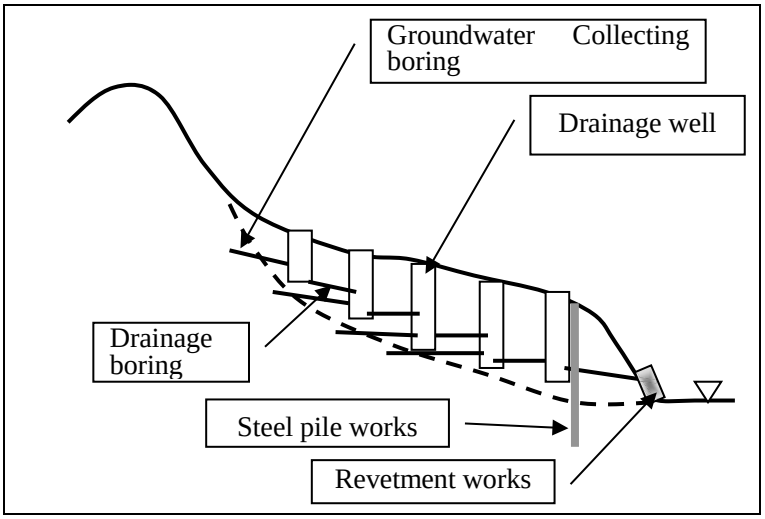


Figure 3.2.9 Proposed Countermeasures

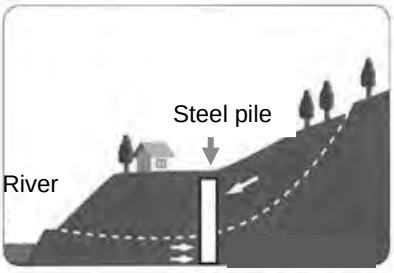
5) Recommendation Sites

Table 3.2.5 Recommendation Sites

Site No	Type	Countermeasures	Related organisations	
1	Mountain stream	Slope protection works Torrent works	FD	◎
2	Slope failure	Slope protection works	FD, PWD	◎
3	Mountain stream	Stream prevention works	FD	○
4	Landslide	Landslide prevention works River training	FD, BRO, ID	

Table 3.2.6 Examples of Japanese Disaster Prevention Techniques

		
Drainage well works and Groundwater Collection boring		



Steel pile works

3.3 Condition of state government

The Disaster Management Department, Government of Uttarakhand is the primary agency responsible for disaster management in the state. Under the aegis of this Department, the Disaster Mitigation and Management Centre (DMMC) was also established. Subsequently, in accordance with the Disaster Management Act, 2005 the Uttarakhand State Disaster Management Authority (USDMA) at the state level and District Disaster Management Authorities at the district level were constituted. A State Disaster Response Force (SDRF) has also been formed.

Although the SDMA is responsible for planning and enforcement of the disaster management plans in the state and also for supervising and monitoring the DDMA, in Uttarakhand SDMA does not have a functional structure. Consequently, it is the DMMC which is presently guiding the DDMAs in Uttarakhand.

3.3.1 Uttarakhand State Disaster Management Authority (USDMA)

Under the Disaster Management Act, 2005 of the Government of India, the Uttarakhand State Disaster Management Authority (SDMA) was constituted in the year 2007. This authority is headed by the Chief Minister of Uttarakhand and has eight additional members. The SDMA is responsible for preparing the policies and plans for disaster management in the state in accordance with the guidelines of the National Disaster Management Authority (NDMA).

Prescribed functions of SDMA include:

- making the state disaster management policy;
- approving the state plan and coordinating its implementation
- approving the disaster management plans prepared by various state departments;
- recommending provision of funds for mitigation and preparedness measures; reviewing the development plans of the different departments of the state and ensuring that prevention and mitigation measures are integrated therein;
- reviewing the measures being taken for mitigation, capacity building, and preparedness by the departments of the government of the state and issue such guidelines as may be necessary.
-

Table 3.3.1: Composition of State Disaster Management Authority in Uttarakhand

S. No	Portfolio	Status
1	Chief Minister	Chairperson
2	Minister, Disaster Management	Vice Chairperson
3	Minister, Health and Family Welfare	Member
4	Minister, Irrigation and Drinking Water	Member
5	Minister, Transport	Member
6	Minister, Rural Development	Member
7	Chief Secretary	Member and CEO
8	Principal Secretary, Finance	Member
9	Principal Secretary, Disaster Management	Member

State Executive Committee (SEC)

In January 2008 a State Executive Committee (SEC) was also formed under the SDMA. The purpose of the SEC is to advise and assist the SDMA on matters of disaster management.

Table 3.3.2: Composition of State Executive Committee

S. No	Portfolio	Status
1	Chief Secretary	Chairperson
2	Addl. Chief Secretary	Member
3	Secretary, Disaster Management	Member
4	Secretary, Finance	Member
5	Secretary, Medical and Health	Member

Although the USDMA was formulated in the year 2007, to date it does not have a functional structure, and hence it is unable to conduct the responsibilities assigned. However, a functional structure for USDMA has been proposed in order to make it fully functional.

3.3.2 State Disaster Response Force (SDRF)

In accordance with the Disaster Management Act, 2005 a State Disaster Response Force (SDRF) has also been formed in Uttarakhand. The mandate of SDRF is to ensure specialized response during disaster incidents. The state government has raised two companies of SDFF, and 310 people are currently deployed in SDRF. Although SDFR is supposed to function under USDMA, since USDMA is not functional, currently the SDRF is working directly under the Disaster Management Department of Uttarakhand.

3.3.3 District Disaster Management Authority

At the district level, District Disaster Management Authorities (DDMAs) have been formed in all 13 districts of Uttarakhand. Each DDMA is headed by the DM of the respective district. It acts as the district planning, coordinating, and implementing body for disaster management in the district in accordance with the guidelines of the SDMA. The following are the major functions of DDMA as prescribed in the Disaster Management Act, 2005:

a) Prepare a disaster management plan including a district response plan;
b) Coordinate and monitor the implementation of the National Policy, State Policy, National Plan, State Plan, and District Plan;
c) Identify area vulnerable to disasters are taken suitable measures for prevention of disaster
d) Monitor the implementation of disaster management plans prepared by the Departments of the Government at the district level;
e) Organise and coordinate specialised training programmes for officials and district and sub-district level as well as for communities

Table 3.3.3: Composition of District Disaster Management Authority

S. No	Portfolio	Status
1	District Magistrate	Chairperson
2	Elected chairperson of local body	Co-Chairperson
3	CEO of DDMA	Member
4	Superintendent of Police	Member
5	Chief Medical Officer	Member
6	Two other district level officers nominated by State Government	Member

Although the DDMAs are supposed to function under the USDMA but currently the DDMAs are being guided by the DMMC.

3.3.4 Disaster Mitigation and Management Centre (DMMC)

Disaster Mitigation and Management Centre (DMMC) is an autonomous institute under aegis of Department of Disaster Management, Government of Uttarakhand.

DMMC is envisioned to function as an apex centre in the field of disaster mitigation and management in the state. DMMC's role is to formulate appropriate policies for the state and to strengthen the capacities of various relevant organisations in Uttarakhand to cope up all aspects of disaster management.

Administrative setup

The DMMC has a Governing body headed by the Chief Secretary of Uttarakhand, along with Principal Secretaries of Finance, Home, Revenue, Disaster Management, and Irrigation as members. Director of Uttarakhand Academy of Administration and Relief Commissioner of Uttarakhand are also members of the Governing body of DMMC. The Executive Director of DMMC is the Secretary of this Committee.

Table 3.3.4: Members of Governing body of DMMC

1	Chief Secretary, Govt. of Uttarakhand	President
2	Principal Secretary, Finance, Govt. of Uttarakhand	Member
3	Principal Secretary, Home, Govt. of Uttarakhand	Member
4	Principal Secretary, Revenue, Govt. of Uttarakhand	Member
5	Principal Secretary, Disaster Management, Govt. of Uttarakhand	Member
6	Principal Secretary, Irrigation, Govt. of Uttarakhand	Member
7	Director, Uttarakhand Academy of Administration, Nainital	Member
8	Relief Commissioner, Govt. of Uttarakhand	Member
9	Executive Director, Disaster Mitigation & Management Centre	Secretary/Member

The Governing body is the apex decision-making body of DMMC and is assisted by the Executive Committee, which makes the day-to-day decisions regarding the functioning of the

DMMC.

Table 3.3.5: Members of Executive Committee of DMMC

1	Principal Secretary/Secretary Disaster Management, Govt. of Uttarakhand	President
2	Director, Uttarakhand Academy of Administration, Nainital	Member
3	Executive Director, Disaster Mitigation & Management Centre	Secretary/Member
4	Additional Secretary Finance, Govt. of Uttarakhand	Member

Role of DMMC

It is expected to function as a think tank for the Department of Disaster Management and look into, and incorporate prevention, preparedness, and mitigation aspects for all projects in order to protect the community and the environment from natural disasters.

DMMC has been given the responsibility to take up training for communities and community-based Organisations and through them develop a strong regional knowledge base towards disaster policy, prevention mechanisms, mitigation measures, preparedness, and response plans.

DMMC is also expected to provide advance information about likely disasters through the latest technologies available for this purpose.

DMMC's mandate is also to provide consultancy services to all levels of government, international agencies, and non-government Organisations in the field of disaster management and mitigation.

3.3.5 Other Government Agencies

1) Public Works Department (PWD)

PWD is responsible for construction, maintenance, and planning of roads, bridges, and government buildings. Broadly the role of PWD includes survey, design, construction, maintenance, and improvement of roads and bridges as well as design construction and maintenance of public buildings in the state.

Administratively, PWD has 72 divisions covering the entire state of Uttarakhand, and each division is headed by an Executive Engineer along with other supporting officers and staff. At a

higher level there are 14 circles, headed by Superintending Engineers, and there are several divisions within each circle.

There are two Zonal Chief Engineers (Level 2) – one each for the Kumaon and Garhwal regions – as well as a Chief Engineer for National Highway and one Chief Engineer for Asian Development Bank (ADB) funded Uttarakhand State Road Investment Programme (USRIP) and Information Technology (IT) infrastructure within PWD. The PWD is headed by a Chief Engineer Headquarters (Level 1) who is responsible for monitoring and managing the establishment of the Department, while there is also a Chief Engineer Planning (Level 1).

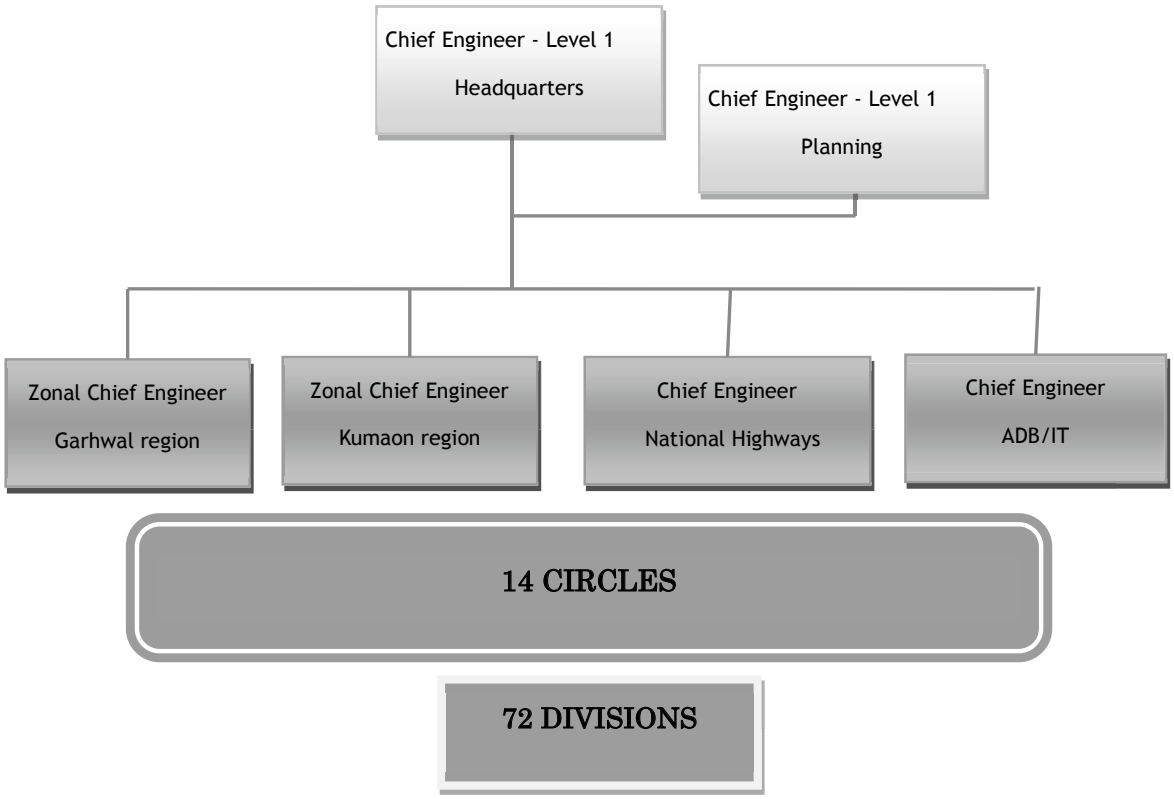


Figure.3.3.1 Administrative setup of PWD in Uttarakhand

Uttarakhand has close to 1,400 km of National Highway, about 3,800 km of state highway, and a large length of Major District roads and Other District roads, and PWD is responsible for construction and maintenance of a majority of these roads. In addition to the roads there are more than 1,000 major bridges in the state, a majority of which are maintained by PWD. Uttarakhand has a border with China; therefore, important border roads are maintained by the Border Road Organisation.

Table 3.3.6 State-Wide Road Category and Length

S. No	Category of Road	Year 2000	Year 2012
		Road Length (in km)	Road Length (in km)
1	National Highway	526.00	1,375.76 km
2	State Highway	1,235.04	3,788.20 km
3	Major District Road	1,364.15	3,289.74 km
4	Other District Road	4,583.01	2,945.04 km
5	Village Road	7,446.23	14,543.89 km
6	Light Vehicle Road	315.77	858.22 km
7	Bridle Roads/Border Tracks	3,970.00	3,729.83 km

Source: Public Works Department, Uttarakhand

In case of any natural disaster the role of PWD is of extreme importance, as the organisation has to ensure that road connectivity is speedily restored. PWD has to repair the damaged roads and bridges and also clear the debris from roads that may be blocked due to landslides. Moreover, PWD also has the responsibility for repairing/reconstructing government buildings that may have been damaged after a natural disaster.

2) Border Roads Organisation

Border Roads Organisation, popularly known as BRO, is a civil engineering institution responsible to provide civil (construction) engineering cover to the Armed Forces of India, during war and peace. It was established in 1960 as an unarmed and non-combatant force integral to the Armed Forces with personnel from both the Army and the General Reserve Engineer Force (GREF).

The Border Roads Organisation (BRO) is an establishment of the Government of India. The organisation is under the Ministry of Defence for specific deployment but is placed under Ministry of Highways for general administration.

The purpose of BRO is to construct and maintain those highways and roads that connect the country's borders and which are important from the standpoint of defence. BRO is currently operating in 21 states and in the union territory of Andaman and Nicobar. BRO is constructing approximately 15,000 km of roads in the country. In addition, more than 20,000 km of roads, including nearly 4,000 km of National Highways, are under maintenance by BRO. The annual budget of the BRO in 2010-11 was Rs.56,200 million.

Over the years, BRO has transformed from a normal road construction agency to a multi-faceted, multi-dimensional, transnational, modern construction agency instrumental in constructing

tunnels in addition to long-span bridges, airfields, National Highways etc. The BRO has diversified from road construction to construction of permanent bridges, airfields, major building projects, and related civil works in the field of tunnelling and hydro-electric projects.

In the high altitude regions, an important role of BRO is winter and summer snow clearance. This is carried out to keep roads open for traffic during winter as well as to open up those roads closed in winter, before the summer sets in. There are approximately 64 roads of a total length of 2,618 km in Uttarakhand, J&K, Himachal Pradesh, Sikkim and Arunachal Pradesh, where the BRO carries out snow clearance. This is essential, not only to ensure the provision of logistic support for the Army, but also to provide road connectivity to the local population in these far flung areas. BRO also works for clearance of roads during disasters.
In Uttarakhand, some of the National Highways and Major State Highways are constructed and maintained by BRO. It has been maintaining about 800 km of National Highway and 1,000 km of other roads in Uttarakhand[1].

The BRO has an important role in case of disaster, as it is responsible for restoring road connectivity by repairing/reconstructing the roads damaged by landslides, floods, and earthquakes. Moreover, in times of disaster BRO also engages in rescue and relief operations.

3.4 Condition of UKFD

3.4.1 Structure

The organisational structure of the UKFD from Head Office to Forest Division Office is shown in Figure 3.4.1. In addition, the organisation structure of UKFD from Forest Division Office to the cutting edge level; i.e., the Beat level, is shown in Figure 3.4.2, taking the organisational structure of Mussoorie Forest Division as an example.

There are no well-defined sections relating to engineering and designing in any of the offices from the headquarters (HQ) to the Territorial CCF office.

The state forest Administration is headed by the Principal Chief Conservator of Forest (PCCF) – Head of Forestry Force (HoFF). PCCF- HoFF is assisted by three other PFFCs; i.e., PCCF- Van Panchayat (Community Forestry), PCCF – Projects, and PCCF- Wildlife.

Under PCCF- HoFF there are total of 14 functions: Planning & Finance Management, Nodal Officer Land Survey Directorate, Administration, Working Plan, Publicity & Extension, Vigilance & Law Cell, Forest Training Academy, Livelihood & NTFP, Environment, Biodiversity Conservation, Development & Research, Eco-Tourism, Monitoring &

[1] The Times of India 29th November 2013, "PWD to take over 50% national highways in Uttarakhand from BRO."

Evaluation & Audit, and Human Resource Development (HRD). An Addl. Principal Chief Conservator of Forest (APCCF) or a Chief Conservator of Forest (CCF) is responsible for each of the above functions.

Importantly, there is no function for erosion control works for sediment disaster management in the HQs.

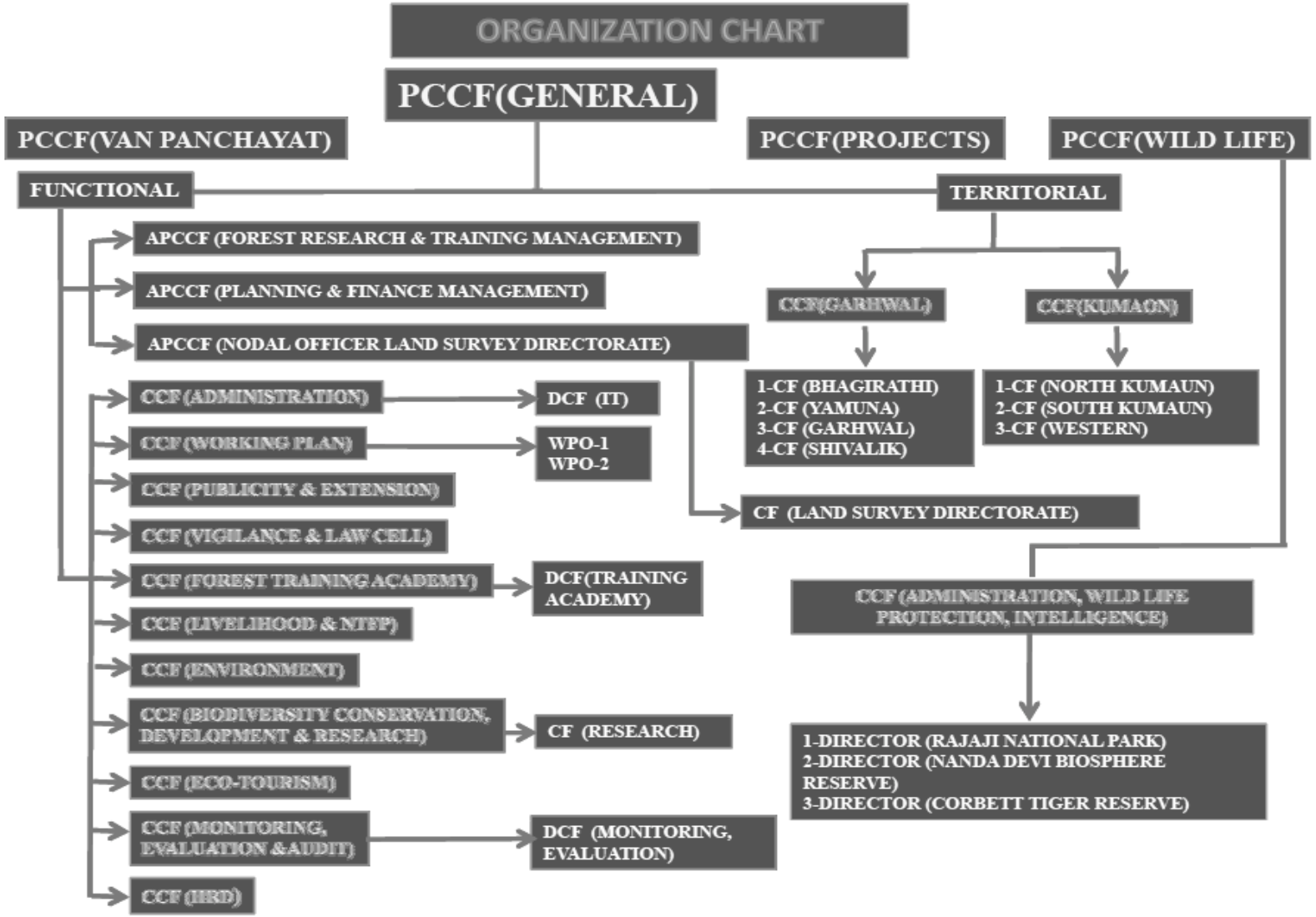


Figure 3.4.1 Organisation Chart of the UKFD down to Divisional Forest Office

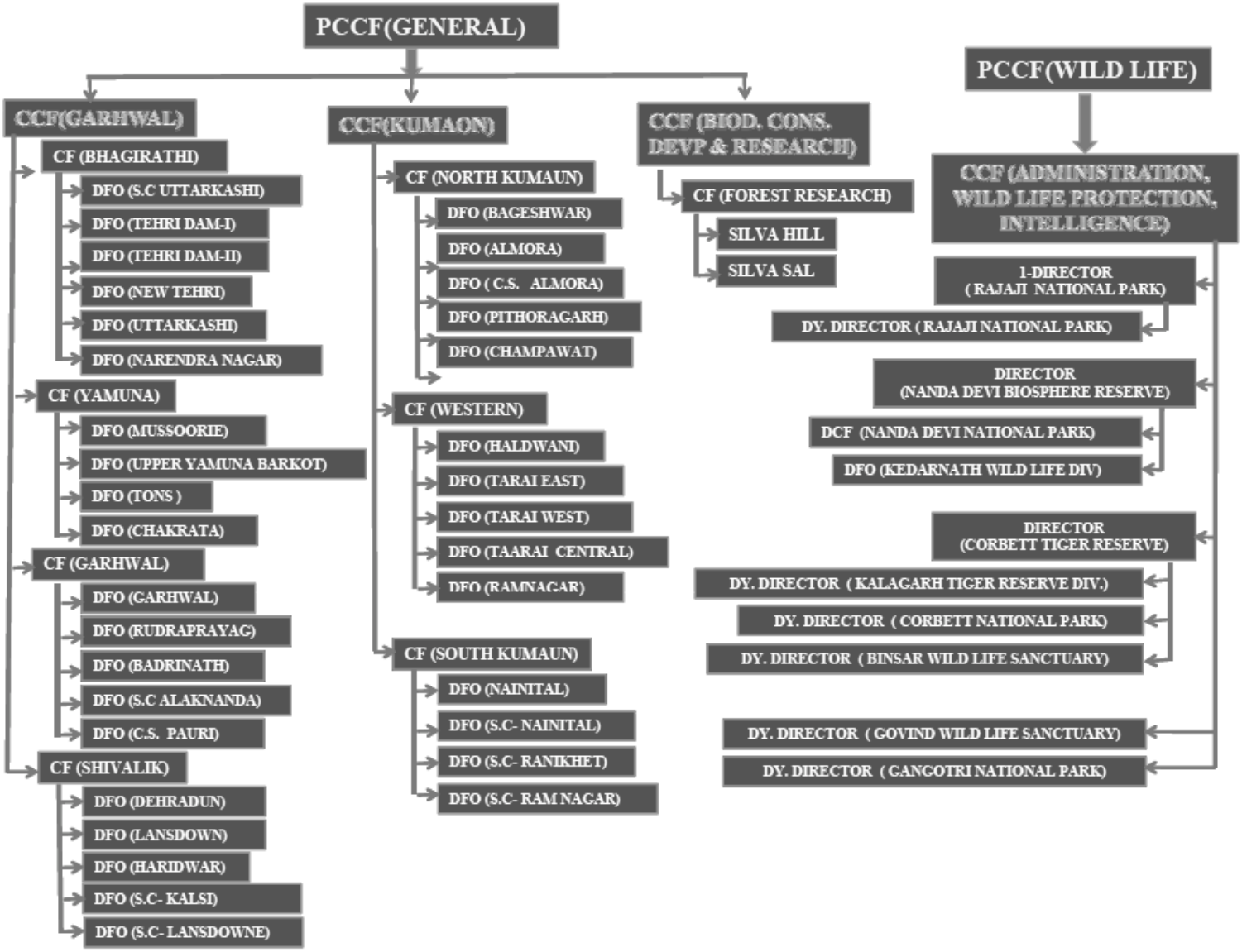


Figure3.4.1 Organisation Chart of the UKFD down to Divisional Forest Office (part

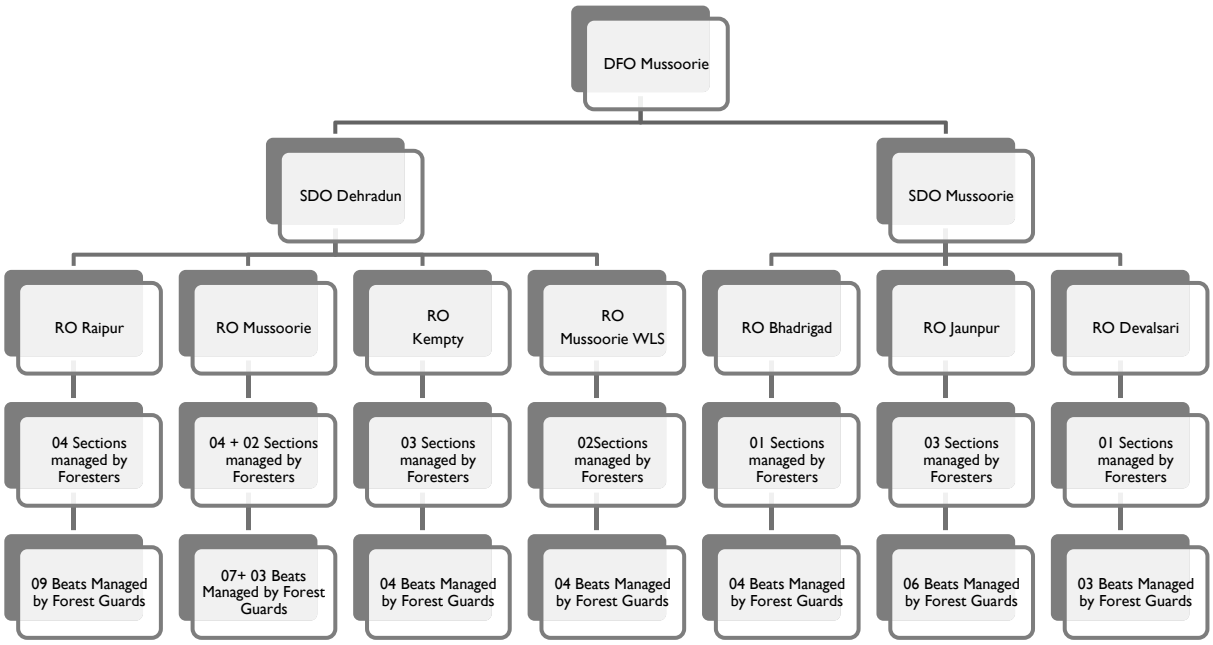


Figure3.4.2 Organisation Chart of Mussoorie Forest Division

Meanwhile, the territorial units of UKFD are instituted as mentioned in the following Figure 3.4.3 in order from higher body to lower body:

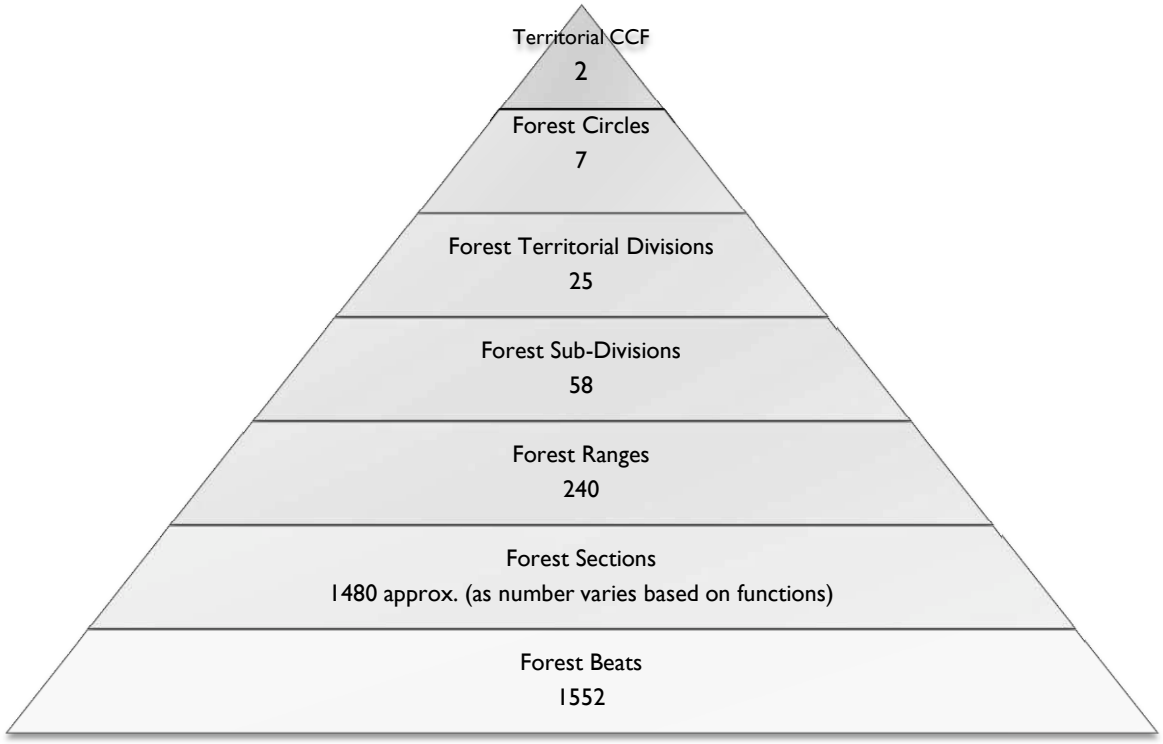


Figure 3.4.3 Various levels of administration under the Territorial CCFs

The UKFD is unique in a sense that it has two types of divisions; i.e., territorial and non-territorial. These divisions operate in the same areas of territorial divisions (overlapping).

The non-territorial divisions operate in the areas outside the Reserved Forests, while the territorial divisions manage mainly Reserved Forests, although some territorial divisions also work on Van Panchayat and Civil & Soyam forests.

Table 3.4.1 Number of divisions by type of division

Type of Division	**Total number**
Territorial Divisions	25 including two territorial soil conservation divisions
Wildlife Divisions	8
Soil Conservation Divisions	5 excluding two territorial soil conservation divisions
Civil Soyam Divisions	2
Others	4
Total	**44**

The locations of Forest Circles & Divisions (Territorial Divisions) are shown in Figure 3.4.4.

The hierarchy of the personnel of UKFD is shown in Figure 3.4.5. As mentioned in the figure, there are positions which require status of Indian Forest Service, Provincial Forest Service (same as State Forest Service, PFS in case of UKFD), and others.

In addition, the minimum qualification levels required for:

Recruitment to Indian Forest Service is Science or engineering graduate,

Recruitment to State Forest Service is Science or engineering graduate,

Recruitment as Forest Ranger is Science or engineering graduate, and

Recruitment as Forest Guard is High School (proposal is for Intermediate in Science)

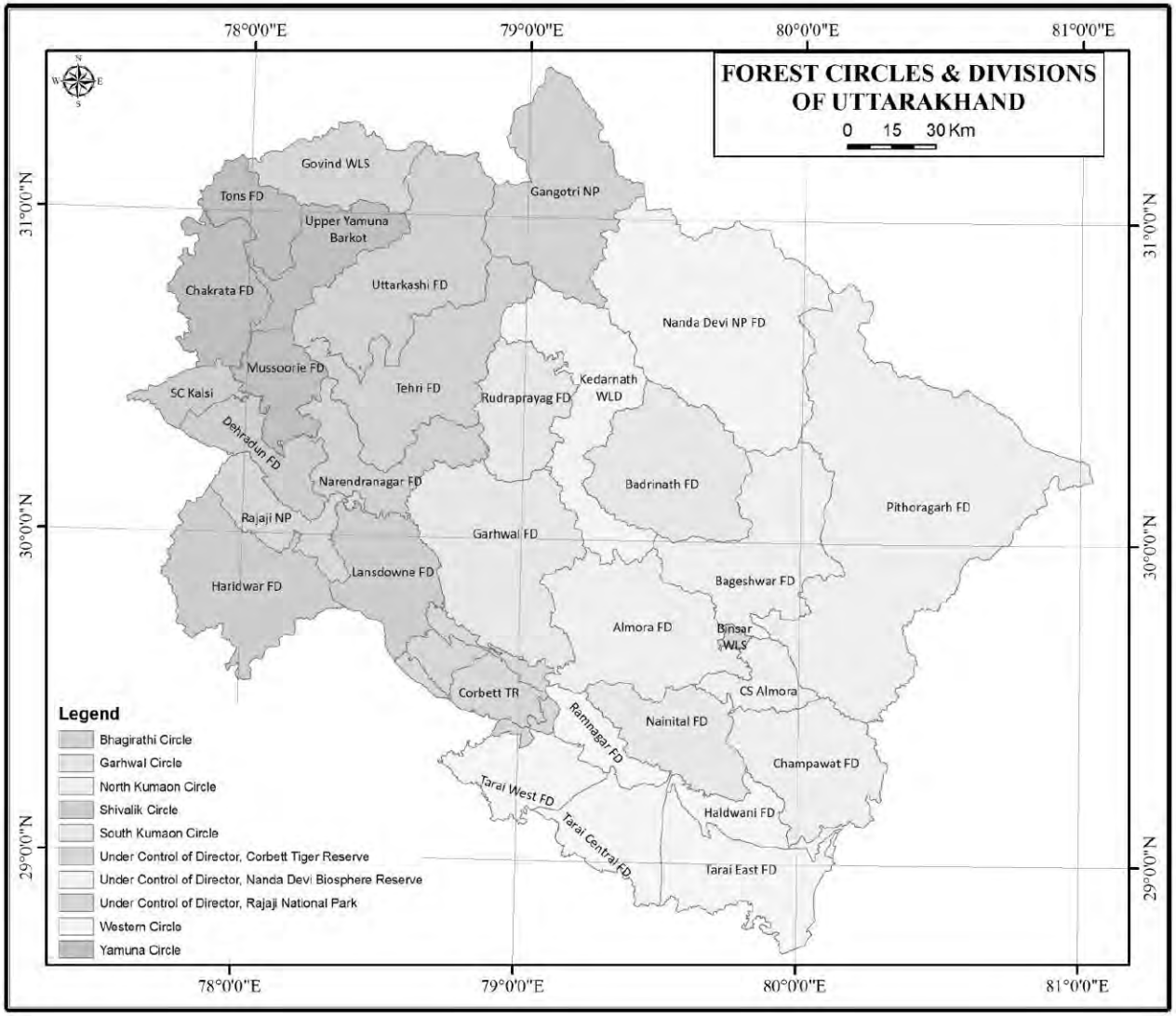


Figure 3.4.4 Location map of Forest Circles & Divisions

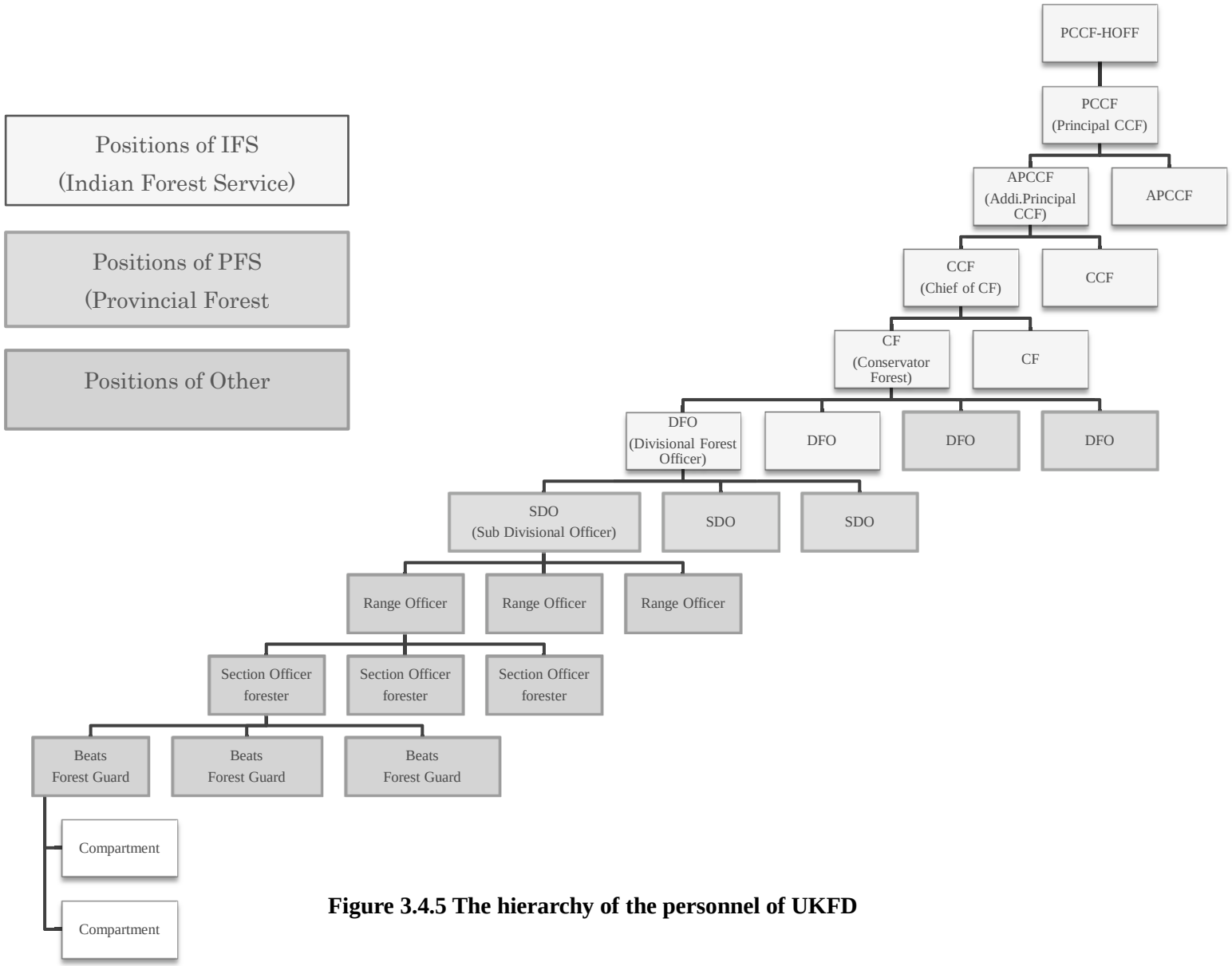


Figure 3.4.5 The hierarchy of the personnel of UKFD

In addition to the above charts, each level of office has some kinds of technical staff and administrative/office/supporting staff. The staff composition in each office is shown in the following tables.

Table 3.4.2 Technical staff and administrative/office/supporting staff in the HQs

S.No	Post	Number of persons	Technical persons	Technical persons for soil and water conservation
1	Personal Officer	1		
2	Senior Administrative Officer	2		
3	Chief Assistant	4		
4	Senior Assistant	5		
5	Junior Assistant	4		
6	Personal Assistant (Grade 1)	1		
7	Personal Assistant (Grade 2)	3		
8	Joint Director Statistics	1	✓	
9	Deputy Director Statistics	1	✓	
10	Statistical Officer	1	✓	
11	Additional Statistical Officer	1	✓	
12	Finance Controller	1		
13	Senior Finance Officer	1		
14	Assistant Accounts Officer	1		
15	Accountant	1		
16	Assistant Accountant	4		
17	Junior Accounts Clerk	1		
18	Senior Auditor	2		
19	Auditor	4		
20	Driver	8		

Note: These are sanctioned posts, and some of these posts might be vacant

Table 3.4.3 technical staff and administrative/office/supporting staff in the Territorial CCF Office

S. No.	Post	Number of persons	Technical persons	Technical persons for soil and water conservation
1	Senior Administrative Officer	1		
2	Administrative Officer	2		
3	Chief Assistant	4		
4	Senior Assistant	4		
5	Junior Assistant	4		
6	Statistical Officer	1	✓	
7	Personal Assistant	1		
8	Stenographer Grade 1	1		
9	Accountant	1		
10	Assistant Accountant	4		
11	Driver	2		

Note: These are sanctioned posts, and some of these posts might be vacant

Table 3.4.4 Technical staff and administrative/office/supporting staff in the Forest Circle Office

S. No.	Post	Number of persons	Technical persons	Technical persons for soil and water conservation
1	Senior Administrative Officer	1		
2	Administrative Officer	1		
3	Chief Assistant	3		
4	Senior Assistant	4		
5	Junior Assistant	3		
6	Additional Statistical Officer	1	✓	
7	Stenographer Grade 1	1		
8	Accountant	1		
9	Assistant Accountant	4		
10	Chief Draftsman	1	✓	✓
11	Surveyor	1	✓	✓
12	Driver	2		

Note: These are sanctioned posts, and some of these posts might be vacant

Table 3.4.5 Technical staff and administrative/office/supporting staff in the Forest Division Office

S. No.	Post	Number of persons	Technical persons	Technical persons for soil and water conservation
1	Senior Administrative Officer	1		
2	Administrative Officer/General	1		
3	Establishment-I, II	2		
4	Accounts Plan/ Non Plan/ Others	1		
5	Revenue/ Legal	1		
6	Record	1		
7	Store	1		
8	Statistics	1	✓	
9	Survey/ Draftsman	1	✓	✓
10	Camp	1		

Note: These are sanctioned posts, and some of these posts might be vacant

As shown in the tables, there are a few technical staff members up to the circle level. However, there are no technical staff members concerning soil and water conservation in the HQs and the Territorial CCF Office. In addition, even though there are technical staff members concerning soil and water conservation in the Forest Circle Office and the Forest Division Office, they do not concentrate solely on the soil and water conservation works and have other works such as plantation and nursery. Moreover, their work is mainly to confirm the plans submitted from lower offices.

3.4.2 Role and responsibility of each office in the UKFD

Regarding the roles and responsibility of HQ in Dehradun, Funds are released by Additional PCCF (Planning & Finance Management) as per the demand, which is proportionate to the budget made available by the government under the appropriate head of account.

At the Territorial CCF level, the Territorial CCF issues sanctions for the works as per delegation of financial and administrative powers and carries out inspections during field visits.

At the Forest Circle Office, the Territorial CF issues sanctions for the works as per delegation of financial and administrative powers and carries out inspections during field visits.

At the Divisional level, the Divisional Forest Officer (DFO) issues sanctions for the works as per delegation of financial and administrative powers. The field staff of the Division are directly involved in the plantation and soil conservation works to be done in the reserve forest areas. The work estimate (Physical and Financial) is prepared by the concerned Dy. Ranger/Forest guard/ Forester and is sent to the Range office, after which it reaches the DFO office after being duly checked and scrutinized by the concerned Sub Division office. The Draughtsman in the DFO's office checks the estimates, and the Accounts Section gets the financial sanction issued by the DFO or DFO's office applies for administrative and financial sanction from higher authority. The proposal after getting approval / sanctions from the CF office is implemented in the field by the field staff. The DFO carries out inspections of the works during field visits.

It needs to be clearly understood that UKFD does not have a separate unit or arrangement to take care of sediment disaster mitigation in forest areas. As has been clearly brought out in the concept note, that Forest Department only carries out minor soil conservation works, including vegetative measures, as per site requirement.

IT Cell

The IT cell was established in 2006. The cell has digitized GIS maps for about 80% of the state of Uttarakhand. In a few months, the IT cell will be called the "INFORMATION TECHNOLOGY AND GEOMATICS CENTER cell (IT&GC). Therefore, this report mentions the information about IT&GC as below.

Figure 3.4.6 IT&GC office

The Project Related Aims & Objectives

1. To bring upe comprehensive changes in the functioning of the Forest Department through ICT & Geomatics.

2. To build and enhance ICT and Geomatic skill capabilities of forest officials.

3. To make Geomatics integral to the decision-making process at all levels in the Department.

4. To enhance the utility of the existing database and generate further reliable data for the different wings of the Forest Department.

5. To keep the database on-line by converting it into Geo Database through intranet and Web GIS and to assign privileges for creating, updating, and exchanging data at different levels throughout the state.

6. To Integrate MIS with GIS through development of the Forest Management Information System (FMIS).

Structure & the Project Related Roles

IT&GC is composed of the IT Branch, Geometrics Branch, and Help & Support Branch.
The IT Branch has Project related roles mainly as below.

- Management of Information System: Making the database related to forest management, human resources, and wildlife management.
- Fire Monitoring: GIS data uploaded on website on near real time basis during the fire season.

The Geometrics Branch has the Project related roles mainly as below.

- Working Plan Mapping: Digitization and Analysis
- Bugyal Mapping: Digitization and classification of Bugyals as per the methodology. Tree line has been delineated for Uttarakhand state.
- Land Transfer: Land transfer related maps are being generated in GIS format.
- Mapping for Division: As and when required, depending upon the project
- Digitization & Analysis: Forest Density, Area, Slope, and all other information related to divisions are analysed and digitized as and when required.
- Disaster Management Studies: Forest Fire Monitoring, Forest Fire associated damage assessment, Landslide Mapping

The Help&Support Branch has the Project related roles mainly as below.

- Training & Workshops: All the customized training programmes and workshops for officers and officials of all the divisions and offices
- Catchment Area Treatment Plan: Monitoring using GIS & RS technologies

3.4.3 Capacity for mountain disaster management

1) Planning

In UKFD, planning for treatment of erosion prone/landslide prone areas and also for treatment of rivers and streams is done at various levels within each Division.

(1) *At the Division level:* At the Division level, planning for soil and moisture conservation works may be of two types:

a) Planned works; i.e., those which are of routine nature and are already prescribed in the Working Plan (WP).

b) Unplanned works: those which have to be taken up due to any exigency such as a landslide or flood and which are not prescribed in the WP document.

For Planned Works: A Working Plan for each Division is prepared for a period of 10 years. Under the Working plan forest blocks, compartments/sub-compartments which are prone to erosion/landslide are identified and are listed. The size of area within each block/compartment that requires treatment is also estimated.

In the Working plan itself, yearly Coupes (comprising a number of compartments identified above) or Micro watersheds may be prescribed. Each Coupe/Micro watershed can comprise several compartments, from one or more Ranges; the area to be treated and the nature of soil and moisture conservation works to be taken up are prescribed for each of the compartments included in the Coupe.

Based on the Working Plan, the Division prepares an Annual Plan of Operation in the year before the work has to be carried out. In this plan the prescriptions given in the Working Plan are mentioned and a Provisional Estimate of costs (Budget) is also indicated.

The allocation of funds to a Division is done by the APCCF Finance, who does the allocation based on the funds received from the State government. In case the State gives less funds, the Provisional Estimate submitted by the Division may be reduced.

For unplanned works: In case of landslides, floods, or other natural exigencies, the FD may have to plan on an ad-hoc basis. For this the Division prepares a “Schedule of New Demand” which proposes the work to the done and the estimated budget for the works. This may or may not be sanctioned.

(2) *At the Range level*: The Range officer is responsible for planning the soil and moisture conservation works to be taken up within the Range. Before starting the treatment works the Range officer conducts a site survey wherein the area to be treated is determined. Suitable engineering works are identified and the nature and number of engineering works is determined. Nature of vegetative measures is determined and the area for plantation and also the suitable species for plantation are considered.

However, in many cases the Range Officer may not be able to himself take up planning activities and may assign the Deputy Range Officer or Forester to take up the planning.

Based on the Site Specific Plan, the estimated cost of the activity is included in the Provisional Estimate submitted by the Division.

A similar process is adopted for unplanned works also.
(3) Perceived weaknesses of the planning process

(i) One of the biggest weakness of the Planning process for soil and moisture conservation work is that although the Division may make a Site Specific Plan for any site and request for funds from the Department, there is uncertainty that a) Whether the Division would get any funds for carrying out the activity; b) it might get less funds and those funds may not be sufficient for efficiently carrying out the soil and moisture conservation activities; c) the funds may not be received in time and hence the area may become further degraded.

(ii) Although the Range Officer is supposed to prepare the Site Specific Plan, in many cases the Range Officer may delegate this responsibility to the Deputy Ranger or Forester who may not have sufficient capacities to prepare the plan.

(iii) In case of difficult sites the Range Officer may lack sufficient technical knowledge to prepare the treatment plan. This is particularly common in the case of those officers who may have earlier been working in a Wildlife Division or any other functional unit and may not have sufficient experience of soil and moisture conservation.

(iv) A generic weakness seems to be that in many cases the FD staff at the Range Level and below may have long years of service and may require refresher training related to planning, designing and implementing soil and moisture conservation works.

2) Designing

Designing of civil works for soil and moisture conservation is usually carried out by the Deputy Ranger or Forester, although in some cases the Range Officer may be involved. However, in case of large or important projects the Sub-Divisional Officer or DFO may also be involved in designing.

The FD officials – including the DFO, SDO, the Range Officer, forester and forest guard - receive formal training for making engineering structures for:

- Soil and moisture conservation
- Protection of banks of rivers and streams.

However, in case of officers promoted through the ranks (i.e., Forest Guard being promoted to Forester or so on) it has been observed that the capacity to design engineering structures is rather weak.

The following are some of the engineering structures for soil and moisture conservation and river training which the FD officials are having experience of constructing:

1. Bunding
2. Bench terrace
3. Contour trenching
4. Bench terrace with stone wall
5. Retaining wall
6. Wattling
7. Geojute
8. Crib structure
9. Diversion channels
10. Gunny bag structure

Moreover, in all soil and moisture conservation works carried out by the FD, vegetative measures form and important part. In fact the working plans and manuals of FD prescribe a number of bushes and tree species that can be used for vegetative treatment.

Perceived weaknesses of the designing process

(i) The senior officials; i.e., the DFO and the SDO are generally not involved in the designing process unless it is a large and important project. Although the Range Officer is usually responsible for designing, due to the large area under his jurisdiction and also due to remote location of certain sites, the Range Officer may also delegate responsibility to his subordinates.

(ii) The Deputy Ranger/Forester and the Forest Guard can design one or two check dams but then do not have sufficient capacities to take up difficult sites or sites where a series of structures have to be systematically constructed.

(iii) FD officials generally adopt low cost designs owing to budgetary constraints. It has been observed that in several cases – particularly in case of heavily degraded sites with excessive soil erosion – such low cost designs may not be useful. Moreover, it is also felt that perhaps the FD officials are generally trained in adopting low cost designs.

3) Implementation

The construction of the soil and moisture conservation works is generally taken up by the Deputy Ranger or the Forester who is generally made in-charge of the site to be treated.

The site supervision is done by the Range Officer or even by the SDO in case of large and important sites.

Perceived weaknesses of the implementation process

i. The Range Officer is not involved in the implementation process on a day-to-day basis and it is the Deputy Ranger/Forester who actually carries out the work. Low technical skills of the Deputy Ranger/Forester can result in reducing the quality of the work.
ii. The FD officials face budgetary constraints and this may affect the quality of engineering works.
iii. The wage rates offered by the FD are lower than the market rates. For example, generally the FD offers wages of around Rs. 150 per day but the market wage rate is between Rs. 200 to Rs. 300 per day. This means that skilled labour force may not be willing to work in the construction works of FD and it is generally semi-skilled or unskilled labour which is willing to work at these wage rates.
iv. Another aspect is the monitoring and quality control of engineering works. Since the Range Officer has to manage a large area and in some cases the locations are very remote, it is felt that efficient monitoring and supervision might be an issue.
v. In case of remotely located and/or small sites, even the Forest Guard might be made in-charge of the implementation. This might adversely impact the quality of work.

IT cell

- Human resources

The table below shows the information about the staff.

Table 3.4.6 IT&GC staff information

Role	Number	Academic background	Work content
DCF	1	Master in Forestry	Management of IT&GC
GIS Analyst	2	Master in Computer Applications (1) Master in Information Technology (1)	GIS Mapping, Remote Sensing study and providing the training of GIS and GPS for field staff
Forester	2	Bachelor in Electric Technology (1) Master in Commerce (1)	Website Maintenance Network system, h/w and s/w solutions
Forest guard	3	Master in Commerce (1) High school graduate (2)	Land transfer, GIS and letter typing Network system, h/w and s/w solutions

Especially to make maps for The Project, it is assumed that the 2 GIS analysts can support. They have about 10 years of related practical experience and have received various types of training about GIS, GPS, and Remote Sensing from IIRS.

-Equipment and Facility

The list of equipment and facilities of IT&GC is as below.

Table 3.4.7 IT&GC Equipment & Facility information

Type	Note
PC	6 to 7
Software	1 ArcGIS license
Server	They don't have. They use an external HDD for data storage.
GPS	They don't have. They use one of the district offices when they collect the coordinate data and Ground Truth
Printer	1 Black & White.
Plotter	They don't have. When they want to print, they outsource to the shops
Internet	They have WAN and LAN
Satellite image	They collect the image of LISS-Ⅲ, Ⅳ, and CARTOSAT (more details shown in Table 4.4.x) from the National Remote Sensing Centre (NRSC) and LANDSAT from USGS.
Basic map	They collect maps from the following organisations. Forest Cover Map: Forest Survey of India (FSI) Topographic Map: Survey of India (SOI) DEM: **U.S. Geological Survey (**USGS) Free downloaded

Table 3.4.8 Using satellite image information

Name	LISS-Ⅲ	LISS-Ⅳ	CartoSat-2B
Type	Multispectral	Optical	Panchromatic
Swath	141 km	23.9 km, 70km	9.6 km
Resolution	23.5 m	5.8 m	1m
Price/Scene	7,000INR 14,000INR (orthorectified)	12,000INR 24,000INR (orthorectified)	8,000INR 12,000INR (orthorectified)
Owner	National Remote Sensing Centre (NRSC)		

-The Existing Project Related Mapping

As mentioned in the Geomatics Branch's roles, 2 GIS analysts of IT&GC are making landslide maps (Shown in Figure3.4.5). The maps were basically made from LANDSAT images and ERDAS classification tool and crosschecked with Google Earth images. The main purposes of maps are to estimate the forest loss and cost for restoration. However, they haven't yet analysed the maps referencing DEM data, geology maps, and other related maps. Therefore, in the project, it is necessary for the JICA expert to supervise them to make more practical maps.

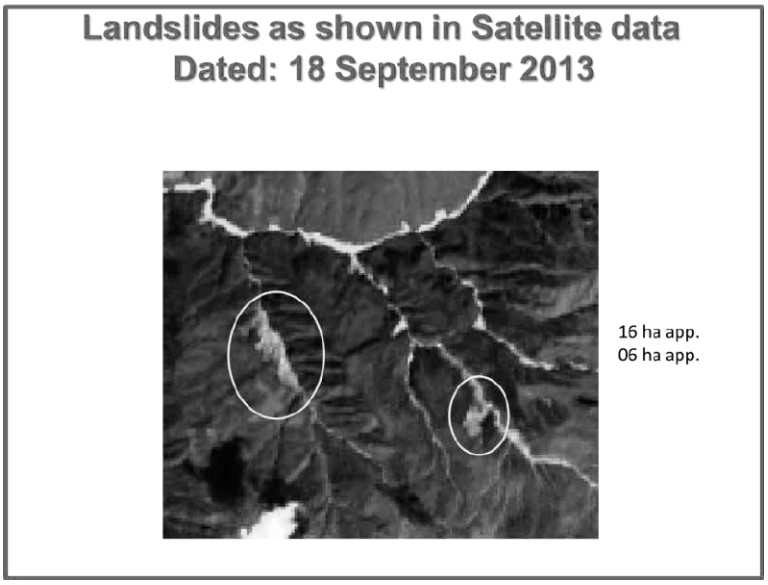


Figure3.4.7 A part of landslide analysed map

Source: Landslide Areas of Uttarakhand 2013 an Estimate of Forest Loss

-Requirements for work improvement

Through the interview with the IT&GC staff members, the following problems were mentioned for supporting the Project.

Regarding the human resources, at present, 2 GIS analysts are contracted temporarily. Therefore, it is difficult to ensure the capacity sufficiently and continuously. To resolve this problem, they need an additional 2 or 3 permanent staff members. Moreover 2 programmers are necessary to establish a database which is function for connecting the various kinds of data. In addition, they need exposure visits to improve the staff's capacity.

Regarding the equipment and facilities, they need a server for data storage and a plotter for map printing. Moreover, they don't have sufficient budget to procure satellite images.

From the above, the Project is expected to support some aspects of the above issues for ideal cooperation.

3.4.4 Needs for mountain disaster mitigation

The UKFD staff is currently treating small areas which require limited engineering works and where the traditional engineering works such as gully plugging, check dams, and gabion structures may be required or in case of rivers and streams, spur may be required. However, such technology and such structures may not be suitable to treat large areas and difficult slopes.

It is therefore felt that new techniques must be transferred to the UKFD personnel for treating large and difficult sites. In fact, technology transfer of effective slope stabilization techniques of Japan for treating various kinds of slopes in different geological conditions is required for UKFD personnel.

Secondly, once the new technology is imparted to UKFD personnel there is a need to transfer the skills for managing and maintaining the technology; e.g., if a slope is treated using new technology and by building new structures, UKFD personnel also need to be trained in the skills required for management and maintenance of such structures.

Thirdly, a number of staff members of UKFD have 15-20 years of service or even more. Such personnel may have received technical training for soil and moisture conservation at the time of joining the UKFD and they might now require refresher courses and training for updating their knowledge.

3.5 Training System

(1) Indira Gandhi National Forest Academy (IGNFA)

Indira Gandhi National Forest Academy (IGNFA) is currently functioning as a Staff College for the officers of the Indian Forest Service (IFS). The primary mandate of the IGNFA is to impart knowledge and skills to the professional foresters and help them to develop competence for managing the country's forest and wildlife resources on a sustainable basis. In the IGNFA, training is provided at different levels of seniority in the Indian Forest Service besides training the new entrants to the service.

The following subjects are provided in the Indian Forestry Service Induction Training,

INTRODUCTORY PHASE

1) Elementary Biology (Theory)/Mathematics
2) Elementary Biology (Practical)
3) Overview of Forestry
4) Forest Statistics
5) Geology
6) Soil Science

7) Soil, Water, and Land Management
8) Computer Awareness and Applications in Forestry

PROFESSIONAL PHASE –I

9) Forest Mensuration
10) Forest Biometry
11) Systematic Botany
12) Forest Ecology
13) Silvicultural Practice
14) Forest Economics
15) Silvicultural Systems
16) Forest Policies, Laws, and Conventions
17) Biodiversity Conservation

PROFESSIONAL PHASE-II

18) Forest Survey
19) RS & GIS
20) Forest Engineering
21) Wildlife Management
22) Forest Production
23) Non- Timber Forest Produce
24) Wood Technology, Harvesting, and Industries

CONVOCATION PHASE

25) Forest Protection
26) Forests and People
27) Environmental Conservation
28) Forest Administration and Accounts Procedures
29) Silvicultural Viva Voce
30) Elective Subject

Regarding training on Soil and Water Conservation in the course of the Indian Forestry Service Induction Training, subject (7) Soil, Water, and Land Management is concerned. In the subject, the

following contents are taught,

(a) Soil conservation: Soil conservation, its scope and role in the national economy. Erosion-agencies, extent, causes, effects, and control measures. Land use classification, land capability classification. Land use maps and land capacity mapping.

(b) Watershed Management: Watershed – definition, classification, and characteristics. Water harvesting structures, watershed management planning – preparation and analysis of integrated watershed management project.

(c) Land Management: Introduction, historical review of land use pattern and degradation, rational land use policy. Cattle and their fodder requirement, grass lands in India-distribution, management and improvement, and carrying capacity. Fodder resources of India, forest grazing and its management.

(d) Waste Land Management: Identification, classification, reclamation, and afforestation techniques, National Perspective Plan, management of wastelands, wasteland maps and atlas.

(2) Central Academy for State Forest Service (CASFOS)

Central Academy for State Forest Service (CASFOS) is a premier institution under the Department of Forestry Education (DFE), MoEF, which imparts training to State Forest Service Officers. There are three CASFOS in India, where are located at Dehradun, Coimbatore and Assam.

Two types of training are provided in the CASFOS:

I. State Forestry Service Induction training – 2 year duration

II. In-service training – which is a 1-week course having the following modules:

a. Training of Trainers
b. Legal Issues in Forest and Wildlife
c. Wildlife Management Module
d. Joint Forest Management
e. Human Resource Management
f. General refresher course – having 2-week duration: this course is a kind of induction training for Range Forest Officers promoted to the rank of Sub Divisional Officer.

The following subjects are provided in the State Forestry Service Induction Training,

1) General Botany/Mathematics
2) Application of Modern Tools and Technology
3) Silviculture I
4) Silviculture II
5) Forestry Resources Assessment
6) Forestry Survey
7) Forest Policy and Law

8) Forest Engineering
9) Ecology and Environmental Science
10) Adverse Influence on Forests
11) Forest Utilization I
12) Forest Utilization II
13) Forest Resource Management
14) Natural Resources Management
15) Environmental Economics
16) Biodiversity Conservation & Management
17) Joint Forest Management, Rural and Tribal Development
18) Human Resource Development and Management
19) Forest Account and Procedure

Regarding training on Soil and Water Conservation in the course of State Forestry Service Induction Training, conservation engineering is one of topics in subject (8) Forest Engineering, and soil and water conservation measures is one of the topics in subject（14）Natural Resources Management.

CASFOS has the faculty for the former topic, while CASFOS, Dehradun does not have any faculty members for providing the latter topic. Therefore, CASFOS sends the trainees to Central Soil and Water Conservation Research and Training Institute (CSWCRTI). The trainees go to CSWCRTI for about 7 to 10 days.

The following contents are taught in the former topic:

- Structural stability and construction of
- Check dam and its components-head wall-apron, wing-wall, spillway, embankment, and gabion's structure
- Spurs, revetments, jetties etc.
- Embankment (masonary, earthen, and gamion's)
- Ecological considerations in designing engineering structures, landscaping etc.

The following contents are taught in the latter topic,

- Counter cultivation, counter trenching design and layout
- Bunding and terracing
- Erosion control and water conservation structures such as spillways, their types, design, construction, and maintenance
- Gully control, principles of planning, and safety of works, use, design and maintenance of check dams
- Stream bank erosion control
- Torrent control, control measures in catchments and in channel

- Landslide control
- Control of erosion on highways and railways
- Wind erosion control, wind breaks, shelterbelts, sand dune fixation

(3) The Forestry Training Institutes

Training Programme for the FD staffs is conducted mostly at Forest Training Institute (FTI) at Haldwani. In addition, there are two Forest Guard Training Centres in Jainti, Civil Soyam Forest Division and Rampurmandi in Chakarata Forest Division. A Wildlife Training Centre is located in Kalagarh, Corbett Tiger Reserve. These three institutes will conduct short-term training programs for the Forest Guards and administered by the respective Divisional Forest Officer or Wildlife Warden. Currently, the rehabilitation of these training centres is undertaken with the support from JICA funded CDFMPT (Capacity Development for Forest Management and Personnel Training Project). The table below shows the Training achievements of the FTI for FY 2012-13.

Table3.5.1 Training Achievement at FTI, Haldwani (FY 2012-13)

Training	Duration	No of Batche	Total No	Batch size	Level of Participants
Forest Range Officers	18 months	1	39	39	Forest Range Officers
Forester Training	6 months	2	48	24	Foresters
Forest Guard Training	6 months	2	77	39	Forest Guards
Van Panchayat Sarpanchs/ Members Training	3 days	4	78	20	Sarpanchs/ members/ secretaries
Scaler Vyavharik Training	3 months	3	272	91	Scalers
Refresher Course of Frontline Staff	13 days	3	95	32	Deputy Range Officers, Foresters, Forest Guards
Assistant Statistical Officer Training	6 days	1	29	29	Assistant Statistical Officer
GPS Training	3 days	1	53	53	Range Officers, Deputy Range Officers, Foresters, Forest Guards
UK State Action Plan for Climate Change	1 day	1	61	61	ACF and above, FRO Trainees, Range Officers, Foresters
Total		**18**	**752**		

Source: Forest Training Academy, Haldwani. (Sep, 2013).

1) Training Programmes for Forest Range Officer, Forester, and Forest Guard

Topics Covered under the Training Programmes for Forest Range Officers, Foresters and Forest Guards are as below. Emphasis is given on the technical aspects of forest management. Especially to note is that Forest Range Officers are trained in Joint Forest Management, Rural and Tribal Development in addition to technical forestry.

Table 3.5.2 Contents of the Training Programmes for Range Officer, Forester, and Forest Guard (FTI, Haldwani)

Forest Range Officer	Forester	Forest Guard
・ General Botany	・ Silviculture	・ Silviculture I/ II
・ Applications of Modern Tools and	・ Forest	・ Forest Protection

Forest Range Officer	Forester	Forest Guard
Technology · Silviculture - I/ II · Forest Resource Assessment · Forest Survey · Forest Engineering · Adverse Influences on Forests · Forest Utilisation - I/ II · Forest Policy and Law · Ecology and Environmental Sciences · Forest Resource Management · Natural Resource Management · Forest Economics · Biodiversity Conservation and Management · Joint Forest management, Rural and Tribal Development · Human Resources Development and Management · Forest Accounts and Procedures	Utilisation · Forest Protection and Law · Forest Engineering · Survey · Forest Botany · Accounts and Procedure · Mensuration · Wildlife Management · Community Forestry & Rural Development Soil Conservation and Land Management · First Aid	& Law · Survey & Engineering · Forest Utilisation · Wildlife Conservation · Accounts and Procedures · Community Forestry & Rural Development · Environmental Conservation
Duration: 18 Months	**Duration: 6 Months**	**Duration: 6 Months**

Source: Forest Training Academy, Haldwani (August 2013)

3.6. Information of World Bank Disaster Recovery Project

3.6.1 Project Components

The Uttarakhand Disaster Recovery Project (UDRP) is a project financed by the World Bank. This project was initiated in October 2013, subsequent to the flash floods in Uttarakhand in June 2013 which led to loss of thousands of human lives and widespread damage to houses, public buildings, roads, and bridges.

UDRP focuses on providing assistance for reconstructing damaged infrastructure, restoring connectivity, and improving technical support for managing future disaster risks. The Project seeks to build community resilience to future disasters and focuses on building disaster resilient housing and seeks to improve institutional capacity at the state level for risk mitigation and response.

The following are the broad components of UDRP:

Component 1: Resilient Infrastructure Reconstruction

This component focuses on construction of houses for those whose houses were damaged in the disaster and also on reconstruction of damaged public buildings.

The aim of the project is to build about 2500 multi-disaster resilient houses and also to reconstruct damaged public buildings such as District and Block offices, educational institutions, and Panchayat buildings. It also seeks to restore partially damaged buildings.

Component 2: Rural Road Connectivity
Under this component, UDRP is supporting the reconstruction of damaged roads and bridges, including: village roads, roads linking villages and major district roads (ODRs), bridle roads, and bridle bridges.

The aim is to reconstruct about 3600 km of village roads, about 675 km of ODRs, 440 bridle roads, and 140 bridle bridges.

Component 3: Technical Assistance and Capacity Building for Disaster Risk Management
Under this component UDRP seeks to enhance the capacities of government entities and others in risk mitigation and response.

This includes technical assistance to institutions to plan, set up, and implement a multi-hazard risk assessment of the state, training for building sustainable risk assessment capacities, and development of tools for optimal utilization of risk information.

Importantly, this component also supports slope stabilization studies and introduction of appropriate technologies for slope stabilization through small demonstrative works.

It also includes establishment of a Decision Support System (DSS), river morphology studies of some key rivers, strengthening of Uttarakhand State Disaster Management Authority, and strengthening hydro-meteorological network and early warning systems.

Component 4: Financing Disaster Response Expenses
This component supports the financing of eligible expenses already incurred by the State during the immediate post-disaster response period.

Component 5: Implementation Support
This component supports the incremental operating costs of the Project, including the operation of the Project Management Unit (PMU) and the respective Project Implementation Units (PIUs).

Table 3.6.1 Component wise summary of costs of UDRP

S. No.	Component	Total IDA financing (million US $)
1	Resilient Infrastructure Reconstruction	31.00
2	Rural Road Connectivity	155.00
3	Technical Assistance and Capacity building for DRM	38.00
4	Financing Disaster Response Expenses	12.00
5	Project Implementation Support	14.00
	Total	250.00

Source: UDRP Project Appraisal Document Report No: 81712-IN

3.6.2 Status of implementation

a) Housing component

Under the UDRP project a total of 2467 beneficiaries have been identified, across 8 districts of Uttarakhand, whose houses needs to be reconstructed under the Owner Driven Construction of Housing (ODCH) component.

Table 3.6.2 Progress report of house construction component under UDRP (as of 08-11-14)

Particulars	Bageshwar	Chamoli	Pithoragarh	Rudraprayag	Uttarkashi	Dehradun	Nainital & USN	TOTAL
Total beneficiaries	96	530	585	741	255	167	93	2467
House Construction started	*96*	*395*	*469*	*602*	*238*	*93*	*43*	1936

Source: UDRP: ODCH status update 08-11-14

As per the available records, house construction has already been started by 1936 beneficiaries. Out of these, houses have already been constructed for 197 beneficiaries.

b) Roads and bridges component

Under this, 379 roads having total length of 2548 km and 57 bridges having a span of 4201 metres have to be reconstructed.

Table 3.6.3 Progress report of roads and bridge component under UDRP (as of 3rd Sept 2014)

	Roads		Bridge		Cost (in Indian Rs. Crore)		
	No.	Length (in km)	No.	Span (m)	Roads	Bridge	Total
Total Scope	379	2,548	57	4,201	832	138	970
Sanctioned by HPC	141	976	-	-	322	-	322
Work Started	27	330	-	-	118	-	118

Source:http://ukdisasterrecovery.in/index.php/downloads/finish/8-roads-and-bridges/358-progress-report-of-piu-r-b

As per the available status (as of 3-09-14) work has been started for reconstruction of 27 roads having a total length of 330 km.

c) *Slope stabilization and river training*

Under the component “Technical Assistance and Capacity building for DRM” of the UDRP, slopes and river training works have been identified at five places on the Rudraprayag to Kedarnath (NH 109) road.

Table 3.6.4 List of places identified for slope stabilization and river training under UDRP

S. No	Location name	Length	Height of slip at apex	Height of road from river	Co- Ordinates	Brief description of work to be done
1	Vijaynagar Km 19	400 m	30 m	4 m to 7 m	30 deg 23 min 37.2 sec N, 079 deg 01 min 48.6 sec E	Slope treatment above road and river training to protect road
2	Silli Km 16	220 m	60 m	6 to 12 m	30 deg 22 min 51 sec N, 79 deg 0 min 26.6 sec E	Slope treatment above road and river training to protect road
3	Km 32 Before Kakraghat Bridge	165 m	90 m	15 to 20 m	30 deg 29 min 2.1 sec N, 79 deg 05 min 8.72 sec E	Slope treatment above road and river training to protect road
4	Km 71 after Sonprayag	150 m	150 m	5 to 7 m	30deg 38.183 min N, 79 deg 0.103 min E	Slope treatment above road and river training to protect road
5	Km 78 bridle road	60 m	75 m	40 m	79 deg 1.97 min N 30 deg 39.618 min	slope stabilization

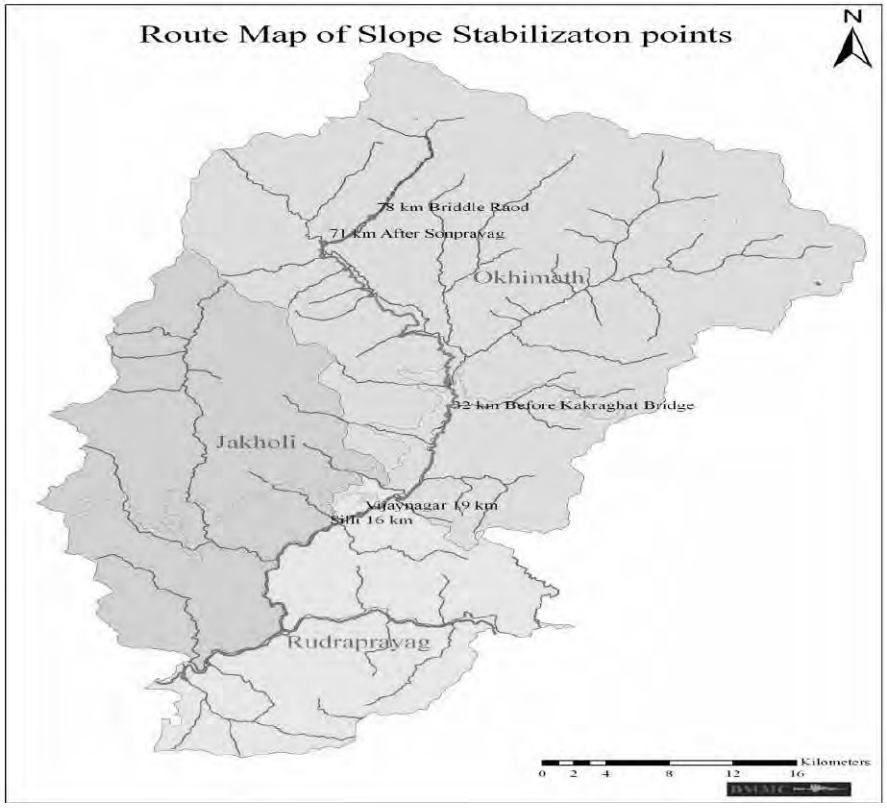


Figure 3.6.1 Map for targets of slope stabilization points by WB

The UDRP has prepared a TOR and has requested Expression of Interest from consulting agencies for:

1. Scientific study of these landslides/slopes and for providing complete engineering and geotechnical solutions for slope stabilization;
2. Scientific study to provide integrated engineering & geotechnical solutions for river morphology and river training works at the same places where landslides/slopes treatment is proposed.

Several consulting agencies have applied for this work, 3 of them have been shortlisted, and now a Request for Proposals (RFP) has been issued to them.

Structure of the Uttarakhand Disaster Recovery Project (UDRP) is shown as follows.

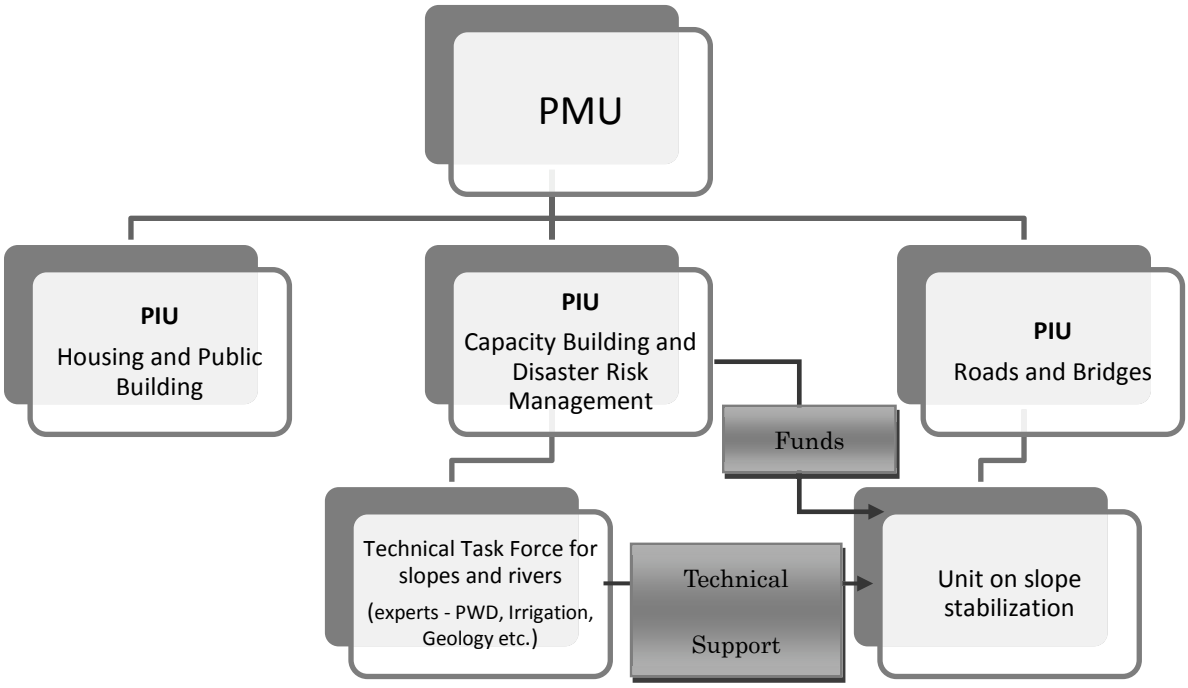


Figure 3.6.2 Structure of the Uttarakhand Disaster Recovery Project (UDRP)

4. Recommendation for JICA technical cooperation project

4.1 Basic concept

4.1.1 Selection of model sites

As mentioned in 3.1 and 3.2, the study team investigated field areas in Uttarakhand State for selection of model sites. From result of the investigation, three candidate model sites were selected. The candidate model sites are located in Parori village, Jawadi village, and Nirgad Village. Among these sites, the site in Nirgad Village is nominated the first model site. Regarding 2nd and 3rd model sites, it will be selected for further investigation after the project started. The sites at Parori village and Jawadi village are candidate sites for 2nd and 3rd model sites. However, the project should consider mobility, access, adopted technology, and socio economic conditions for the model site selection. Details are mentioned in Annex (4) "Minutes of meeting, 4. Selection of the Model Sites."

4.1.2 Cost allocation for the model site

Regarding cost allocation for the model site, the 1st model site will be allocated by JICA. For the 2nd and 3rd model sites, cost for the field survey, the basic design, and detailed design will be allocated by JICA, while the cost for construction will be allocated by UKFD, considering the possibility of utilisation of the Budget of the Government of Uttarakhand State or the ODA loan project "Uttarakhand Forest Resource Management Project." Details are mentioned in Annex (4) "Minutes of meeting, 4. Selection of the Model Sites."

4.1.3 Collaboration with Uttarakhand Disaster Recovery Project (UDRP) - World Bank funded project

The project will collaborate with Uttarakhand Disaster Recovery Project (UDRP) which is funded by WB. Details are mentioned in Annex (4) "Minutes of meeting, 5. Collaboration with Uttarakhand Disaster Recovery Project (UDRP) - World Bank funded project."

4.1.4 Proposed implementation schedule of the project

The proposed implementation schedule of the project was considered between JICA and UKFD. Details are mentioned in Annex (4) "Minutes of meeting, 7. Proposed implementation schedule of the project."

4.2. Expected components of erosion controlled works for model sites

4.2.1 Outline of Candidate Sites

(1) Locations of Candidate Sites

The locations of the candidate sites are three sites shown in Table 4.2.1 and Figure 4.2.1

Table 4.2.1 Locations of Candidate Sites

Site	Village	Latitude	Longitude
1	Parori	30° 30'18.30"N	78° 7'35.74"E
2	Jawadi	30° 17'23.97"N	78° 57'59.69"E
3	Nirgad	30° 8'9.41"N	78° 20'30.73"E

Figure 4.2.1 Location Map of Candidate Sites

(2) Outline of Geology

The geological structure of Uttarakhand is divided by the thrust fault of NW-SE as follows (ref: Geology and Mineral Resources of U.P. & Uttarakhand).

i) Tethyan Himalayan Belt (Sedimentary Rocks in Neoproterozoic – Cretaceous)

ii) Higher Himalayan Belt (Metamorphic Rocks)

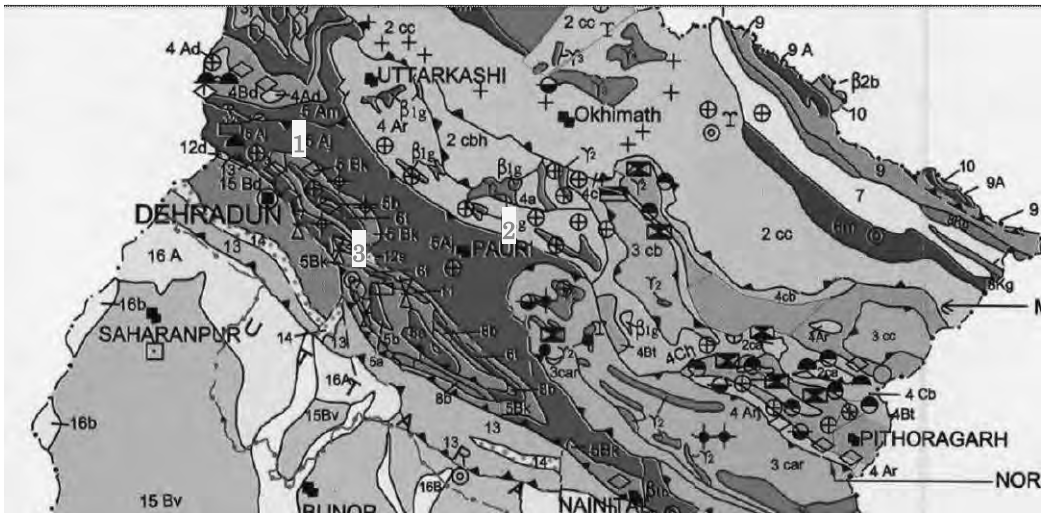
iii) Lesser Himalayan Belt (Deposit in Proterozoic, Transgressive deposit, and Crystalline rocks in Cambrian, Permian, Cretaceous and Eocene)

iv) Sub Himalayan Belt (Continental deposit in Cainozoic)

Also, these belts are in contact with the Tethyan Fault (STDS), Main Central Thrust (MCT), and Main Boundary Fault (MBF) from the top.

Quaternary deposit is distributed in the south side of the Sub Himalayan Belt, which has Foot Hill Fault as its southern limit.

Figure 4.2.2 shows geology of a part of Uttarakhand.



(No. 1: Parori, No. 2: Jawadi, No. 3: Nirgad)

9 TRIASSIC - JURASSIC : Spiti Shale (9 A); Laptal Formation, Kioto Limestone, Kuti Shale, Kalapani Limestone; Chocolate Formation

8 CARBONIFEROUS - PERMIAN : Kuling Formation (8 A); Boulder Slate Formation (8 b), Kali and Girithigal formations (8 kg),; Talchir-Barakar (8 tb)

7 ORDOVICIAN - DEVONIAN : Muth Quartzite, Variegated Shale, Shiala, Garbyang, Ralam formations

6 NEOPROTEROZOIC - CAMBRIAN : Tal Group (6 t), Martoli Group (6 m)

5 NEOPROTEROZOIC : Baliana Group, Krol Group (5 Bk), Jaunsar Group (5 Aj), Morar-Chakrata Formation (5 Am), Bijni (5 b), Amri (5 a) ; Bhander Group (5 Bb), Rewa Group (5 Ar)

4 MESOPROTEROZOIC : Berinag (4 Cb), Tejam (4 Bt), Rautgara (4 Ar) (Formations of Garhwal Group); Deoban Group (4 Bd), Dharagad Formation (4 Ad), Bhimtal Formation (4 Ab), Agastmuni Formation (4 a); Kaimur Group (4 Ck), Semri Group (4 Bs)

3 PALAEOPROTEROZOIC - MESOPROTEROZOIC : Jutogh Group (3 j), Almora-Ramgarh (3 car), Baijnath (3 cb), Chhiplakot Crystalline (3 cc); Bijawar (3 b), Ajabgarh Group (3 a)

2 PALAEOPROTEROZOIC : Bhilangana Formation (2 cbh), Askot (2 ca), Central Crystalline (2cc) ; Mahakoshal Group (= Sidhi Group) (2m)

1 ARCHAEAN - PALAEOPROTEROZOIC : Dudhi Gneissic Complex

(Sourced by http://www.portal.gsi.gov.in/portal/page?_pageid=127,603606&_dad=portal&_schema=PORTAL)

Figure 4.2.2 Geology of Survey Area

4.2.2 Parori Village

(1) Outline of Topography and Geology

i) This site is included in “the Lesser Himalayan belt” between “the Shiwakiks” and “the Higher Himalayas.”

ii) The Lesser Himalayan belt is composed of a massive mountainous region of different rocks.

iii) This site is surrounded by steep mountains with advanced slope erosion.

iv) Conditions are such that the old terrace surface and the talus on the surrounding slope are observed.

v) Geology of this area is presumed to be of the Janusar Group in the Neoproterozoic which are composed of sedimentary rocks and metamorphic rocks.

(2) Outline of Sediment Disaster

i) This village was damaged by debris flow in 2013.

ii) This debris flow occurred at the Bangar River, which is the left tributary of the Kyari River. The Kyari River is the left tributary of the Ganga River.

iii) The Kyari River was a small stream whose width had been about 2m before the disaster.

iv) Houses are located along the small stream.

v) Damage was inflicted on houses, livestock, and rice fields.

vi) Debris flow flowed out through the small stream in the middle of the night.

vii) Fortunately, the people were safe by evacuation.

viii) At present, the width of the end part of the debris flow deposit is about 90m.

ix) The riverbed gradient is 9-13 degrees.

x) Deposits such as terrace or talus are located along the river.

xi) Deposit of big boulders whose diameter is about 0.5 to 1.5m is observed around the river. Also, deposit of cobble whose diameter is about 10 to 20 cm is observed at the end part of the alluvial fan.

xii) A lot of boulders are observed on the riverbed.

xiii) These boulders and cobbles are sediment which was produced by bank erosion.

xiv) Some private houses are located over the large slope failure which occurred on the right bank of the upper stream.

xv) Some slope failures which occurred by bank erosion are observed along the river of the upper stream.

The site conditions are shown in Figure 4.2.3 to Figure 4.2.5.

(3) Countermeasures of Sediment Disaster

i) Basic concept

a) To prevent sediment movement of the riverbed deposit

b) To promote stabilization of the river stream

c) To prevent bank erosion

d) To promote natural restoration of the large slope failure site of the right bank

ii) Proposed countermeasures

a) A series of consolidation works : about 50 to 70m intervals

b) A series of consolidation works

c) Bank protection works

d) Planting works on hillside and earth retaining work

Countermeasures of Sediment Disaster are shown in Figure 4.2.6 to Figure 4.2.7.

Also, an example of proposed countermeasures is shown in Figure 4.2.8.

(4) Approximate Quantity and Cost Estimation of the Countermeasures

Approximate Quantity and Cost Estimation of the Countermeasures is shown in Table 4.2.2.

(5) Site Photos

Full view of village

Village damaged by sediment discharge

Houses damaged by debris flow

Condition of the end of debris flow deposit

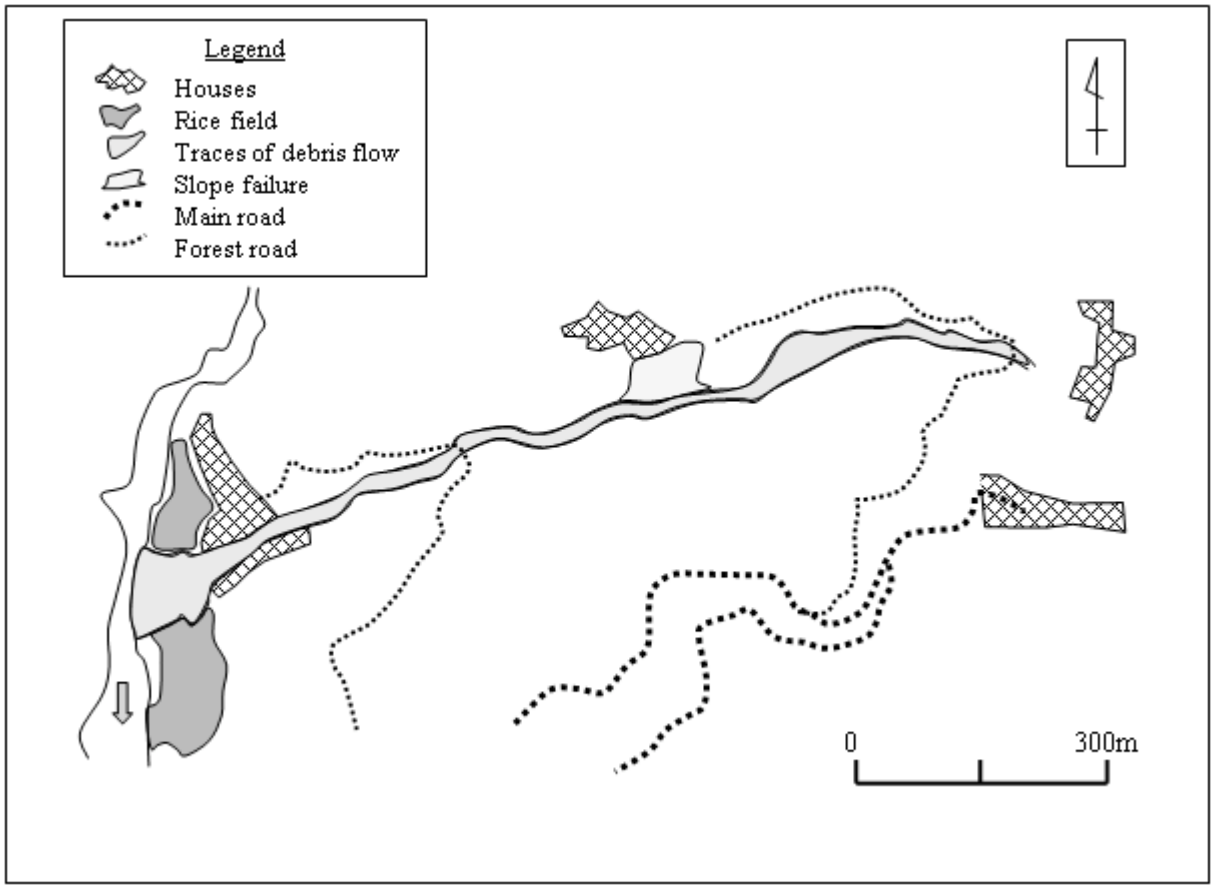
Slope failure of the upper stream side

Slope failure along the river

Figure 4.2.3 Site photos

(6) Site Condition

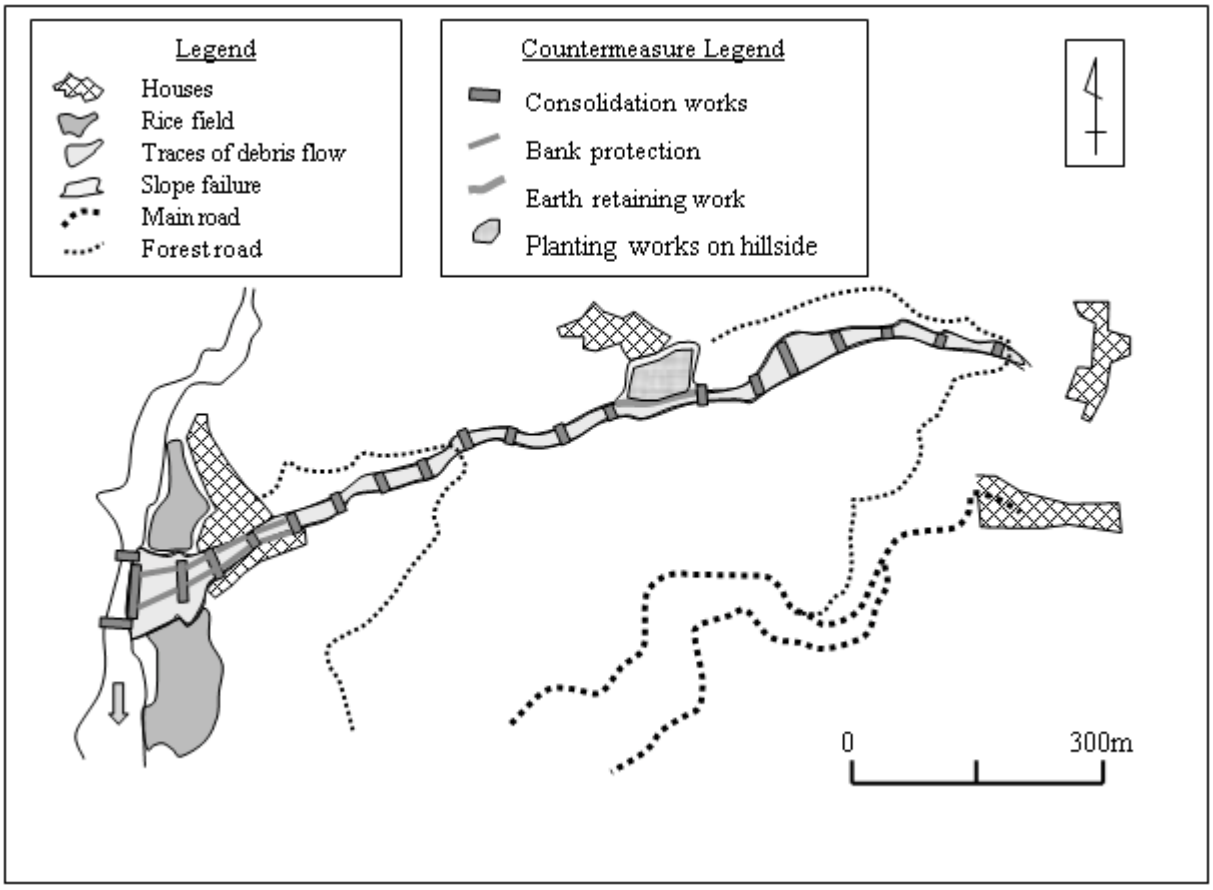
Figure 4.2.4 Satellite Photo by Google (30/10/2013)



Sourced by JICA Survey Team

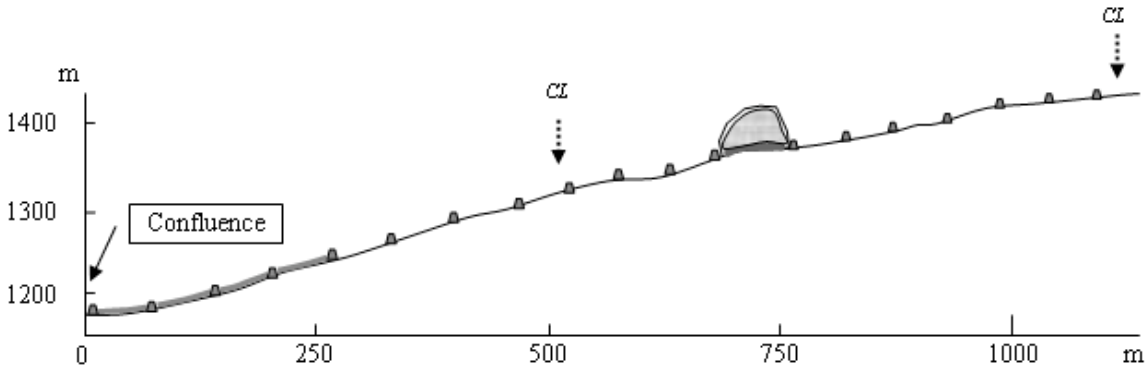
Figure 4.2.5 Present Plane Figure (Parori)

(7) Countermeasures of Sediment Disaster



Sourced by JICA Survey Team

Figure 4.2.6 Countermeasure Plane Figure (Parori)



Sourced by JICA Survey Team

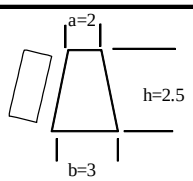
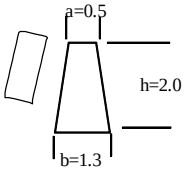
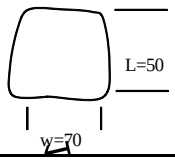
Figure 4.2.7 Countermeasure Cross Section Figure

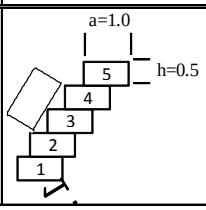
(8) Approximate Quantity and Cost Estimation of the Countermeasures

Table 4.2.2 Approximate Quantity and Cost estimation (Parori)

(1,000 yen)

Type of works	Unit	Quantity	Unit Price	Cost	Note
Consolidation dam	m^3	2,625	20	52,500	About 50m intervals
Bank protection	m^3	900	20	18,000	Downstream from houses
Earth Retaining work (Gabion)	m	350	13	4,550	Stabilization of bottom of slope
Planting works on hillside	m^2	3,500	4	14,000	Covering by the greening net
Subtotal				89,050	
Indirect cost				44,525	Subtotal *50%
Total cost				133,575	

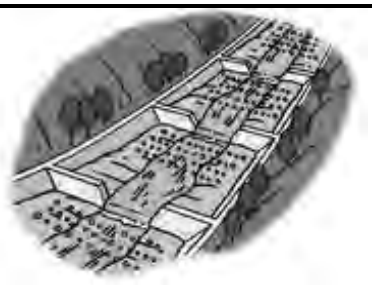
Type of Consruction	Structure	Cross section (m2)	Ave Length (m)	Volume (m3)	No	ΣV (m3)	Note
Consolidation dam (Concrete)		6.25	20	125	21	**2625**	Depth of embedment : 1.5 - 2m
Bank protection (Concrete)		1.8	250	450	2	**900**	Depth of embedment : 0.5 - 1.0m
Planting works on hillside		**3500**	—	—	—	—	Greening filter

Type of Consruction	Structure	Number of steps	Length (m)			ΣL (m)	Note
Earth retaining work (Gabion)		5	70			**350**	Using collapse material

Sourced by JICA Survey Team

(9) Examples of Proposed Countermeasures

Figure 4.2.8 shows examples of countermeasures in Japan.

Type of works	Sample photos
Consolidation dam	 
Bank protection	 
Earth Retaining work (Gabion)	 
Planting works on hillside	 

Sourced by JICA Survey Team

Figure 4.2.8 Proposed Countermeasures (Parori)

4.2.3 Jawadi Village

(1) Outline of Topography and Geology

i) This site is included in "the Lesser Himalayan belt" as with Parori Village.

ii) This site is also surrounded by steep mountains with advanced slope erosion.

iii) Old terraces and large landslides are distributed along the river.

iv) Geology of the basement rocks of this area is presumed to be the sedimentary rocks composed of Bautgana Formation from the Mesoproterozoic.

(2) Outline of Sediment Disaster

i) This site is located at the north side of Rudraprayag town.

ii) The landslide has occurred in the upper part of the mountain.

iii) The road which had run in the upper part of hillside was damaged by the landslide.

iv) This sedimentary rock has a lot of cracks and the property of being easily separated along the stratum.

v) Actually, weathered rocks are observed at the outcrop of the cutting slope.

vi) A part of the unstable sediment is left on the slope.

vii) The relative elevation of slope failure is about 200m. The slope failure sediment is distributed in the downward area of the slope. The slope gradient of the upper slope is 40 degrees to 50 degrees.

The site conditions are shown in Figure 4.2.9 to Figure 4.2.11.

(3) Countermeasures of Sediment Disaster

i) Basic concept

a) To construct a new road by cutting

b) To promote the stabilization of cutting slope

c) To promote natural restoration at the slope failure site

ii) Proposed countermeasures

a) Retaining wall to protect the road shoulder

b) Grating crib & anchor

c) Planting works on hillside and earth retaining work

Countermeasures of Sediment Disaster are shown in Figure 4.2.12 to Figure 4.2.13.

Also, examples of the proposed countermeasures are shown in Figure 4.2.14.

(4) Approximate Quantity and Cost Estimation of the Countermeasures

Approximate Quantity and Cost Estimation of the Countermeasures is shown in Table 4.2.3.

(5) Site Photos

Full view of landslide -1

Full view of landslide -2

Top part of landslide

View downward from top part

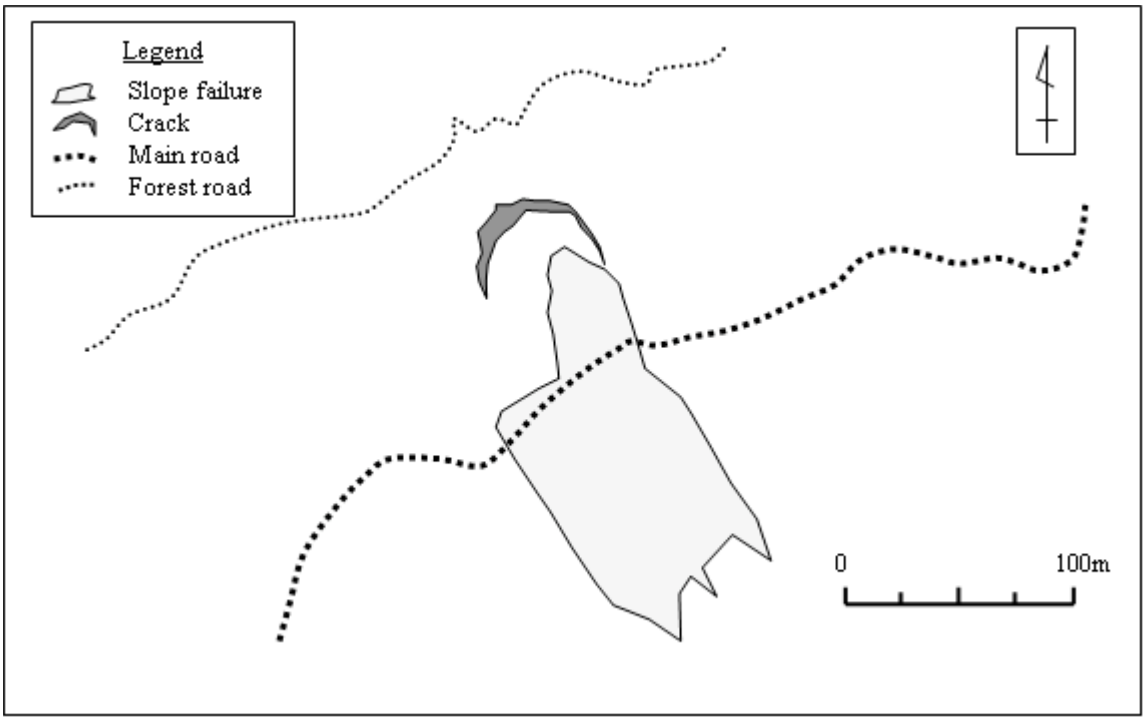
Near side of landslide

Sedimentary rocks from Mesoproterozoic

Figure 4.2.9 Site photos

(6) Site Condition

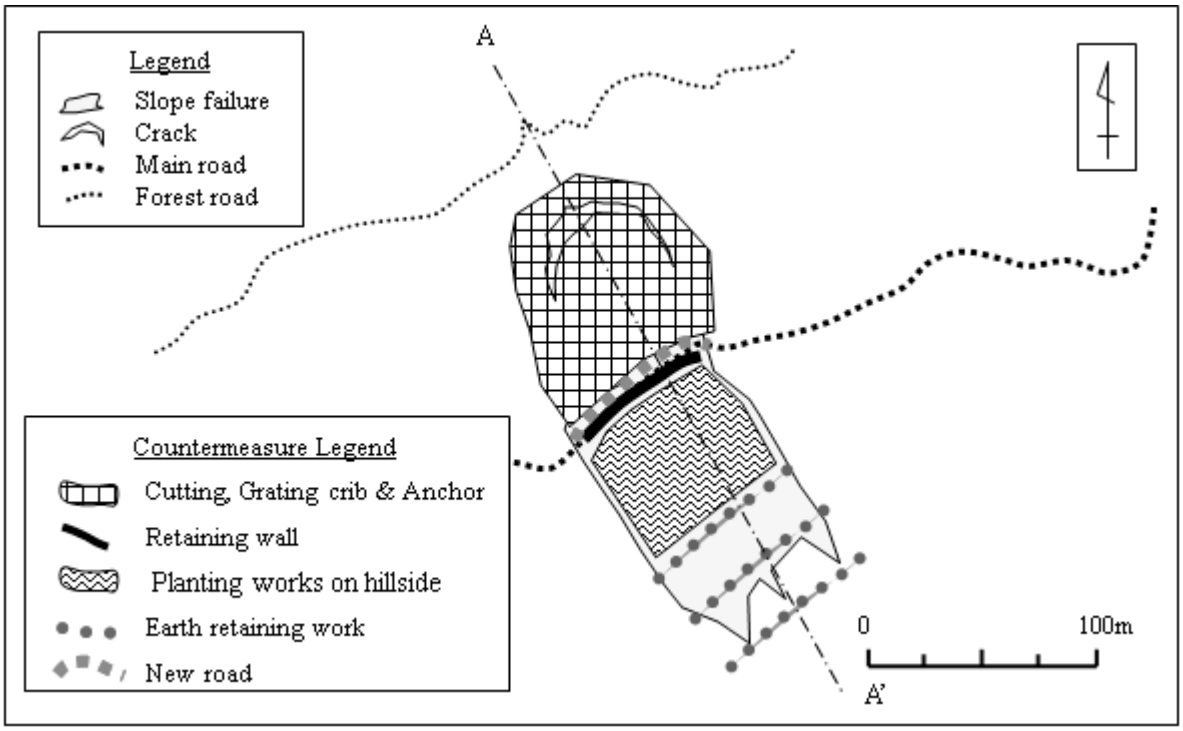
Figure 4.2.10 Satellite Photo by Google (24/04/2014)



Sourced by JICA Survey Team

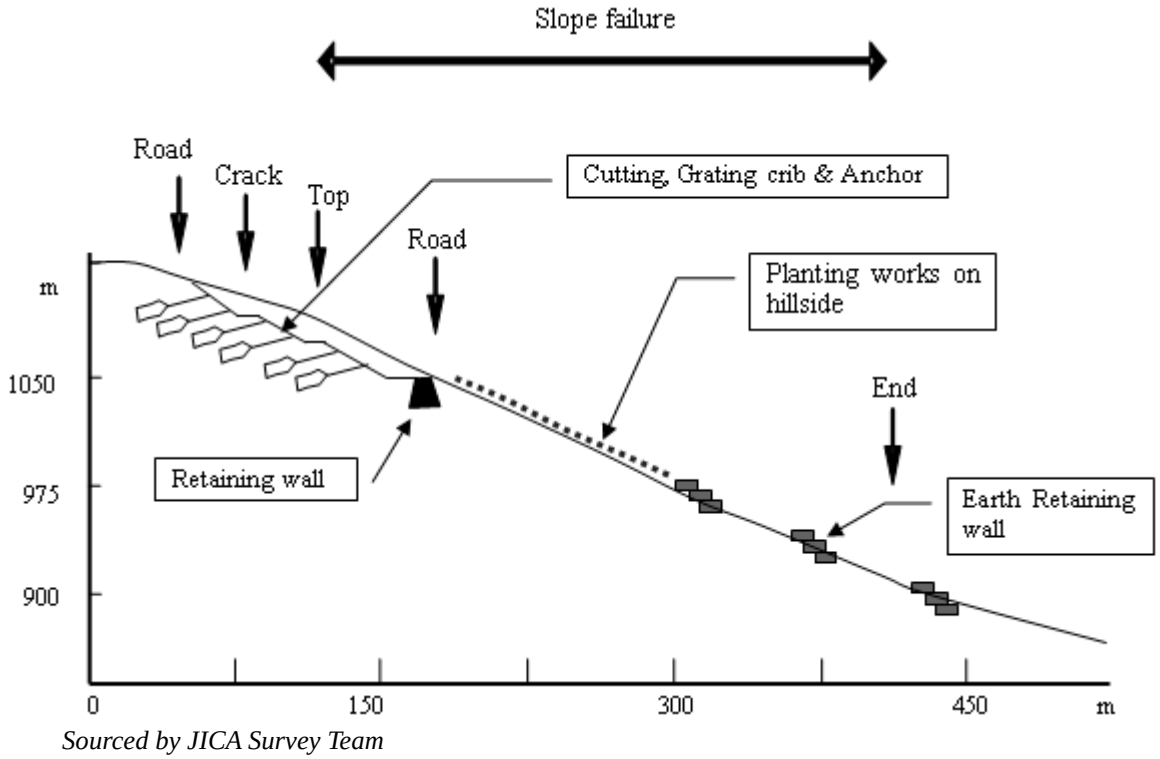
Figure 4.2.11 Present Plane Figure (Jawadi)

(7) Countermeasures of Sediment Disaster



Sourced by JICA Survey Team

Figure 4.2.12 Countermeasure Plane Figure (Jawadi)



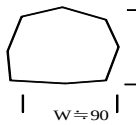
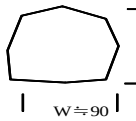
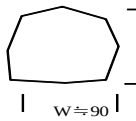
Sourced by JICA Survey Team

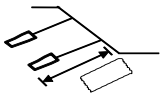
Figure 4.2.13 Countermeasure Cross Section Figure

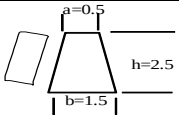
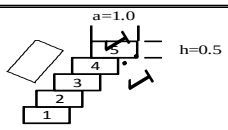
(8) Approximate Quantity and Cost Estimation of the Countermeasures

Table 4.2.3 Approximate Quantity and Cost estimation (Jawadi) (1,000 yen)

Type of works	Unit	Quantity	Unit Price	Cost	Note
Cutting	m^3	40,000	2	80,000	Stabilization of bottom of slope
Grating crib works	m^2	8,000	30	240,000	Stabilization of slope
Anchor works	M	5,400	35	189,000	Stabilization of unstable area
Retaining wall	M	225	20	4,500	Mitigation of sediment disaster
Planting works on hillside	m^2	8,000	4	32,000	
Earth retaining wall	M	450	13	5,850	Stabilization of bottom of slope
Subtotal				551,350	
Indirect cost				275,675	Subtotal *50%
Total cost				827,025	

Type of Consruction	Structure	Area (m2)	Depth (m)	Volume (m3)	No	ΣV (m3)	Note
Cutting		8,000	5	40,000	1	**40,000**	Depth of Cutting : by geological survey
Grating crib works		**8,000**	—	—	—	—	As pressure plate of anchor with planting works
Planting works on hillside		**8,000**	—	—	—	—	With foundation works of erosion control afforestation

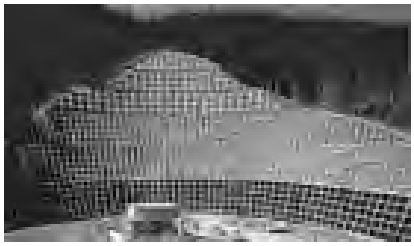
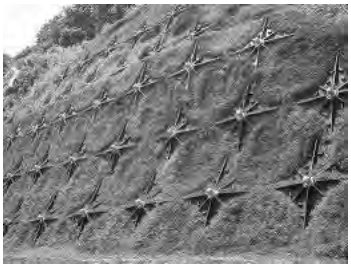
Type of Consruction	Structure	a:No/slope	b:Slope No	c: Σ No/line (a*b)	d:Anchor interval (m)	e:Construction extention (m)	f:line No (e/d)	g: Σ No (c*f)	anchor length (m)	Total anchor length (m)
Anchor works		2	10	20	3	80	27	540	10	**5,400**

Type of Consruction	Structure	Cross section (m2)	Length (m)	Volume (m3)	No	ΣV (m3)	Note
Retaining wall		2.5	90	225	1	**225**	Prevention of new road
Type of Consruction	Structure	Number of steps	Length (m)			ΣL (m)	Note
Earth retaining wall		5	90	—	—	**450**	Using collapse material

Sourced by JICA Survey Team

(9) Example of Proposed Countermeasures

Figure 4.2.14 shows examples of the countermeasures in Japan.

Type of works	Photos sample
Grating crib works	 
Anchor works	 
Retaining wall	 
Planting works on hillside	 
Earth retaining wall	 

Sourced by JICA Survey Team

Figure 4.2.14 Proposed Countermeasures (Jawadi)

4.2.4 Nirgad Village

(1) Outline of Topography and Geology

i) This site is located at the boundary of “the Shiwaliks” and “the Lesser Himalayan belt”; namely, is near the entrance of the mountain area.

ii) This site is surrounded by a steep mountain with advanced slope erosion.

iii) Conditions such that the old terrace surface and the talus on the surrounding slope are observed.

iv) Geology of this area is presumed to be the Janusar Group from the Neoproterozoic, which are composed of sedimentary rocks and metamorphic rocks.

(2) Outline of Sediment Disaster

i) This site is located at the roadside.

ii) At this site, 2 (two) phenomena are observed. One is the slope failure which occurred at the roadside. The other is the sediment discharge which flowed out from a gully.

iii) In this gully, two large slope failures whose slope length is about 80m in length are observed.

iv) The material of the slope failure is sediment which consists of small gravel.

v) A power pylon is located over the top of the slope of the failure site which is at the upper stream side.

The site conditions are shown in Figure 4.2.15 to Figure 4.2.17.

(3) Countermeasures of Sediment Disaster

i) Basic concept

a) To prevent sediment discharge to the road

b) To mitigate the sediment discharge from the gully

c) To prevent the impact on the tower of high voltage electric transmitter from expansion of the slope failure.

ii) Proposed countermeasures

a) Rockfall prevention fence work, reinforced earth retaining wall, banking and rockfall prevention net

b) Consolidation dams

c) Grating crib works & Anchor

Countermeasures of Sediment Disaster are shown in Figure 4.2.18 to Figure 4.2.19.

Also, examples of the proposed countermeasures are shown in Figure 4.2.20.

(4) Approximate Cost Estimation

Approximate Quantity and Cost Estimation of the Countermeasures is shown in Table 4.2.4.

(5) Site Photos

Sediment flowed out on the road

Top part of the fan deposit

Slope failure along the road (left side)

Slope failure along the road (right side)

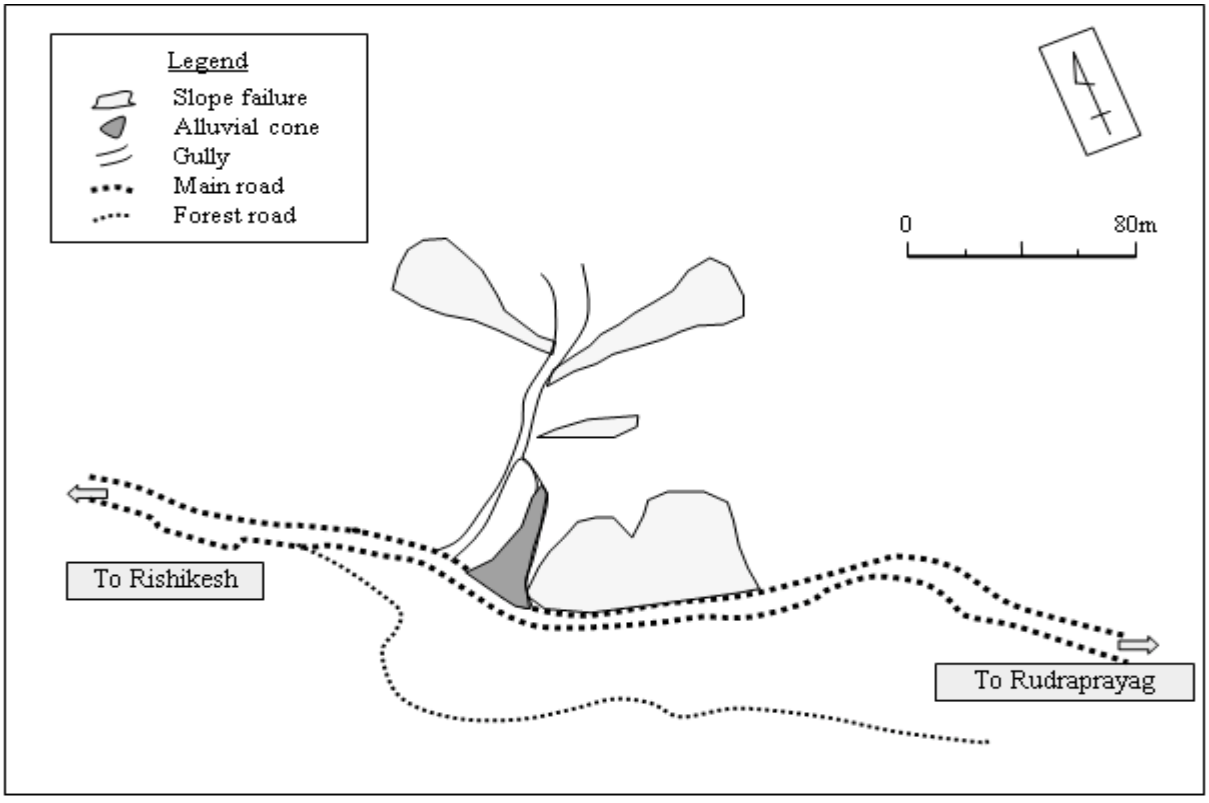
Slope failure in the gully(downstream side)

Slope failure in the gully(upper stream side)

Figure 4.2.15 Site photos

(6) Site Condition

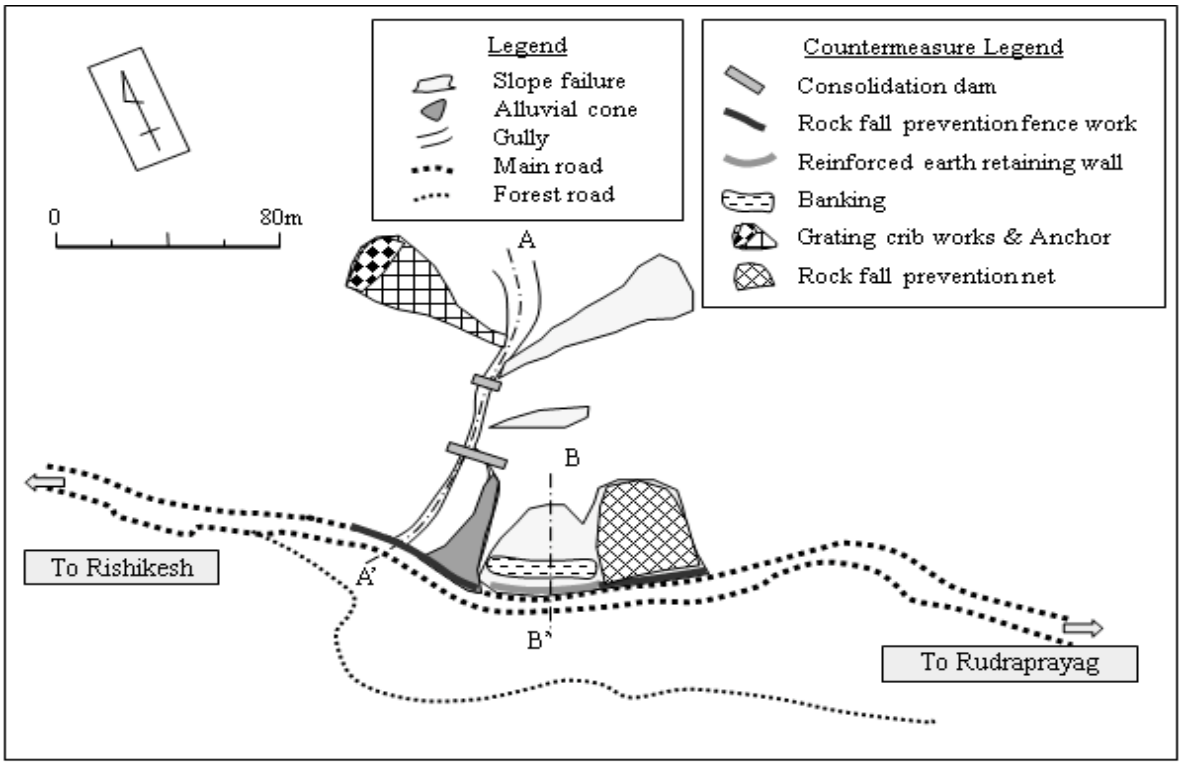
Figure 4.2.16 Satellite Photo by Google (30/04/2014)



Sourced by JICA Survey Team

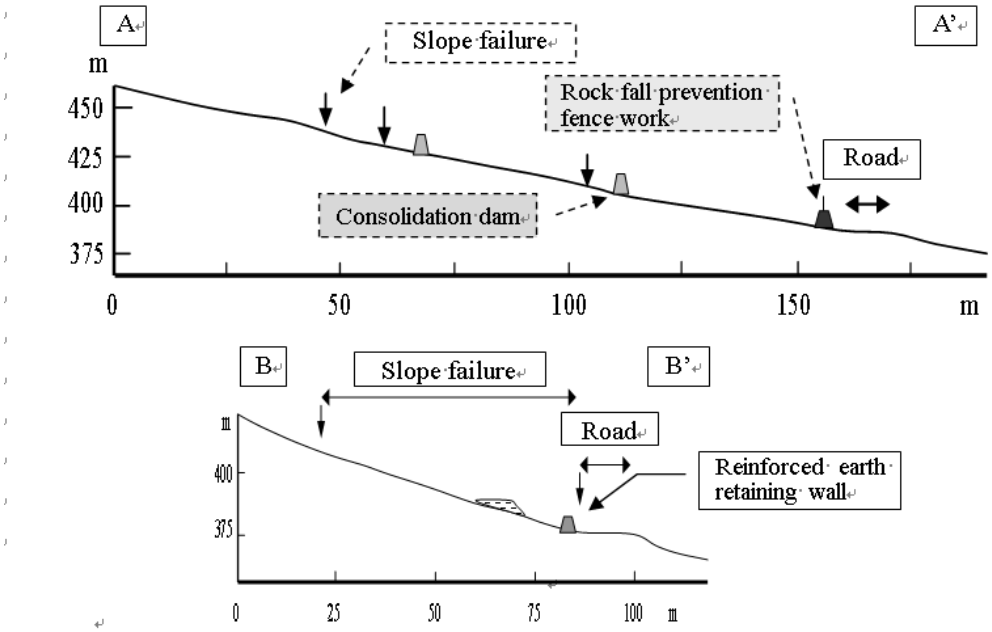
Figure 4.2.17 Present Plane Figure (After disaster: Nirgad)

(7) Countermeasures of Sediment Disaster



Sourced by JICA Survey Team

Figure 4.2.18 Countermeasure Plane Figure (Nirgad)



Sourced by JICA Survey Team

Figure 4.2.19 Countermeasure Cross Section Figure

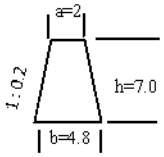
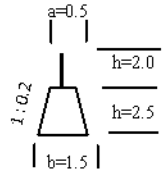
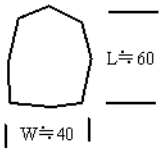
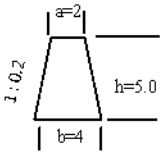
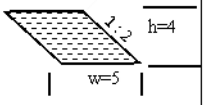
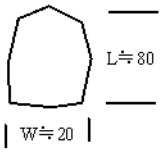
(8) Approximate Quantity and Cost Estimation of the Countermeasures

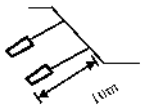
Table 4.2.4 Approximate Quantity and Cost estimation (Nirgad)

Nirgad (1,000yen)

Type of works	Unit	Quantity	Unit Price	Cost	Note
Consolidation dam	m^3	667	20	13,340	Stabilization of bottom of slope
Rockfall prevention fence work	m	110	35	3,850	Mitigation of sediment disaster
Rockfall prevention net	m^2	2,400	6	14,400	Stabilization of slope
Reinforced earth retaining wall	m	40	500	20,000	Mitigation of sediment disaster
Banking	m^3	800	4	3,200	Stabilization of bottom of slope
Grating crib works	m^2	1,600	30	48,000	Stabilization of bottom of slope
Anchor works	m	200	35	7,000	Stabilization of unstable area
Subtotal				109,790	
Indirect cost				54,895	Subtotal *50%
Total cost				164,685	

Sourced by JICA Survey Team

Type of Consruction	Structure	Cross section (m2)	Length (m)	Volume (m3)	No	ΣV (m3)	Note
Consolidation dam (Concrete)		23.8	28	667	1	**667**	Depth of embedment : 1.0-2.0m 2 sites (L=20m, L=8m)
Rock fall prevention fence work (Concrete)		1.8	**110**	198	1	198	Depth of embedment : 0.5m 2sites (L=58m,L=52m)
Rock fall prevention net		**2400**	—	—	—	—	By wire netting
Reinforced earth retaining wall (Earth)		15	**40**	600	1	600	Land leveling of basement
Banking (Earth)		20	40	2	1	**800**	Using site material
Grating crib works		**1600**	—	—	—	—	As hillside works & pressureplate of anchor with planting works

Type of Consruction	Structure	a:No/slope	b:Slope No	c:ΣNo/line (a*b)	d:Anchor interval (m)	e:Construction extention (m)	f:line No (e/d)	g:ΣNo (c*f)	anchor length (m)	Total anchor length (m)
Anchor works		2	1	2	3	30	10	20	10	**200**

Sourced by JICA Survey Team

(9) Example of Proposed Countermeasures

Figure 4.2.20 shows examples of the countermeasures in Japan.

Type of works	Sample photos
Consolidation dam	
Rockfall prevention fence work	
Rockfall prevention net	
Reinforced earth retaining wall	
Anchor & Grating crib works	

Sourced by JICA Survey Team

Figure 4.2.20 Proposed Countermeasures (Nirgad)

4.2.5 Total Quantity and Cost Estimation of the Countermeasures of Three Sites

Total Quantity and Cost Estimation of Three Sites is shown in Table 4.2.5.

Table 4.2.5 List of Total Quantity and Cost Estimation (3 Sites total)

(1000yen)

	Type of works	Unit	Quantity	Unit Price	Cost	Note
Parori	Consolidation dam	m^3	2,625	20	52,500	About 50m intervals
	Bank protection	m^3	900	20	18,000	Downstream from houses
	Earth Retaining work (Gabion)	m	350	13	4,550	Stabilization of bottom of slope
	Planting works on hillside	m^2	3,500	4	14,000	Covering by the greening net
	Subtotal				89,050	
	Indirect cost				44,525	Subtotal *50%
	Total cost				133,575	
Jawadi	Cutting	m^3	40,000	2	80,000	Stabilization of bottom of slope
	Grating crib works	m^2	8,000	30	240,000	Prevention of sediment disaster
	Anchor works	m	5,400	35	189,000	
	Retaining wall	m	225	20	4,500	Mitigation of sediment disaster
	Planting works on hillside	m^2	8,000	4	32,000	Covering by the greening net
	Earth retaining wall (Gabion)	m	450	13	5,850	Stabilization of bottom of slope
	Subtotal				551,350	
	Indirect cost				275,675	Subtotal *50%
	Total cost				827,025	
Nirgad	Consolidation dam	m^3	667	20	13,340	Stabilization of bottom of slope
	Rock fall prevention fence work	m	110	35	3,850	Mitigation of sediment disaster
	Reinforced earth retaining wall	m	40	500	20,000	Mitigation of falling rock shock
	Rock fall prevention net	m^2	2,400	6	14,400	Stabilization of slope
	Banking	m^3	800	4	3,200	Stabilization of bottom of slope
	Grating crib works	m^2	1,600	30	48,000	Prevention of sediment disaster
	Anchor works	m	200	35	7,000	
	Subtotal				109,790	
	Indirect cost				54,895	Subtotal *50%
	Total cost				164,685	
3 sites	Total cost				1,125,285	

Sourced by JICA Survey Team

4.3 Capacity Building and Technology Dissemination

This chapter, describes, with respect to capacity building for staff of UKFD, mainly counterpart personnel and technology dissemination on erosion control to be developed in the Project to the other states of the Himalayan region other than Uttarakhand State.

4.3.1 Capacity Building

Regarding the capacity building, it is important to promote the capacity building efforts dividing into two (2) kinds: Off-JT (Off-the-Job-Training) such as training courses and seminars, and OJT (On-the-Job-Training) through the actual works. The methodology of such Off-JT and OJT will be based on the technology transfer plan for erosion control works to be prepared after the start of the Project through identifying necessary technology and knowledge, checking the level of current capacity of target persons, implementing gap analysis, and reviewing and analysing the issues and needs of technology transfer. This section describes, with respect to the recommendations on the targets persons, methods and contents presently assumed for each of Off-JT and OJT.

（1）Off-JT

For the Off-JT, implementation of training courses and seminars will be main activities. The contents of training courses and seminars will be mainly basic concept for erosion control works, preparation of plan on erosion control works, method of basic field surveys for designing erosion control works, design and construction management for erosion control facilities, etc.

In the Uttarakhand State, range officers or the following staff such as section officers and forest guards are supposed to carry out such survey and works in the field. Meanwhile, manuals on soil and water conservation exist, and check dams by with wet masonry work and gabion work have been constructed in fields. However, check dams that do not necessarily appear to have been built while understanding the essence of erosion control works can be observed. This indicates that the ranges officers and the following staff only superficially understand water and soil conservation and soil erosion techniques and substantially have not acquired such techniques. Therefore, with respect to the training courses for the range officer and following staff, it should be major pillar to aim at acquiring required knowledge and skills on soil erosion works in the field.

On the other hand, it is necessary for the staff of more sub-DFO levels in UKFD to fully understand the needs for soil erosion works proposed from field officer such as the range officers, including the concept of soil erosion works. Therefore, training or seminars for such staff member that focuses on this point of view can be considered.

In addition, since one of the methods for OJT shown below is for the range officers and the following staff, the training courses for range officer and the following staff are needed to make a plan of the Off-JT while taking into account synergistic effect with OJT. For example, it is conceivable to undertake to let learned techniques and knowledge through Off-JT become firmly established in the OJT.

Moreover, the contents shown in the following table are assumed when more specifically considering the training contents mentioned above. Furthermore, it is considered that not only classroom but also being incorporated field practice utilizing erosion control facilities built in the model site for the training of these specific details are needed toward the implementation of more effective training

Table 4.3.1 Proposed detailed contents of the training

Item of training	Detailed contents of training
Basic concept for erosion control works	Lecture：Mechanism for mountain disaster, Geology, Hydraulics and hydrology, Soil engineering, Structural mechanism, Type of soil erosion control
Preparation of plan on erosion control works,	Lecture : Objectives of preparing the plan, method of the preparation of plan, contents of works on erosion control, Working scale, purpose of the works, Selection of working method
Basic field surveys for designing erosion control works	Lecture and Practice : Topographic survey, Geology survey, Soil survey, Meteorological survey, Discharge survey, Vegetation survey, Survey for land degradation, Socio-economic survey
Design for erosion control facilities	Lecture and Practice : Land measurement, drawing, Designing for various erosion control facilities
Construction management for erosion control facilities	Lecture and Practice : Significance of supervision, Contents of supervision, Procedure, Planning for supervision (Structure for working staff, Plan for equipment and materials, Plan for temporary work, working schedule, etc.) Supervision of schedule, Quality control, Investigation of outputs, Safety control, Supervision by photo, Cost management).

For the implementation of Off-JT, it is important to be aligned with the existing training organisations located in Uttarakhand State. The following methods should be considered for cooperation with the organisations.

- Trainers in the training organisations are resource persons for the Off-JT to be implemented by the Project
- The Project and the training organisations implement seminars and workshops on erosion control in cooperation

Since the training organisations have fixed target of UKFD staff, this points should be considered when cooperating with the organisations for implementation of Off-JT by the Project.

(2)OJT

OJT will be implemented through the erosion control works being implemented in the model sites for the members of the task team to be established in the project implementation unit shown in the

project implementation structure mentioned in the below section 4.4 and range officers and following staff in the forest division offices where model sites are located, especially range officers and following staff in charge of the area of model sites. It is assumed that the contents of OJT will be various basic field surveys and design and construction management for erosion control facilities that will be actual activities for erosion control works in model sites from among the training contents shown in the above Off-JT. In addition, the basic concepts for erosion control works will be taught to the target personnel throughout the OJT.

Furthermore, at least the members of task teams are required to always act together with Japanese experts because of OJT by Japanese experts.

4.3.2 Technology Dissemination

With regard to technology dissemination, it basically aims that knowledge and technology on the basis of erosion control technical handbook to be developed in the Project are utilized in other states of the Himalayan region other than Uttarakhand State.

In order to utilize them, an activity that seminars and workshops for the stakeholders in other Himalayan States in collaboration with MoEF are organized is incorporated into the activities in the Project. In the seminars and/or workshops, not only the provision of knowledge but also contents such as considering the vision how the knowledge and technology on erosion control works are utilized in each state should be accepted. Moreover, it is necessary to incorporate field trips such as the visit to erosion control facilities constructed in model sites in the seminars and/or workshops.

4.4 Implementation Structure

The proposed implementation structure for the Project mainly by the UKFD and local resources of sub-contractors which implement erosion control works in the model sites is mentioned in this section.

4.4.1 Implementation Structure for the Project

According to the Minutes of Meetings exchanged between the Japanese Survey Team and Authorities concerned of the Government of Uttarakhand State on 24th November 2014, proposed implementation structure within UKFD for implementation of the Project is shown as the following table.

Table 4.4.1 Idea of assignment of UKFD staff into the Project

	No of personnel to be appointed	Cadre	Note (Qualification, etc.)
Project Director	1	CCF cum CPD of UFRMP	
Project Manager	1	CF	Exclusive for the Project
Task Manager	3	DFO or equivalent	Exclusive for the Project
Task Member A	3	Sub DFO	Exclusive for the Project, Engineering or Science background

Task Member B	3	RO	Exclusive for the Project, Engineering or Science background
Task Member C	3	DyRO or Forester	Exclusive for the Project, Engineering or Science background

A task team consists of one person from each of Task Manager, Task Member A, Task Member B, and Task Member C mentioned in the table. Consequently, one task team is composed of four (4) members and a total of three task teams will be established. Each task team will be in charge of one model site from among three model sites, but all task teams will take part in the activities in the model site 1 until start of activities in the model site in charge. In addition to the above members, personnel assigned to divisions where model sites are located shall take part in the Project.

The whole implementation structure for the Project consisting of JICA, JCC, and other related organisations as well as structure within UKFD is proposed in the following Figure 4.4.1. Based on the proposed implementation structure, UKFD and JICA expert team will compose the Project Implementation Unit.

Regarding the Project Director, the Chief Project Director of UFRMP, which is a Japanese loan project, will be also the Project Director for the Project. Consequently, it is expected to make smooth cooperation and coordination between the two projects.

Joint coordinating committee

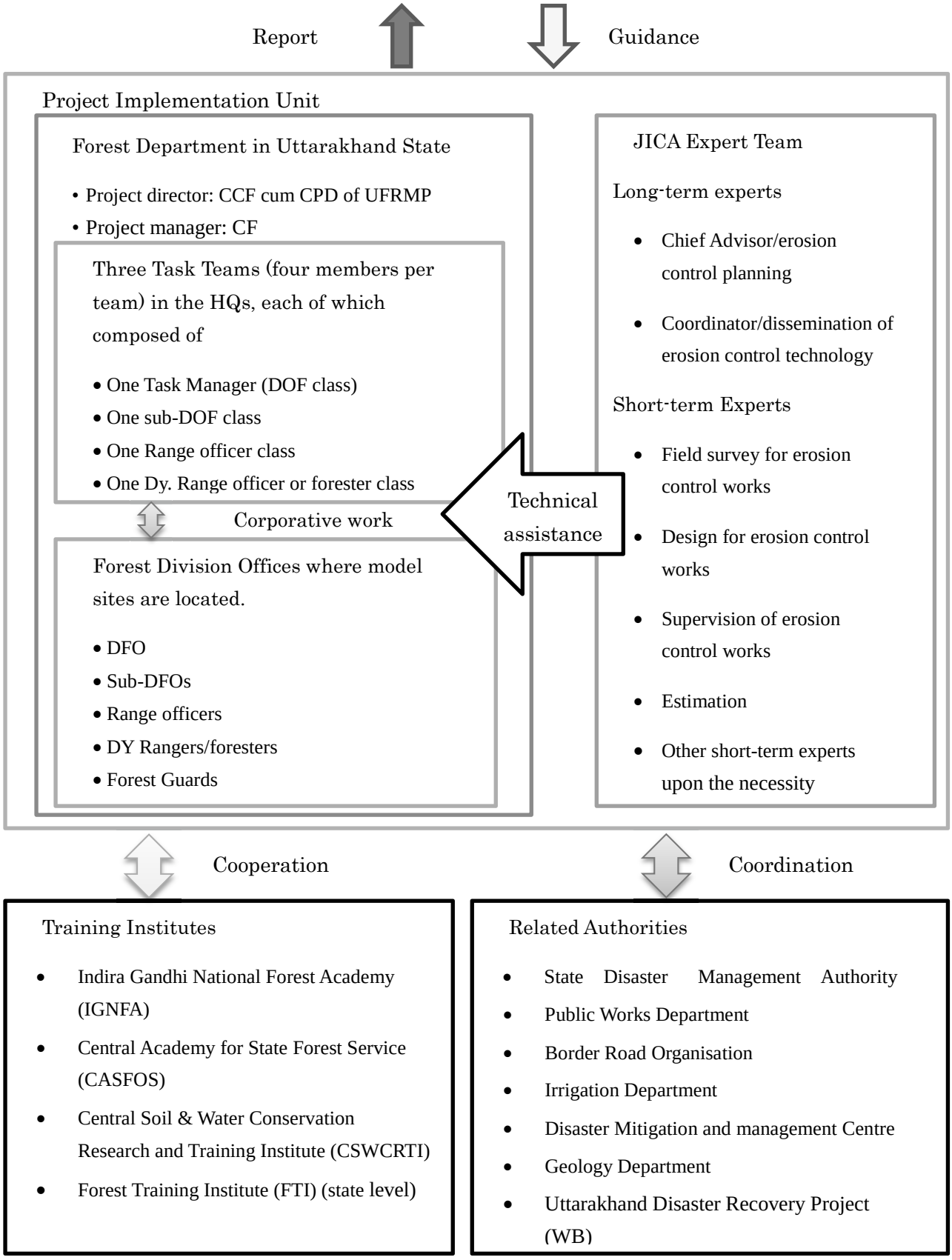


Figure 4.4.1 The project implementation structure

It is required that members of the task teams always act together with Japanese experts, because they

are major targets of the OJT, and particularly in the model site, they learn the method of a series of works for construction of erosion control facilities from various basic survey until design and construction management. In addition, in the future, the members of task teams become the centre, to play a role as a trainer, to transfer erosion control technology to range officers and the following staff of UKFD, and to aim at promoting development of erosion control works to the entire State of Uttarakhand.

Staff in Divisional Forest Offices where model sites are located shall take part in the Project to monitor daily works of construction as well as be involved in the implementation of field survey and designing for erosion control works. Accordingly, the staff can get to implement erosion control works in their area in charge in the future.

Regarding JICA expert team, long-term experts and short-term experts will implement technical assistance in collaboration. It is expected as reasonable way that the long-term experts implement the technical assistance being in charge of individually assigned fields and confirming perspective of the whole project, while short-term experts implement the technical assistance being in charge of individual fields especially regarding erosion control works at the model sites.

The Project Implementation Unit will coordinate with the related authorities regarding 1) cooperation as member of JCC, and 2) cooperation for the activities regarding setting up policy-level council for erosion control works among UKFD and other related organisations and organizing the periodical meeting of policy-level council, which are activities for the output 3 in the draft PDM, 3) cooperation for the activities together with the World Bank (WB) Project since cooperation on the design works for the World Bank sites is considered between both parties of JICA and WB.

Regarding cooperation with the training organisations, the following methods should be considered.

- Trainers in the training organisations are resource persons for the Off-JT to be implemented by the Project
- The Project and the training organisations implement seminars and workshops on erosion control in cooperation
- The training organisations utilize the manuals on erosion control in which the technologies to be developed by the Project are put together and compiled in training courses to be organized by the training organisations. Study tour and field exercise are included in the utilizations.
- Trainers in the training organisations provide the Project with technical advice for the development of the technical guideline and manuals

The detailed policies for the cooperation with the training organisations will be considered and decided after commencement of the Project.

4.4.2. Local resources for sub-contractor

When model site will be established through the technical cooperation activity, the project requires several kinds of local resources for the model site construction. Candidate contractors are mentioned as follows:

- Geological survey
- Land measurement

- CAD
- Contractor for Civil work construction

Geological survey is necessary work for beginning of model site establishment. According to Mr. S.M. Joshi, “Wadia Institute of Himalayan Geology” is the most suitable organisation for the geological survey. This organisation is located in Dehradun. “Geological Survey of India” also is a candidate organisation for geological survey. Although this organisation covers the whole Indian area, “Wadia Institute of Himalayan Geology” is concentrate only on the Himalayan region. Thus the “Wadia Institute of Himalayan Geology” is the best organisation for geological survey.

Land measurement is common work for construction, so there are a lot of organisations and private companies for land measurement in Dehradun. It is relatively easy to find suitable organisations and private companies.

A lot of CAD operators also exist in Dehradun. The project can hire easily a CAD operator for drawing of civil work construction when the project will start.

Contractor for Civil work construction is an important body for the civil work construction. The project should select a superior level contractor for the work. Some contractors which have capacity of a certain level; these contractors are registered at PWD. PWD puts ranking for contractor’ level from A to D for the contractors, depending on the capacity of working level. The project should approach PWD for consulting of contractor selection in advance.

4.5 Draft Project Design Matrix (PDM) and Draft Plan of Operation (PO)

Draft Project Design Matrix (PDM) and Draft Plan of Operation (PO) are shown in table 4.5.1 and 4.5.2 respectively, for which the agreement was reached at the stage of the preliminary study through the discussion between JICA and UKFD. Points to be kept in mind regarding the draft are mentioned as follows.

(1) An Output for Securing Achievement of Overall Goal

Two overall goals are set in the draft PDM. One of the overall goals is that “Knowledge and technology on erosion control works are disseminated in other Himalayan States.” This overall goal was set because the UKFD side strongly insisted to set the effect of dissemination in other Himalayan States as one of the Project objectives. However, this overall goal is not logically linked to the project purpose in the draft PDM that “System to appropriately implement erosion control works for sediment disaster management in the forest area is established in Uttarakhand State.” Taking into consideration this condition, as one of the outputs in the draft PDM, it is set that “Appropriate technology developed for erosion control in the forest area is shared at the State level and National level.” Then, activity of information sharing on erosion control works for the stakeholders in other Himalayan States as well as in Uttarakhand is included in the activities for this output. This structure can partially secure the achievement of the overall goal.

(2) Activities to Measure the Objectively Verifiable Indicators for Outputs

Some activities to measure the objectively verifiable indicators for outputs are set. They are mentioned in the following paragraphs.

It is set that “xx % of the staff in charge of the erosion control works in UKFD evaluate the models of

erosion control high by xx, 201x." as the objectively verifiable indicator 1.2 for the output 1 "Technology for erosion control which is adapted in the Uttarakhand State is developed." For measuring the indicator, it is set that "Implement evaluation of erosion control model constructed in the model sites by staff of UKFD" as the activity 1.11. In the activity, at first evaluation sheets will be prepared. Therefore, in the evaluation sheet, a method to evaluate the models of erosion control mentioned in the indicator should be clarified, and it should be judged whether the effect of the model is high or low based on the results of evaluation.

It is set that "xx % of the staff in the UKFD who participated in the training planned and implemented based on the technology transfer plan pass an understanding test." as the objectively verifiable indicator 2.1 for the output 2 "Knowledge and skills on erosion control of staff in UKFD and another related organisation are improved." For measuring the indicator, it is set that "Evaluate improved level of the knowledge and skill of the staff." as the activity 2.4. In the activity, a comprehension test will be implemented and the results will be sorted out and analysed. Therefore, the indicator 2.1 for the output will be measured. When preparing the test, a passing mark of the test can be set.

It is set that "xx % of other related organisations in Uttarakhand State recognize the effect of the erosion control models constructed by the Project by xx, 201x." as the objectively verifiable indicator 3.1 and "xx % of Forest Departments in other Himalayan States recognize the effect of the erosion control models constructed by the Project by xx, 201x." as the objectively verifiable indicator 3.2 for the output 3 "Appropriate technology developed for erosion control in the forest area is shared at the State level and National level." For measuring the indicators, it is set that "Study the condition and level of the information sharing" as the activity 3.7. In the activity, a questionnaire survey for the related organisations in Uttarakhand State and Forest Departments in other Himalayan States will be implemented and the results will be sorted out and analysed. Therefore, the indicators 3.1 and 3.2 for the output will be measured. Therefore, when preparing the questionnaire, it should be clarified in the questionnaire in what conditions recognizing the effect of the erosion control models is indicated.

Table 4.5.1 Draft Project Design Matrix (PDM)

Name of Project: The Project for Slope Disaster Mitigation in Forest Areas in Uttarakhand			Ver. No. 0
Target Group: Staff of UKFD (Forest Department in the Uttarakhand State)			Date: 25, November, 2014
Target Area: The Uttarakhand State			
Duration of the Project: xx, xx, 2015～ xx, xx, 2020			
Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
Overall Goal	by year 202x		
1. Erosion control works for sediment disaster management in the forest area are appropriately implemented in the Uttarakhand State.	1. Erosion control works are implemented in more than xx places based on the technology developed by the Project.		
2. Knowledge and technology on erosion control works are disseminated in other Himalayan States.	2.1 Knowledge and technology on erosion control works based on the erosion control technical handbook developed by the Project are utilized in other Himalayan States recognize.		
Project Purpose			
System to appropriately implement erosion control works for sediment disaster management in the forest area is established in the Uttarakhand State.	1. the erosion control technical handbook are approved by the responsible authorities and are applied.	1. Authorized paper	- Budget of erosion control works in the Uttarakhand State is secured.
	2. Effect of the model for erosion control developed for sediment disaster management is evaluated as good practices.	2. Project Report	
	3. Specified function which sustainably implement erosion control works is set up in the UKFD.	3. Authorized paper	
Outputs			
1. Technology for erosion control which is adapted in the Uttarakhand State is developed.	1.1. Models of erosion control for sediment disaster management which are adapted in the given sites are	1.1. Project Report	- Needs on erosion control works in the Uttarakhand are kept.
	1.2. xx % of the staff in charge of the erosion control works in UKFD evaluate the models of erosion control high by xx, 201x.	1.2. Project Report	
2. Knowledge and skills on erosion control of staff in UKFD and another related organization are improved.	2.1. xx % of the staff in the UKFD who participated in the training planned and implemented based on the technology transfer plan pass an understanding test.	2.1. Project Report	
	2.2. Staff in charge of erosion control works in the UKFD make designs of the erosion control works for at least xx places by xx, 201x.	2.2. Project Report	
3. Appropriate technology developed for erosion control in the forest area is shared in the State level and National level.	3.1. xx % of other related organizations in Uttarakhand State recognize the effect of the erosion control models constructed by the Project by xx, 201x.	3.1. Project Report	
	3.2. xx % of Forest Departments in other Himalayan States recognize the effect of the erosion control models constructed by the Project by xx, 201x.	3.2. Project Report	
	3.3. Recommendation to the policy for mainstreaming erosion control works for sediment disaster management is submitted to the State Government.	3.3. Project Report	

0.1 Organize Joint Coordinating Committee (JCC).	<Indian Side>	<Japanese Side>	- Whether and other natural conditions exceeding the designing condition of erosion control facilities (e.g. much heavier rain and big earthquake) does not occur.
0.2 Establish and manage technical working groups for necessary field in the UKFD.	1. Personnel 1.1. Project Director 1.2. Project Manager 1.3. Member of three task teams (each task team consisting of 4 members, total 12 personnel) 1.4. Staff concerned in Forest Division Offices where model sites are located 1.5. Supporting Staff 1.5.1. Administrative Staff 1.5.2. Secretaries 1.5.3. Drivers 2. Land and Facilities 2.1. Project Office with necessary facilities in HQs of UKFD 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 2 & 3 3.2. Administrative and Operational Cost for the Project 3.2.1. Travelling allowance and daily allowaince for C/P 3.3.2. Cost of expendable supplies 3.3.3. Cost of communication 3.3.4. Fuel and lighting expenses in the project offices 3.3.5. Petrol for the project vehicles and motorbikes 3.3.6. Maintenance cost for the project vehicles and motorbikes 3.3.7. Other necessary administrative and operational cost for the Project	1. Personnel 1.1. Long-term experts 1.1.1. Chief Advisor/erosion control planning 1.1.2. Coordinator/dissemination of erosion control technology 1.2. Short-term Experts 1.2.1 Field survey for erosion control works 1.2.2. Design for erosion control works 1.2.3. Supervision of erosion control works 1.2.4. Estimation 1.2.5. Other short-term experts upon the necessity. 2. Equipment 2.1. Vehicle(s) 2.2. Necessary field survey equipment 3. Expense for the Project 3.1. The construction cost of model site 1 3.2. Cost for organizing Off-JTs 3.3. Supplementary budget for local expenditure 4. Counterpart Training 4.1. Training in Japan	- Staff of UKFD who took part in the training continues their .
1.1. Prepare and update sediment disaster location map.			
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 analyze mechanism of occurrence of sediment disaster.			
1.4. Make design of erosion control works in the model sites.			
1.5. Select company for the erosion control works in the model sites and contract with the selected company.			
1.6. Supervise the erosion control works in the model sites until the completion based on the approved design.			
1.7. Periodically implement monitoring of the facilities in the model sites.			
1.8. Prepare the erosion control works guideline as a part of the erosion control technical handbook.			
1.9. Prepare manual on the design of erosion control works as a part of the erosion control technical handbook.			
1.10. Set the standard operating procedure for erosion control works as a part of the erosion control technical handbook.			
1.11. Implement evaluation of erosion control model constructed in the model sites by staff of UKFD.			
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 the technology transfer plan.			
2.4. Evaluate improved level on the knowledge and skill of the staff.			
3.1 Prepare a plan for the information sharing of erosion control works.			
3.2. Organize seminars and workshops for stakeholders within the Uttarakhand State.			
3.3. Organize seminars and workshops for the stakeholders in other Himalayan States in collaboration with MoEF.			Pre-Condition
3.4. Prepare policy recommendation for mainstreaming erosion control works for sediment disaster management into forestry and other key development sectors.			- Staff in the UKFD who should be engaged with the Project are allocated.
3.5. Set up policy-level council for erosion control works among UKFD and other related organizations.			
3.6. Organize the periodical meeting of policy-level council for erosion control works.			
3.7. Study the condition and level of the information sharing.			

Table 4.5.2 Draft Plan of Operation (PO)

Outputs		Activities			Year 1				Year 2				Year 3				Year 4				Year 5			
					1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
		0.1	Organize joint coordinating committee (JCC)																					
			0.1.1	Make the following Preparation of holding the JCC meeting ・Inform the participants ・Arrange the venue ・Prepare the materials for discussion ・Prepare the necessary equipment ・Other necessary preparation																					
			0.1.2	Hold the JCC meeting																				
			0.1.3	Prepare the Minutes of Meeting																				
		0.2	Establish and manage technical working groups (TWGs) for necessary field in the UKFD.																					
			0.2.1	Discuss and decide the necessary technical working groups including its purpose and role.																				
			0.2.2	Select of members for each TWG.																				
			0.2.3	Hold the TWG meetings in necessary time.																				
1	Technology for erosion control which is adapted in the Uttarakhand State is developed.	1.1	Prepare and update sediment disaster location map.																					
			1.1.1	Confirm existing related maps.																				
			1.1.2	Decide the definition of sediment disaster location map taking into account of the existing maps and data which can be collected from some possible surveys																				
			1.1.3	Digitalize the base mapping information into GIS.																				
			1.1.4	Prepare the sediment disaster location map in the GIS.																				
			1.1.5	Consider and decide the update method of the sediment disaster location map.																				
			1.1.6	Update the sediment disaster location map.																				
		1.2	Select model sites based on the prescribed selection criteria, in which erosion control model having effect of demonstration are constructed.																					
			1.2.1	Consider and decide the criteria for selection of model sites.																				
			1.2.2	Implement field reconnaissance based on the criteria.																				
			1.2.3	Select candidate of model sites based on the criteria.																				
			1.2.4	Select model site 2 & 3 among from the candidates through the discussion in the Project.																				
		1.3	Implement survey in the model sites and analyze mechanism of occurrence of sediment disaster.																					
			1.3.1	Make the plan for necessary field survey in each model site (together with 1.4.2).																				
				Model site 1																				
				Model site 2																				
				Model site 3																				
				Two WB sites																				
			1.3.2	Implement the survey planned (together with 1.4.3).																				
				Model site 1																				
				Model site 2																				
				Model site 3																				
				Two WB sites																				
			1.3.3	Analyze the mechanism of occurrence of sediment disaster in each model sited based on the results of survey.																				
				Model site 1																				
				Model site 2																				
				Model site 3																				
				Two WB sites																				

Outputs	Activities			Year 1				Year 2				Year 3				Year 4				Year 5			
				1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
		1.4	Make design of erosion control works in the model sites.																				
			Implement topographic survey.																				
			Model site 1																				
		1.4.1	Model site 2																				
			Model site 3																				
			Two WB sites																				
			Make the plan for necessary field survey in each model site (together with planning of 1.3).																				
			Model site 1																				
		1.4.2	Model site 2																				
			Model site 3																				
			Two WB sites																				
			Implement the survey planned (together with 1.3.2).																				
			Model site 1																				
		1.4.3	Model site 2																				
			Model site 3																				
			Two WB sites																				
			Make the basic design including decision of type of works for erosion control facilities based on the topographic survey and results of fields surveys.																				
			Model site 1																				
		1.4.4	Model site 2																				
			Model site 3																				
			Two WB sites																				
			Implement field work such as detailed surveying based on the basic design.																				
			Model site 1																				
		1.4.5	Model site 2																				
			Model site 3																				
			Two WB sites																				
			Make the detailed design of erosion control facilities in each model site.																				
			Model site 1																				
		1.4.6	Model site 2																				
			Model site 3																				
			Two WB sites																				
			Estimate the cost based on the design.																				
			Model site 1																				
		1.4.7	Model site 2																				
			Model site 3																				
			Two WB sites																				

Outputs	Activities			Year 1				Year 2				Year 3				Year 4				Year 5			
				1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	1.5	Select company for the erosion control works in the model sites and contract with the selected company.																					
			Prepare draft contract document including TOR and tender document for procurement of contractor for erosion control works.																				
		1.5.1	Model site 1																				
			Model site 2																				
			Model site 3																				
			Complete the contract document including TOR and tender document through discussion in the Project.																				
		1.5.2	Model site 1																				
			Model site 2																				
			Model site 3																				
			Make a short-list for the contractor through the pre-qualifying.																				
		1.5.3	Model site 1																				
			Model site 2																				
			Model site 3																				
			Make an official announcement for the tender.																				
		1.5.4	Model site 1																				
			Model site 2																				
			Model site 3																				
			Select a contractor based on the proposal with quotation submitted by the candidate contractors.																				
		1.5.5	Model site 1																				
			Model site 2																				
			Model site 3																				
			Make the contract negotiations with the contractor.																				
		1.5.6	Model site 1																				
			Model site 2																				
			Model site 3																				
			Make a contract with the contractor.																				
		1.5.7	Model site 1																				
			Model site 2																				
			Model site 3																				
	1.6	Supervise the erosion control works in the model sites until the completion based on the approved design.																					
			Confirm the detailed contents, methods and schedule etc. for erosion control works with the contractor.																				
		1.6.1	Model site 1																				
			Model site 2																				
			Model site 3																				
			Periodically supervise the erosion control works until completion with necessary instruction to the contractor.																				
		1.6.2	Model site 1																				
			Model site 2																				
			Model site 3																				

Outputs	Activities		Year 1				Year 2				Year 3				Year 4				Year 5			
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
		Inspect the erosion control facilities constructed.																				
	1.6.3	Model site 1																				
		Model site 2																				
		Model site 3																				
		Complete the erosion control works.																				
	1.6.4	Model site 1																				
		Model site 2																				
		Model site 3																				
	1.7	Periodically implement monitoring of the erosion control facilities in the model sites.																				
	1.7.1	Consider and decide the method of monitoring.																				
		Implement the monitoring based on the method decided.																				
	1.7.2	Model site 1																				
		Model site 2																				
		Model site 3																				
		Analyze the results of monitoring and evaluate the erosion control facilities.																				
	1.7.3	Model site 1																				
		Model site 2																				
		Model site 3																				
		Let the contractor implement repair works if defects of contractor are detected within guarantee duration.																				
	1.7.4	Model site 1																				
		Model site 2																				
		Model site 3																				
	1.8	Prepare the erosion control works guideline as a part of the erosion control technical handbook.																				
	1.8.1	Review the draft erosion control works guideline prepared in the preliminary study based on the erosion control works in the model sates, and clarify points to be modified in the draft guideline.																				
	1.8.2	Implement necessary field survey and collect necessary existing information for the modification of draft guideline.																				
	1.8.3	Discuss the guideline preparation with concerned persons.																				
	1.8.4	Complete the erosion control works guideline.																				
	1.8.5	Compile and print out the guideline as the erosion control technical handbook including manual on the design of erosion control works and the standard operating procedure for erosion control works as well as the guideline, which is revised (same activities with 1.9.5 and 1.10.5).																				
	1.9	Prepare manual on the design of erosion control works as a part of the erosion control technical handbook.																				
	1.9.1	Consider and decide the composition of manual based on the erosion control works guideline and erosion control works in the model sites, including the update.																				
	1.9.2	Prepare the draft manual based on the composition and design methods of erosion control works in the model sites, including the update.																				
	1.9.3	Discuss the draft manual with concerned persons.																				
	1.9.4	Complete the manual repeating the modification.																				
	1.9.5	Compile and print out the manual as the erosion control technical handbook including the erosion control works guideline and the standard operating procedure for erosion control works as well as the manual, which is revised (same activities with 1.8.5 and 1.10.5).																				

Outputs		Activities			Year 1				Year 2				Year 3				Year 4				Year 5			
					1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
		1.10	Set the standard operating procedure for erosion control works as a part of the erosion control technical handbook.																					
			1.10.1	Consider and decide the composition of standard based on erosion control works in the model sites, including the update.																				
			1.10.2	Prepare the draft standard based on the composition and implementation methods of the erosion control works in the model sites, including the update.																				
			1.10.3	Discuss the draft standard with concerned persons.																				
			1.10.4	Complete the standard.																				
			1.10.5	Compile and print out the standard as the erosion control technical handbook including the erosion control works guideline and manual on the design of erosion control works as well as the standard, which is revised (same activities with 1.8.5 and 1.9.5).																				
		1.11	Implement evaluation of erosion control model constructed in the model sites by staff of UKFD.																					
			1.11.1	Prepare the evaluation sheet in each stage of survey, design, work, and monitoring & maintenance.																				
			1.11.2	Implement the evaluation.																				
			1.11.3	Sort out and analyze the results of evaluation.																				
2	Knowledge and skills on erosion control of staff in UKFD and another related organization are improved.	2.1	Implement basic study for preparation of technology transfer plan.																					
			2.1.1	Study the necessary knowledge, technology and skill.																				
			2.1.2	Specify target staff for technology transfer.																				
			2.1.3	Confirm current level of knowledge and skill of the target staff and carry out gap-analysis.																				
			2.1.4	Study the resource persons for trainings.																				
		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.																					
			2.2.1	Decide the policy for the technology transfer based on its issues and needs.																				
			2.2.2	Decide the method, schedule, target persons including number by contents (items) of technology transfer.																				
			2.2.3	Prepare the format of the technology transfer plan, and modify it in each year if necessary.																				
			2.2.4	Prepare the rough technology transfer plan for whole project period.																				
			2.2.5	Prepare the detailed annual technology transfer plan in each year.																				
		2.3	Implement Off-JT and OJT based on the technology transfer plan.																					
			2.3.1	Make the following preparations for each Off-JTs and OJTs based on the annual technology transfer plan, ・Inform the participants ・Request to lecturers ・Arrange the venue ・Request lecturers to prepare teaching materials (text, PPT, etc.) ・Copy the necessary number of the teaching materials ・Prepare the necessary equipment ・Transportation for the participants as need demands ・Other necessary preparation																					
			2.3.2	Implement OFF-JT and OJT.																				
		2.4	Evaluate improved level on the knowledge and skill of the staff.																					
			2.4.1	Prepare the format of understanding test.																				
			2.4.2	Implement the understanding test.																				
			2.4.3	Sort out and analyze the results of understanding test.																				

Outputs		Activities		Year 1				Year 2				Year 3				Year 4				Year 5			
				1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
3	Appropriate technology developed for erosion control in the forest area is shared in the State level and National level.	3.1	Prepare a plan for the information sharing of erosion control works.																				
		3.1.1	Discuss and decide the contents of information sharing.																				
		3.1.2	Discuss and decide the target persons of information sharing.																				
		3.1.3	Discuss and decide the time and place of information sharing.																				
		3.1.4	Discuss and decide the methods of information sharing.																				
		3.2	Organize seminars and workshops for stakeholders within the Uttarakhand State.																				
		3.2.1	Make the following preparations for each seminar and workshop to be organized based on the plan of information sharing ・Inform the participants ・Request to presenters ・Arrange the venue ・Request the presenters to prepare presentation teaching materials (PPT, etc.) ・Copy the necessary number of the presentation materials ・Prepare the necessary equipment ・Transportation for the participants as need demands ・Other necessary preparation																				
		3.2.2	Organize the seminars and workshops.																				
		3.2.3	Analyze the results of seminars and workshops and utilize the results of analysis for further seminars and workshops.																				
		3.3	Organize seminars and workshops for the stakeholders in other Himalayan States in collaboration with MoEF.																				
		3.3.1	Make the following preparations for each seminar and workshop to be organized based on the plan of information sharing ・Inform the participants ・Request to presenters ・Arrange the venue ・Request the presenters to prepare presentation teaching materials (PPT, etc.) ・Copy the necessary number of the presentation materials ・Prepare the necessary equipment ・Transportation for the participants as need demands ・Other necessary preparation																				
		3.3.2	Organize the seminars and workshops.																				
		3.3.3	Analyze the results of seminars and workshops and utilize the results of analysis for further seminars and workshops.																				
		3.4	Prepare policy recommendation for mainstreaming erosion control works for sediment disaster management into forestry and other key development sectors.																				
		3.4.1	Consider and prepare the draft recommendation paper for mainstreaming erosion control works.																				
		3.4.2	Discuss the draft recommendation paper with concerned persons.																				
		3.4.3	Complete the recommendation paper.																				
		3.4.4	Discuss the method of recommendation with concerned persons.																				
		3.4.5	Execute the recommendation based on the decided method, and follow it.																				
		3.5	Set up policy-level council for erosion control works among UKFD and other related organizations.																				
		3.5.1	Discuss and decide the objectives and TOR of the policy-level council.																				
		3.5.2	Decide the members of policy-level council.																				
		3.5.3	Get approval of setting up the policy-level council.																				

Outputs	Activities		Year 1				Year 2				Year 3				Year 4				Year 5			
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	3.6	Organize the periodical meeting of policy-level council for erosion control works.																				
		3.6.1 Make the following Preparation of holding the meeting of policy-level council • Inform the participants • Arrange the venue • Prepare the materials for discussion • Prepare the necessary equipment • Other necessary preparation																				
		3.6.2 Hold the meeting of policy-level council																				
		3.6.3 Prepare the Minutes of Meeting																				
	3.7	Study the condition and level of the information sharing.																				
		3.7.1 Prepare interview sheet for other related organizations in the Uttarakhand Sate.																				
		3.7.2 Conduct interview survey to other related organizations in the Uttarakhand Sate.																				
		3.7.3 Sort out the results of interview survey to other related organizations in the Uttarakhand Sate.																				
		3.7.4 Prepare interview sheet for Forest Departments in other Himalayan States.																				
		3.7.5 Conduct interview survey to Forest Departments in other Himalayan States.																				
		3.7.6 Sort out the results of interview survey to Forest Departments in other Himalayan States.																				

Legend

▭ Activities that must take place at given time

┈┈┈ Sporadic activities

5. Draft Guideline for erosion control works

Draft Guideline for erosion control works is shown as follows, for which agreement was reached at the stage of the preliminary study through the discussion between JICA and UKFD.

Japan International Cooperation Agency

Uttarakhand Forest Department

DRAFT GUIDELINE
FOR
EROSION CONTROL WORKS

JANUARY 2015

Contents

1. Objectives of the Guideline

Objectives of this guideline are to ensure the maintenance and improvement of technical level of erosion control works in Uttarakhand and the other related states and to reasonably promote implementation of the erosion control works.

2. Plan of Erosion Control works

2.1 Definition and Objectives

(1) Definitions

"Erosion control works" is the general term for restoration and erosion prevention works. Restoration works are to restore and develop degraded mountains, and erosion prevention works are to prevent in advance the devastation of mountains.

(2) Objectives

The objectives of erosion control works are to ensure the prevention and mitigation of disasters and to contribute to water conservation by appropriate setting of erosion control facilities and maintenance of the forest.

2.2 Basic Policy

(1) Basic Concept

Based on the survey results obtained in a given watershed, an erosion control works plan must be a most economical and efficient plan founded upon natural and social characteristics.

(2) Specific Policy

An erosion control works plan is developed for prevention of disasters in the entire watershed. It seeks to promote conservation and improvement of water resources and other public benefits of the forests by appropriate setting of erosion control facilities and conservation and improvement of the forests.

2.3 Preparation of Project Plan

(1) Formulation of Emergency Plan and medium and Long –Term Plan (Restoration Measures and Preventive Measures)

Erosion control works are classified into i) highly urgent restoration measures, ii) restoration measures to be implemented in a medium to long-term period and iii) preventive measures to be implemented in a medium to long-term period. Then in view of economy and efficiency, these measures must be carried out according to a plan.

(2) Selection of Construction Site with Priority

Watersheds are classified according to their importance, taking into account their characteristics, relationships with the objects to be conserved, etc. Based on this classification, the construction sites are prioritized.

3. Survey

3.1 Items and Procedure

When an erosion control works project is planned and designed, surveys meeting the project purpose and its activities need to be systematically carried out. The survey items and measures are selected according to the objectives of the project. The survey consists of a preparatory survey and a detailed survey.

3.2 Preparatory Survey

A preparatory survey is mainly collection and arrangement of existing materials. Natural and social conditions of the project area will be understood by this survey.

3.3 Topographic Reconnaissance

(1) Purpose

The purpose of topographic reconnaissance is to understand topographic features of the area to be surveyed and to obtain basic information required for planning and designing the erosion control works.

(2) Topographic Outlines

The purpose of survey of topographic outlines is to understand topographic factors of the survey area, such as orientation, slope, elevation, height difference, undulation, drainage density, shape of cross section, etc. on the basis of existing materials.

(3) Site Reconnaissance

Site reconnaissance is done to collect topographic information in the survey area.

3.4 Geology/Soil Property/Lithology/Ground Water Survey

(1) Purpose

The purpose of geology/soil property/lithology/ground water survey is to understand specific features of geology, soil property, lithology, and ground water and to obtain basic information that is required for planning and designing the erosion control works.

(2) Boring Survey

The purpose of Boring Survey is to directly understand features of soil property and lithology, geological structure, etc. Surveys and sample collection are conducted using boreholes when necessary.

(3) Sounding Survey

Sounding survey is done to measure the resistance of penetration, rotation, and pulling of the soil layers for understanding the soil strength and the soil density.

(4) Ground Water Survey

Ground water survey is conducted to understand the groundwater level, supply channel, tendency of

flow, and ground water pressure in the survey area.

(5) Soil Test
Soil test is conducted to understand physical and mechanical properties of the soil in the survey area.

(6) Rock Laboratory Test
Rock laboratory test is conducted to understand physical and mechanical properties of the rock in the survey area.

(7) Site Reconnaissance
Site reconnaissance is done to check the details of geology and soil property, etc. on the basis of existing materials.

3.5 Soil Survey

(1) Purpose
The purpose of soil survey is to obtain the basic information for examining measures of introducing vegetation for forest conservation.

(2) Soil Profile Survey
Soil profile survey is conducted to identify the soil origin, soil morphology, and physical and chemical properties of the soil.

3.6 Forest/Vegetation Condition Survey

(1) Purpose
The purpose of forest/vegetation condition survey is to understand the condition of forest and vegetation in the survey area and to obtain basic information that is required for planning and designing the erosion control works.

(2) Forest Type Survey
Forest type survey is conducted to make a forest cover map by using remote sensing techniques and site reconnaissance.

(3) Forest Inventory Survey
Forest inventory survey is conducted for forest conservation. Tree height, diameter at breast height, the number of trees etc., are understood quantitatively.

(4) Vegetation Survey
Vegetation Survey is carried out to record stratification structure and plant species from a plant sociological point of view.

3.7 Meteorology Survey

(1) Purpose

Meteorology survey is carried out to understand climatic conditions of the survey area and its surrounding area to obtain basic information that is required for planning and designing the erosion control works.

(2) Precipitation/Temperature

Record of precipitation/temperature is investigated at the observatory of the target area.

(3) Survey on the Field

If meteorological data cannot be obtained, or the adaptability of the data against the survey area is extremely low or the climatic factors need to be understood, a climatic survey will be carried out in the target area as necessary.

3.8 Hydrological Survey

(1) Purpose

The purpose of hydrological survey is to understand hydro-cultural weight of the survey area and to obtain basic information that is required for planning and designing the erosion control works.

(2) Collection of Hydrological Data

Hydrological data will be collected and corrected as necessary.

(3) Hydrological Quantity

Occurrence probability of hydrological quantity is analyzed and its result is examined by appropriate measures.

(4) Run-off Analysis

Run-off Analysis is conducted by appropriate measures that correspond with the survey purposes. In addition, amount of running water during flood will be estimated by an appropriate model.

(5) Discharge Measurement

Discharge Measurement is conducted when the discharge needs to be measured on the field.

3.9 Survey of Devastation

(1) Purpose

The purpose of survey of devastation is to understand the conditions and properties of the devastation in the target area and to obtain basic information that is required for planning and designing of the erosion control works.

(2) Survey of Amount of Erosion

Survey of the amount of erosion is conducted to understand the amount of soil loss by surface erosion.

(3) Survey of Slope Failure Site

Survey of slope failure site is conducted to obtain information about distribution of slope failures and its properties such as collapse mechanisms, morphology, amount of sediments, and so on. As necessary, the required survey items are conducted.

(4) Survey of Devastated Torrent

Survey of devastated torrent is conducted to obtain information about distribution of devastated torrent and its properties such as generation mechanisms, time-serial change, unstable sediment volume, and so on. As necessary, the required survey items are conducted.

(5) Survey of Rockfall

Survey of rockfall is conducted to obtain information about where rockfall has occurred and/or rockfall may occur, its properties such as fall mechanism and morphology of the movement, and vegetation around the survey area. As necessary, the required survey items are conducted.

3.10 Natural Environment Survey

(1) Purpose

The purpose of natural environment survey is to understand the environment of the target area and its surroundings to obtain the basic information that is required for project planning, its designing, and verification of its effect.

(2) Natural Environment Survey

A survey of natural environment associated with plants, animals, and water quality is conducted referring to literature and interviews. As necessary the field survey is conducted.

(3) Landscape Survey

When the erosion control works might adversely affect the natural landscape, a landscape survey is conducted as necessary and its result is used for consideration.

3.11 Social Characteristics Survey

(1) Purpose

The purpose of social characteristics survey is to understand the social characteristics of the target area and its surroundings to obtain the basic information that is required for project planning, its designing, and the verification of its effect.

(2) Social Environment Survey

The purpose of social environment survey is to investigate the history of disasters and the targets to be protected in the survey area.

(3) Laws and Regulations Study

Laws and regulations study is carried out to investigate laws and regulations in the survey area.

4. Design and Estimation

4.1 Surveying

(1) Purpose

Surveys are conducted to obtain basic materials for consideration in designing the erosion control works.

(2) Topographic Survey

Topographic survey is conducted in the field to make a plane figure and a longitudinal profile of the range covered by the design. The survey is also conducted in the surroundings of the survey area as necessary.

4.2 Hillside Works

(1) Basic Concept

The basic concept of hillside works is restoration and prevention of slope failure.

(2) Type of Hillside Works

Hillside works consist of foundation works of erosion control afforestation, planting works on hillside, and rockfall prevention works. It is necessary to implement these works in the required scale and to place them appropriately so that each of these works can become functionally effective.

(3) Foundation Works of Erosion Control Afforestation

The purpose of foundation works of erosion control afforestation is to ensure slope stabilization. These works include grading works, soil retaining works, water channel works, closed conduit, grating crib works, ground anchor works, reinforced soil works, plastering works, mortar (concrete) spraying works, and so on.

1) Grading Works

The purpose of grading works is to prevent slope failure and expansion of slope failure by shaping unstable portions inside and outer edge of the slope failure site.

2) Soil Retaining Works

The purpose of soil retaining works is to ensure prevention of movement of unstable sediment, modification of the slope, and dispersing of surface water.

3) Water Channel Works

The purpose of the water channel works is to gather rainwater and/or spring water which can cause landslide and surface erosion and to drain the water outside of the site concerned.

4) Closed Conduit

The purpose of closed conduit is to drain underground water and/or seepage water outside the site concerned and to ensure slope stabilization.

5) Grating Crib Works

The purpose of the grating crib works is to ensure prevention of sheet erosion and surface failure by constructing grating-like structures on the slopes. It can be expected to improve their function by combining the grating crib works with vegetation works.

6) Ground Anchor Works

The purpose of ground anchor works is to prevent slope failure, including large-scale failure, and to ensure the stability of the structure.

7) Reinforced Soil Works

The purpose of reinforced soil works is to improve the stability of the natural slopes by installing reinforcing materials in the soil.

8) Mortar (Concrete) Spraying works

The purpose of the mortar (concrete) spraying works is to ensure prevention of weathering and erosion on the slopes by covering the slopes with mortar or concrete.

(4) Planting Works on Hillside

The purpose of the planting works on hillside is to recover the vegetation on the slopes and to ensure slope stabilization. It is composed of foundation works of erosion control afforestation, the foundation works of vegetation, and vegetation works. These works include foundation works to facilitate regeneration of the surrounding natural vegetation.

1) Greening Foundation Works

The purpose of greening foundation works is to create a conducive environment for growing of vegetation. These works are composed of fence works, simple terracing works, covering works, and so on.

2) Vegetation Works

The purpose of the vegetation works is to make vegetation grow on the slopes stabilized by the foundation works of erosion control afforestation and/or the greening foundation works. These works are composed of seeding works and planting works. Also, appropriate management will be required after the vegetation works are conducted.

3) Rockfall Prevention Works

The rockfall prevention works are composed of “rockfall preventive measures” that prevent the occurrence of a rockfall, “the rockfall guard works” that deter the falling rocks or diminish the energy of the falling rocks and “Woodland Creation” that makes the planted trees deter the occurrence of a rockfall or mitigate the rockfall.

(5) Rockfall Preventive Measures

The purpose of the rockfall preventive measures is to prevent the occurrence of a rockfall by

removing or consolidating unstable loose rocks, boulders or exposed rocks that have many cracks.

1) Rockfall Guard Works

The purpose of rockfall guard works is to deter the falling rocks or to diminish the energy of the falling rocks at the origin of rockfall or on the hillside slope to be conserved.

2) Woodland Creation

The purpose of woodland creation is to develop the forests on the slopes where rocks may fall, in order to deter or mitigate the falling rocks with assistance of root system of the trees to consolidate the soil or boles to diminish rockfall energy.

4.3 Torrent Works

(1) Basic Concept

The basic concept of the torrent works is the restoration and the disaster prevention of the devastated torrent.

(2) Type of Torrent Works

The type of torrent works to be implemented is selected according to the conditions and property of the watershed and the torrent. It is necessary to implement these works in the appropriate scale and arrangement so that each of these works can become effective functionally.

(3) Check Dam

1) Purpose

The purpose of the dam is stabilization of the river bed, fixing of the spur and control of sediment discharge.

2) Selection of Model and Type of Dam

The model and type of dam to be constructed is determined according to purpose of constructing the dam and site condition.

3) Dam Site

The appropriate dam site is determined according to the purpose of constructing.

4) Dam Direction

The direction of the dam is determined so as not to affect the stability of the dam as well as the direction of the torrent.

5) Design Accumulating Gradient of Dam

The design accumulating gradient of the dam is based on the conditions of the sedimentation of the bed load, the discharge, and the bed slope of upstream and downstream.

6) Dam Height

The height of the dam is based on the purpose of constructing the dam, the design accumulating gradient, the topographical/geological conditions of the construction site, etc.

7) Floodway of Dam

The floodway of the dam should be designed appropriately, considering its position, shape, cross section, height, and so on.

8) Wing of Dam

The wing of the dam should be designed appropriately, considering the dam site and its floodway.

9) Cross Section of Dam

The slope gradient upstream of the gravity dam should be designed, in principle, considering the stability of the dam body, after determining the slope gradient of downstream and crown width.

10) Foundation of Dam

The foundation ground of the dam should have sufficient bearing capacity and friction resistance force. Safety should be ensured against scouring at the toe of downstream slope of the dam and distraction by piping.

11) Weep hole of Dam

The function of weep hole is drainage during the construction of dam and reduction of the osmotic pressure after reservoir sedimentation. The position and size of the weep hole should be considered so that it does not weaken the dam body.

12) Prevention of Scouring of the Dam

If the foundation ground of the dam is likely to be scoured, preventive measures against scouring are carried out. Some preventive measures against scouring are a counter-dam, a front apron, and side walls.

13) Expansion Joint of Dam

The function the expansion joint is to reduce concrete cracks.

14) Horizontal Construction Joint of Dam

The horizontal construction joint of the concrete gravity dam should be reinforced so as not to be the weak point of the dam body against any abnormal impact load such as debris flow.

(4) Revetment Works

1) Purpose

The purpose of the revetment works is to prevent lateral erosion of the river bank by running water, and also to prevent the hillside failure and to be the basis of the hillside works.

2) Type of Works

The type of revetment works is selected appropriately depending on the site condition.

3) Site

The site and alignment of the revetment works should be decided in the most effective way depending on the purpose and the site condition.

4) Height of Revetment Works

The height of revetment works should be anticipated considering the gravel and flood wood at the time of flood.

5) Structure

The structure of the revetment works is selected appropriately considering the topography, geology, and river regime.

6) Installation

The revetment works of upstream and downstream should be installed to the river bank so as not to be scoured or destroyed by running water.

7) Basis

The basis of the revetment works should have the depth of embedment which would not be scoured, considering the design bed slope and the riverbed conditions. As necessary, preventive measures against scouring should be taken, and if the foundation ground is fragile, foundation treatment should be conducted.

(5) Groyne Works

1) Purpose

The purpose of the groyne works is to keep the center of stream away from river bank, to regulate the watercourse, to control the erosion of the river bank, and to prevent scouring of the river bank.

2) Type of Works

The type of groyne works is selected appropriately depending on the site condition.

3) Site

The site of the groyne works should be decided in the most effective way depending on the purpose and the site condition.

4) Direction

The direction of the groyne works should be decided in the most effective way depending on the purpose and the site condition.

5) Structure

The structure of the groyne works is decided considering the shape of the river and the river regime.

6) Length and Interval

The length and interval of the groyne works are decided considering the shape of the river and the river regime.

7) Height

The height of the groyne works is decided considering the shape of the river and the river regime.

(6) Channel Works

1) Purpose

The purpose of the channel works is to prevent turbulent flow by fixing flow channel and to prevent longitudinal and lateral erosion by regulating longitudinal slope.

2) Alignment

The alignment of the channel works should be considered so that the flood flows downstream safely.

3) Shape of Longitudinal Section

The shape of longitudinal section of the channel works should be decided based on the topography, geology, and river regime.

4) Structure

The structure of the channel works should be considered so that the stabilization of the river bed can be maintained.

5) Change Point and Head of Design Bed slope

The changing point and head of the design bed slope of the channel works should be comprehensively decided considering the purpose, the site condition, and the placement of the groundsel.

6) Cross Section Profile

The cross section profile of the channel works should be decided considering the purpose and the site condition.

7) Relevance of each Structure

The channel works should be designed considering the attachment to the other structures such as the check dams, the revetment works, the groyne works, etc.

4.4 Estimation

(1) Preparation of Estimation Standard （Person Day and Unit Price）

Estimation standard （Person day and Unit price）has to be prepared for estimating costs of surveys and designing. The estimation standard must be revised as necessary.

(2) Update of Unit Price List

All costs and expenses have to be updated periodically.

5. Operation and Maintenance

5.1 Purpose

Facilities constructed as the erosion control works have to work effectively for a certain period or semi-permanently. The purpose of operation and maintenance is to verify the effect of the constructed facilities.

5.2 Inspection/Monitoring

Verification of the effect of the facilities constructed is carried out with visual inspection as a general rule. Inspection items should be recorded on a check-sheet prepared for this inspection. If the effect cannot be evaluated visually (e.g. deformation of the ground surface, deformation of the facilities, etc.), inspection accuracy is required to be improved by using appropriate instruments.

5.3 Judgment of Effect of Countermeasure

Evaluation criteria of the effect of facilities have to be prepared according to the purpose of the facilities. The criteria have to be revised as necessary.

5.4 Consideration of Remedial Measure

As a result of the judgment, if the facilities are judged not to be sufficiently effective, the causes and countermeasures should be considered.

6. Utilization of GIS

6.1 Purpose

The purpose of practical utilization of GIS is to promote maintenance and improvement of the level of erosion control works functionally and effectively.

6.2 Compilation of Database of Various Survey Results

Various survey results are arranged in a database and should be utilized effectively.

6.3 Preparation of Hazard Map and Regional Disaster Prevention Map

A hazard map in which the risk location of the sediment disaster is shown is created. Based on this map, the regional disaster prevention map, in which the evacuation points and evacuation routes are shown, is created. These maps have to be updated as necessary.

6.4 Promotion of Providing Information

It is necessary that the hazard map and the regional disaster prevention map are opened to the public and are used for the security of the local residents.

6 List of collected materials

The list of materials which were collected in the period is shown below.

From April 2013 to March 2014

No.	Title	Author	Form
1	Map of Uttaranchal (geology, ground-water, irrigation, natural hazards, rainfall, rock &mineral, slope, soil)	UKFD	Jpg
2	Map of Uttarkashi	UKFD	Pdf
3	Landslide Areas Of Uttarakhand 2013 An Estimate of Forest Loss	UKFD	Pdf
4	Landslide Areas Of Uttarakhand 2013 An Estimate of Forest Loss	UKFD	MS-PowerPoint
5	Uttarakhand's Structure of Administration and Forest department	UKFD	MS-Word
6	Presentation for Core Committee Meeting June 25, 2014	UDRP & UEAP	MS-PowerPoint
7	Mandate of ITCELL- Uttarakhand	UKFD	MS-Word
8	Uttarakhand_Forest_Statistics_2012-13	UKFD	PDF

Appendix

(1) Survey result of reconnaissance survey

Appendix1. Result of mountain disaster mitigation observation

Date : 11/Aug/2014			No : Site 01
Sheet for investigation of sediment disaster			
Division and Range	Uttarkashi, Dharasu	Villege	Patara
Location information by GPS	Latitude	Longitude	Elevation (m)
	N 30°37'51.04"	E 78°19'46.75"	955
Disaster type	(Landslide) (Slope failure) Debris flow (complex type)		
Occurrence Situation	upper side (mountainside) lower side riverside roadside		
Geology (hardness)	metamorphic rock ((very hard) hard middle soft)		
Weathering condition	Strong Middle (Weak) Note (Color)		
Slope degree (Ave)	About (Ave) 60° (Write in cross section)		
Failure Scale	Length (m)	Width (m)	Depth (m) (Max Ave)
	50	50	Max. 3 Ave. 2
Failure Volume (m3)	50 × 50 × 2 = 5000		
Damaged target	Forest (Road) River Houses other ( )		
Surrounding vegetation	*P. roxburghii, Emblica officinalis, Acacia catechu, Rhus punjabensis, Ficus spp., Woodfordia spp., Euphorbia royleana, Mallotus philippensis*		
Proposed disaster measures	(Terrace hillside works,) Vegetation works, Water channel works Reinforcement soil works, Steped dams, others ( )		
Note	✓Monkeys drop stones ✓Remarkable rock fall and surface failure ✓Talus accumulation ✓Example of construction Under part: Lock bolt + Frame work and spraying, Lock bolt + Net work and spraying Middle-Upper part: Anchor work		

Slope failure caused by cutting

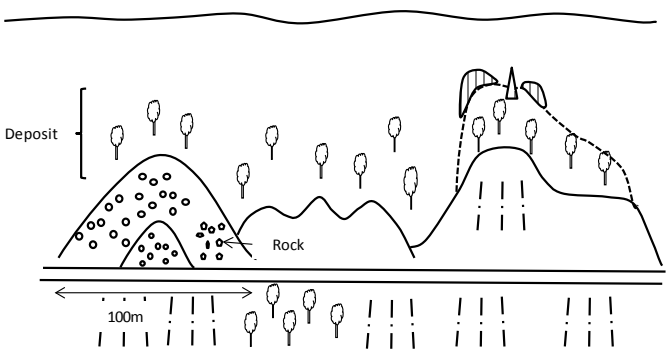
Falling rocks (d=20cm)

Slope failure caused by cutting

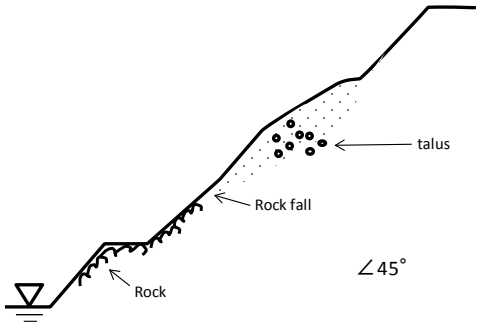
Basement rock

location

Sketch(Plane)



(cross section)



Date : 11/Aug/2014			No : Site 02
Sheet for investigation of sediment disaster			
Division and Range	Uttarkashi, Dunda	Villege	Dunda reservation forest Compartment 1
Location information by GPS	Latitude	Longitude	Elevation (m)
	N 30°39'30.31"	E 78°20'10.34"	1026
Disaster type	Landslide (Slope failure) Debris flow complex type		
Occurrence Situation	upper side (mountainside) lower side riverside roadside		
Geology (hardness)	sedimentary rock(sandstone, shal ((very hard) hard middle soft)		
Weathering condition	Strong Middle (Weak) Note (Color surface:Brown)		
Slope degree (Ave)	About (Ave) 60° (Write in cross section)		
Failure Scale	Length (m)	Width (m)	Depth (m) (Max Ave)
	50	50	Max. 4-5 Ave. 3
Failure Volume (m3)	50 × 30 × 3 = 4500		
Damaged target	Forest (Road) River Houses other ( )		
Surrounding vegetation	*P. roxburghii, Emblica officinalis, Moria ponigaya, Albizia lebbeck, Rosa moskata, Bambusoideae, bahunia retusa,*		
Proposed disaster measures	Terrace hillside works, Vegetation works, Water channel works Reinforcement soil works, Steped dams, (others) ( )		
Note	✓Monkeys drop stones ✓Remarkable rock fall and surface failure ✓Talus accumulation		

Slope failure caused by cutting

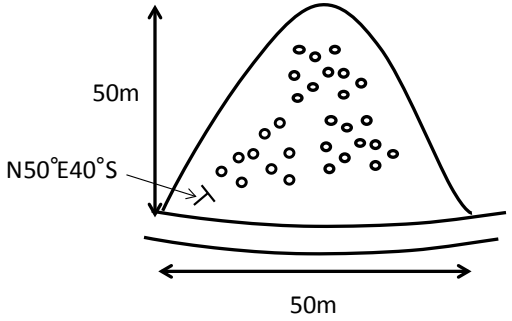
Near view

Surface failure and rock fall

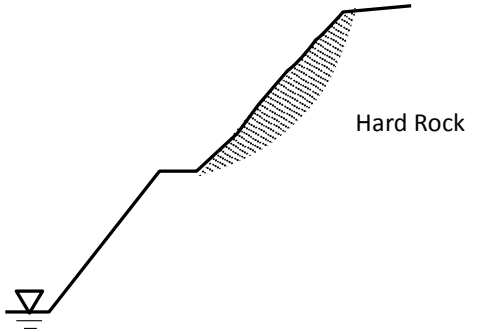
Cracked rocks

Location

Sketch(Plane)



(cross section)



Date : 13/Aug/2014			No : Site 03
Sheet for investigation of sediment disaster			
Division and Range	Uttarkashi,Dunda	Villege	Ranari compartment 4
Location information by GPS	Latitude	Longitude	Elevation (m)
	N 30°41'20.73"	E 78°21'32.23"	1005
Disaster type	Landslide Slope failure (Debris flow) complex type		
Occurrence Situation	upper side (mountainside) lower side riverside roadside		
Geology (hardness)	-		
Weathering condition	Strong Middle Weak Note (Color)		
Slope degree (Ave)	About (Ave) 5° (Write in cross section)		
Failure Scale	Length (m)	Width (m)	Depth (m) (Max Ave)
	–	–	–
Failure Volume (m3)	-		
Damaged target	Forest Road River Houses other (Cultivated lands)		
Surrounding vegetation	*Pinus roxburghii, Emblica officinalis, Woodfordia fruticosa, bahunia retusa, Toona ciliata*		
Proposed disaster measures	Terrace hillside works, Vegetation works, Water channel works Reinforcement soil works, Steped dams, others ( )		
Note	✓Traces of sediment dischrge ✓Preservation objects : Cultivated lands, houses on the slope		

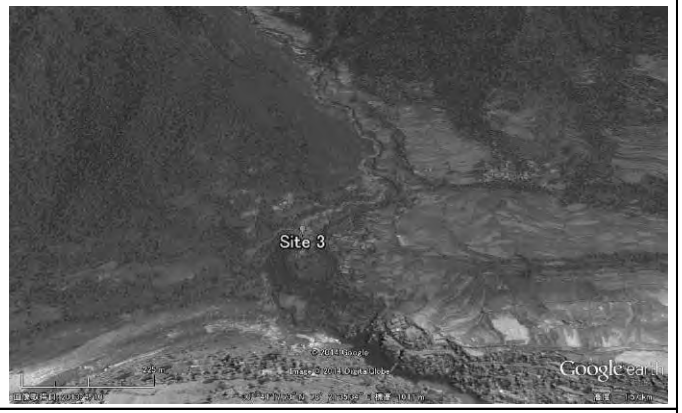
Full view of mountain stream

Cultivated land along the steam

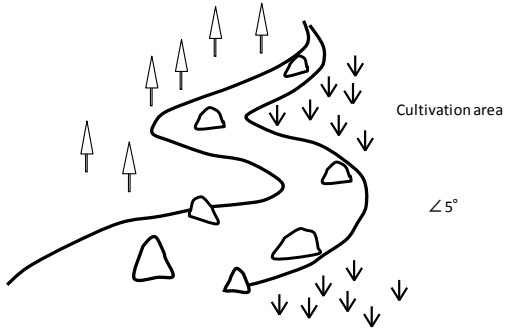
Slope failure along the stream

Deposit of big boulders

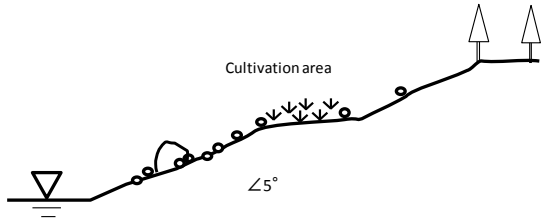
Location



Sketch(Plane)



(cross section)



Date : 13/Aug/2014			No : Site 04
Sheet for investigation of sediment disaster			
Division and Range	Uttarkashi,Dunda	Villege	ranal compartment 4-5
Location information by GPS	Latitude	Longitude	Elevation (m)
	N 30°41'55.92"	E 78°21'26.63"	1009
Disaster type	Landslide Slope failure (Debris flow) complex type		
Occurrence Situation	upper side (mountainside) lower side riverside roadside		
Geology (hardness)	-		
Weathering condition	Strong Middle Weak Note (Color)		
Slope degree (Ave)	About (Ave) 15° – 18° (Write in cross section)		
Failure Scale	Length (m)	Width (m)	Depth (m) (Max Ave)
	–	–	–
Failure Volume (m3)	-		
Damaged target	(Forest) (Road) River Houses other ( )		
Surrounding vegetation	*Pinus roxburghii, Emblica officinalis, Woodfordia fruticosa, bahunia retusa, Toona ciliata, Xanthoxylum,Mallotus philippensis*		
Proposed disaster measures	Terrace hillside works, Vegetation works, Water channel works Reinforcement soil works, Steped dams, others ( )		
Note	✓Astal streem(4km) ✓Traces of sediment dischrge ✓Preservation objects : Forest road		

Condition of sediment discharge

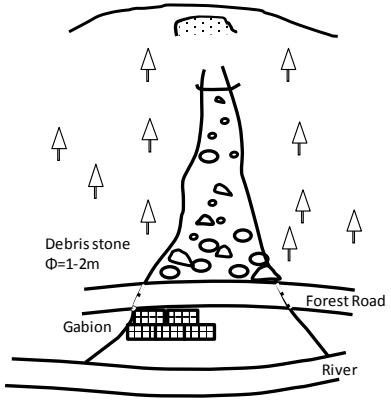
Little a trace of sediment discharge

Old deposit

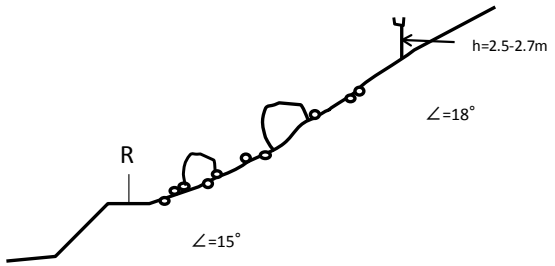
Nothing a trace of debris flow

Location

Sketch(Plane)



(cross section)



Date : 11/Aug/2014			No : Site 05
Sheet for investigation of sediment disaster			
Division and Range	Uttarkashi, Dunda	Villege	Raturisera
Location information by GPS	Latitude	Longitude	Elevation (m)
	N 30°44'22.98"	E 78°21'20.28"	1040
Disaster type	Landslide (Slope failure) Debris flow complex type		
Occurrence Situation	upper side (mountainside) lower side riverside roadside		
Geology (hardness)	Talus (very hard hard middle soft)		
Weathering condition	Strong Middle Weak Note (Color surface:Brown)		
Slope degree (Ave)	About (Ave) 50° (Write in cross section)		
Failure Scale	Length (m)	Width (m)	Depth (m) (Max Ave)
	50	40	Max. 3 Ave. 2
Failure Volume (m3)	50 × 30 × 2 = 3000		
Damaged target	Forest (Road) River Houses other ( )		
Surrounding vegetation	*P. roxburghii, Emblica officinalis, Moria ponigaya*		
Proposed disaster measures	Terrace hillside works, Vegetation works, Water channel works Reinforcement soil works, Steped dams, others ( )		
Note	✓Slope failure of road side ✓Remarkable surface failure ✓Remarkable river erosion		

Slope failure caused by river erosion

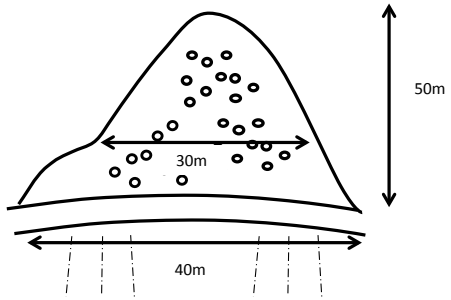
Expansion of cutting associated with road shift

Slope composed of schist

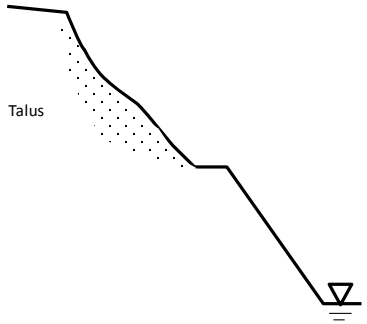
Near view of deposit

Location

Sketch(Plane)



(cross section)



Date : 12/Aug/2014			No : Site 06
Sheet for investigation of sediment disaster			
Division and Range	Uttarkashi, Dunda	Villege	Raturisera
Location information by GPS	Latitude	Longitude	Elevation (m)
	N 30°46'39.23"	E 78°27'13.11"	1319
Disaster type	(Landslide) Slope failure Debris flow complex type		
Occurrence Situation	(upper side) (mountainside) (lower side) riverside roadside		
Geology (hardness)	mudstone (very hard hard middle soft)		
Weathering condition	Strong Middle Weak Note (Color Dark grey)		
Slope degree (Ave)	About (Ave) 30° (Write in cross section)		
Failure Scale	Length (m)	Width (m)	Depth (m) (Max Ave)
	50	40	Max. 3 Ave. 2
Failure Volume (m3)	50 × 30 × 2 = 3000		
Damaged target	(Forest) (Road) River Houses other ( )		
Surrounding vegetation	*P. roxburghii, Emblica officinalis,*		
Proposed disaster measures	Terrace hillside works, Vegetation works, Water channel works Reinforcement soil works, Steped dams, others ( )		
Note	✓Cutting by road construction ✓Abundance of groundwater ✓Clack by landslide actibity(W=10cm, Ramp=25cm)		

Leaning of trees caused by landslide

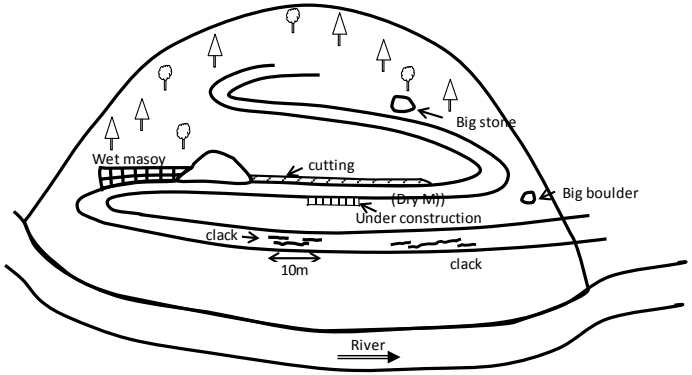
Slope failure caused by cutting

Undulating landform

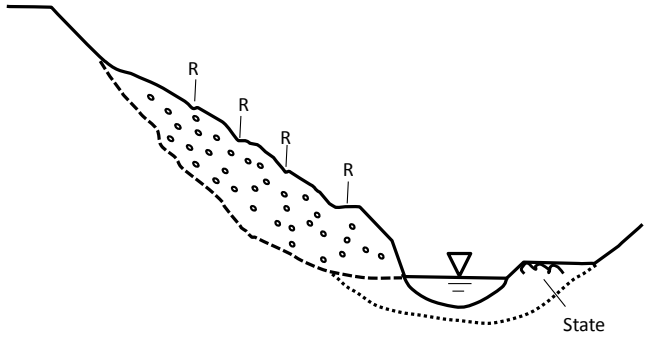
Crack occurred on the road

Location

Sketch(Plane)



(cross section)



Date : 13/Aug/2014			No : Site 07
Sheet for investigation of sediment disaster			
Division and Range	Uttarkashi	Villege	Gavana
Location information by GPS	Latitude	Longitude	Elevation (m)
	N 30°45'30.60"	E 78°27'42.74"	1192
Disaster type	Landslide Slope failure (Debris flow) complex type		
Occurrence Situation	upper side mountainside lower side riverside roadside		
Geology (hardness)	-		
Weathering condition	Strong Middle Weak Note (Color)		
Slope degree (Ave)	About (Ave) 25° – 30° (Write in cross section)		
Failure Scale	Length (m)	Width (m)	Depth (m) (Max Ave)
	–	–	–
Failure Volume (m3)	-		
Damaged target	(Forest) (Road) River Houses other ( )		
Surrounding vegetation	*Agave spp., Erythrina spp., Ficus spp.*		
Proposed disaster measures	Terrace hillside works, Vegetation works, Water channel works Reinforcement soil works, Steped dams, others ( )		
Note	✓Example of construction (Debris flow ocurred at 2010 and the work has been framed at 2011) ✓Small check dams by gabion ✓Soil retaining works by gabion		

Full view of valley

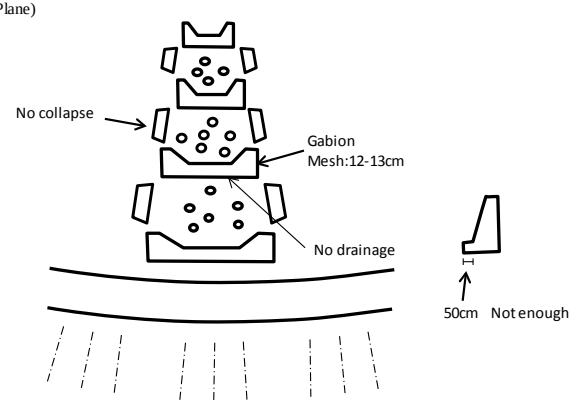
Check dams

Check dam by gabion

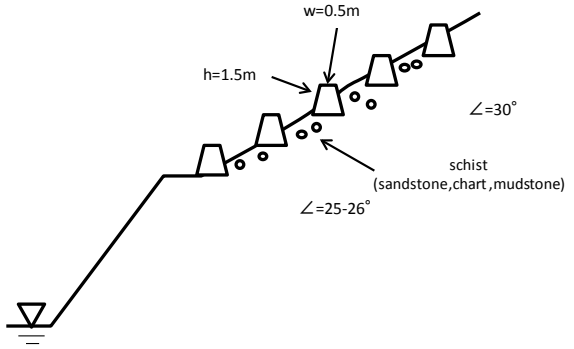
Near view of gabion

location

Sketch(Plane)



(cross section)



Date : 13/Aug/2014			No : Site 08
Sheet for investigation of sediment disaster			
Division and Range	Uttarkashi,Bardhat	Villege	Netala, Gwang compartment 1
Location information by GPS	Latitude	Longitude	Elevation (m)
	N 30°45'7.15"	E 78°28'57.51"	1237
Disaster type	Landslide Slope failure (Debris flow) complex type		
Occurrence Situation	upper side mountainside lower side riverside roadside		
Geology (hardness)	-		
Weathering condition	Strong Middle Weak Note (Color)		
Slope degree (Ave)	About (Ave) 13° – 25° (Write in cross section)		
Failure Scale	Length (m)	Width (m)	Depth (m) (Max Ave)
	–	–	–
Failure Volume (m3)	-		
Damaged target	(Forest) (Road) River (Houses) other ( )		
Surrounding vegetation	*Vrtica dioica, Butea monosperma, Prunus padam, Bombax ceiba, Pinus roxburghii*		
Proposed disaster measures	Terrace hillside works, Vegetation works, Water channel works Reinforcement soil works, Steped dams, others ( )		
Note	✓Traces of sediment discharge		

Exit of valley

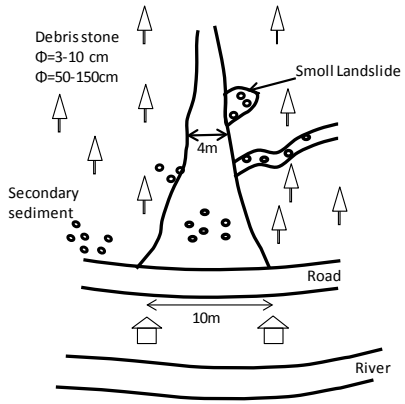
Riverbed covered by sediment

Trace of sediment discharge

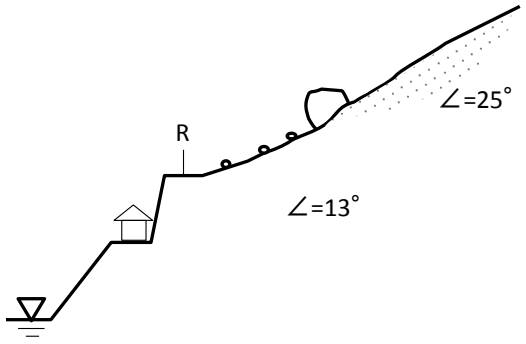
Inadequate channel works

Location

Sketch(Plane)



(cross section)



Date : 14/Aug/2014			No : Site 09
Sheet for investigation of sediment disaster			
Division and Range	Mussoorie,Devalsni	Villege	parori
Location information by GPS	Latitude	Longitude	Elevation (m)
	N 30°30'18.30	E 78° 7'35.74"	1206
Disaster type	Landslide Slope failure (Debris flow) complex type		
Occurrence Situation	(upper side) (mountainside) lower side riverside roadside		
Geology (hardness)	-		
Weathering condition	Strong Middle Weak Note (Color)		
Slope degree (Ave)	About (Ave) 13° (Write in cross section)		
Failure Scale	Length (m)	Width (m)	Depth (m) (Max Ave)
	–	–	–
Failure Volume (m3)	-		
Damaged target	Forest Road (River) (Houses) other (Rice field and bridge)		
Surrounding vegetation	*Grewia oppositifolia, Anogeissus latifolia,Celtis aaustralis,Bauhinia variegata,Bombax malabaricum*		
Proposed disaster measures	Terrace hillside works, Vegetation works, Water channel works Reinforcement soil works, Steped dams, others ( )		
Note	✓Debris flow(13/jun/20113 AM2:00) ✓Damaged condition by debris flow : houses, rice field and bridge rehabilitaion is required ✓600 villagers still live in the village.		

Full view of village

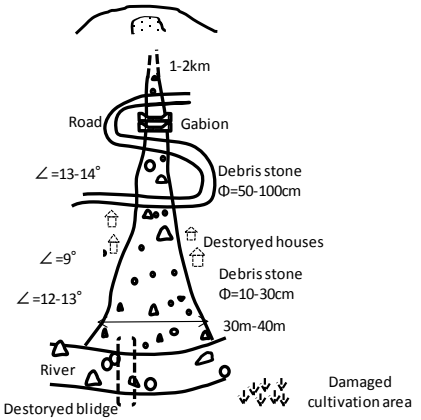
Rice field damaged by sediment discharge

Houses damaged by debris flow

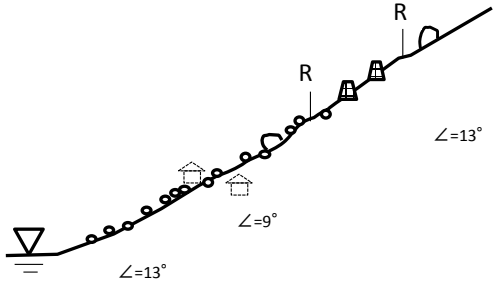
Trace of debris flow

location

Sketch(Plane)



(cross section)



Date : 20/Aug/2014			No : Site 01
Sheet for investigation of sediment disaster			
Division and Range	Tehri Garhwal, Narendranagar	Villege	Nirgad
Location information by GPS	Latitude	Longitude	Elevation (m)
	N 30°08'09.41"	E 78°20'30.73"	417
Disaster type	(Landslide) Slope failure (Debris flow) complex type		
Occurrence Situation	upper side (mountainside) lower side riverside roadside		
Geology (hardness)	sedimentary rock, mudstone (very hard hard middle soft)		
Weathering condition	(Strong) Middle Weak Note (Color)		
Slope degree (Ave)	About (Ave) 8° (Write in cross section)		
Failure Scale	Length (m)	Width (m)	Depth (m) (Max Ave)
Failure Volume (m3)			
Damaged target	Forest (Road) River Houses other ( )		
Surrounding vegetation	*Erythrina spp.Lantana canara, Acacia catechu, muraya, cassia fistula*		
Proposed disaster measures	Terrace hillside works, Vegetation works, Water channel works Reinforcement soil works, Steped dams, others ( )		
Note			

Debris flow which flowed out on the road

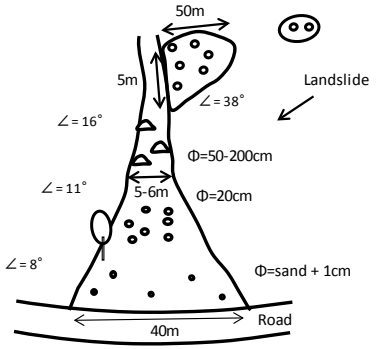
Top part of the fan deposit

Sediment deposit condition

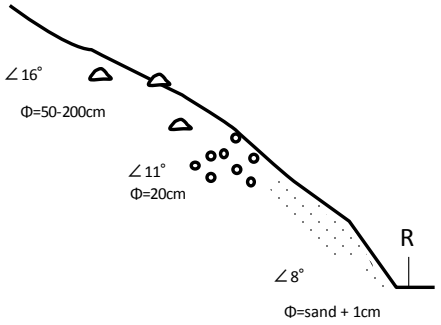
Slope failure

location

Sketch(Plane)



(cross section)



Date : 23/Aug/2014			No : Site 02
Sheet for investigation of sediment disaster			
Division and Range	Rudraprayag, Bhiri	Villege	Jowari
Location information by GPS	Latitude	Longitude	Elevation (m)
	N 30°17'23.09"	E 79°57'59.69"	1037
Disaster type	(Landslide) Slope failure Debris flow complex type		
Occurrence Situation	upper side (mountainside) lower side riverside roadside		
Geology (hardness)	(very hard hard middle soft)		
Weathering condition	Strong Middle Weak Note (Color)		
Slope degree (Ave)	About (Ave) ° (Write in cross section)		
Failure Scale	Length (m)	Width (m)	Depth (m) (Max Ave)
Failure Volume (m3)			
Damaged target	(Forest) (Road) River (Houses) other ( )		
Surrounding vegetation	*Pinus roxburghii..Lantana canara, Rhus parvensis, Euphorbia royaliena, Bombax ceiba, cassia fistula,adhatoda vasica*		
Proposed disaster measures	Terrace hillside works, Vegetation works, Water channel works Reinforcement soil works, Steped dams, others ( )		
Note			

Full view of slope failure -1

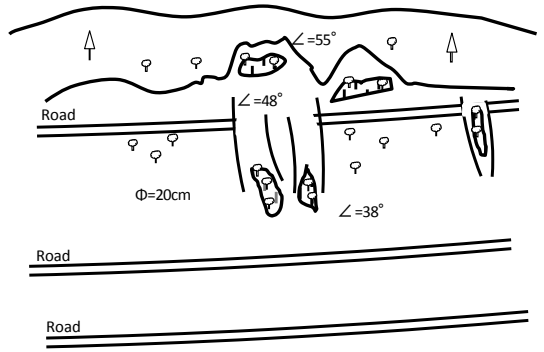
Full view of slope failure -2

Top part of slope failure

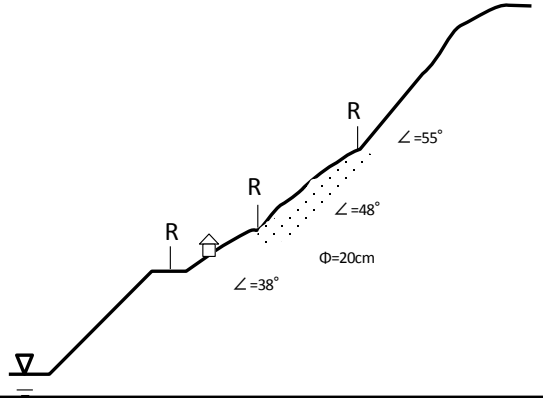
View of downward from top part

location

Sketch(Plane)



(cross section)



Date : 21/Aug/2014			No : Site 03
Sheet for investigation of sediment disaster			
Division and Range	Rudraprayag, Bhiri	Villege	Bhiri
Location information by GPS	Latitude	Longitude	Elevation (m)
	N 30°27'47.4"	E 78°04'38.6"	982
Disaster type	(Landslide) Slope failure (Debris flow) complex type		
Occurrence Situation	upper side (mountainside) lower side riverside roadside		
Geology (hardness)	granite, schist (very hard hard middle soft)		
Weathering condition	(Strong) Middle Weak Note (Color)		
Slope degree (Ave)	About (Ave) ° (Write in cross section)		
Failure Scale	Length (m)	Width (m)	Depth (m) (Max Ave)
Failure Volume (m3)			
Damaged target	Forest (Road) River Houses other ( )		
Surrounding vegetation	*Pinus roxburghii..Lantana canara, Rhus parvensis, Euphorbia royaliena, Bombax ceiba, cassia fistula,adhatoda vasica*		
Proposed disaster measures	Terrace hillside works, Vegetation works, Water channel works Reinforcement soil works, Steped dams, others ( )		
Note			

Exit of hillside collapse

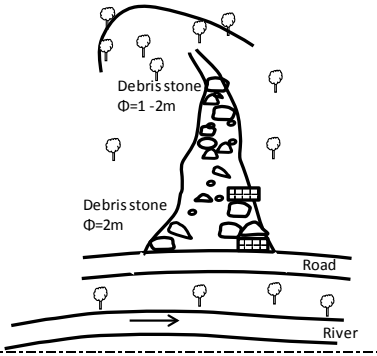
Hillside collapse deposit

View of downward from middle part

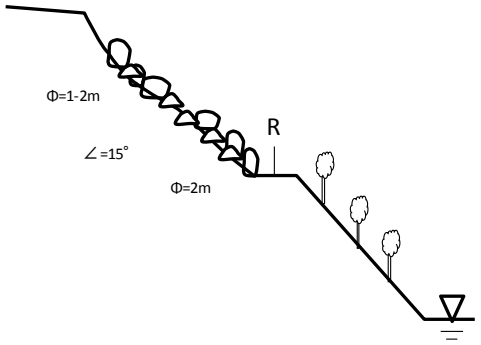
Deposit condition of big boulders

location

Sketch(Plane)



(cross section)



Date : 21/Aug/2014			No : Site 04
Sheet for investigation of sediment disaster			
Division and Range	Rudraprayag	Villege	Semi
Location information by GPS	Latitude	Longitude	Elevation (m)
	N 30°30'45.6"	E 79°05'08.6"	1065
Disaster type	(Landslide) Slope failure Debris flow complex type		
Occurrence Situation	upper side (mountainside) lower side riverside roadside		
Geology (hardness)	granite, schist (very hard hard middle soft)		
Weathering condition	Strong Middle Weak Note (Color)		
Slope degree (Ave)	About (Ave) ° (Write in cross section)		
Failure Scale	Length (m)	Width (m)	Depth (m) (Max Ave)
	500	500	50
Failure Volume (m3)	7,500,000		
Damaged target	(Forest) (Road) (River) (Houses) other ( )		
Surrounding vegetation	*Pinus roxburghii..Lantana canara,*		
Proposed disaster measures	Terrace hillside works, Vegetation works, Water channel works Reinforcement soil works, Steped dams, others ( )		
Note	✓Huge landslide		

Inclination of house and uneven road

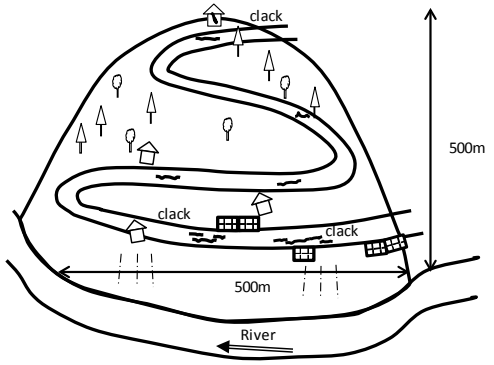
Uneven road caused by landslide

Sinking of steps caused by landslide

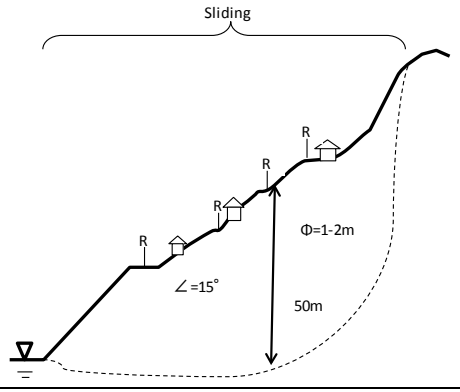
Clack of wall caused by landslide

location

Sketch(Plane)



(cross section)



Date : 20/Aug/2014			No : Site 05
Sheet for investigation of sediment disaster			
Division and Range	Tehri Garhwal, Narendranagar	Villege	Nirgad
Location information by GPS	Latitude	Longitude	Elevation (m)
	N 30°08'09.41"	E 78°20'30.73"	417
Disaster type	(Landslide) Slope failure Debris flow complex type		
Occurrence Situation	upper side (mountainside) lower side riverside roadside		
Geology (hardness)	sedimentary rock, mudstone, sandstone ((very hard) hard middle soft)		
Weathering condition	Strong Middle Weak Note (Color)		
Slope degree (Ave)	About (Ave) 50° (Write in cross section)		
Failure Scale	Length (m)	Width (m)	Depth (m) (Max Ave)
Failure Volume (m3)			
Damaged target	Forest (Road) River Houses other ( )		
Surrounding vegetation	*Erythrina spp.Lantana canara, Acacia catechu, muraya, cassia fistula*		
Proposed disaster measures	Terrace hillside works, Vegetation works, Water channel works Reinforcement soil works, Steped dams, others ( )		
Note			

Full view of landslide

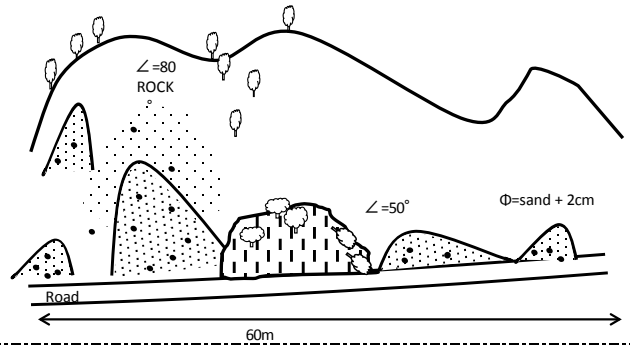
Top of the landslide

the road is affected by soil and rocks

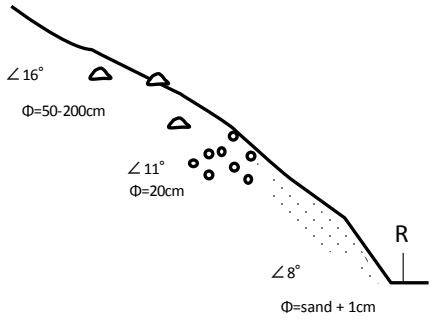
road condition

location

Sketch(Plane)



(cross section)



Date : 20/Aug/2014			No : Site 06
Sheet for investigation of sediment disaster			
Division and Range	Rudraprayag,	Villege	Siroh Baggar
Location information by GPS	Latitude	Longitude	Elevation (m)
	N 30°14'29.5"	E 78°54'00.1"	696
Disaster type	(Landslide) (Slope failure) (Debris flow) complex type		
Occurrence Situation	upper side (mountainside) lower side (riverside) roadside		
Geology (hardness)	sedimentary rock (very hard hard middle soft)		
Weathering condition	Strong Middle (Weak) Note (Color)		
Slope degree (Ave)	About (Ave) 40-50 ° (Write in cross section)		
Failure Scale	Length (m)	Width (m)	Depth (m) (Max Ave)
Failure Volume (m3)			
Damaged target	Forest (Road) River Houses other ( )		
Surrounding vegetation			
Proposed disaster measures	Terrace hillside works, Vegetation works, Water channel works Reinforcement soil works, Steped dams, others ( )		
Note	✓River training is required ✓it better to build a bridge to across this area.		

Full view of Landslide

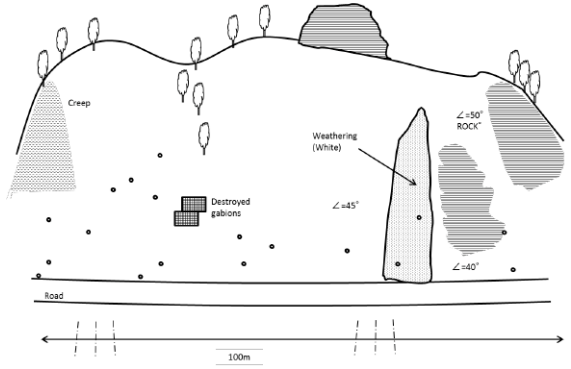
destroyed old works

Falling rocks

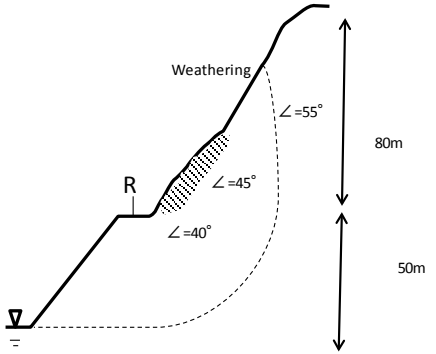
View of downward from the road

location

Sketch(Plane)



(cross section)



Appendix

(2) Result of village interviews

1. Village Chua, District Uttarkashi

Date of survey	12-08-14
Name of answer person	Bijen Singh Panwar, VP Sarpanch, Rina Rawat, Gram Pradhan along with a number of community members
Position	
Tel number	
E-mail:	
Location of interview	Chua village

Question

1. Question regarding the village

1-1. Official name of the village

Chua Nad, Gram Sabha Nad, District Uttarkashi.

It forms a part of the Nad Gram Sabha which comprises of 4 villages namely: Nad, Rawadu, Gangori and Chua

1-2. Representative of the village

Rina Rawat, Gram Pradhan

1-3.Number of population in the village

	Chua village	Gram Sabha Total
No. of Families	100	235
Population	500	1,200

1-5. Location of village

About 15 km from Uttarkashi town

1-6. Ratio of male/female

Approximately 45% males and 55% females

1-7. The working population (excluding the elderly, children population who cannot join working)

Based on estimates with villagers approximately 30 to 40% of the village population comprises working population

1-8. The main livelihood of the village

Agriculture supplemented by animal husbandry comprises the main occupation of as much as 80 to 90% of village population. Although agriculture is primarily subsistence in nature and much of the agriculture produce is used for home consumption but some cash crops are also grown.

About 7 to 8 families in the village also rear sheep and practice transhumance during the summers (taking sheep to high altitude pasturelands during summers).

Approximately 10 to 15% of the villagers are also doing jobs. While some are doing private jobs in Uttarkashi and also in places like Dehradun some are working in government departments as well as in the army.

1-9. Type of land use within the village

Within the village a majority of the land comprises private land (locally called “naap” land) on which villagers have their houses as well as farms. Apart from that there is also civil land (land belonging to entire village/Gram Sabha) on which a Van Panchayat has been formed.

2. Forestry land Agriculture situation in the village area

2-1. Vegetation type village area

The village is surrounded by Chir Pine (Pinus Roxburghii) forests which are gregarious in nature. There are also some Banj forests (*Quercus leucotrichophora*) along with Burans (*Rhododendron arboretum*).

2-3. Type of land title

The village land is classified as revenue land which the land adjoining the village is forest land.

2-4. Anually activities of your village

- Logging operation (Species, Volume, Concession area, logging method)
- Plantation operation (Species, planting areas, planting method)
- Conservation activity (type of conservation, target area, areas, etc.)
- Budget system
- Bearer of afforestation

NOT APPLICABLE AS LOGGING IS NOT PERMITTED.

2-5. Cause of forest degradation in the village

The village communities lop the broad leaved trees such as Oak for use as fodder and lopping of broad leaved trees forms a major cause of forest degradation. Moreover, at times illegal cutting of trees for fuelwood or for timber requirements as leads to forest degradation.

Village community also told that frequent landslides around their village are resulting in uprooting of trees and causing forest degradation.

2-6. Situation of animal breeding

- Species

  Although traditionally the communities kept more cows but about 2 decades ago the number of cows had come down and the number of buffaloes had increased. However, communities told that in the past few years the number of cows had again increased. The reason being that cows need less upkeep as they can be sent to the forests to graze and also that buffaloes were unable to adjust to the heat during the summers.

  Each family has about 2 cows/buffaloes. Although earlier (about 20 years ago) each family had a pair of bulls for ploughing but now only a few families keep bulls and rest hire the bulls.

  A number of families are keeping hybrid “jersey cows” which give more milk yields.

- System of breeding

  Breeding is mostly based on traditional system (natural breeding) however through government support and support of an NGO called BAIF hybrid bulls were being used for breeding and in a few cases Artificial Insemination (AI) was also being done.

- Fodder

  Fodder is provided through cutting grasses from around the fields, from the forests and also from the Van Panchayat. Moreover, broad leaved trees are also lopped for fodder purposes.
  Village women have the prime responsibility for collecting fodder and they collect fodder from forests located 3-4 km away. During winter they have to walk up to 5 to 10 km to get fodder from forests. Fodder shortages are most severe during the winters.

  Women complained that they did not have fodder trough where animals could eat fodder and also lack of chaff cutter (fodder cutter).

2-7. Situation of collecting firewood

- Species

  The communities avoid using Chir Pine as fuelwood as it gives a lot of smoke and the utensils as well as the walls turn black.

- Method of collection

  Fuelwood is collected mainly by women who carry 25 to 30 kg loads of fuelwood from forests located 3-4 km away. Small quantities of fuelwood are also collected from VP forests.

- Regulation for collection of firewood

  From the Reserve Forests as well as in Van Panchayats the cutting of green trees or cutting branches of green trees is not allowed. Women told that they usually cut dry branches of collect fallen branches.

2-8. Charcoal making

NOT APPLICABLE

2-9. Agriculture system

- Commodity for agriculture

The main agriculture crops are rice, wheat, mandua (finger millet), jhangora (barnyard millet), soyabean, pulses (urad, bhatt and tor).

- Cultivation method

While a majority of the crops are cultivated through sowing of seeds or broadcast of seeds (in case of dryland rice) but in irrigated fields rice is cultivated by transplantation method.

- **Calendar for agriculture**

Generally two crops are taken in an year.

Agriculture calendar

Crop	Sowing season	Harvesting season	
Wheat	October-November	April-May	
Rice	June-July	November	
Urad (pulses)	May-June	November-December	
Millets	May-June	November	

Wild boar and monkeys are causing extensive damage to agriculture.

- **Existing slash and burn shifting cultivation** – NOT APPLICABLE

- **Agroforestry system**

Generally agroforestry is not very popular. Although traditionally the communities plant Bhimal (Grevia optiva) on the boundaries of their fields and also some fruit trees. Bhimal is a multipurpose tree as its leaves are rich in fodder and also its fiber is used for making ropes.

2-10. Cooperative system

There is a Van Panchayat in the Nand Gram Sabha (of which Chua village is a part). Although the VP Sarpanch (headman) reported the area of VP to be 60 ha but upon verification of records the area was found to be about 15 ha.

- Structure of cooperative

  The VP has a management body of 9 members. The Sarpanch is the head of the VP while a forest officer (Forest guard/Forester/Deputy Ranger) shall be the secretary of the VP.
- Member of cooperative

  All residents of the Gram Sabha are members of the VP.

- Role of cooperative

  The purpose of VP is to sustainably manage the community land around the Gram Sabha and to utilize that for providing fuelwood and fodder to the villagers. The VP forests can also be used to ensure income for the Gram Sabha e.g. by selling resin of Chir Pine.

  The VP has to prepare a micro plan and that micro plan has to be approved by the FD and then the FD provides some funds to the VP for plantation and related activities. In Chua the VP was formed in 2004-05 and it took up plantation work in 4-5 ha land where Oak and Burans trees were planted.

  However, the VP in Chua has not formulated any regulations for extraction of biomass from VP. Only the cattle are prevented from entering the VP.

3. Mountain disaster mitigation work in the village

3-2. Priority target for prevention for mountain disaster with in village

A major portion of the village land is sinking and has become unstable and prone to landslides.

Moreover, the river nearby has eroded a lot of productive agriculture land. The priority for this village is to arrest sinking of land, prevent landslides and also protect the fields from being eroded away by the river.

3-3. Target area for mountain disaster restoration

The entire area of the Gram Panchayat is the target.

3-4. Experience of mountain disaster mitigation work in the village

The communities do not have much experience of disaster mitigation work. However, in the past they have contributed in removing debris from village roads and also worked as labourers for gully plugging and construction of check dams.

3-5. How to cooperate to the mountain disaster mitigation work

After the 2012 and 2013 disasters the villagers did voluntary labour work for clearing the debris from the approach road to their village. They also made small repairs to the roads. During the discussions the community told that if some disaster mitigation work is take up in their village they are willing to cooperate with FD.

3-6. Knowledge of individual mountain disaster mitigation work (Terracing, Hedgerow)

The villagers can construct stone check dams and terraces.

3-7. Bearer of for mountain disaster mitigation work in the village

The Gram Pradhan and the VP.

3-8. Annual budget for mountain disaster mitigation work in the village

Currently the Gram Panchayat got Rs. 30,000 to 60,000 per year. Part of this was used for repair of roads etc.

3-9. What kind of materials and equipment do you use for mountain disaster mitigation work?

The villagers use basic equipment like spade and pick axe.

3-10. What materials and equipment for mountain disaster mitigation work do you have?

The villagers do not have any specific equipment for mountain disaster mitigation work. They only have Spades and pick axe.

3-11. Where do you purchase materials and equipment for mountain disaster mitigation

work?

3-12. Training system for technology of mountain disaster mitigation work

In 2011 2-3 persons from the village got trained in rescue operations and first aid. However, no specific training in mountain disaster mitigation has been received.

3-13. Damage of mountain disaster on 2013

The area suffered from an earthquake in 1991. Consequently the houses of some families were affected by landslides and these families shifted to their present location.

Subsequently in 2012 there were flash floods and a large area of agriculture land of the village near the Assi Ganga River was washed away. Consequent to heavy rains a large portion of land near the village started sinking and there were landslides near the village.

In 2013 also a lot of agriculture land was washed away and there were more landslides near the village.

2. Village Hitanu, District Uttarkashi

Date of survey	13-08-14
Name of answer person	Bishambeer Dutt Uniyal ,VP Sarpanch along with a number of community members
Position	
Tel number	
E-mail:	
Location of interview	Hitanu village

Question

1. Question regarding the village

1-1. Official name of the village

Hitanu village, Gram Sabha Hittanu, Dunda Range, District Uttarkashi.

It forms a part of the Hitanu Gram Sabha which comprises of 6 villages namely: Hitanu, Bhukra, Tokhar, Binoli, Jhokani and Choti Bhalsi.

1-2. Representative of the village

Dinesh Chamoli, Gram Pradhan

1-3. Number of population in the village

	Hitanu village	Gram Sabha Total
No. of Families	120	300-350
Population	750	1,200-1,300

1-4. Location of village

About 30 km from Uttarkashi town

1-5. Ratio of male/female

Approximately 50% males and 50% females

1-6. The working population (excluding the elderly, children population who cannot join working)

Based on estimates with villagers approximately 50 to 60% of the village population comprises working population

1-7. The main livelihood of the village

Agriculture supplemented by animal husbandry comprises the main occupation of as much as 75% to 80 % of village population. Although agriculture is primarily subsistence in nature and much of the agriculture produce is used for home consumption but some cash crops are also grown.

Moreover after the damage to agriculture land after the disaster in 2012 and 2013 an increasing number of families are engaging in daily wage labour. However, villagers told that labour is not readily available throughout the year and only about 6 to 8 months of labour work is available. Only about 10 to 15 persons from the village are in government jobs/army/para military forces.

1-8. Type of land use within the village

Within the village a majority of the land comprises private land (locally called “naap” land) on which villagers have their houses as well as farms. Apart from that there is also civil land (land belonging to entire village/Gram Sabha) on which a Van Panchayat has been formed in 6 ha area.

2. Forestry land Agriculture situation in the village area

2-1. Vegetation type village area

The major tree species surrounding the village include Chir Pine (Pinus Roxburghii), Aonla (Emblica Officinalis), Kachnar (Bauhinia variegate), Semla (Bauhinia roxburghiana), Baanj (*Quercus leucotrichophora*), Burans (*Rhododendron arboretum*). Farmers also grow Bhimal (Grevia optiva) in their fields.

2-2. Type of land title

The village land is classified as revenue land which the land adjoining the village is forest land.

2-3. Anually activities of your village

- Logging operation (Species, Volume, Concession area, logging method)
- Plantation operation (Species, planting areas, planting method)
- Conservation activity (type of conservation, target area, areas, etc.)
- Budget system
- Bearer of afforestation

NOT APPLICABLE AS LOGGING IS NOT PERMITTED.

2-4. Cause of forest degradation in the village

The communities told that soil erosion was leading to degradation of forests as a lot of trees were uprooted in landslides. However, according to the FD officials village communities lop the broad leaved trees such as Oak for use as fodder and lopping of broad leaved trees forms a major cause of forest degradation.

2-5. Situation of animal breeding

- Species

  Each family, on an average, keeps one cow or one buffalo. The cows yield about 2 kg milk per day and buffaloes yield about 4 kg milk per day. Earlier the villagers used to keep more number of buffaloes but they told that now they kept more number of cows as it was easier to maintain cows. The villagers told that it was easy to take cows to graze in the forests while buffaloes had to be stall fed.

- System of breeding

  Breeding is mostly based on traditional system (natural breeding) however through government support and support of an NGO called BAIF hybrid bulls were being used for breeding and in a few cases Artificial Insemination (AI) was also being done.

- Fodder

Grazing of livestock is allowed in the Van Panchayats and hence the communities take their cows to graze in the VP. In addition to this the women collect grasses from the reserve forests and also the VP forest. Moreover lopping of Baanj trees is done and their leaves are used for feeding the livestock. Women have to walk long distances to collect fodder from the RF.

2-6. Situation of collecting firewood

Almost 90% of the families have cooking gas (LPG) but since the LPG is costly therefore the communities use LPG as well as fuelwood from the forests.

- Species

  The communities do not use Chir Pine for fuel. Apart from that they use all locally available species. The usually collect dry and fallen branches.

- Method of collection

  The fuelwood is collected mainly from the RF and women carry between 25 to 30 kg on headload. Women told that it took them about 3-4 hours to collect fuelwood.

- Regulation for collection of firewood

  The firewood is collected from the RF. However cutting of green trees or green branches is not allowed so women collect dry branches.

2-7. Charcoal making

- Species
- Volume
- Purpose

NOT APPLICABLE

2-8. Agriculture system

On an average each family has 5-6 nali land. Although a few families have as much as 20 to 25 nali land. 3-4 families are also landless.

- Commodity for agriculture

The main agriculture crops are rice, wheat, mandua (finger millet), soyabean, pulses (urad, gahat, bhatt and tor).

- Cultivation method

While a majority of the crops are cultivated through sowing of seeds or broadcast of seeds (in

case of dryland rice) but in irrigated fields rice is cultivated by transplantation method.

- **Calendar for agriculture**

Agriculture calendar

Crop	Sowing season	Harvesting season	
Wheat	October-November	April-May	
Rice	June-July	November	
Urad (pulses)	May-June	November-December	
Millets	May-June	November	

Wild boar and monkeys are causing extensive damage to agriculture. “Bandrolu” (or monkey chasers) were traditionally employed by villagers to drive away the monkeys from their fields but now this system is not in practice.

- **Existing slash and burn shifting cultivation** – NOT APPLICABLE

- **Agroforestry system**

Generally agroforestry is not very popular. Although traditionally the communities plant Bhimal (Grevia optiva) on the boundaries of their fields and also some fruit trees. Bhimal is a multipurpose tree as its leaves are rich in fodder and also its fiber is used for making ropes. However, in this village people told that they are planting less Bhimal as the shade of the tree affects the productivity of agriculture.

2-9. Cooperative system

There is a Van Panchayat having an area of 6 ha.

- Structure of cooperative

  The VP has a management body of 9 members out of which 5 are women. The microplan of the VP has been made but till date not funding has been provided to the VP for taking up any forest conservation/plantation activities.

  Member of cooperative

- Role of cooperative

  The purpose of VP is to sustainably manage the community land around the Gram Sabha and to utilize that for providing fuelwood and fodder to the villagers. The VP forests can also be used to ensure income for the Gram Sabha e.g. by selling resin of Chir Pine.

MAHILA MANGAL DAL

The village also has a Mahila Mangal Dal since the past 15 years. This is an all-women's group formed for the purpose of savings, inter-loaning and also for taking up women's issues.

The group has about 30 members from the village. It is headed by women called Pratima Devi. Each members saves about Rs 200 per year with the group and the total savings of the group are Rs. 50,000.

The savings of the group are used to provide loans to the group members in times of need.

3. Mountain disaster mitigation work in the village

3-1. Priority target for prevention for mountain disaster with in village

Treatment of Kairi gad stream which flows near the village is a priority. Moreover, repair of the irrigation channels (guhls) from the stream and also repair of a pipeline for drinking water is required.

3-2. Target area for mountain disaster restoration

The Kairi gad stream is the target.

3-3. Experience of mountain disaster mitigation work in the village

In the past the communities have been involved in clearing debris and repairing the roads near their village. They have also cleared some debris from the stream.

3-4. How to cooperate to the mountain disaster mitigation work

The villagers are quite willing to cooperate for treatment of the stream and also for repair of their irrigation channels. Due to breaking up of irrigation channels agriculture productivity has been severely impacted.

The villagers told that they had planned to repair the irrigation channels through their own resources and had collected some money but it was not sufficient. But they are quite willing to work with government departments.

3-5. Knowledge of individual mountain disaster mitigation work (Terracing, Hedgerow)

The villagers can construct stone check dams and make simple stone terraces. Some of them are able to do some masonry work.

3-6. Bearer of for mountain disaster mitigation work in the village

The Gram Pradhan and the VP Sarpanch.

3-7. Annual budget for mountain disaster mitigation work in the village

None

3-8. What kind of materials and equipment do you use for mountain disaster mitigation work?

The villagers use basic equipment like spade and pick axe.

3-9. What materials and equipment for mountain disaster mitigation work do you have?

The villagers do not have any specific equipment for mountain disaster mitigation work. They only have Spades and pick axe.

3-10. Training system for technology of mountain disaster mitigation work

No training received.

3-11. Damage of mountain disaster on 2013

In 2009 a stream near the village called Kairi gad caused massive landslides and erosion of agriculture lands of the village.

Then in 2013 again the stream eroded the agricultural lands on the boundary of the stream and according to villagers about 60% of their farms were washed away in 2013. About 10-15 animal shelters and houses were also damaged.

3. Village Parori, District Tehri

Date of survey	14-08-14
Name of answer person	Mrs Shashi Badhani Gram Pradhan Mr Ajay Badhani VP Sarpanch along with a number of community members
Position	
Tel number	
E-mail:	
Location of interview	Parori village

Question

1. Question regarding the village

1-1. Official name of the village

Parori village, Gram Sabha Parori, Thatyur Block, District Tehri Garhwal.

It forms a part of the Parori Gram Sabha which comprises of 3 villages namely: Kotai, Sonar and Parori.

1-2. Representative of the village

Mrs Shashi Badhani, Gram Pradhan

1-3. Number of population in the village

	Parori village	Gram Sabha Total
No. of Families	140	170
Population	600	750

After the disaster of 2013 a number of families have migrated from the village. However, the exact number is not available.

1-4. Location of village

About 10 km from Thatyur town. Thatyur is located at a distance of about 35 km from Mussoorie.

1-5. Ratio of male/female

Approximately 55% males and 45% females

1-6. The working population (excluding the elderly, children population who cannot join working)

Based on estimates with villagers approximately 50% of the village population comprises working population.

1-7. The main livelihood of the village

85% of the population of the village is engaged in agriculture. Agriculture is supplemented by animal husbandry and also daily wage labour.

About 5% of the working population is engaged in government jobs while about 10% is

engaged in private jobs outside the village.

Earlier a lot of cash crops such as vegetables (beans, onion, ginger and potatoes) were sold by the villagers. According to the communities, on an average each family earned about Rs. 100,000/- annually from the sale of vegetables.

However, after the disaster of 2013 much of the productive agriculture lands of the villagers (located on the banks of Aglar river) was washed away and hence the income from cash crops has declined significantly.

In order to earn cash incomes a lot of people now have to do daily wage labour. Under MNREGP (Mahatma Gandhi National Rural Employment Guarantee Programme) they are getting employment for 50 to 60 days in an year and are paid Rs 142/- as daily wages.

1-8. Type of land use within the village

Within the village a majority of the land comprises private land (locally called “naap” land) on which villagers have their houses as well as farms. Apart from that there is also civil land (land belonging to entire village/Gram Sabha) and surrounding the village is Reserve Forests.

2. Forestry land Agriculture situation in the village area

2-1. Vegetation type village area

Chir Pine (Pinus Roxburghii), Tun (Toona ciliata), Shishum (Dalbergia shishoo), Kharak, Mahua (Madhuca indica), Guriyal and Paiya (Prunus carasoides). Farmers also grow Bhimal (Grevia optiva) in their fields.

2-2. Type of land title

The village land is classified as revenue land which the land adjoining the village is forest land.

2-3. Annually activities of your village

- Logging operation (Species, Volume, Concession area, logging method)
- Plantation operation (Species, planting areas, planting method)
- Conservation activity (type of conservation, target area, areas, etc.)
- Budget system
- Bearer of afforestation

NOT APPLICABLE AS LOGGING IS NOT PERMITTED.

2-4. Cause of forest degradation in the village

The primary cause of forest degradation is lopping of broad leaved tree species by the communities for use as fodder. However, forest fires in Chir Pine forests as well as landslides are also reported as causes for forest degradation.

2-5. Situation of animal breeding

- Species

  Each family, on an average, keeps one cow or one buffalo. Earlier most families also had a pair of bulls but after the disaster a lot of agriculture land of the village has been washed away so very few families are keeping bulls.

  About 30 years ago the villagers used to keep large number of livestock – an old man told that he had 30 cows, 8 buffaloes and about 20 goats. But over the years the number of livestock has declined significantly due to shortage of manpower for upkeep of livestock. Moreover, there is also an increasing shortage of fodder.

- System of breeding

  Traditional breeding system.

2-6. Situation of collecting firewood

About 50% of the families have cooking gas (LPG) but since the LPG is costly therefore the communities use LPG on in case of emergency – like heavy rains or during snow or in case some guests come to their house.

- Species

  Tun, Shisham, Kharak, Mahua, Bhimal and Paiya

- Method of collection

  The fuelwood is collected mainly from the RF but not from VP forest. Collection is mainly done by women although sometimes men also go for collection. During winters women have to travel 4-5 km to get fuelwood.

- Regulation for collection of firewood

  The firewood is collected from the RF. However cutting of green trees or green branches is not allowed so women collect dry branches.

2-7. Charcoal making

- Species
- Volume
- Purpose

NOT APPLICABLE

2-8. Agriculture system

Earlier each family had about 20 to 25 nali land but after the 2013 disaster a majority of the land was washed away and now only about 6-7 nali of land is available with each family.

- Commodity for agriculture

The main agriculture crops are rice, wheat, potato, garlic, Ginger, beans, onion, mandua (finger millet), jhangora (barnyard millet) and pulses (urad, gahat, bhatt and tor).

- Cultivation method

While a majority of the crops are cultivated through sowing of seeds or broadcast of seeds (in case of dryland rice) but in irrigated fields rice is cultivated by transplantation method.

- **Calendar for agriculture**

Agriculture calendar

Crop	Sowing season	Harvesting season	
Wheat	October-November	March- April	
Rice	July- August	October-November	
Onion	October	May	
Potato	October	January	
Urad (pulses)	May-June	November-December	
Garlic	October	May	
Millets	May-June	October-November	

- **Existing slash and burn shifting cultivation** – NOT APPLICABLE

- **Agroforestry system**

In this village farmers are planting lemon trees, peach trees, guava trees and banana trees near their fields.

2-9. Cooperative system

There is a Van Panchayat having an area of 9.305 ha.

- Structure of cooperative

  The VP has a management body of 7 members. The microplan of the VP has been made but till date it has not been approved by the FD.

  Member of cooperative

- Role of cooperative

  The purpose of VP is to sustainably manage the community land around the village. In case of this village the community has imposed some restrictions on grazing of animals in some area of VP but otherwise nothing much has been done.

  MAHILA MANGAL DAL

  The village also had a Mahila Mangal Dal which was established in the 1990 but after working for about 5 years it was closed in 1995-96.

  This group has worked very efficiently for few years and the women members of the group had also put an end to illegal making of liquor in the village. However, according to women the men got angry because liquor making was stopped and they forced the women to close the group.

3. Mountain disaster mitigation work in the village

3-1. Priority target for prevention for mountain disaster with in village

The treatment of Bangar khud is the priority.

3-2. Target area for mountain disaster restoration

Bangar Khud seasonal stream.

3-3. Experience of mountain disaster mitigation work in the village

In the past the communities have been involved in clearing debris and repairing the roads near their village. After the 2013 disaster they cleared the debris from their houses, made small check dams and also cleared the debris from a temple in the village.

3-4. How to cooperate to the mountain disaster mitigation work

After the 2013 disaster the village women voluntarily contributed labour in order to clean the temple premises of their village. The village community is keen to work together with a government agency.

3-5. Knowledge of individual mountain disaster mitigation work (Terracing, Hedgerow)

The villagers can construct stone check dams and make simple stone terraces. Some of them are able to do some masonry work.

3-6. Bearer of for mountain disaster mitigation work in the village

The Gram Pradhan and the VP Sarpanch.

3-7. Annual budget for mountain disaster mitigation work in the village

After the 2013 disaster Rs.2 lakhs were given to each household whose houses were damaged. But there is no budget for disaster mitigation.

3-8. What kind of materials and equipment do you use for mountain disaster mitigation work?

The villagers use basic equipment like spade and pick axe.

3-9. What materials and equipment for mountain disaster mitigation work do you have?

The villagers do not have any specific equipment for mountain disaster mitigation work. They only have Spades and pick axe.

3-10. Training system for technology of mountain disaster mitigation work

No training received.

3-11. Damage of mountain disaster on 2013

There is a stream near the village called Bangar Khud which joins a river below the village. The river is called Aglar river.

In 2010 and 2012 there was a flood in Aglar river which led to erosion of some of the fields located on both sides of the river. However, in 2013 there was a massive flood in the river which led to washing away of almost 90% of the fields of the villagers located on the banks of the river.

Moreover, on 16 June 2013 night there was a cloud burst above the village owing to which there was a large landslide in Bangar khud and 16 houses in the village (including a school) were either damaged or submerged in debris. About 15 livestock were killed but there was no loss of human life.

4. Village Semi

Date of survey	21st August, 2014
Name of answer person	Villagers, Forest Panchayat Chairman
Position	
Tel number	
E-mail:	
Location of interview	Semi Village

Question

1. Question regarding the village

1-1. Official name of the village

Semi

1-2. Representative of the village

Shri Surendra Singh Negi

1-3. Number of population in the village

280 persons 65-70 families

1-4. Structure of the village

Falls under Bhainsari Gram Sabha. Gram Sabha consists of two villages, Bhainsari and Semi.

1-5. Location of village

5 km from Guptkashi

1-6. Ratio of male/female

1:1

1-7. The working population (excluding the elderly, children population who can notjoin working)

65%

1-8. The main livelihood of the village

Agriculture + Livestock

1-9. Type of land use within the village

Approx. 25 ha agriculture land

2. Forestry and Agriculture situation in the village area

2-1. Vegetation type village area

N/A

2-2. Type of land title

Agriculture land: Privately owned

Reserve Forests: Under administrative control of Forest Department

Civil Forests: Under administrative control of Revenue Department

2-3. Anually activities of your village

Logging operation (Species, Volume, Concession area, logging method)

NOT APPLICABLE

Plantation operation (Species, planting areas, planting method)

Dhar Semi Van Panchayat has planted 1,200 saplings in 2014 main species are Quercus, Fraxinus.

Conservation activity (type of conservation, target area, areas, etc.)

Budget system

Bearer of afforestation

Van Panchayat

2-4. Cause of forest degradation in the village

Landslides

2-5. Situation of animal breeding

- Species Cows and Buffaloes
- System of breeding Natural breeding by private owner on fees

2-6. Situation of collecting firewood

- Species LPG is main source
- Method of collection Quercus spp, is logged to some extent for fuelwood
- Regulation for collection of firewood Regulated by Van Panchayat

2-7. Agriculture system

- Commodity for agriculture — Rabi: Brassica, Wheat, Pulses
  Kharif: Urad, millets, Paddy, soyabean,
- Cultivation method
- Calendar for agriculture
- Existing slash and burn shifting cultivation

  No shifting cultivation. Slash/Agri waste is burnt in fields in march/April.
- Agroforestry system

2-8. Cooperative system

Two forest panchayats consisting of 9 members (3 women) each and headed by Sarpanch exists in the village.

One local level organisation named " Karuna Samaj Sewa Sanstha" is engaged in activities like agriculture, vegetable growing, knitting/stitching etc.

- Structure of cooperative
- Member of cooperative
- Role of cooperative

3. Mountain disaster mitigation work in the village

3-1. History of mountain disaster mitigation in the village

1986, 2013 June

3-2. Priority target for prevention for mountain disaster with in village

Stabilizing the large landslide

3-3. Target area for mountain disaster restoration

River training/diversion. Protection wall. 2/3rd agriculture land lost

3-4. Experience of mountain disaster mitigation work in the village

Not available

3-5. How to cooperate to the mountain disaster mitigation work

Through local level committee of the villagers.

3-6. Knowledge of individual mountain disaster mitigation work(Terracing, Hedgerow)

Not specific training, only traditional knowledge.

3-7. Bearer of for mountain disaster mitigation work in the village

Van Panchayat and Gram Sabha.

3-8. Annual budget for mountain disaster mitigation work in the village

NOT APPLICABLE

3-9. What kind of materials and equipment do you use for mountain disaster mitigation work?

Local material and hand operated tools are used to clear the paths in the village. BRO uses earth moving equipment also.

3-10. What materials and equipment for mountain disaster mitigation work do you have?

Same as above.

3-11. Where do you purchase materials and equipment for mountain disaster mitigation work?

Not applicable.

3-12. Training system for technology of mountain disaster mitigation work

No formal trainings received.

3-13. Damage of mountain disaster on 2013

21 families lost their houses. 3 families are being surveyed for compensation. Rest have been given compensation.

Other points:

- December/January is the lean period for women when they can meet/participate in meetings.
- The most convenient time for arranging meetings of the village women is between 2 to 4 pm.
- A village motivator (Ms Anita Joshi) has been engaged by FD for some time.
- There was a Mahila Mangal Dal (women's group) in the village which had around 12 members but seems to be defunct for some time now.
- There are two Van Panchayats: Dhar Semi and Talli semi. The latter is relatively in poor

shape.

- Main species are Alnus, Quercus, Pinus, Rhododendron, Toona, Bauhinia, Grewia, Celtis, Ficus, Zanthozylum, etc.

Appendix

(3) Minutes of Meetings (1st, 2nd)

MINUTES OF MEETING BETWEEN
JAPAN INTERNATIONAL COOPERATION AGENCY
AND
UTTARAKHAND FOREST DEPARTMENT
ON
JAPANESE TECHNICAL COOPERATION PROJECT
FOR
NATURAL DISASTER MANAGEMENT IN THE FOREST AREAS IN UTTARAKHAND STATE
(UFTCPD)

The Japan International Cooperation Agency (hereinafter referred to as "JICA") had a discussion on the framework of the Technical Cooperation Project- "Project for Natural Disaster Management in the forest area in Uttarakhand State with particular reference to sediment disaster mitigation" (UFTCPD) (hereinafter referred to as "Project") with Uttarakhand Forest Department (hereinafter referred to as "UKFD"), and the senior authorities concerned in Government of Uttarakhand.

As a result of the discussions, JICA and UKFD, agreed to summarize the matters referred to in the document, attached herewith.

Dehradun, August 25th 2014

Mr. Kazuhiro GOSEKI
Executive Technical Advisor to
Director General
Global Environment Department
Japan International Cooperation Agency
Japan

Mr. Anup Malik
Chief Conservator of Forests &
Chief Project Director, JICA Forestry Project
Uttarakhand Forest Department
India

Mr. S.S Sharma
Principal Chief Conservator of Forests
Uttarakhand Forest Department

Mr. Rakesh Sharma
Principal Secretary Finance
Government of Uttarakhand

UKFD and JICA mission had discussions on the basic direction and issues, to be considered under the project. Government of Uttarakhand through Government of India shall formally request to Government of Japan for consideration of the proposed Project.

1. Basic direction for cooperation

The project aims at restoration of the landslided hill slopes, which have occurred on the upper side of the torrent in the forest areas and erosion control on the torrent.

UKFD and JICA provisionally agreed on the basic design of the project, which is as follows;

1) Establishment of technical system through rehabilitation and conservation of landslided hill slopes and the erosion control at the model sites.
2) Capacity Building of the Counterpart personnel of UKFD in the process, so that UKFD is able to manage landslides and soil erosion in forest areas in a more effective manner as a part of future preparedness.
3) Dissemination of the established technical system to not only other relevant stakeholders in Uttarakhand State, but also in other states, through a mechanism evolved after discussions with Ministry of Environment and Forests (hereinafter referred to as "MoEF"), Government of India.

The final outline and the detailed contents of the Project would be further discussed and agreed upon through dialogues on the next proposed survey to be conducted by JICA Mission in November 2014.

2. Implementation schedule

UFD and JICA provisionally agreed that 5 years would be an appropriate period for implementation of the project, considering the necessary formalities for final determination of the model sites, designing, preparation of estimates and bid documents including tender process for executing & construction, formulation of technical manual/guidelines and dissemination of the outputs.

3. Candidates for model sites

Considering access from Dehradun and the maximizing of display effect, UKFD and JICA examined the following sites as candidates for model sites:

1) Paroli village, Mussoorie Forest Division (Rehabilitation of landslided hill slopes and the erosion control)
2) Jawadi village, Rudraprayag Forest division (Rehabilitation of landslided hill slopes)

3) Upper side of national highway No. 58 in Nirgad village, Narendranagar Forest division (Rehabilitation of landslided hill slopes and the erosion control)

The final determination of the place and number of model sites would be further discussed through the dialogues during the next JICA Mission survey in November 2014, considering the total budget allocation for the project by both UKFD and JICA.

4. Cooperation with World Bank project

Both side agreed that the Project will cooperate with "Uttarakhand Disaster Recovery Project" which is assisted by the World Bank, in capacity building of the related organization of the Government of Uttarakhand, such as Disaster Management Department, Public Works Department (PWD) and Irrigation Department, based on the further discussions among related parties.

5. Further Actions

JICA requested UKFD to take following actions:

1) Submitting the concept note for Japan's Technical Cooperation, based on the agreement between both sides, including this Minutes, to Embassy of Japan (and CC to JICA) through MoEF and DEA as soon as possible.
   - The next JICA mission in Nov. will be dispatched after receiving the concept note; and
2) UKFD shall arrange the necessary organizational unit in the department such as Counterpart personnel (Project Director, Project Manager, fulltime C/P officials in the State and Division level) and Joint Coordinating Committee at the State level having members such as MoEF, UKFD, PWD, etc for implementation of the Project

UKFD agreed to complete these actions.

End

MINUTES OF MEETINGS
BETWEEN
THE JAPANESE SURVEY TEAM
AND
AUTHORITIES CONCERNED OF THE GOVERNMENT OF UTTARAKHAND STATE
ON
JAPANESE TECHNICAL COOPERATION
FOR
THE PROJECT FOR NATURAL DISASTER MANAGEMENT IN FOREST AREAS IN UTTARAKHAND

The Japanese Survey Team (hereinafter referred to as "the Team") organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA") headed by Mr. Kei JINNAI, Director, Natural Environment Team 1, Global Environment Department, JICA, visited Uttarakhand, India from 17 November to 25 November 2014, for the purpose of formulating the technical cooperation project, "the Project for Natural Disaster Management in Forest Areas in Uttarakhand State" (hereinafter referred to as "the Project").

During its stay, the Team and Uttarakhand Forest Department (hereinafter referred to as "UKFD") representing the Government of Uttarakhand State, India had a series of discussions and exchanged views on the Project. As a result of the discussions, both parties agreed on the matters referred to in the document attached hereto.

Dehradun, 26th November 2014

神内 圭一

Mr. Kei JINNAI
Team Leader
Survey Team
Japan International Cooperation Agency

Mr. Rakesh SHARMA
Additional Chief Secretary cum
Principal Secretary Finance
Government of Uttarakhand

Mr. S. [illegible] SHARMA
Principal Chief Conservator of Forests
Uttarakhand Forest Department

Mr. Anup MALIK
Chief Conservator of Forests &
Chief Project Director, Uttarakhand Forest
Resources Management Project
Uttarakhand Forest Department

Mr. Amit Singh NEGI
Secretary, Public Works Department cum
Program Director of Uttarakhand Disaster Recovery
Project
Government of Uttarakhand

MAIN POINTS DISCUSSED

Both parties agreed on the following points.

1. Current Status of the Request of the Project

The official request of the Project has not been submitted from the Government of India (hereinafter referred to as "GoI") to the Government of Japan (hereinafter referred to as "GoJ") yet. Upon an arrival of the official request from GoI, GoJ will start examination of the Project. These Minutes of Meetings will be effective upon the approval of the Project by GoJ.

Through this survey, both parties elaborated the detailed contents of the Project, including the collaboration with Uttarakhand Public Works Department (hereinafter referred to as "UKPWD") - World Bank funded project as in the item 5 of these minutes, in line with the item 13 of the Concept Note of the Project. Therefore, JICA strongly requested UKFD to consult with the Ministry of Environment, Forests and Climate Change about the necessity of further consultation on the Project with other relevant line Ministries. UKFD took note it.

2. Title of the Project

In order to precisely describe the objective and content of the Project, the title of the Project should be changed to "the Project for Slope Disaster Mitigation in Forest Areas in Uttarakhand" before signing of Record of Discussions (hereinafter referred to as "R/D").

3. Framework of the Project

Both parties acknowledged that the draft Project Design Matrix (hereinafter referred to as "PDM") and the draft Plan of Operation (hereinafter referred to as "PO") as shown in Annex 1 and 2, provide an overall framework and necessary elements for the implementation of the Project in an appropriate manner and agreed to continue further elaboration, as needed, to finalise the draft PDM and PO before signing of the R/D.

4. Selection of the Model Sites

At the previous survey on August 2014, both parties had agreed that "Considering access from Dehradun and the maximising of display effect, UKFD and JICA examined the Parori village, Jawadi village and Nirgad Village as candidates for model sites. The fine determination of the place and number of model sites would be further discussed through the dialogues during the next JICA Mission survey in November 2014, considering the total budget allocation for the project by both UKFD and JICA.", refer the Minutes of the Meetings dated on 25th August.

As a result of the further discussions on this survey, both parties agreed on the following points regarding the model sites of the Project.

(1) Location

1) 1st Model Site

Considering access from Dehradun, versatility and variety of technology to be mobilised,

and maximising of demonstration effect, both parties finalised the 1st model site where JICA Experts shall take lead for implementation of a series of the process for countermeasure constructions to transfer technologies to the personnel of UKFD as follows;

- Nirgad Village, Narendranagar Forest Division (N30° 08' 39.41 E78° 20' 30.73, Rehabilitation of landslided hill slopes and the erosion control)

This site is contiguous with National Highway No. 58. From the perspective of the road management, UKFD shall coordinate and cooperate with Border Road Organisation.

2) 2nd and 3rd Model Sites

Both parties agreed that 2nd and 3rd model sites will be implemented a series of the process for countermeasure constructions by the personnel of UKFD with support from JICA Experts. The final determination of 2nd and 3rd model sites is to be finalised after the initiation of the Project, considering the following criteria;

- Mobility and access from Dehradun (the location will be reached by daytrip from Dehradun with safety measures);
- Proposed countermeasure construction works are same or similar as in the 1st model site; and
- The site categorised as "A", in the light of the "JICA Guidelines for Environmental and Social Considerations" dated April 2010, which require considerable volume of land acquisition, involuntary settlement, or have significant impacts on Indigenous people etc. shall be excluded.

(2) Cost Allocation

1) 1st Model Site

Cost for a series of implementation of countermeasures (the field survey, basic design, detailed design, procurement and construction) at 1st model site will be allocated by JICA, subject to the final approval of by JICA.

2) 2nd and 3rd Model Sites

Cost for the field survey, the basic design and detailed design at 2nd and 3rd model sites will be allocated by JICA, while the cost for construction will be allocated by UKFD, considering the possibility of utilisation of the Budget of the Government of Uttarakhand State or the ODA loan project "Uttarakhand Forest Resource Management Project" (hereinafter referred to as UFRMP).

5. Collaboration with Uttarakhand Disaster Recovery Project (UDRP) - World Bank funded project

Uttarakhand Disaster Recovery Project (hereinafter referred to as UDRP) is commencing execution of slope treatment and river training works in five places located between Rudraprayag and Kedarnath road (NH 109) along River Mandakini (IDA Credit No. 5513 - IN). Facing technical difficulties to procure capable technical consultants in a timely manner, the state government as well as the World Bank requested JICA to provide demonstratable technical solutions to some of the above mentioned sites by utilising services of capable Japanese consultant firm

Responding to the needs and urgency of the request, JICA intends to conduct field surveys, conceptual, basic and detailed designs of the following two sites:

- "Sitli Km 16" (N30° 22' 51.0, E79° 0' 28.8; Slope treatment above road and river training to protect road), and
- "Vijaynagar Km 19" (N30° 23' 37.2, E78° 01' 16.8; Slope treatment above road and river training to protect road),

as a component of the Project, on condition that the GoI approves the Project and other important condition JICA requires (e.g. waiver right from design liability) is confirmed.

To implement the above-mentioned component of the Project the state government will organise an inter-departmental executing committee chaired by Project Director of the Project and composed of representatives of UDRP, UKPWD, Irrigation Department, Geology Department and other relevant agencies.

Upon completion of the detailed designs by the Project, procurement and supervision of construction contractor shall be made by the Project Implementation Unit of UDRP and its Project Management Consultant.

Program Director of UDRP has requested the Team to extend technical advice to Project Implementation Unit during the execution of the above works. The Team took note of it.

Details of terms and conditions on the above-mentioned collaboration, including JICA's waiver right from design liability, will be articulated and agreed among relevant parties in the form of minutes of understandings as a deliverable of the R/D to be concluded between the Government of Uttarakhand and JICA, i.e. the primary project agreement.

6. Duration of the Project

Both parties agreed that an appropriate duration of the Project is five (5) years in order to achieve the Project purpose.

7. Proposed Implementation Schedule of the Project

Both parties acknowledged that the proposed Implementation Schedule of the Project as shown in Annex 3 is appropriate.

8. Joint Coordinating Committee of the Project

Joint Coordinating Committee (hereinafter referred to as "JCC") will be established in order to facilitate inter-organisational coordination. JCC meeting will be held at least once a year as well as whenever deemed necessary. JCC will approve the plan of operation and an annual work plan, review overall progress, conduct monitoring and evaluation of the Project, and exchange opinions on major issues that arise during the implementation of the Project. A List of Proposed Members of JCC is attached as Annex 4.

9. Appointment of necessary personnel of UKFD

UKFD shall appoint its personnel necessary for the project implementation and depute them to the Project Management Unit of UFRMP to synergise with the Project. Detail of the personnel is as follows;

	No of personnel to be appointed	Cadre	Note (Qualification, etc.)
Project Director	1	CCF cum CPD of UFRMP	
Project Manager	1	CF	Exclusive for the Project
Task Manager	3	DFO or equivalent	Exclusive for the Project
Task Member A	3	Sub DFO	Exclusive for the Project, Engineering or Science background
Task Member B	3	RO	Exclusive for the Project, Engineering or Science background
Task Member C	3	DyRO or Forester	Exclusive for the Project, Engineering or Science background

In addition to the above members, personnel assigned to divisions where model sites are located shall take part in the Project to monitor daily works of construction, as well as be involved in the implementation of field survey and designing for erosion control works.

Three task teams dedicated for each model site, each of which is composed of a Project Manager and three members with science or engineering background shall be established from the beginning of the Project for the purpose of capacity development of the department and the implementation of the countermeasures on the model sites. JICA requested UKFD to ensure not to transfer members of task team during the project period and to minimise transfer of other members. UKFD agreed to it.

Furthermore, as establishment of permanent function in the department dedicated to sediment management is essential not only for sustainability of the Project's outputs but also for effective forest management in the State, JICA requested UKFD to take necessary measures for the establishment which is to be functionalised at the timing of the project termination. UKFD agreed to it.

10. Dissemination to the Related Organisations of the Government of Uttarakhand

Both parties agreed to disseminate the Project's output to related organisations of the Government of Uttarakhand, such as Disaster Mitigation and Management Center, UKPWD, Irrigation Department, Watershed Directorate through the On the-job training at the model sites, seminars and workshops.

11. Coordination with Indira Gandhi National Forest Academy

Both parties agreed to promote the coordination with Indira Gandhi National Forest Academy from the perspective of dissemination of the Project's outputs to other states in India.

12. Position on the climate change

It is recognised that the Project will also contribute to adaption to climate change, by means of disaster management and forest conservation.

Annex 1 Draft Project Design Matrix (PDM)
Annex 2 Draft Plan of Operation (PO)
Annex 3 Proposed Implementation Schedule
Annex 4 A List of Proposed Members of JCC

Annex 1 Draft Project Design Matrix (PDM)

Name of Project: The Project for Slope Disaster Mitigation in Forest Areas in Uttarakhand

Ver. No. 3

Target Group: Staff of UKFD (Forest Department in the Uttarakhand State)

Date: 25. November, 2014

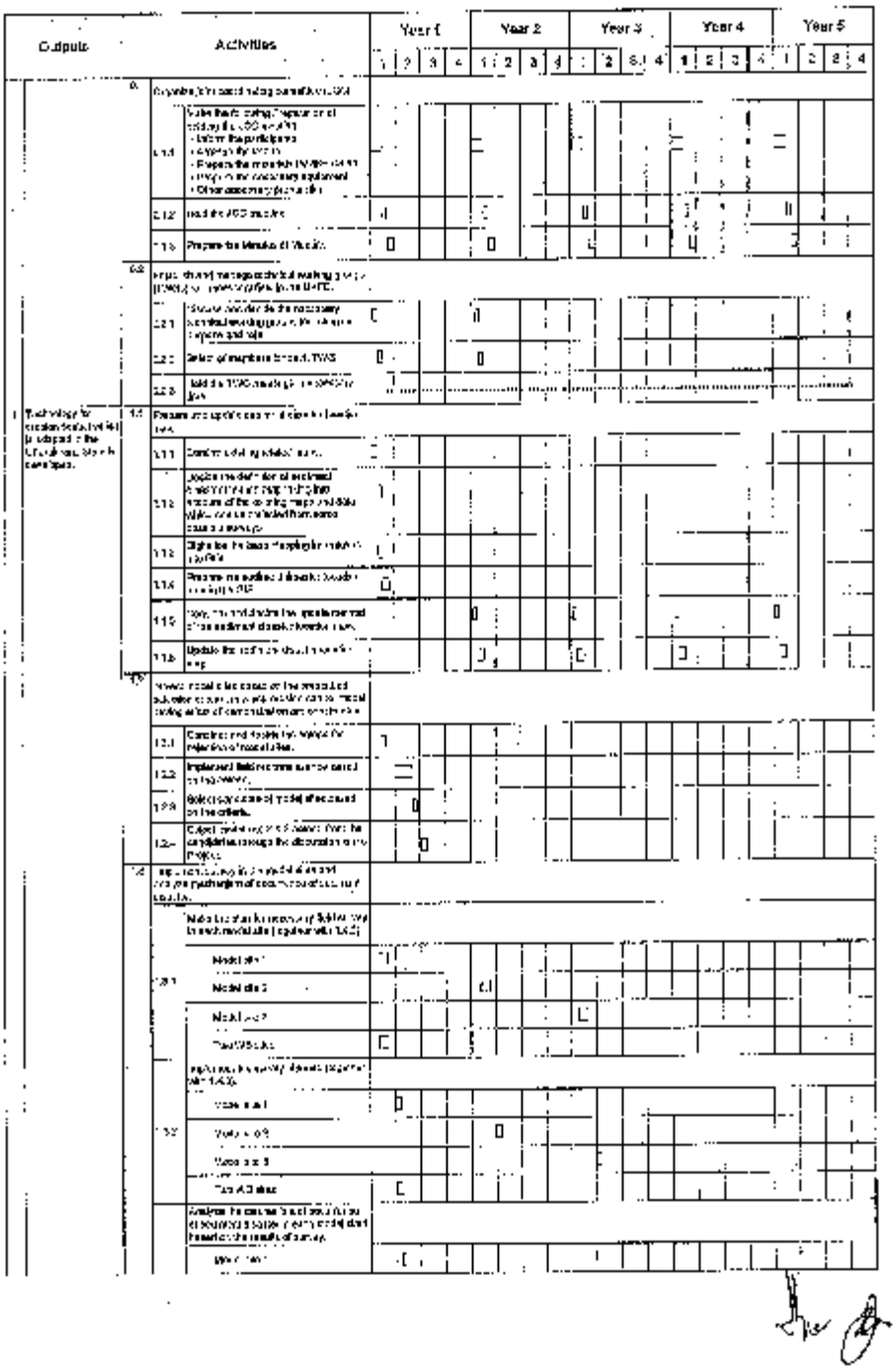
Target Area: The Uttarakhand State

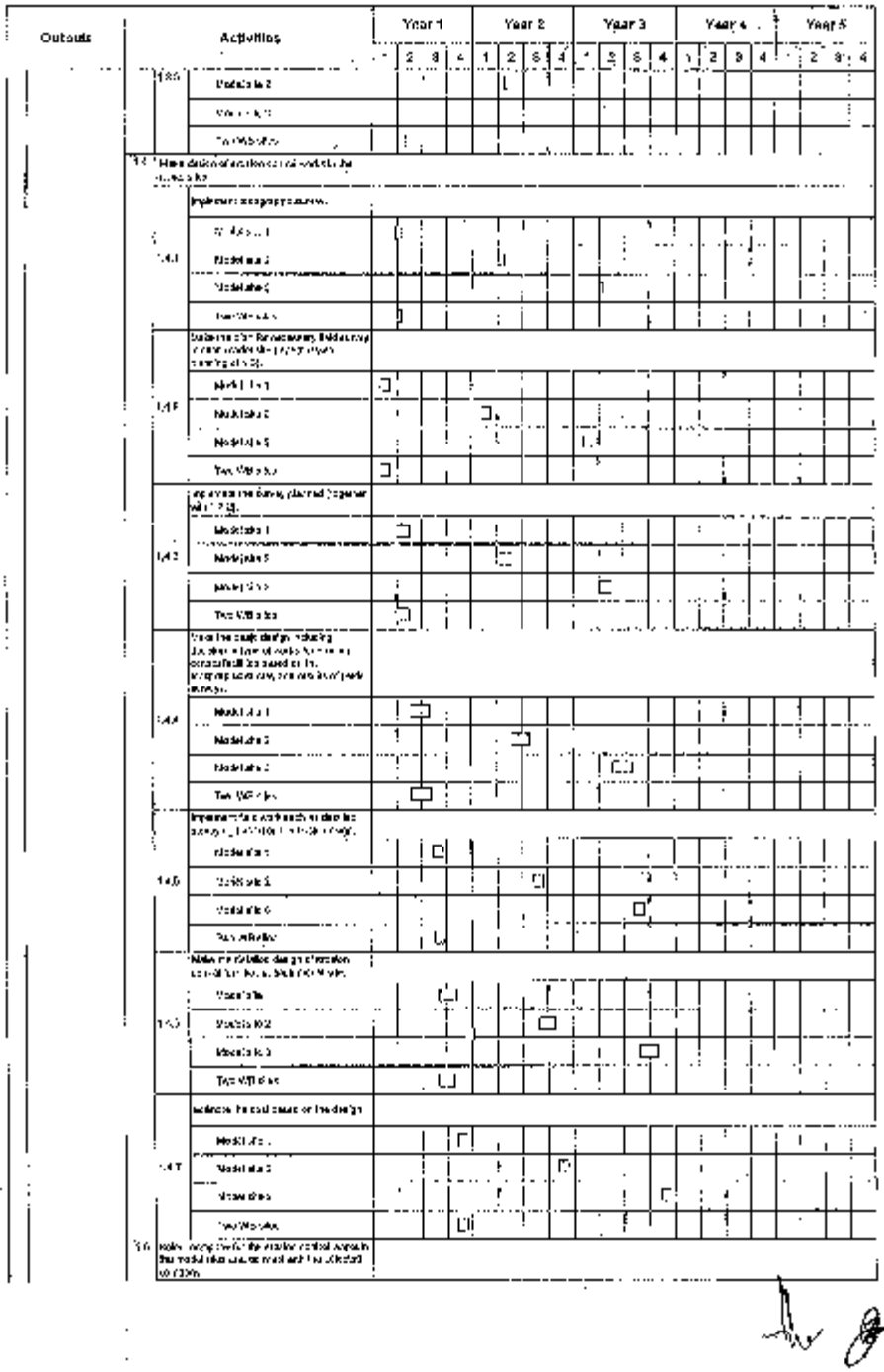
Duration of The Project: xx, xx, 2015 ~ xx, xx, 2020

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal	by year 2028		
1. Erosion control works for sediment disaster management in the forest areas are appropriately implemented in the Uttarakhand State.	1. Erosion control works are implemented in more than xx places based on the technology developed by the Project		
2. Knowledge and technology on erosion control works are disseminated in other Himalayan States.	2-1 Knowledge and technology on erosion control works based on the erosion control technical handbook developed by the Project are utilized in other Himalayan States		
Project Purpose			
System is appropriately implement erosion control works for sediment disaster management in the forest area is established in the Uttarakhand State.	1. The erosion control technical handbook are approved by the responsible authorities and are used in	1. Authorized paper	- Budget of erosion control works in the Uttarakhand State is secured
	2. Effect of the works for erosion control developed for sediment disaster management is evaluated as good practices.	2. Project Report	
	3. Specified Section which sustainably implement erosion control works is set up in the UKFD.	3. Authorized paper	
Outputs			
1. Technology for erosion control which is adapted to the Uttarakhand State is developed.	1-1. Models of erosion control to sediment disaster management which are adapted to Project sites are established.	1-1. Project Report	- Needs of erosion control works in the Uttarakhand is high
	1-2. xx % of the staff in charge of the erosion control works in UKFD evaluate the models of erosion control high. by xx, 20xx,	1-2. Project Report	
2. Knowledge and skills on erosion control of staffs in UKFD and another related organizations are improved.	2-1. xx % of the staffs in the UKFD who participated in the training planned and implemented based on the technology transfer plan pass an understanding test.	2-1. Project Report	
	2-2. Staff in charge of erosion control works in the UKFD make designs of the erosion control works for all six places by xx, 201x.	2-2. Project Report	
3. Appropriate technology developed for erosion control in the forest areas is shared in the State, national, National level	3-1. xx % of other related organizations in Uttarakhand State recognize the effect of the erosion control models constructed by the Project by xx, 201x.	3-1. Project Report	
	3-2. xx % of Forest Departments in other Himalayan States recognize the effect of the erosion control models constructed by the Project by xx, 20xx.	3-2. Project Report	
	3-3. Recommendation on the policy for mainstreaming erosion control works for sediment disaster management is submitted to the State Government.	3-3. Project Report	

Activities	Inputs		
0.1 Organize Joint Coordinating Committee (JCC). 0.2 Establish and manage technical working groups for necessary field in the DKFD. 1.1. Prepare and update soil erosion disaster location map. 1.2. Select model sites based on the prescribed selection criteria, in which erosion control mode, having effective erosion control are constructed. 1.3. Implement survey in the model sites/world bank sites and analyze mechanism of occurrence of sediment disaster. 1.4. Make design of erosion control works in the model sites/world bank sites. 1.5. Select company for the erosion control works in the model sites and contract with the selected company. 1.6. Supervise the erosion control works in the model sites until the completion (trial) of the approved design. 1.7. Periodically implement monitoring of the facilities in the model sites. 1.8. Prepare the erosion control works guidelines as a part of the erosion control technical handbook. 1.9. Prepare manual on the design of erosion control works as a part of the erosion control technical handbook. 1.10. Set the standard operating procedure for erosion control works as a part of the erosion control technical handbook. 1.11. Implement evaluation of erosion control works constructed in the model sites by staff of DKFD. 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, the level of surveys for designing erosion control works, and design and works for erosion control. 2.3. Implement OJT and OJT based on the technology transfer plan. 2.4. Evaluate proposed level on the knowledge and skill of the staff. 3.1 Prepare plan for the information sharing of erosion control works. 3.2. Organize seminars and workshops for stakeholders within the Dhulikhel. 3.3. Organize seminars and workshops for the stakeholders in other Himalayan States in collaboration with MoFF. 3.4. Prepare policy recommendation for mainstreaming erosion control works for sediment disaster countermeasures into forestry and main key development sectors. 3.5. Set up policy level council for erosion control works among DKFD and other related organizations. 3.6. Organize the periodical meetings of policy-level council for erosion control works. 3.7. Analyze composition and level of the information sharing.	<Indian Side> 1. Assigned 1.1. Project Director 1.2. Project Manager 1.3. Members of Counterpart team (each sub team consisting of 4 members, total 15 personal) 1.4. Staff concerned in Forest Division Office where model sites are located 1.5. Supporting Staff 1.5.1. Administrative Staff 1.5.2. Secretaries 1.5.3. Drivers 2. Land and Facilities 2.1. Project Office with necessary facilities in DKFD 2.2. Project Office with necessary facilities in local office of DKFD where the model sites are located 2.3. Land of the model sites 3. Counter Budget 3.1. The construction cost of model site 2 & 3 3.2. Administrative and Operational Cost for the Project 3.2.1. Travelling allowance and daily allowance for OJT 3.2.2. Cost of expendable supplies 3.2.3. Cost of communication 3.2.4. Electrical building 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	<Japanese Side> 1. Personnel 1.1. Long-term experts 1.1.1. Chief Advisor/General counterpart planning 1.1.2. Coordinator/Dissemination of erosion control technology 1.2. Short-term Experts 1.2.1 Field survey for erosion control works 1.2.2. Design for erosion control works 1.2.3. Supervision of erosion control works 1.2.4. Estimation 1.2.5. Other short-term experts as the necessary. 2. Equipment 2.1. Vehicle(s) 2.2. Necessary construction equipment 3. Expense for the Project 3.1. The construction cost of model site 3.2. Cost for organizing OJT(s) 3.3. Supplementary budget for local expenditure 4. Counterpart Training 4.1. Training in Japan	Whether and other natural conditions exceeding the designing conditions of erosion control facilities (e.g. flash flood or rain and big earthquake) do not occur. - Staff of DKFD who took part in the training continues their. Pre-Condition - Staff in the DKFD who should be engaged with the project are allocated.

Annex 2 Draft Plan of Operation (PO)

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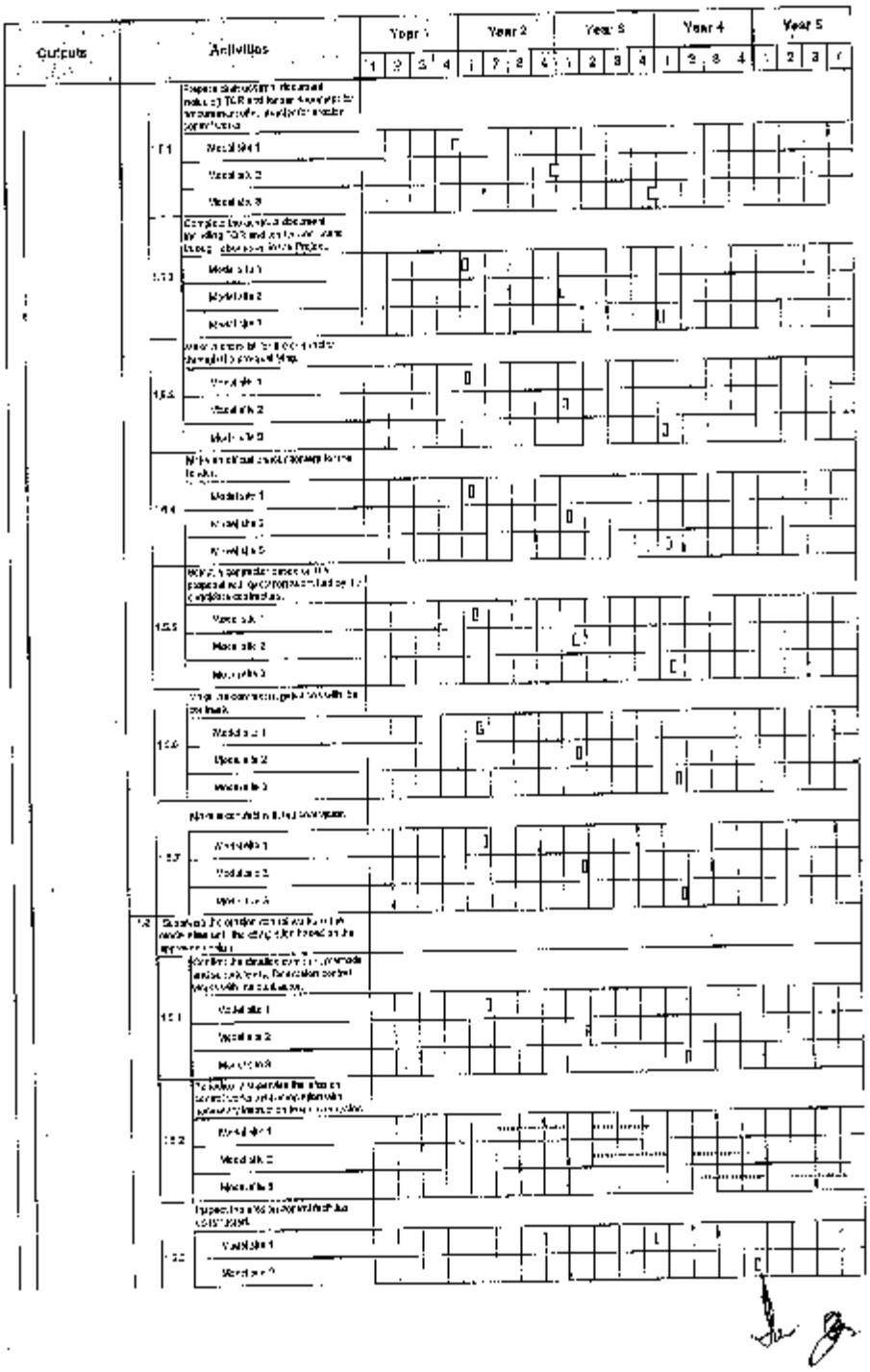
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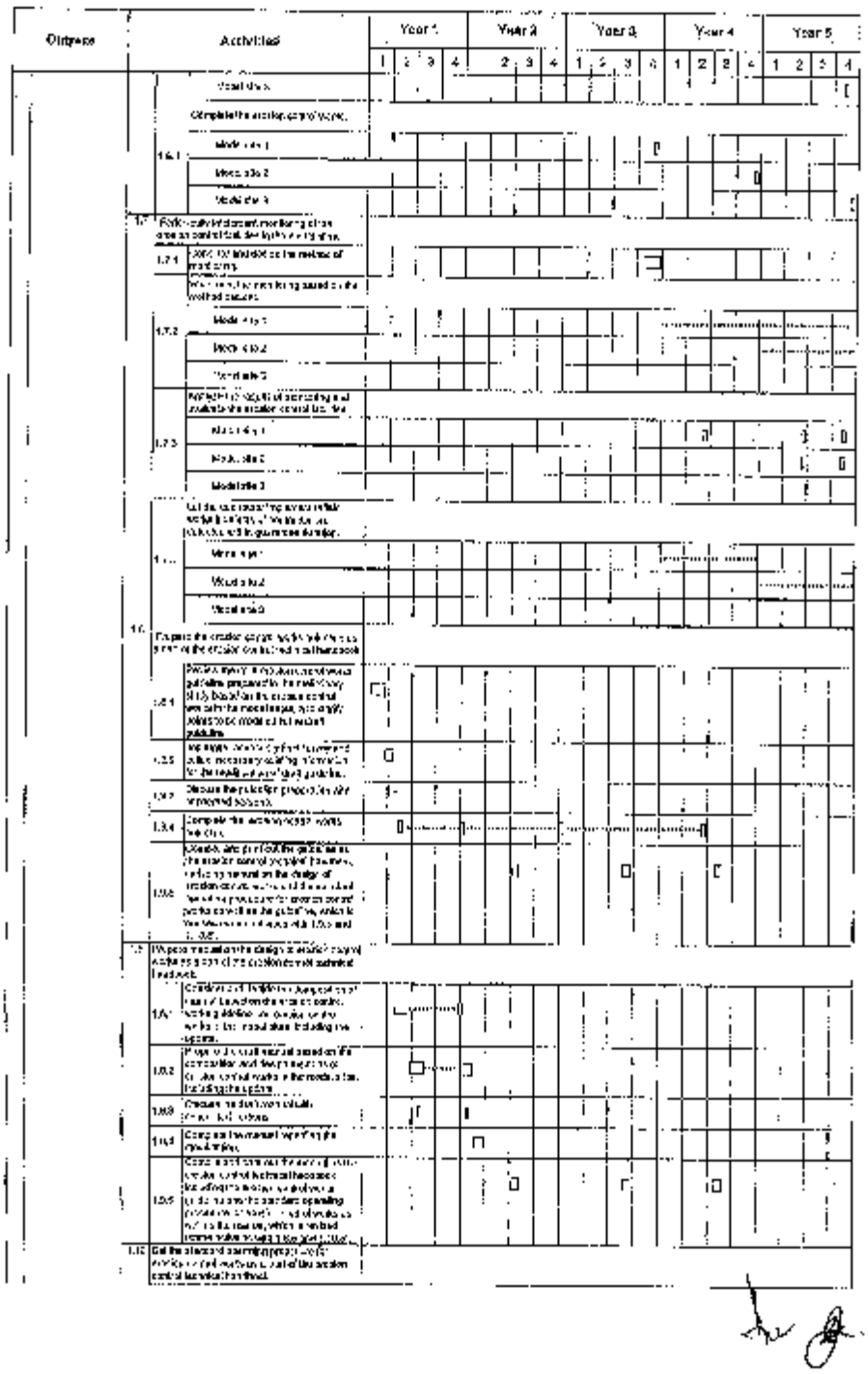
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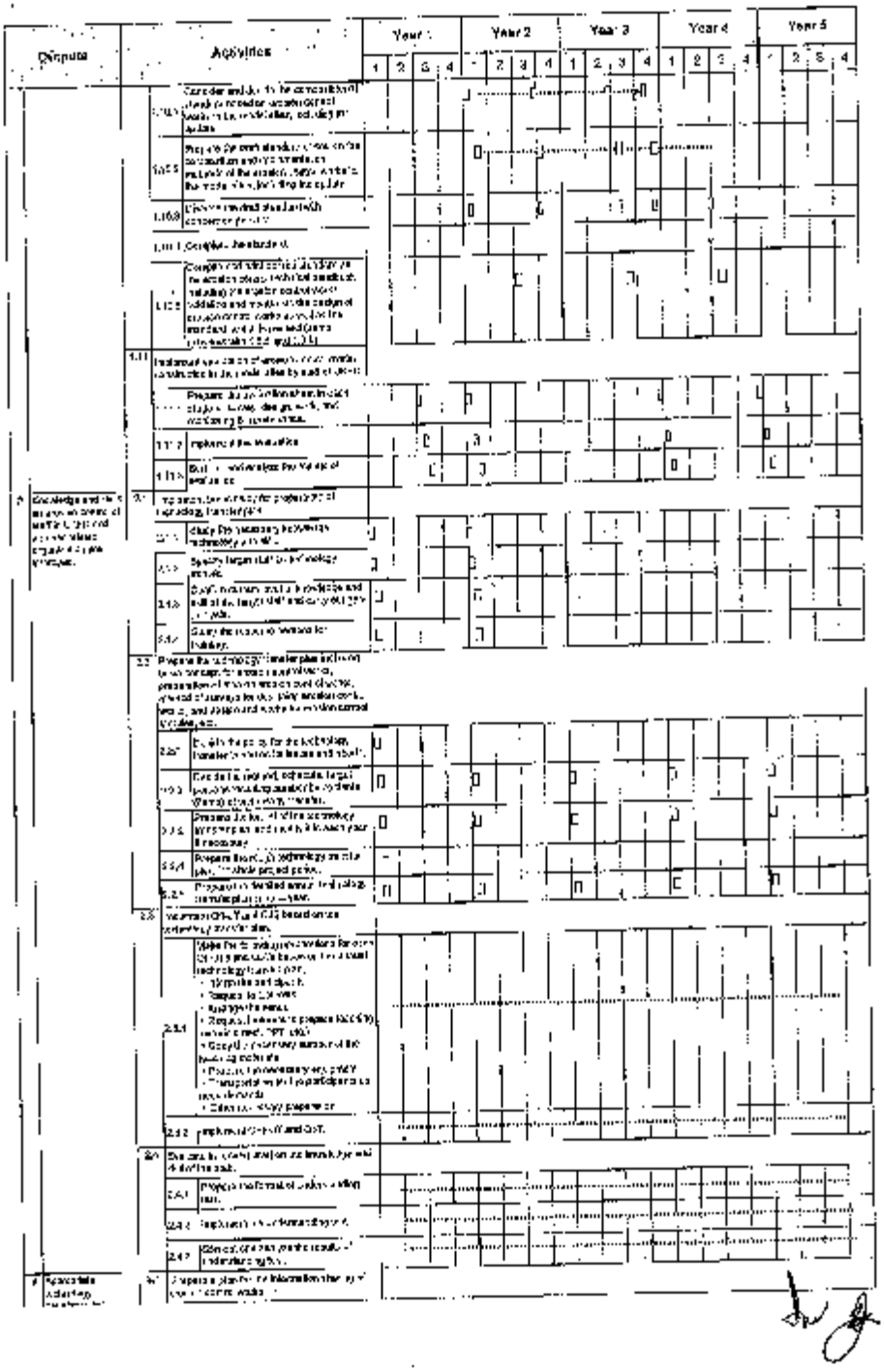
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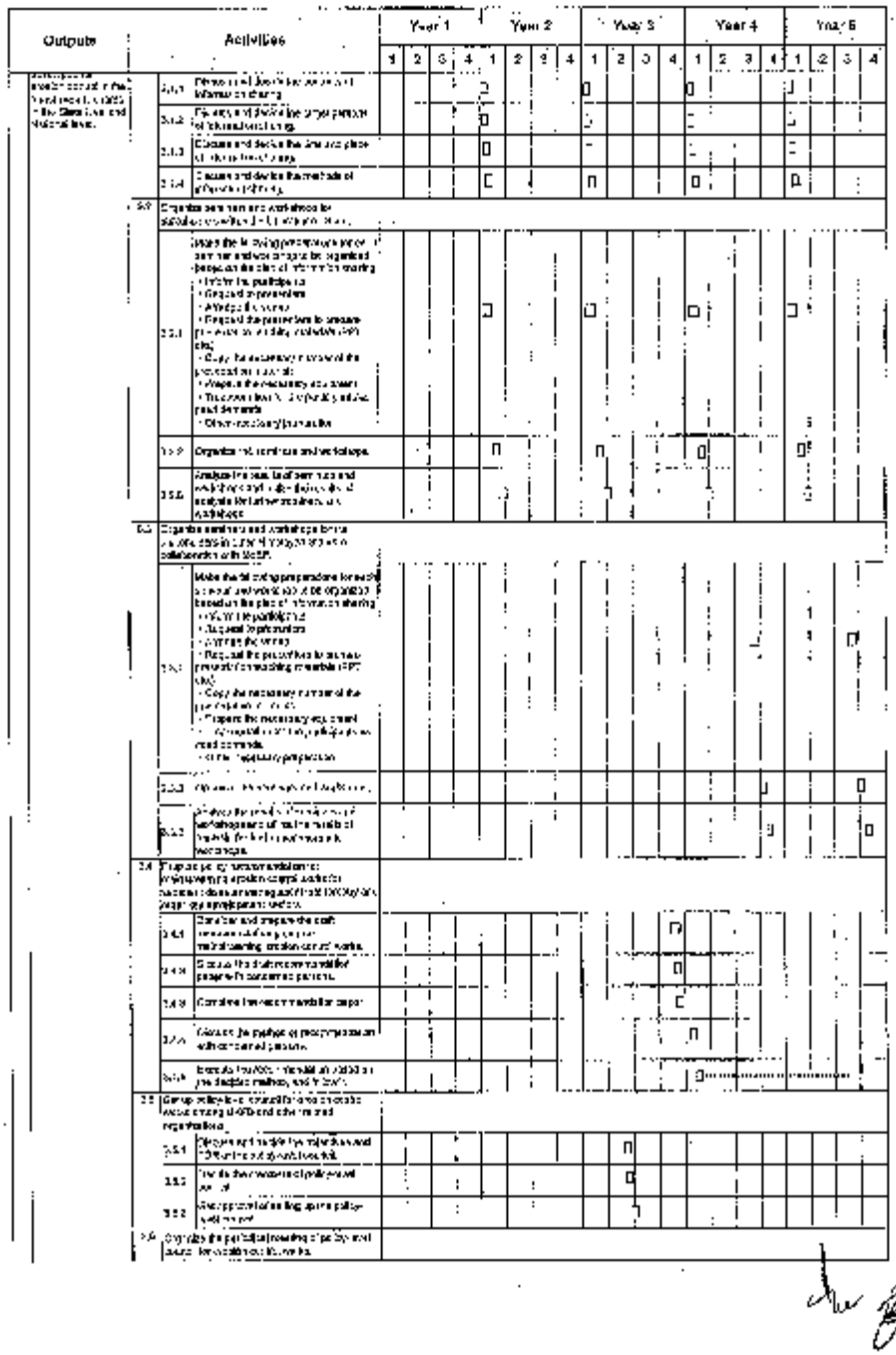
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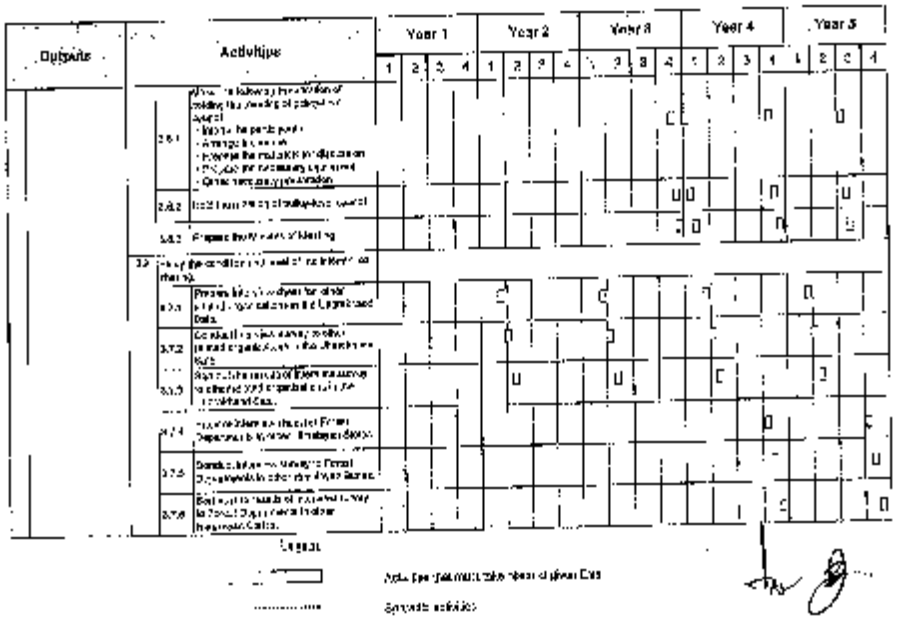
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Annex 4

A List of Proposed Members of Joint Coordinating Committee

1. Function

The Joint Coordinating Committee (JCC) will meet at least once a year or whenever necessity arises.

The main functions of JCC are:

(1) To approve the Plan of Operation and the annual work plan of the Project.

(2) To review the overall progress of the Project activities as well as the achievement of the above-mentioned annual plan; and

(3) To review and exchange views on major issues arising from or in connection with the Project, and to recommend corrective measures.

2. Members

(1) Chairperson: Additional Chief Secretary, Government of Uttarakhand

(2) Indian side:

Principal Secretary of Forest, Government of Uttarakhand

Principal Chief Conservator of Forests, HoFF, UKFD

Project Director (Chief Conservator of Forests & Chief Project Director of Uttarakhand Forest Resources Management Project, UKFD)

Project Manager (xxxx)

Representative from Public Works Department, Government of Uttarakhand

Representative from Irrigation Department, Government of Uttarakhand

Representative from Watershed Directorate Government of Uttarakhand

Representative from Disaster Mitigation and Management Center, Government of Uttarakhand

Representative from MoEF, Government of India

Representative from Border Road Organisation, Government of India

Other officials mutually agreed upon

(3) Japanese side:

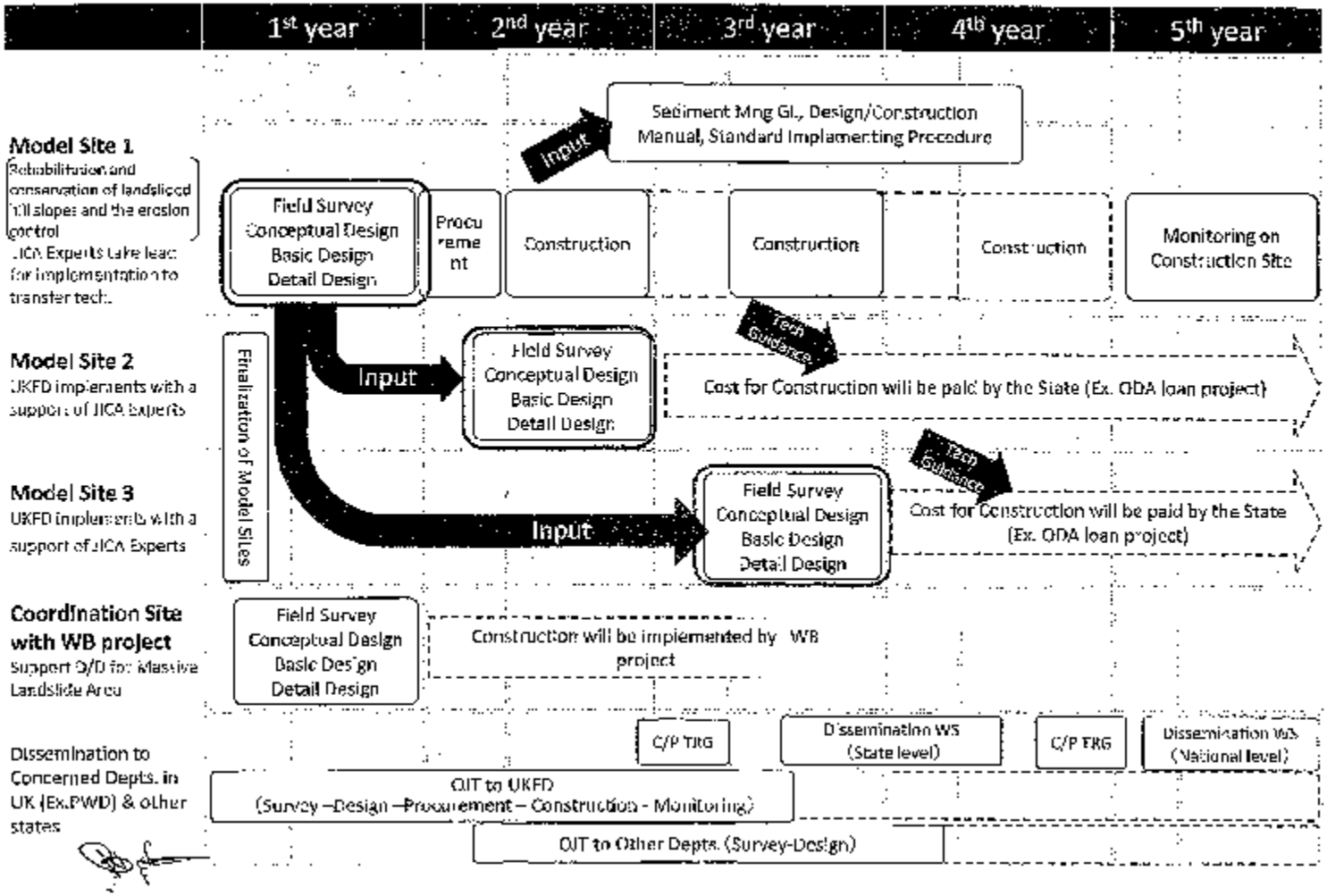
Representative of JICA India Office and/or JICA HQ

JICA Expert(s) of the Project

Other relevant personnel mutually agreed upon

Note: Officials(s) of Embassy of Japan in India may attend the JCC as observer(s).

Proposed Implementation Schedule (the Project for Slope Disaster Mitigation in Forest Areas in Uttarakhand) Annex 3



Appendix

(4) Minutes of the study team

Minutes of Meeting

Between

Preparatory Survey team and

Mr. Anup Malik CPD, UKFRMP

Mr. S.M. Joshi, Conservator Forest

Mr. P.K. Patra (Additional Secretary Forests)

Date: 07-08-14

Candidate sites

Mr. Malik explained the geography of the state and told that the state can be divided into two distinct zones i.e. Garhwal and Kumaon. He told that Garhwal mountains were higher and had steep slopes as compared to Kumaon mountains.

He suggested that 2 candidate sites must be selected from Garhwal and 1 from Kumaon. Bageshwar in Kumaon; Chamoli and Uttarkashi in Garhwal were suggested by him.

He said that these were the priority areas but within these areas easily approachable sites could be selected.

Field survey schedule

Mr. Malik suggested Uttarkashi and Rudraprayag at the sites for field survey. It was discussed that at least 4 days would be required to visit each place and landslides may also be an issue.

It was decided that the field visit would be scheduled from 11th to 14th August to Uttarkashi. Mr. S.M. Joshi agreed to accompany the preparatory survey team to the field.

Mr. S.M. Joshi was requested to make the necessary stay arrangements in the field

It was discussed that the preparatory survey team would hire 2 Scorpio (four wheel drive) vehicles for the field visit and Mr. Joshi would travel along with the team.

Discussions were also made regarding the visit of JICA Mission from 19th August. Mr. Malik suggested that the FD could arrange for a helicopter and take the JICA Mission (3 persons only) to Chamoli District. It could be a day visit or the team could return the next day depending on the availability of helicopter. Mr Toyoda said that he would discuss about this with JICA.\

Counterparts in UKFRMP

Mr. Malik informed that FD was the main counterpart in UKFRM project.

He told that a committee consisting of the following departments had been formed for this project:

- Irrigation department
- Public Works Department
- Disaster Management Department
- Finance Department
- Home Department

Structure of FD
Mr. Malik informed that there was no separate disaster management section/division within the FD.

Regarding proposed technical cooperation
Regarding the proposed technical collaboration project Mr. Malik said that the main intention of the project must be to focus on the capacity building of the Forest Department so that the FD is able to treat all major and minor landslides in forest areas.

He explained that the intention of the project is to manage landslides but not to reconstruct roads as the repair of roads was a responsibility of the Public Works Department (PWD).

Mr. Joshi told that 65% of the area of Uttarkhand was forest area and there were a number of villages who had bridle paths, footpaths and culverts passing through forest areas. The need was to manage these bridle paths and rural roads such that communication was not affected.

It was also discussed that landslides occurring in forest areas above the PWD roads were also to be managed by the forest department.

Mr. Malik expressed the desire that project should include capacity building of forest department in order to enable them to contribute effectively in case of disaster.

Involvement of private companies

Mr. Malik told that in case of minor landslides the forest department makes the designs for restoration/treatment structures. But in case of minor landslides the department did not have the technology .

He told that there were no private companies who engaged in landslide control.

Regarding maps

Regarding getting maps for the preparatory survey it was discussed that:
Vegetation maps are available with Forest Survey of India (FSI)
Disaster map with DMMC
Topography map with Forest Department
Geological maps with Wadia Institute

Mr. Anmol requested Mr. Malik to issue letters to the concerned departments so that the maps may be collected.

Mr. Patra promised that he had some geological maps which he would share with the team.

Minutes of Meeting

Between

Preparatory Survey team and

Mr. Rakesh Sharma, Addl. Chief Secretary, Uttarakhand

Mr. Anup Malik CPD, UKFRMP

Mr. S.M. Joshi, Conservator Forest

Mr. P.K. Patra (Additional Secretary Forests)

Date: 07-08-14

Impact of disaster

Mr . Sharma told that three districts were the worst affected in the disaster of June 2013 namely, Uttarkashi, Rudraprayag and Chamoli districts.

He said that Rudraprayag district was the worst affected district.

In Uttarkashi he told that Bhagirathi river had caused massive devastation in the valley. 2 power projects were badly damaged. In this valley he suggested river training with slope stabilization.

In Rudraprayag he said that the Mandakini river had caused devastation. He said that slope stabilization was required in this region.

In Chamoli district he said that active slopes were coming down.

Field survey schedule

Regarding the schedule of field survey Mr. Sharma told that it would be better to spend 3 days in Uttarkashi and then move to Rudraprayag and Chamoli.

He suggested that on 13th the team could move to Rudraprayag. He also promised that if the weather was clear he could arrange for helicopters to get the team transported to Rudraprayag.

Scope of technical cooperation

According to Mr. Sharma the technical cooperation project must focus on slope stabilization both within forests as well as outside forests.

He emphasized on the need for capacity building of all stakeholders.

He said that a total of 5 river catchments were affected in Uttarakhand and the project must cover all these catchments.

Minutes of Meeting

Between

Preparatory Survey team and

Mr. Amit Negi, Secretary Externally Aided Projects and PWD

Mr. Neeraj Khairwal, Addl. Secretary Disaster

Mr. Deepak Malik, Operations Supervisor, World Bank Project

Mr. Sanjay Mathur, Deputy Project Director, World Bank Project

Date: 08-08-14

It was informed that under the World Bank supported project some slope stabilization work, river morphology and river training works has been identified. These sites were identified by irrigation and PWD persons.

Mr. Negi emphasised that slope stabilization near the PWD roads is of utmost importance so that roads do not get blocked especially in pilgrim areas.

Mr. Malik told that there is lack of adequate technology for slope stabilization. He said that the expectation from the Technical cooperation project was that it would help in transfer of knowledge and institutional building on disaster management.

Mr. Negi suggested that Japan could provide support in Early Warning Systems/Communication. He said that Uttarakhand government was looking at a spectrum of Disaster Risk Reduction support.

Mr. Negi also told that slope stabilization above the PWD roads was very important. He said that the project must provide technical assistance for all stakeholders including forest, PWD, Irrigation department.

Mr. Toyoda made a detailed presentation about the preparatory survey.

Mr. Negi explained that toe erosion was occurring at a wide scale in the state and in most cases slope stabilization was being taken up by the PWD while in rivers work was being done by the irrigation department.

He also said that while the ownership of the public roads was with PWD but the hills above the roads were forests and that forest department did not have adequate knowledge regarding slope stabilization.

Mr. Malik told that there was no shortage of funds with the World Bank and perhaps if mega slope stabilization works are required there must be scope for technical cooperation with Japan.

Mr. Negi told that there was a slope stabilization cell in Uttarakhand and all major DPRs were with that cell.

Minutes of Meeting

Between

Preparatory Survey team and

Mr. Ravi, DM, Uttarkashi

Date: 12-08-14

The District Magistrate had invited officials from all the line departments including irrigation department, forest department, Uttarakhand Jal Vidyut Nigam (electricity department), Jal Sansthan (water department), Border Roads Organisation (BRO) and Public Works Department (PWD).

The officials of all the department made a detailed presentation about the kind of disaster that occurred on June 16, 2013 and also about the restoration efforts that were being made by the various departments.

The departments also made a pictorial presentation about the situation before and after the disaster.

Subsequent to the presentation DM Uttarkashi told that the district had suffered heavy damage in the flash floods in 2013. He also told that the district had also been affected by floods in August 2012 as well.

He told that the district had identified various points where slope stabilization was required on NH 108 and had also identified places where river training works were required.

The points identified for slope stabilization were:

- Sukki
- Gangnani
- Bhatwari/Charethi
- Malla
- Sainj
- Bhatukisaur
- Netala
- Gangori/Garam Pani
- Barethi Chunngi
- Raturi sera
- Dharasu/Nalu pani

The DM told that technical cooperation was essential for disaster mitigation and also for restoration. He also told that the fragile mountain zone required technically sound interventions.

Subsequently Mr. Toyoda explained to the DM the purpose of the visit of the preparatory survey team. He explained that the team was visiting the district to see the impacts of disaster and also to identify potential candidate sites/model sites.

List of Participants

Name	Organization	Position
Mr. Ravi	**Uttarkashi District**	**District Magistate**
Mr. Har Giri Goswami	**Uttarkashi District**	**Deputy Collector**
Mr. Shiv Das	**Uttarkashi District**	**Executive Engineer**
Mr. P.S. Panwar	**Irrigation Department (ID)**	**Executive Engineer**
Mr. R.S. Negi	**Jal Sansthan**	**Executive Engineer**
Mr. G.K. Rustogi	**Uttarkashi District**	**Divisional forest officer (DFO)**
Mr. R.B. Singh	**Uttarkashi District**	**Sub divisional officer(SDO)**
Mr. O.M. Prakash	**Public works department (PWD)**	**Superintending Engineer**
Mr. Ashok Kumar	**Public works department (PWD)**	**Executive Engineer**
Mr. T.R. Bondim	**Border road Organization (BRO)**	**AE Civil**
Mr. Gyanendra Tomar	**Border road Organization (BRO)**	**AE Civil**
Mr Abhay Singh	**Uttarakhand Jal Vidyut Nigam**	**Executive Engineer,**
Mr. S.M. Joshi	**Forest Department(FD)**	**Conservator Forest**
Mr. Takaki Toyoda	**JICA Study team(JOFCA)**	**Team leader**
Mr. Hiroyuki katsuro	**JICA Study team(NIPPON KOEI)**	**Expert of soil conservation**
Ms. Sahori Matsumoto	**JICA Study team(JOFCA)**	**Coordinator**
Mr. Anmol Jain	**JICA Study team**	**Specialist**

Minutes of Meeting

Between

Preparatory Survey team and

Mr. Amit Negi, Secretary Externally Aided Projects and PWD

Mr. Neeraj Khairwal, Addl. Secretary Disaster

Mr. Deepak Malik, Operations Supervisor, World Bank Project

Mr. Sanjay Mathur, Deputy Project Director, World Bank Project

Date: 16-08-14

At the outset of the meeting Mr. Toyoda made a presentation about the field visit made by the preparatory survey team to Uttarkashi and Parori between 11th to 14th August, 2014.

Mr. Toyoda made a very interesting presentation using pictures from the field visit to explain the kind of sites visited by the team, the nature of village surveys done and the impressions of the team from the field visit.

Mr. Amit Negi and representatives from the World Bank Project were very curious to know the scope of the technical assistance project and about the model sites that could be selected under this project.

Mr. Sanjay Mathur wanted that the scope of this project should be outside the Reserve Forest areas also and that landslide prone areas in the state like Dharasu must be taken up for treatment.

Mr. Anmol Jain explained that even the areas above the PWD roads generally belonged to the forest department and hence areas such as Dharasu fell within the scope of the project.

Mr. Toyoda explained that although under this TA certain model sites for slope stabilization would be identified but since the scope of the funds available under TA was limited and hence perhaps very bit sites may not be selected.

Mr. Amit Negi asked about the amount of funds available under the TA project.

Mr. Toyoda told that probably about US$ 5 million was available. He however clarified that it depended upon the JICA mission and if the mission agreed then the budget could also be increased.

Mr. Amit Negi told that if required additional funding could be routed through the WB project. He however told that currently the PWD and line departments lacked the capacities to treat large scale landslides and hence it was important to get suitable technologies from Japan. He stressed that the TA should focus on getting technologies from Japan even for large landslides.

Mr. Toyoda told that the team was not planning a visit to Rudraprayag.

Mr. Negi also told that the World Bank project and PWD had identified 5 sites in Rudraprayag district.

Mr. Neeraj Khairwal called up the DM Rudraprayag and requested him to provide all possible support to the team.

Minutes of Meeting

Between

JICA Mission team, Preparatory Survey team and

Mr. Raghav, DM, Rudraprayag

Date: 22-08-14

The District Magistrate told that the district had identified various landslides and the technical corporation should be implemented where there are many populations and/or traffic in order to the greatest number can receive benefits from the project.

Mr. Goseki explained to the DM the purpose of the visit of the JICA Mission team and preparatory survey team. He explained that the team was visiting the district to see the impacts of 2013's disaster and also to identify potential candidate sites/model sites.

The DM told that he had expectations for the technical cooperation was the latest technology like ecological technology etc. Then he asked some points as below.

	Question From DM	Answer from JICA Mission and Preparatory Survey team
1	How long does it take to be stabilized one landslide?	It is depend on the condition of the landslide, in the case of Japan, the big scale landslide needs about 10 years to stabilise.
2	Are there any difference between the Landslide of Rudraprayag and that of Japan?	The scale of the landslides in Rudraprayag and the number of it are beggar than that of Japan. But even in japan, there are many landslides and it is difficult to treat all of them. So we take measure in order of priority.
3	Is it possible to include the landslides that are tackled by the other department in the technical cooperation?	The main counterpart of this technical cooperation is FD. But some technology and/or knowledge that will be transfer by this technical cooperation will be able to be share with other department such as PWD and BRO. And also JICA considers cooperating with WB and/or ADB, in that case, it might be possible to include the other department in some cooperation activity.
4	There are 3type of landslide , 1. Road side Landslide 2. Landslide (From top of the mountain to river) 3.Mountain Landslide (Ecological, Biodiversity) Which type of landslide will be the	Since the counterpart is FD, Mountain Landslide will be the target.

	target of technical cooperation?	
5	What kind of data are you collecting?	We prepared field note for data collection. We fill out the field note, GPS position information, scale of the landslide, slope, geology information, vegetation information, sketch etc.
6	Did you observe the huge landslide site at Sirohbaggar ? And in Japan how do you treat this type of landslide.	Yes, it is huge landslide. And in japan if there were such kind of huge landslide, we don't construct road but we construct bridge to pass this area.
7	In India, construction of roads has the highest priority. And countermeasure for landslide is not enough. I expect to the technical cooperation, not only transfer new technic, but also show applicable model of landslide countermeasure. Actuary we don't have good example and if we have applicable model of landslide countermeasure, we can change current situation.	We agree with you. We would like to transfer not only new technic, but also the system and structure for countermeasure landslide, how we can manage and avoid landslide to change current situation of India.

List of Participants

Name	Organization	Position
Mr. Raghav Langer	**Rudraprayag District**	**District Magistrate**
Mr. C.S Chauhan	**Uttarkashi District**	**Sub Divisional Magistrate**
Mr. Chauhan	**Rudraprayag District**	**Sub divisional officer(SDO)**
Mr. Kazuhiro Goseki	**JICA Mission team (JICA)**	**Executive Technical Advisor to Director General, Global Environment Department,**
Mr. Yuki Okada	**JICA Mission team (JICA)**	**Assistant Director, Global Environment Department**
Mr. S.M. Joshi	**Forest Department(FD)**	**Conservator Forest**
Mr. Takaki Toyoda	**JICA Study team(JOFCA)**	**Team leader**
Mr. Hiroyuki katsuro	**JICA Study team(NIPPON KOEI)**	**Expert of soil conservation**
Ms. Sahori Matsumoto	**JICA Study team(JOFCA)**	**coordinator**

Minutes of Meeting
Between
Mr. Rakesh Sharma, Addl. Chief Secretary, Uttarakhand
Mr. Amit Negi, Secretary PWD, Uttarakhand
Mr. Neeraj Khairwal, Addl. Secretary Disaster
Mr. Sharma, PCCF Uttarakhand
Mr. Deepak Malik, Programme Manager World Bank Project
Mr. Anup Malik, Chief Conservator Forest
Mr. S.M. Joshi, Conservator Forest (Retd.)

And
JICA Mission
And
JICA Preparatory Survey Team

Date: 25-08-14

Mr. Amit Negi informed that the Public Works Department (PWD) has already identified 5 sites between Rudraprayag and Sonprayag that required treatment and that could be covered under the TCP.

Mr. Rakesh Sharma said that the people of the state were expecting action on the ground. That US $ 5 million assistance from TCP has to result into some action on the ground.

Mr. Amit Negi said that site selection was very important and that the Districtd Magistrates of Uttarkashi and Rudraprayag had provided a list of possible sites to the preparatory survey team.

Mr. Deepak Malik said that if JICA project could provide technical support then the funds could be provided by the World Bank even for the treatment of bigger sites.

Mr. Amit Negi gave the example of a site at Vijaynagar (Rudraprayag district) that if JICA provided technical assistance in preparing the DPR then the project could be funded by the World Bank.

Mr. Goseki then presented the preliminary impressions of the survey and the possible sites that could be taken up.

Mr. Amit Negi said that sites located on the main road were more visible and accessible and that there was a need to select state roads and national highways.

Mr Goseki explained that under the TCP JICA only wanted to focus on forest areas.

Mr. Rakesh Sharma said that in Uttarakhand most of the land was under forests and constituted forest area. He also said that for the state all the departments were the arms of the state and that he did not differentiate between Forest Department, PWD and Irrigation Department as all were working for the people of the state.

Mr. Deepak Malik also said that the scope of the project must be expanded beyond forests.

Mr Rakesh Sharma expressed the opinion that the project must fully treat the model sites so that they are useful for the people of the state.

Finally the Minutes of Discussion were signed between JICA and Uttarakhand government.

Observations:
The Indian side did not seem very happy with the size of the TCP as they were expecting the TCP to be of a larger size so that it could take up more sites.

They wanted that the model sites must be fully treated by JICA under the TCP. They were not comfortable with the idea that JICA would prepare the master plan and only do a part of the construction works while the rest would be done by the Indian side.

They seemed more keen that the project must target the slopes and landslides near the major roads.

They expressed that after the disaster there were a large number of unstable slopes near the roads and wanted the project to take up more slopes but treat them fully.

Minutes of Meeting
Between
Mr. Anup Malik, CPD
Mr. S.M. Joshi, CF (Retd.)

And

JICA Mission

And
JICA preparatory survey team

Date: 25-08-14

Mr. Goseki explained to the FD representatives the findings of the study team and the proposal of the JICA mission.

Target area: He told that the target area for this TCP would be landslides occurring within forest areas. He explained that the TCP would not cover major landslides owing to budgetary constraints. He said that it would be better to concentrate on landslides occurring in forest areas and for stabilizing debris flow.

Project Duration: Mr. Goseki told that although the FD had proposed the duration of project for 3 years and 7 months but it would be better if the project had a duration of 5 years.

He explained that in the first year a detailed survey of each site and preparation of a Master plan shall be done.

In the second year construction work shall be started.

From third year onwards monitoring of the construction work would be done and finally technical guidelines/manuals would be prepared.

Capacity building: Mr. Goseki explained that Capacity building of the relevant officials would be done alongside the treatment work. He said that for capacity building JICA also wanted to involve other organisations like the PWD.

Candidate sites: Mr. Goseki told that the Mission would like to propose through candidate sites and told that candidate site could be at Parori village near Mussoorie, one at Nirgad village in Tehri and one at South Jakholi in Rudraprayag.

He told that in Parori the village was being affected by debris flow and also told that at the top of the site also many people were living and their houses were affected by landslides so this was an urgent matter.

Mr. Malik asked about the size of the Parori site and Mr. Toyoda explained that the about 2 kms of the stream had to be treated.

Mr. Malik asked about the techniques to be used in the treatment work.

Mr. Goseki explained that the treatment of Parori site would involve arresting the debris flow and covering the surface of the landslide affected area with vegetation.

Mr. Joshi asked whether there was any possibility of recovering the fields near the river that had been covered by debris.

Mr. Goseki told that it was difficult to remove the debris as their volume was huge.

Mr. Malik asked about the involved in treatment at Parori village.

Mr. Goseki told that although a detailed estimate of cost had not been made but according to rough estimates it could cost several million US $.

Mr. Malik asked about the size of TCP.

Mr. Goseki told that although the cost was not finalized but JICA could spend several million US$. He told that roughly for 3 sites the cost of construction would be around US $ 5 to 10 millions. He said that all the construction works may not be completed during the project duration and that JICA may complete some construction works and the rest may be completed by the Indian side.

Mr. Malik asked that what was the total budget for TCP project.

Mr. Goseki told that usually in TCP about US $ 2 million was spending on construction works and there was also a budget for training and Capacity building.

Mr. Okada told that TCP projects had an outlay of about US $ 1 million for a year but it depended upon the contents of the project. He explained that usually the cost of capacity building was more than the construction cost.

Mr. Malik asked that if the TCP would not be able to cover the complete construction cost of these sites then how would TCP cover the capacity building costs.

Mr. Goseki told that the solution could be that the TCP may take smaller sites and complete the construction work.

Mr. Malik remarked that treatment of smaller sites may not be of much use.

Mr. Goseki told that under the TCP a master plan would be made for taking up several construction works. The project would take up some construction works while the Indian side would take up the remaining construction works.

Mr. Malik wanted to know about the total budget for this TCP

Mr. Okada told that it could not be decided at this moment, it would depend upon the concept note.

Mr. Malik wanted to know about the expensive techniques for treatment used in Japan.

Mr. Goseki explained about such techniques.

Mr. Goseki told that the three sites were being proposed by the Mission as candidate sites. The FD could consider these sites and a final decision could be taken. If more suitable areas could be found then they could also be considered.

Mr. Goseki also told that it was important to select one model site close to Dehradun. He also told that all the model sites must not be far away from Dehradun and must be located at such as distance that the team from Japan could go to the site and come back the same day if required.

Later a Minutes of Discussion was finalized between the JICA Mission and FD.

Minutes of Meeting

Between

Preparatory Survey team and

Mr. Anup Malik CPD, UKFRMP

Mr. S.M. Joshi, Conservator Forest (Retd.)

Mr. P.K. Patra (Additional Secretary Forests)

Date: 10-11-14

Concept Note

Mr. Toyoda asked about the status of concept note. Mr. Malik informed that it was with the MoEF and that the MoEF had sought certain clarifications on the concept note. He told that now the MoEF shall send it to the Department of Economic Affairs (DEA) within about 10 days and then the DEA would submit it to the Embassy of Japan.

Mr. Toyoda asked that whether the concept note would take the form of official application document for the Embassy of Japan. Mr Malik said that yes it would.

Mr. Malik pointed out that there was an error in the concept note and that the duration of the TCP must be mentioned from April 2015 to March 2020.

Signing of Minutes of Meeting

Mr. Toyoda enquired about signing the M/M and said JICA mission wanted to discuss with PWD, BRO and irrigation department.

Mr. Malik said that only the UKFD would sign the M/M therefore there was no need for discussion with other department. He told that he himself along with one official from the Finance Department would sign the MM. He also told that he would not be available on 24th November.

Mr. Toyoda asked that whether the signature would be done at Dehradun or at Delhi since Mr. Malik was not available on 24th November.

Mr. Malik told that he would inform the team tomorrow about his schedule and maybe he would return on 24th morning. He also said that he would check on the schedule of Finance department official and whether he was available on the 24th or not.

Field trip schedule

Mr. Toyoda informed about the schedule for field trip to Mussoorie and Rishikesh. Mr. Malik called up DFO Mussoorie to confirm his availability.

Visit to training institutions

Mr. Toyoda also informed that the team wanted to visit IGNRA, CASFOS and CSWCRTI in order to discuss their existing training programmes and also to identify possibilities for collaboration with these institutes for extension work related to JICA TCP.

There was a discussion between Mr. Malik, Mr. Joshi, Mr. Patra and Mr Anmol. Mr Malik said that it would be better to visit these institutes and discuss with their officials.

Mr. Malik suggested that the project should hire resource persons for a period of 5 years and that these resource persons could provide training in the various institutes.

Mr. Kato said that the team wanted to know about the status of training related to mountain disaster management in various organisations in the state. He said that the modalities for training and extension would be worked out after visiting the institutions.

Mr. Toyoda said that the team wanted to know about the various training programmes of the UKFD.

Mr. Malik told that the training programmes of UKFD were conducted by Forest Training Institute (FTI) which as located at Haldwani. He said that he would see if it was possible to get the Director of FTI to come to Dehradun to meet the team.

Structure of TC project (power point presentation)

Mr. Toyoda explained the structure of the project to Mr. Malik.

Mr. Malik asked to:

- reframe slide 5 point 4.
- Change slide 3 point 2

Mr. Toyoda mentioned that for large scale sites it was important to discuss with JICA mission.

Mr. Malik said that there was a problem with selecting 3 model sites in Garhwal region of Uttarakhand and that it was important to select one site in Kumaon region. He suggested that 2 sites may be selected in Garhwal and 2 in Kumaon.

Mr. Toyoda told that this must be discussed with the JICA mission as already the project had limited budget.

Regarding slide 10 Mr. Malik suggested that JICA experts must help in project design, preparing estimate and preparing the bid. The UKFD would float the bid and then JICA experts must help UKFD in selection of contractor. Later JICA experts must monitor the construction.

Regarding slide 11 Mr. Malik said that he did not agree and that it was required to discuss with JICA mission.

Minutes of Meeting
Between
Preparatory Survey team and
Dr. Dheeraj Pandey, DFO Mussoorie
Mr. S.M. Joshi, Conservator Forest (Retd.)
And
Mr. Neeraj Sharma (SDO Mussoorie)
Date: 12-11-14

Mr. Toyoda explained to DFO Mussoorie about the T/C project of JICA.

He asked DFO Mussoorie that if Parori was selected as a candidate site then whether local contractors would be available to take up civil works at Parori.

Dr. Dheeraj Pandey told that local contractors are available but they are not very skilled. That the project would have to provide trainings to local contractors for taking up highly skilled/technical tasks.

Mr. Toyoda said that it may be possible to impart techniques to local contractors.

Mr. Kato asked about the specific persons within the Division who are responsible for soil and moisture conservation.

DFO Mussorie told that there are no specific persons and that the Range Officer and Deputy Range Officers also take up soil and moisture conservation works. He also informed that there is a Working Plan which is prepared for each Forest Division for a period of 10 years and in the working plan there is a separate section on Soil and Moisture Conservation. DFO Mussoorie also shared a photocopy of this chapter in the Working Plan of Mussoorie Forest Division.

DFO Mussoorie said that for Parori village apart from civil works it was also important to take up vegetative treatment measures.

Mr. Kato suggested that the T/C project could take up the civil works and the other works could be taken through the JICA loan project.

However, DFO Mussoorie clarified that in the site of Parori village a CAT (Catchment Area Treatment) Plan was being prepared that that this site was not covered under the JICA loan project.

DFO Mussoorie also told that there no specific manual for disaster management had been prepared by the UKFD.

Minutes of Meeting

Between

Preparatory Survey team and

Mr. Anup Malik CPD, UKFRMP

Date: 15-11-14

Site Selection

Mr. Malik mentioned that at least one site must be selected in the Kumaon region of Uttarakhand. He said that if additional budget was required for selecting one site in Kumaon then possibilities for additional budget could be explored with the UKFD or by other agencies of the state government.

Staffing for JICA grant project

Mr. Malik suggested that for the JICA loan project several staff would be employed. He said that support staff such as accountants, drivers, office assistants with the JICA loan project and vehicles could be used for JICA grant project also.

Mr. Kato discussed that under the JICA grant project it was being important that the same team must be working at all the three sites so that they are able to effectively learn the slope stabilization techniques. He asked that since all three model sites were in different divisions therefore how would the same team of forest officials be involved?

Mr. Malik agreed that a separate team would be formed for the JICA grant project which would work in all the model sites. This team would comprise of one Sub-Divisional Forest Officer (SDO), two Range Officers, and two Deputy Range Officers.

Capacity of contractors

Mr. Toyoda asked that whether local contractors could be available having sufficient capacities to take up the civil works under the guidance of Japanese experts.

Mr. Malik told that capacities of local contractors would be poor but national bidding could be done in order to get good contractors.

Minutes of meeting
Between
Mr. Anup Malik, CPD UKFRMP
And
JICA Mission
Date: 21-11-14

Mr. Jinnai told that 3 sites would be taken up under T/C project and Nirgad would be the 1st site as it was easily accessible, had potential for demonstration of a variety of works and it was also on national highway.

Mr. Anup Malik told that the number of model sites would depend upon counterpart budget. He said that the Chief Minister has said that 1 or 2 model sites could be funded by the state on pilot basis and maybe 2 sites could be taken up under TCP and 2 sites could be funded by state.

He also asked that whether the construction at Nirgad would affect the traffic?

Mr. Toyoda said that construction would not obstruct traffic.

Mr. Jinnai said that since that road is managed by BRO therefore BRO has to be involved in planning. He told that the size of T/C project was US$ 5 million for 5 years.

Mr. Anup Malik asked that whether the size could be increased.

Mr. Jinnai told that he could not guarantee that and for taking additional sites co-financing could be done through the JICA loan project.

Mr. Anup Malik told that two sites could be taken up under the WB project.

Mrs. Horikawa told that for WB sites only detailed designing could be done under the T/C project.

Mr. Anup Malik told that we must design as well as provide technical support for construction otherwise there would be lack of synergy.

Mrs. Horikawa told that WB had only requested JICA for doing detailed designing.

Mr. Anup Malik said that he said that he would discuss this with WB persons. He also said that ideally the WB should transfer money to UKFD and UKFD would take up the entire site treatment under the T/C project.

Mrs. Horikawa told that only support up to detailed design could be provided to the WB. She said that WB project was separate and that first discussion on UKFD T/C project must be done.

Mr. Anup Malik told that his first objection was that the T/C project had not identified any model site in Kumaon region.

Mr. Okada told that first it was important to agree to finalize Nirgad as the first model site so that work could be started in June 2015. He told that the field survey would be done during the rainy season and the final design would be prepared by May 2016.

It was discussed that sites 2 and 3 would be selected based upon certain criteria and norms of JICA like environmental norms, using technology similar to that used in site 1 and also considering the aspect of accessibility.

Mr. Okada suggested that the cost of construction of site 2 and 3 must come from the state government.

Mr. Jinnai explained that experts hired by JICA would close monitor the entire process and that perhaps major part of US$ 5 million would be used for mobilizing experts.

Mr. Anup Malik asked about dissemination of knowledge.

Mr. Jinnai explained that the project could organise workshops and other programmes.

Mrs. Horikawa told that IGNFA faculty could be invited for workshops and they would be sensitized so that they could use that knowledge for training.

Mr Anup Malik said that there was a need to give some budget to IGNFA for dissemination activities.

Mrs. Horikawa told that giving budget to IGNFA might be difficult.

Mr. Anup Malik suggested that if the project wanted to organise workshops then it could be done at IGNFA and the cost of the workshops could be borne by the project.

Mrs. Horikawa told that this could be possible but JICA experts must take the lead for technical sharing.

Task team

It was decided that a task team of about 9 to 10 persons would be constituted by the UKFD. After initial training at the 1st site this team would divide into 3 teams and each team would work at one model site. It was also decided that the team would be mobile and would work in field and also at Dehradun.

Project management structure

Mrs. Horikawa asked about the management structure and about supervision of the activities.

Mr. Anup Malik told under the CPD a separate PD (IFS officer) would be appointed who would be incharge of supervision.

It was then decided that under the CPD/PD there would be a Joint PD (JPD) and under the JPD there would be three Project Managers (PM) and each PM would supervise one task team.

Mrs. Horikawa said that it was important to institutionalize the learning and that it was necessary to form a separate functional unit with the UKFD like CCF- Sediment Disaster Management.

Mr. Anup Malik said that he would propose that to UKFD.

Project Cost

Mr. Jinnai said that after including the cost of construction of site 1 in the T/C project the cost was overshooting. He said that UKFD must support the other sites through the loan project otherwise the project could not go further.

Mr. Anup Malik said that this could be discussed tomorrow.

Minutes of meeting
Between
Mr. Dinesh Aggarwal, Minister of Forests, Govt. of Uttarakhand
Mr. Ranbir Singh, Principle Secretary Forests, Govt. of Uttarakhand
Mr. S.S. Sharma, Principal Chief Conservator Forests (PCCF), Uttarakhand
Mr. Anup Malik, CPD UKFRMP
Mr. P.K. Patra, PD UKFRMP
Mr. S.M. Joshi, UKFRMP
And
JICA Mission
Date: 21-11-14

Mr. Anup Malik welcomed everyone and made a short power point presentation about the T/C project to the Minister of Forests.

He told that the T/C project was needed because:

- There were no Standard Operating Procedures for slope stabilization with Uttarakhand government
- The capacities in slope stabilization were limited with UKFD as well as with other agencies.
- JICA loan project had a component on disaster management but there was a need for technical inputs for implementation.
- Japan had great expertise in Disaster Management.

He told that this project would help in:
Development of Standard Operating Procedures for slope stabilization
Capacity building of UKFD staff and other agencies
Development of model sites in state – although he told that the number and location of sites needed to be finalized.
Cooperating with UDRP for enhancing their capacities.

He said that the project was expected to commence from April, 2015.

Mr. Dinesh Aggarwal enquired about the funding mechanism in the T/C project and Mr Malik told that it was a grant project by JICA.

Mr. Jinnei of JICA Mission made the following observations:

- The date of commencement of the project was not yet final and it would depend upon when the DEA would make a formal request to the Govt. of Japan. He said that although JICA had not made any formal commitment so far as no official request had been received from the Govt. of India but JICA would like this project to start soon although the schedule may vary.

(Mr. Malik informed that the document had been given to the DEA but the DEA had sent it for comments to the Planning Commission, Ministry of Environment and Forests (MoEF) and the Home Ministry, Govt. of India. He told that the comments from Planning Commission and MoEF had been received but comments from Home Ministry were awaited.)

- That regarding the structure of the project the UKFD had informed that 2 new task teams would be set up whose capacities would be developed. He said that the task teams would not be

ad-hoc structures but that it was important to internalize the technical training within the department.

- There was a need for Inter Department collaboration within the state. He that there were several agencies in the state like PWD for roads, BRO for National Highways, Irrigation department for rivers. He said that the mechanism for inter departmental collaboration must be strengthened through this project.

- That dissemination of expertise to other departments and other states of India was an important component of this project.

- The Mission was meeting IGNFA for the purpose of involving them in dissemination of knowledge. He said that the basic objective of T/C project was technical transfer and capacity building.

- The World Bank project had also requested for technical assistance from JICA and the Mission had also visited the candidate sites of WB project also in Rudraprayag. The major part of their work was river training which may be beyond the scope of UKFD.

PCCF enquired Mr. Malik about the linkage between the JICA loan project and grant project.

Mr. Malik told that the T/C project would help in building technical capacity for implementing the disaster component under the loan project.

Mr. Dinesh Aggarwal asked the Preparatory Survey team to show some pictures about the possible technologies that could be introduced in India and some photographs were shown to him.

Mr. Dinesh Aggarwal said that Uttarakhand was suffering from disaster and the T/C project would greatly help in providing relief in the disaster prone slopes. He said that he looked forward to the early commencement of the T/C project and promised all support from his government.

Mr. S.M. Joshi proposed a vote of thanks.

Minutes of meeting
Between
Mr. Harish Rawat, Chief Minister of Uttarakhand
Mr. Dinesh Aggarwal, Minister of Forests, Govt. of Uttarakhand
Mr. N. Ravi Shankar, Chief Secretary, Govt. of Uttarakhand
Mr. Rakesh Sharma, Addl. Chief Secretary, Govt. of Uttarakhand
Mr. Ranbir Singh, Principle Secretary Forests, Govt. of Uttarakhand
Mr. S.S. Sharma, Principal Chief Conservator Forests (PCCF), Uttarakhand
Mr. Neeraj Khairwal, Addl. Secretary Disaster
Mr. Anup Malik, CPD UKFRMP
Mr. S.M. Joshi, UKFRMP
And
JICA Mission
Date: 21-11-14

Mr. Harish Rawat told that landslides were frequent in Uttarakhand and the state was facing problem in road connectivity and also the lives of people were being endangered. He asked that whether the JICA mission had visited the field and also asked whether the scope of the T/C project has been finalized.

Mr. Jinnai told that a field survey had been done by JICA Mission. He briefed the Chief Minister that Japan was prone to natural disasters and that Japan had developed a variety of slope stabilization techniques. He also told that Japan government allocated 2% of national budget for slope stabilization.

Mr. Harish Rawat informed that in some areas of Uttarakhand landslides were old while in some areas they occurred due to some natural calamity like floods. He said that the state required advanced technology for landslide prone areas.

Mr. Jinnai showed the Chief Minister pictures of landslide treatment techniques used in Japan.

Mr. Harish Rawat remarked that a disaster affected area could be assigned to Japanese experts where a pilot based upon Japanese technology could be done.

Mr. Ranbir Singh suggested that about Rs. 600 to 700 crores could be allocated by the state for using Japanese technical assistance for slope stabilization.

Mr Harish Rawat told that the state must identify priority areas first where Japanese technology could be used. He said that he wanted to use Japanese technical assistance because:

- Japanese technology was superior.
- Culture of Japan was similar to that of India.
- Landslides were frequent in Japan.

He suggested that 1 or 2 sites could be taken up on a pilot basis under the T/C project.

Mr. Neeraj Khairwal suggested that out of 5 slopes identified by the World Bank some slopes could be taken up for treatment under the T/C project and could be funded through UDRP.

Mr. Harish Rawat told that source of funding could identified but more important was to judge the effectiveness of Japanese technology and also find out whether it was cost effective.

Mr. Anup Malik told that Japanese technology was very effective but it was costly.

Minutes of meeting
Between
Mr. Vinod Kumar, Director IGNFA
Mr. Alok Saxena, Addl. Director IGNFA
Mr U.K. Sharma, Associate Professor, IGNFA
Dr. S. Senthil Kumar, Faculty Member IGNFA
Mr. Sanjay Srivastava, Faculty Member IGNFA
Mr. Anup Malik, CPD UKFRMP
Mr. S.M. Joshi, UKFRMP
And
JICA Mission

Date: 21-11-14

Mr. Malik made a presentation about the JICA Technical Cooperation project and mentioned that knowledge dissemination was a major component under this project. He said that the purpose of meeting with IGNFA officials was to explore the role of IGNFA in knowledge dissemination for the T/C project.

Mr. Jinnai of JICA Mission told that JICA was already working for capacity building of forest officials with CASFOS. He said that the purpose of meeting was to see how this project could collaborate with IGNFA.

IGNFA role in capacity building

Mr. Vinod Kumar enquired about the number of capacity building exercise that were required, number of persons to be trained etc. He also wanted to know the duration of these trainings and when would these trainings be started.

Mr Jinnai informed that at the earliest the T/C project could commence from June 2015. He also told that 2 resident experts from Japan would be stationed in UKFD for 5 years and these experts would work closely with IGNFA.

Mr. Vinod Kumar enquired that whether these experts would be with UKFD full time or part time.

Mr. Jinnai informed that although the experts may change but 2 persons would be working with UKFD for 5 years continuously.

Mr. Vinod Kumar enquired that whether the T/C project organise some exposure visits for trainers from IGNFA.

Mr. Jinnai told that the project would have an Off Job Training component as well as On Job Training component - through the model sites. He said that UFKD and experts would jointly do planning designing etc. of the model sites.

Mr. Vinod Kumar mentioned that this would be a new area of knowledge for IGNFA. He enquired about the infrastructure required at IGNFA for knowledge sharing and capacity building for the T/C project.

Mr. Anup Malik suggested that IGNFA could hire some professionals also for training purposes.

Mr. Jinnai told that under the T/C project Standard Operating Procedures (SOP) would be prepared which would could be utilized by IGNFA.

Mr. Vinod Kumar informed that IGNFA has specific papers on soil conservation and watershed management. But he told that there was a need to further discuss the technology and skills required by IGNFA for the T/C project. He said that the number of people to be trained, duration of training and timing of training had to be finalized. He said that it was important for the trainers of IGNFA to be involved in the process of preparation of SOP and also visit the model sites so that their capacities could be built.

Mr. Senthil Kumar asked that if a Training Needs Assessment (TNA) was prepared for the T/C project then that may be shared with IGNFA.

Mr Jinnai told that the relevant documents would be shared with IGNFA.

Visit of consultant team for information gathering

Mr. Toyoda mentioned that the consultant team was planning how to structure the training programmes. He said that for that purpose it was important to get basic information about the training structure within IGNFA. He requested if the consultant team could visit next week.

Mr. Vinod Kumar said that it would be alright to visit next week.

Contact persons from IGNFA side

Ms. Horikawa requested that some officer could be deputed to interact with the consultant team.

Mr. Vinod Kumar mentioned that he would appoint Dr. S. Senthil Kumar and Mr. Balaji as contact persons from IGNFA side.

Existing training of IGNFA related to soil conservation

Mr. Vinod Kumar informed that IGNFA training involved 43 to 46 subjects in total. In the existing curriculum there was a separate training course of 50 hour duration on construction of roads, bridges and buildings.

He also informed that there were also programmes on drainage and treatment, geology and soil science.

Existing capacities at IGNFA

IGNFA officials informed that each year 70 to 80 newly recruited Indian Forest Service (IFS) officers came to IGNFA. Out of these 30 to 40% were from engineering background and out of these about 5 to 6 persons were civil engineers.

It was also informed that in the next batch there were about 50% engineers.

Minutes of Meeting

Between

Preparatory Survey team and

Mr. Amit Negi, Secretary Externally Aided Projects and PWD

Mr. Neeraj Khairwal, Addl. Secretary Disaster

Mr. Deepak Malik, Operations Supervisor, World Bank Project

And

JICA Mission

Date: 22-11-14

Mr. Amit Negi asked that JICA Mission that which WB sites had been seen by the Mission and what were the impressions of the Mission.

Mr Jinnai responded that the Mission had seen Vijaynagar and Silli sites and these sites required river training works but these did not seem very difficult sites.

Mr. Amit Negi told that the WB project required JICA support for slope stabilization. He also told that the WB could fund the projects and money was not an issue.

Mr. Deepak Malik also told that based on the currently available capacities the WB was not confident of taking up large works.

Mr Jinnai suggested that there could be two ways of technical assistance:

1. JICA could provide a single Technical person who would supervise and guide the WB team.
2. JICA could procure a consultant team which would take up design and supervision.

Mr. Amit Negi told that the second option was better.

Mr. Deepak Malik also told that the WB project required detailed design and supervision of construction. He said that the WB could fund this and money was not an issue.

Mrs. Horikawa told that if money was not an issue then the WB project could hire good technical experts as part of PMC.

Mr. Amit Negi told that under the WB project several proposals were received from firms from countries like France and Greece but they did not seem to have superior skills like the Japanese consultants.

Mr. Jinnai asked that whether the same TOR as designed by the WB for the PMC would apply to the consultants of JICA.

Mr. Amit Negi told that TOR could be modified as per JICA requirements. He also told that the PMC constituted by the WB could work in some other sites.

Mr. Neeraj Khairwal told that there were more than 150 such sites in Uttarakhand.

Mr. Jinnai told that the current T/C project was with the UKFD and that Mr. Anup Malik had mentioned that in order to take up the WB sites he would like to get the funds from the WB so that these sites could be treated under the supervision of UKFD.

Mr. Deepak Malik told that the modalities for transfer of money could be worked out and the WB had no problem if Mr. Anup Malik was responsible for supervision of the work.

Mr. Amit Negi said that if with JICA collaboration detailed designs of the sites are prepared then the WB could hire contractors and later JICA could help in monitoring of construction.

Mr. Neeraj Khairwal suggested that a separate TA could be requested from JICA and that UKFD project and WB project could be separated.

Mr. Deepak Malik told that floating a separate project would take a long time and that it was important to immediately get JICA support through this project. He said that internal modalities between the state government and UKFD could be worked out.

Mr. Jinnai said that requesting for a new project would be a good idea.

Mr. Neeraj Khairwal said that a new request for TA could be sent to JICA and 5 new sites could be taken up.

Mr. Amit Negi asked the JICA Mission about some immediate support.

Mr. Jinnai said that he would discuss within the team and then get back to Mr. Amit Negi.

Later it was decided to hold a meeting in the afternoon on 25th November in order to further discuss.

Minutes of Meeting
Between
Mr. N. Sonzalian,
Principal, CASFOS
Ms. Meera Iyer,
Faculty, CASFOS
And
Preparatory Survey Team
Date: 26-11-14

Mr. Sonzalian explained that there were three CASFOS in India under the Department of Forestry Education (DFE), MoEF. These were at Dehradun, at Coimbatore and at Assam.

He told that in the CASFOS two types of trainings are provided:

1. State Forestry Service Induction training – 2 year duration
2. In-service training – which is 1 week course having the following modules:
    a. Training of Trainers
    b. Legal Issues in Forest and Wildlife
    c. Wildlife Management Module
    d. Joint Forest Management
    e. Human Resource Management
    f. General refresher course – having 2 week duration this course is kind of induction training for Range Forest Officers promoted to the rank of Sub Divisional Officer.

Under In service training there were 6 courses in an year and although there were 45 seats but actually only about 15 to 20 trainees were there in each course.

Regarding the SFS training he told that each training academy had a batch strength of 40 trainees. However, the number of trainees depended upon the recruitment by the respective states. He told that in the past few years the recruitment by the states to SFS was less and consequently the CASFOS at Dehradun was having 40 trainees but other CASFOS did not have any trainees. Therefore the other two CASFOS were training the Range Forest Officers but if the number of trainees increased then the other two CASFOS would also train the SFS officers.

Regarding each academy having trainees from any particular state Mr Sonzalian told that any trainee from any state could be trained in any of the 3 academy. It depended upon the DFE.

Regarding training on Soil and Moisture Conservation being provided by CASFOS he told that CASFOS, Dehradun did not have any faculty members for providing this trainings and for this training CASFOS sends the trainees to Central Soil and Water Conservation Research and Training Institute (CSWCRTI). The trainees go to CSWCRTI for about 7 to 10 days.

He also told that there was separate module on Forest Engineering for SFS officers and for that module he himself was the faculty.

He also told that although the CASFOS had requirements for 5 officers but currently there were only 3 officers in the academy.