

**NATIONAL RECONSTRUCTION AUTHORITY
FEDERAL DEMOCRATIC REPUBLIC OF NEPAL**

**THE PROJECT
ON
REHABILITATION AND RECOVERY
FROM NEPAL EARTHQUAKE**

**FINAL REPORT
(OUTPUT 1~3)**

MAIN REPORT

OCTOBER 2017

JAPAN INTERNATIONAL COOPERATION AGENCY

**ORIENTAL CONSULTANTS GLOBAL CO., LTD.
PACIFIC CONSULTANTS CO., LTD.
MOHRI, ARCHITECT & ASSOCIATES, INC.
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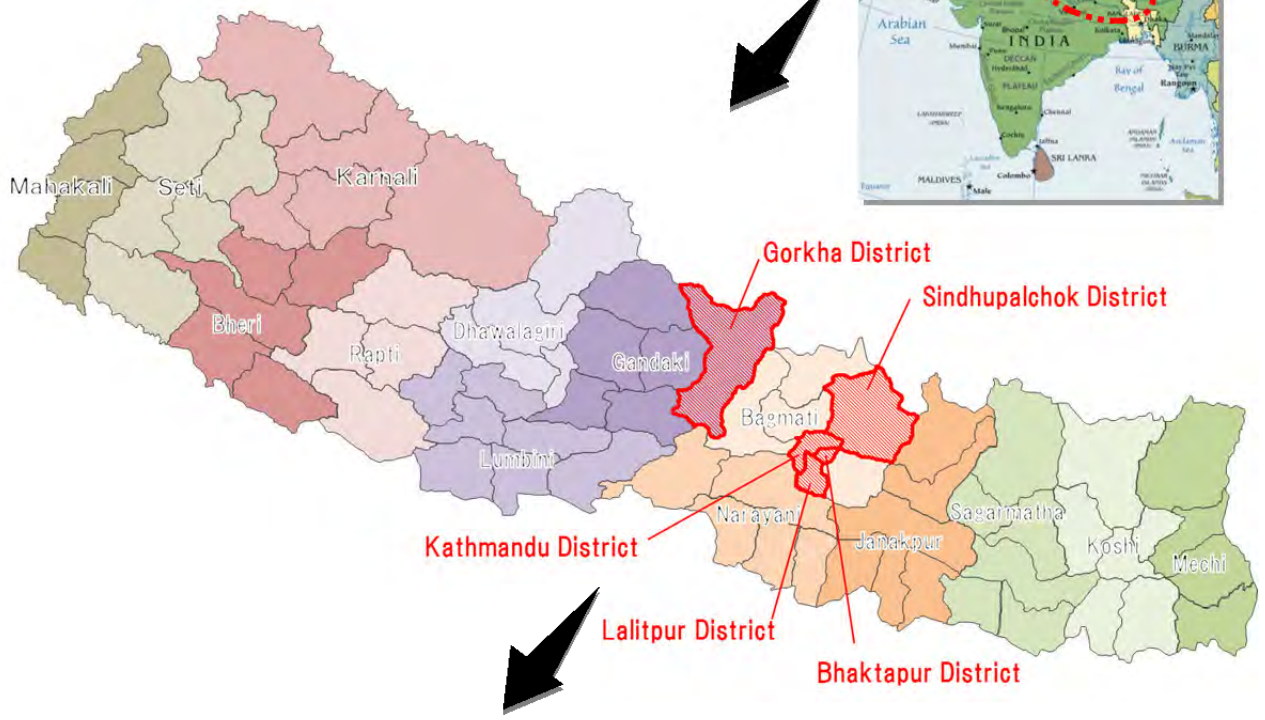
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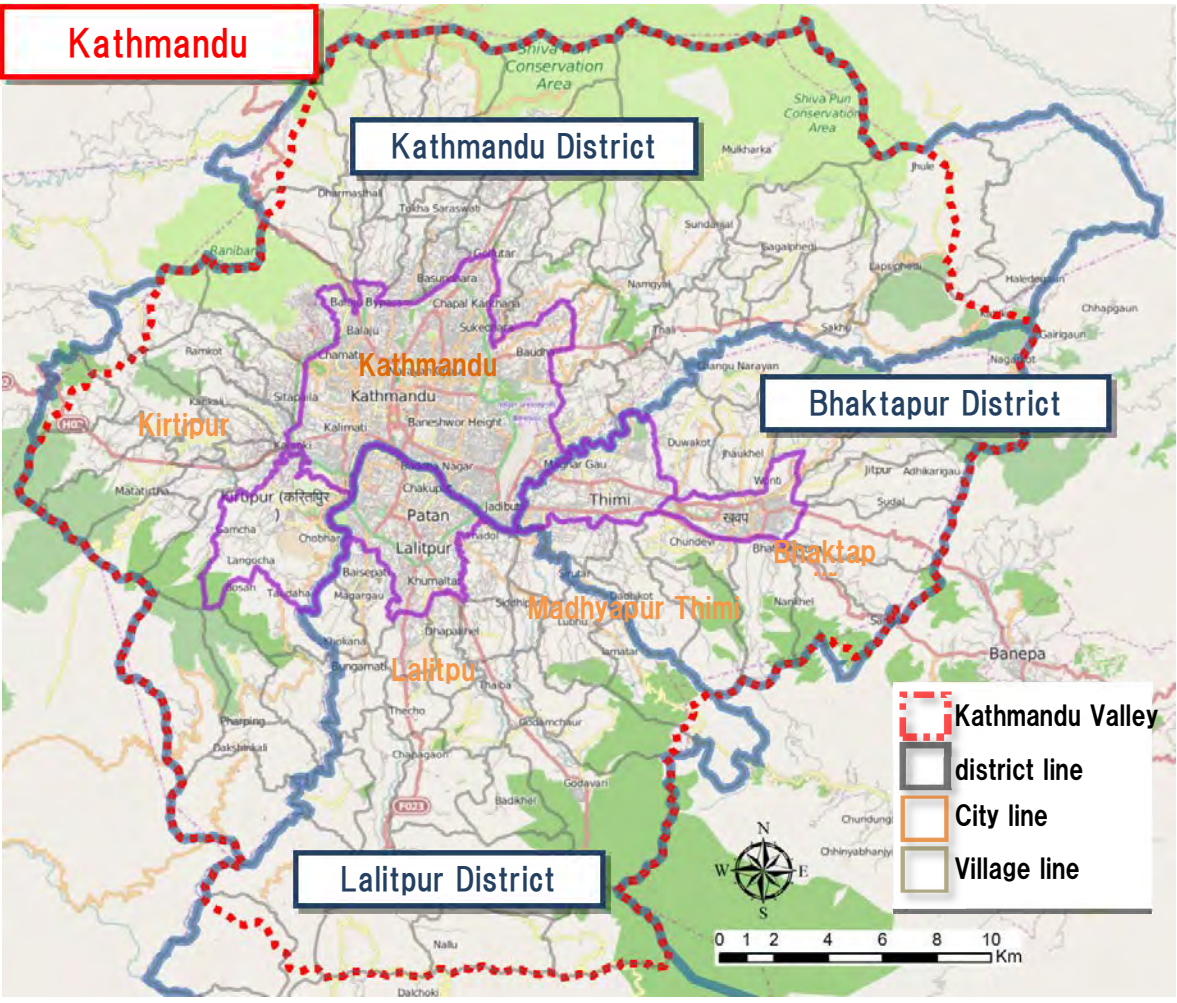
US\$ 1.00 = Nepalese Rupee (NPR) 103.47 = Japanese Yen ¥ 112.72
(October, 2017)

Location Map of Project Area

Nepal



Kathmandu



Kathmandu District

Bhaktapur District

Lalitpur District

- Kathmandu Valley
- district line
- City line
- Village line



Executive Summary

1. Background and Purpose

1.1. Background of the Project

On 25th April 2015, a magnitude 7.8 earthquake occurred and its epicentre was in the Gorkha District which is approximately 77km northwest of Kathmandu, the capital city of Nepal. Due to several aftershocks, devastating damage was recorded. The total number of deaths was 8,702, the number of injuries was 22,303; there were approximately 500,000 totally collapsed houses and 260,000 partially collapsed houses.

The Japan International Cooperation Agency (JICA) dispatched a fact finding mission to Nepal from the 1st of May to conduct a needs assessment related to rehabilitation and reconstruction and to develop the contents of urgent projects. Furthermore, JICA shared a concept with the Nepalese side that the timing before the rehabilitation and reconstruction phase is the opportunity to develop a more resilient society than the pre-disaster phase; a concept that was based on the “Sendai Framework for Disaster Risk Reduction 2015-2030” adopted by the Third United Nations World Conference on Disaster Risk Reduction held in Sendai in March 2015, and “Sendai Cooperation Initiative for Disaster Risk Reduction” stated by the Japanese government.

In response to the official request from GON to the Government of Japan, JICA has started implementation of this Project, which is based on the on the Record of Discussion (R/D) signed on 15th June 2015 and its amendment signed on 4th March, 2016.

1.2. Purpose of the Project

The purpose of the Project is to comprehensively support the process of early rehabilitation and reconstruction of the affected areas and the formulation of a disaster resilient nation and society by referring to the experience and lessons learned from the disasters and reconstruction in Japan.

1.3. Outputs of the Project

The Project is comprised of four outputs as indicated in the following table. While activities for Output 4 are still under implementation as of September 2017, this Report presents the results of Outputs 1 to 3.

Table 1 Components of the Project

<p>Output 1: Formulation of national level and district level plans</p> <ul style="list-style-type: none"> • Setting of expected disaster (Setting expected earthquake disaster and risk assessment based on the result of “The Project for Assessment of Earthquake Disaster Risk for Kathmandu Valley in Nepal” and expected landslide hazard by the formulation of landslide hazard maps) • Formulation of Kathmandu Valley Resilient plan (KVRP) • Formulation of Rehabilitation and Reconstruction Plan (RRP) in two districts • Institutional capacity development for the formulation and implementation of the above-mentioned plans and designs 	<p>Output 2: Promotion and dissemination of seismic resistant buildings and structures</p> <ul style="list-style-type: none"> • Investigation for the necessity of updating codes for seismic resistant housing, buildings such as schools, infrastructures such as roads and bridges, and lifelines • Formulation of a guideline for seismic resistant housing and school buildings (herein after the seismic resistant building guideline) • Investigation of a subsidy system and mechanism for disseminating a seismic resistant building guideline • Human resource development for seismic resistant housing and school buildings (Including developing curriculum and textbooks, and the implementation of a training programme)
<p>Output 3: Formulation of prioritized reconstruction project (Programme grant aid)</p> <ul style="list-style-type: none"> • Selection of prioritized reconstruction project plans • Design and approximate cost estimation of the prioritized reconstruction project plans 	<p>Output 4: Formulation and implementation of Quick Impact Projects (QIPs)</p> <ul style="list-style-type: none"> • Formulation of QIPs • Implementation of QIPs

Source: JICA Project Team

2. Work Items Common for All Outputs

2.1. Social Survey

2.1.1. Outline of the Social Survey

A series of social surveys were conducted in the districts of Gorkha and Sindhupalchok in order to understand basic information at the VDC level and to utilize this in examining the contents of assistance through the Project.

Table 2 Outline of the Social Survey

Type of Survey and Survey Period	Information to be Collected	Number of Target VDCs
Quick Survey Aug. - Sep. 2015	General situation and access to local natural and social resources and damages caused by the earthquake.	32VDCs (14 in Gorkha District and 18 in Sindhupalchok District)
Detailed Survey Jan. - Feb. 2016	Detailed information on the situation of recovery from the earthquake, and those related to the reconstruction of housings	14VDCs (2 in Gorkha District and 12 in Sindhupalchok District)

Source: JICA Project Team

2.2. Knowledge Co-Creation Programme in Japan

Knowledge Co-Creation Programmes in Japan were conducted with support and cooperation from Japanese local governments and central governments in order to strengthen the capacity of rehabilitation and recovery from earthquake through sharing knowledge and experience with Nepalese government officials. The outline is shown in Table 3.

Table 3 Outline of Knowledge Co-Creation Programme in Japan

SN	Schedule	Participants (Person)	Objective	Activities
1 st	27 th Nov. – 7 th Dec. 2016	NRA : 4 KVDA : 1 DUDBC : 1 Local government : DDC (Gorkha, Sindhupalchok) : 2 each Total : 10	Developing an understanding about the cooperation of related organizations in resilient plan. Developing an Understanding about the Rehabilitation and Recovery Plan and implementation process after the disaster.	Resilient Plan of National level, Resilient Plan and Regional Revitalization of Prefecture level and City level. Cooperation with private enterprises. Rehabilitation and Recovery Plan and implementation process of each local government. Site observation
2 nd	7 th Mar. – 16 th Mar. 2017	NRA : 2 MoFALD : 1 MoHA : 1 MoF : 1 Local government : DDC (Gorkha, Sindhupalchok) : 1 each, WCO (Gorkha, Sindhupalchok) : 1 each, DADO (Gorkha, Sindhupalchok) : 1 each, Barpak VDC : 1 Total 12	Sharing the current Nepalese situation of rehabilitation and recovery in Sendai Disaster Reduction Future Forum 2017. Developing an understanding about the Rehabilitation and Recovery Plan and implementation process after the disaster. Developing an understanding about the idea of "disaster prevention" for future disasters.	Role of National level (Reconstruction Agency), prefecture level, city level and community level. Cooperation with private enterprises. Site observation
3 rd	11 th Sep.– 19 th Sep. 2017	NRA : 4 MoUD : 1 MoPIT : 1 MoF : 1 Local government : Lalitpur Municipality : 1, DDC (Sindhupalchok) : 1, WCO (Gorkha, Sindhupalchok) : 1 each, DLSO (Gorkha) : 1 Total 12	To Understand the Present Situation of the Rehabilitation and Efforts from the Area Affected 1 year ago To Understand the Process of the Rehabilitation and Problems from the Area Affected 20 years ago	Transition of earthquake countermeasures, Specific cases after the Great Hanshin-Awaji Earthquake, Dissemination of self-help / public aid and mutual assistance, Specific measures such as landslide and livestock, Site observation in Kobe City and Kumamoto prefecture

Source: JICA Project Team

2.3. Publicity

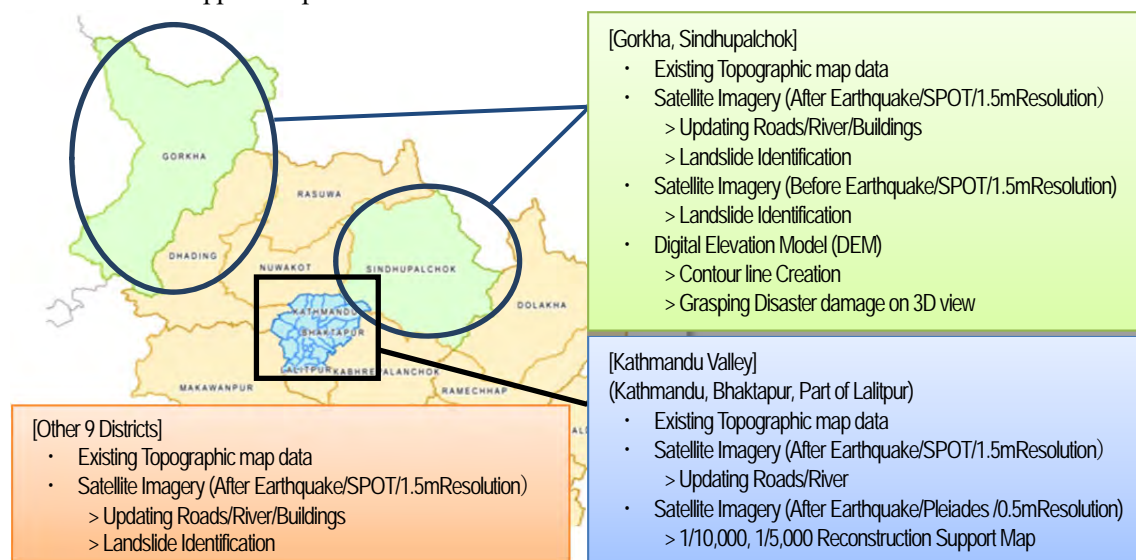
Project news updates were prepared for the JICA web-site and Facebook of JICA Nepal Office as publicity activities. The project news updates on the JICA web-site targets Japanese citizens and Japanese media, and were posted in Japanese.

3. Formulation of National Level and District level Plans

3.1. Satellite Imagery Preparation and Geo-Information Collecting

Collection of district-wise damage data, procurement of existing and newly captured Satellite Imageries (before and after the earthquake), and collection of the related Geo-Information were implemented for the

preparation of Kathmandu Valley Reconstruction Support Map, and Hazard Maps in the districts of Gorkha and Sindhupalchok. In this activity, the Project Team closely coordinated with the Nepal Geo-Information from the Survey Department (SD) of Nepal. For the effective utilization of the Geo-Information, the Project Team requested SD of Nepal and the Nepal Mapping Committee to scrutinize the Kathmandu Valley Reconstruction Support Map.



Source: JICA Project Team

Figure 1 Collected Information in Each District

Table 4 List of Satellite Imagery and Geo-information

Work	Data	Area	Remarks
Kathmandu Valley Reconstruction Support Map	Satellite Imagery Pleiades	Kathmandu Valley 721 sq km	Stereo image / 0.5m Resolution
Landslide Identification	Satellite Imagery SPOT After Earthquake	14Districts Project Area 22,771 sq km	Image / 1.5m Resolution Archive (May 2015 -)
	Satellite Imagery SPOT Before Earthquake	Gorkha Sindhupalchok 6,130 sq km	Image / 1.5m Resolution Archive (- March 2015)
Hazard map Geo-information updating of the project area	Existing Topographic map Survey Department (SD) Nepal Vector data	14Districts Project Area 22,771 sq km	SHP Format, Attribute information (1992) 1/25,000 (Partially1/50,000)
	Existing Topographic map SD Nepal Printed map	Gorkha Sindhupalchok 44Sheets	(1992) 1/25,000 (Partially1/50,000)
	Digital Elevation Model (DEM) Before Earthquake	Gorkha Sindhupalchok 6,130 sq. km	World Digital 3D Terrain Data 5m Index Archive (2011)

Source: JICA Project Team

3.2. Preparation of Landslide Hazard Maps

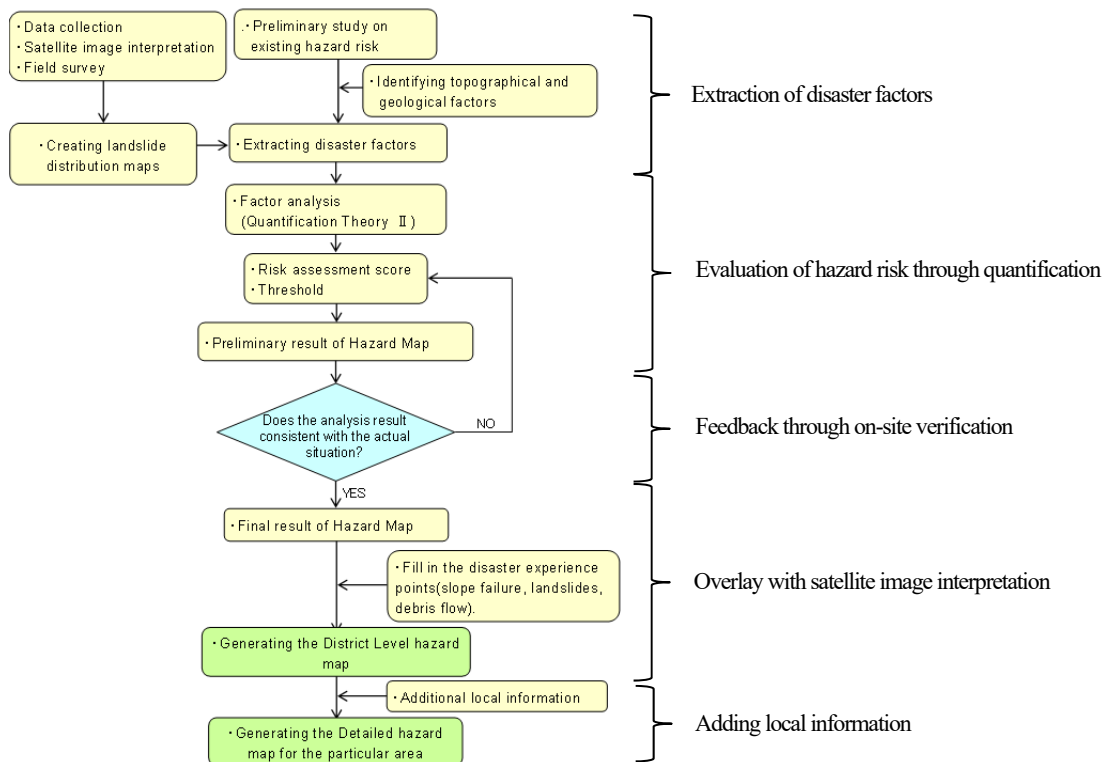
Landslide Hazard Maps have been prepared for the districts of Gorkha and Sindhupalchok. The prepared Hazard Maps has been used for the preparation of the Rehabilitation and Recovery Plans in the two districts

of Gorkha and Sindhupalchok in order to materialize the concept of Build Back Better, and can be further used for the following:

- Basic data for the land use planning
- Utilization and evaluation for residential relocation plan
- Application for road infrastructure reconstruction plan
- Area plan for provincial reconstruction for disaster prevention plan
- Enlightenment of local Residents

3.2.1. Generating Process of Landslide Hazard Maps

The following figure shows the generating process of the landslide Hazard Map.



Source: JICA Project Team

Figure 2 Generating Process of Landslide Hazard Maps

It was noticed that technical transfer to the technical staff of relevant government organizations of Nepal was necessary to facilitate the preparation of new Hazard Maps for the other districts affected by the earthquake. It was further agreed that two series of workshops, each with the duration of two weeks 1) workshop on Hazard Map utilization, and 2) workshop on outline of Hazard Map preparation, will be held for transferring the necessary knowledge.

3.2.2. Workshops on Hazard Maps

The outline of the workshops on Hazard Map utilization and outline of Hazard Map preparation are indicated in the following:

Table 5 Summary of Workshop

Content and Period of the Workshops	Workshop on the Utilization of Hazard Maps: 22 nd January to 2 nd February, 2017 Workshop on outline of Hazard Map preparation: 28 th February to 10 th March, 2017
Target Participants	20 people (Bachelor degree of Civil engineering, Geology or Geotechnics with working experience in relevant fields) 10 people (Master degree of Civil engineering, Geology or Geotechnics with at least 10 years working experience in relevant fields): 9 participants are assumed to work for preparation of the hazard map in nine earthquake damaged districts, while one will work on database preparation
Venue	NRA Office and Districts (field visits)
Input from the Project Team	1 Expert on Hazard Map , 1 Expert on GIS, 1 Coordinator

Source: JICA Project Team

3.3. Kathmandu Valley Resilience Plan (KVRP)

3.3.1. Objectives

- The KVRP is a comprehensive policy framework for disaster prevention and mitigation in preparation for large scale natural disasters that may occur at any moment.
- The KVRP includes vulnerability assessment to large scale natural disasters, and sets priorities and proper measures in advance, with the aim of building land and society resilient to large scale natural disasters.
- In order to avoid repeating efforts for the recovery and reconstruction from tremendous damage after large scale disasters, the KVRP is a preparation of the Build-Back-Better (BBB) concept for large scale disasters in advance during normal times.
- The KVRP is an overall development guideline for the Kathmandu Valley promoting resilience-related policies and measures.

3.3.2. Basic Principles of KVRP

- Prevent human loss by any means;
- Avoid fatal damage to important functions for maintaining administration as well as social and economic systems;
- Mitigate damage to property of the citizenry and public facilities; and
- Achieve swift recovery and reconstruction.

3.3.3. Time Frame of KVRP

Taking into consideration the time frame of the Strategic Development Master Plan, which is under preparation by the Kathmandu Valley Development Authority, the time frame of the KVRP is set as

eighteen years. Monitoring and updating of the plan should be conducted every five years by the KVDA with the participation of relevant stakeholders.

3.3.4. Vulnerability Assessment

The KVRP identifies a number of worst case scenarios that should never happen in the Kathmandu Valley. The envisaged natural disaster risk analysis in the KV is based on the results of the JICA Project for the Assessment of Earthquake Disaster Risk for the Kathmandu Valley (ERAKV). Accordingly, the Central Nepal South Scenario Earthquake with correction factor (x2/3) was selected as the scenario earthquake in the ERAKV. The KVRP follows the same scenario earthquake and analysis envisaged disaster risk in the KV.

The KVRP identifies 33 worst case scenarios. The key proposals are selected from the five worst events as a priority area for improvement for the next twenty years. The five worst events are as follows:

- A large number of casualties due to large-scale and multiple collapses of buildings and infrastructure.
- A large number of casualties due to the collapse of facilities used by the general public.
- A large number of casualties due to the lack of evacuation facilities.
- Isolation of many settlements for long periods due to the interruption of the transportation network.
- Long term stagnation of the tourism industry due to damage to important cultural and historical heritage sites.

Furthermore, the KVRP proposes measures to avoid the above five worst case scenarios for each of the following sectors.

- | | |
|---|---|
| • Housing and Building | • Urban Planning and Land Use |
| • Open Space and Emergency Evacuation Space | • Transportation Network |
| • Lifelines (Water Supply and Sanitation) | • Tourism and Cultural Heritages |
| • Social Consideration on Disaster Management | • Capacity Development on Disaster Management |
| • Partnership with Relevant Organization and Private Sector | |

3.4. Rehabilitation and Recovery Plan (RRP) of Two Districts

3.4.1. Integration of RRP into PDDP

In order to assure the legitimacy of the RRP, the JICA Project Team suggested that MOFALD and DDC in the two districts should incorporate the RRP into PDDP and both parties agreed to the framework. The JICA Project Team also explained the importance of the legitimacy of the RRP to the NRA, and NRA formulated the Post Disaster Reconstruction Framework (PDRF) which has a description of the necessity of formulating RRP at the district level to assure its implementation in the context of promoting reconstruction.

3.4.2. Formulation Process of RRP

The District RRP has been formulated through the formulation of the PDDP to be in line with a legally designated plan. Through the process of formulating the RRP, the JICA Project Team providee input from the experience of past earthquakes and reconstruction in Japan. The issues of the RRP have been identified through the workshops to investigate the current conditions and cluster workshops in the PDDP planning process. Based on the issues, the policy and programme for the reconstruction are designed. While the PDDP is designed for the next five years, the Rehabilitation and Recovery Plan targets longer term as well as short and medium term policies and projects. The long-term programme was designed based on the five-year plan developed during the PDDP formulation.

3.4.3. Outline of the RRP

1) Gorkha District

Title : Gorkha District BBB Rehabilitation and Recovery Plan 2073/74-2082/83

Planning Period : 10 Years from 2016

Vision : “Agriculture, Tourism and Resilient Infrastructure are Pillars of Beautiful, Equitable and Prosperous Gorkha”

Basic Principles :

1. Recovery of Daily Life: Reconstruction of housings, resuming public services (administrative, health, education, social), improvement of livelihoods for households headed by a female and those suffering from poverty
2. Reconstruction of Safer Cities: Effective use of Hazard Maps, promotion of reconstruction in safer areas, establishment of DRRM system
3. Revival of Livelihoods: Recovery of agriculture, tourism, commerce and other industries

2) Sindhupalchok District

Title : Sindhupalchok District BBB Rehabilitation and Recovery Plan 2073/74-2082/83

Planning period : 10 Years from 2016

Vision : “Safe, Prosperous and Beautiful Sindhupalchok”

Basic Principles :

1. Recovery of Daily Life: Reconstruction of housings, resuming public services (administrative, health, education, social), improvement of livelihoods for households headed by a female and those suffering from poverty
2. Reconstruction of Safer Cities: Effective use of Hazard Maps, Promotion of reconstruction in safer areas, establishment of DRRM system
3. Revival of Livelihoods: Recovery of agriculture, tourism, commerce and other industries

4. Formulation of a Seismic Resistant Building Guideline, Its Dissemination and Human Resource Development

4.1. Review on the Building Standards in Nepal

In the course of formulating seismic resistant building guidelines, the contents of the existing building standards in Nepal were reviewed and the necessities for revision of the standards were examined. For designing masonry structures, NBC202 and NBC203, which explain the standards with visual material that are easily understood, are commonly used for cement mortar and mud mortar. However, the contents have not been prepared based on structural calculation, but on experience from past earthquakes. Their technical compliances with the NBC105 have not been validated up to now.

The JICA Project Team has worked on structural calculation and analysis on the residence model construction and other buildings with various types of structures. As a result, the seismic standard for the reconstruction of residential buildings was determined to follow the National Building Code (NBC) 105.

4.2. Characteristic and Observations on Collapsed Houses and Schools due to the Earthquake

4.2.1. Housing

A total of 755,549 houses have been damaged by the earthquakes in 31 districts in Nepal. Of which, 498,852 houses (66.0%) were completely destroyed and 256,697 houses (34%) were partially damaged.

Many housings were completely destroyed in the mid-hill areas, where the effect of the earthquake were more prominent. The housings in these areas were mostly constructed using random rubble masonry and bricks stacked in mud mortar. Many of the housings had walls thicker than 45cm, wooden floors, corrugated galvanized iron sheet roofing with a two to three storey structure. Roofing with slate material were also commonly seen, while some housings had walls of concrete blocks, bricks and adobe.

In masonry walls, out-of-plane is the most typical failure pattern, and diagonal shear cracks as in plane failure also happen. But in this earthquake, wall separation (delamination) failure was prominent. Such houses were destroyed because of the weakness of the mortar used and the absence of bond stones across the thick stone walls resulting in delamination of the inner and outer walls along with the separation of the walls at the corners. These finally resulted in the total collapse of the buildings.

4.2.2. Schools

There are 2,419 primary, lower secondary, secondary and higher secondary schools in these districts and the total number of classrooms is 25,503. Out of these classrooms, 9,058 (36%) are fully damaged including collapse, 2,819 (11%) suffered major damage and 3,969 (16%) suffered minor damage. This means that 63% of classrooms have at least some damage.

Most buildings in rural areas were constructed by the people in the communities instead of by professional contractors. Since community people carried out the construction of the all-stone masonry walls, the quality may not be uniform. There were no “lintel beams” or “top-tie beams” used in the buildings to increase the strength of masonry walls. In addition, the joint material used for both stone and brick masonry walls were mud mortar. These factors are assumed to have significantly affected the strength of the walls and resulted in their collapse.

4.3. Review of Implementing of NBC

Implementation of NBC means the implementation of building permits in Nepal. A building permit system exists in Nepal, however only some municipalities are currently implementing the system. None of the other municipalities and none of the VDCs are implementing the system.

4.4. Establishment of a Seismic Resistant Building Guideline

4.4.1. Housing

A Technical Working Group (TWG) comprising of DUDBC, World Bank, JICA Project Team, members of the Shelter Cluster and local NGOs was formulated and meetings were held from August 2015 in order to formulate a Seismic Resistant Building Guideline for housing construction. The TWG has also worked on the preparation of the Minimum Requirements to be followed in housing construction. On 14 September 2015, a Technical Workshop on Rural Housing Designs was held by the NPC in order to discuss the seismic resistance standards for reconstructed housings. Further, technical issues in relation to the RRNE Project were shared and discussed with the Technical Committee in Japan.

With the establishment of the National Reconstruction Authority (NRA) in December 2015, the TWG was transformed in the Technical Standard Committee (TSC) with NRA, JICA Project Team, World Bank and several other experts as its members. As a result of the discussions based on the results of the structure analysis, which was conducted by JICA Project Team under technical support of the Technical Committee in Japan, the TSC concluded the following:

- NBC105 is the requirement for the BBB.
- Verification of the earthquake resistance should be done with structural calculation.
- Structure analysis on timber band will be re-conducted by NRA based on further survey / examination of material coefficient and details of the joint structure.
- Minimum Requirements for housing reconstruction will be further prepared based on the results of the above structure analysis.
- Minimum Requirements shall be prepared for each construction method in order to cover all details.

1) Design Catalogue for the Reconstruction of Earthquake Resistant Houses

Prototypes for housing reconstruction prepared by DUDBC, JICA Project Team, NGOs and private companies were presented in a Technical Workshop on Rural Housing Design organized by the NPC on 13th September, 2015. The prototypes were further technically examined under the Technical Working Group and the “Design Catalogue for Reconstruction of Earthquake Resistant Houses, Vol.1” was presented by the DUDBC in November 2015. The Catalogue incorporates seventeen model types of stone / brick masonry structures with cement or mud mortar, which are in compliance to NBC202 and NBC203. By selecting a specific design from the Catalogue, the house owner will have a construction design that takes into consideration seismic resistance and will be able to simplify the process of building examination. The Catalogue includes six types of reconstruction housing models proposed by the Project to the Government of Nepal. With top priority attached to the seismic resistance of the housing, the model proposed by the Project consists of stone / brick masonry structures with horizontal bands made of reinforced concrete.

2) Minimum Requirements

The Minimum Requirements to be followed in order to ensure seismic resistance was prepared with the JICA Project Team playing the central role. The minimum requirements consist of ten items, namely; site selection, shape /size of building, materials, foundation, vertical member, plinth, walls, and doors/windows. The Minimum Requirements aim at popularizing the building standards to the local population through easy understanding of its contents. Furthermore, check-sheets for these ten items have been prepared for the use of the requirements in building examinations.

3) Capacity Development

Examinations and verifications for the preparation of the Seismic Resistant Building Guideline have been done through a series of co-operation meetings by the DUDBC, NRA and the JICA Project Team. DUDBC and NRA provided a workspace for JICA Project Team members, where they spent many days to discuss the contents of the Guideline. A series of technical committees and working groups were held in order to discuss technical aspects. The understandings of the relevant personnel from the Government of Nepal are considered to have been significantly developed through this process.

4.4.2. Schools

The preparation of the Seismic Resistant School Building Guideline has been carried out through a joint effort of ADB, JICA Project Team and DOE. The procedures followed were; ADB prepares a draft of the guideline, which is then reviewed by DOE and JICA Project Team, and ADB modifies the draft based on the results of the review.

The guideline describes the principles on architectural design, planning of environment and structural design and is comprised of two volumes a mechanical and electrical volume, and a structural volume.

The guideline proposes a variation of new prototypes taking into consideration the diverse conditions that may occur between different areas and locations. The new prototypes are prepared with the basic understanding that their designs will be applied in hundreds of schools. The main concepts of the mechanical and electrical designs are as follows:

- Modular sizing and layout of classrooms
- Modular sizing and layout of individual buildings
- Standardization of items including material, windows, doors and lighting equipment.

On the other hand, the principles indicated in the structure volume differ between ADB and the JICA Project Team in the following terms:

- Structure design by RRNE complies to both NBC and Indian Standards
- Structure design by ADB either complies or refers to the NBC as well as Indian Standards and other international standards (International Building Code, Uniform Building Code, etc.)

These two volumes of seismic resistant building guidelines will be applied not only for JICA, ADB, and DOE but also different kinds of donors who will help with the reconstruction of schools. In addition, each donor will choose JICA's structural design method or ADB's structural design method based on the decision.

4.5. Support on the Construction of Housing and School Models Based on the Seismic Resistant Building Guidelines.

4.5.1. Housing

1) Model Housing

The Project Team was initially planning to construct model housings in each of the five target cluster areas. The Project Team prepared a set of design works and bill of quantities for the construction of cutaway models of 1-storey and 2-storey models indicated in the Design Catalogue for the Reconstruction of Earthquake Resistant Houses. However, four were cancelled due to the long time required by the Government of Nepal to secure necessary land. One model housing is being constructed under a Quick Impact Project in Barpak VDC of Gorkha District, as of September 2017.

2) Training for Housing Reconstruction

Under the initial scope of the Project, training on the construction of seismic resistant housing was planned to be implemented through the actual construction of the model housings. However, due to the long time required to secure public land for construction, the plan was revised and training sessions were conducted through the "Transitional Project Implementation Support for Emergency Reconstruction Projects (TPIS-ERP)", which is another project implemented by JICA. In the training sessions, the RRNE Project Team prepared the training material and TPIS-ERP Team took charge of managing the trainings.

Under the concept of BBB, areas where appropriate construction skills and subsidy systems for housing reconstruction are duly familiarized were selected with preference for the training on reconstruction, with the aim of promoting the reconstruction of housing with better quality than those conventional housing of the past. Training sessions were conducted for skilled labourers, namely masons and carpenters, who will work on housing reconstruction, and for local residents who intend to reconstruct their own housing.

3) Material for Promoting Seismic Resilient Model Housings

Material to promote the application of seismic resilient housing designs, including posters, pamphlets and guidebooks explaining the necessity to apply Minimum Requirements were prepared.

Posters explaining how to apply Minimum Requirements for each construction method were approved by NRA in September 2016, and are now being used as official guidance material introducing the seismic resistant construction methods. Brochures for disseminating the Minimum Requirements to all the areas affected by the earthquake were also prepared as well. A total of 12,000 sets were printed in December 2016 and have been distributed through the training sessions by TPIS-ERP and VDC offices in order to disseminate the information to local residents. Other materials are also being effectively utilized in training sessions and in other occasions.

4.5.2. Schools

1) Design of New School Prototype

The new school prototypes were designed in compliance to the Seismic Resistant School Building Guideline. The number of new prototypes was initially expected to include several designs, but the final number of basic designs for the new prototypes was expanded to 37, in order to cover the range from early child development to higher secondary schools. The new prototypes covered different building types: classroom buildings, special classroom buildings, office buildings, multi-purpose hall buildings, and water closets. Different sizes were proposed for each type of building in order to match the different demands of schools. The storeys of the buildings ranged from one to three in order to fit the buildings in smaller pieces of land.

2) Structural Analysis of New Prototype

As mentioned, all new prototypes followed the Seismic Resistant School Building Guideline, which was proposed by the JICA Project Team, ADB and DOE. In the guideline, the structural design of the JICA's prototype had an option to conduct pushover analysis by using computer software in order to analyse the deformation and cracking of a structure in case of an earthquake.

For the pushover analysis, four prototypes (1-storey type, 2-storey type, 3-storey type and multi-purpose hall type) out of 37 prototypes were selected and the actual analysis was carried out by a local consultant under TPIS-ERP. The results of the pushover analysis of the four prototypes were checked by the Project Team and the results satisfied the Seismic Resistant School Building Guideline.

The actual reconstruction of schools was implemented under TPIS-ERP until March 2017 and was taken over by the Emergency School Reconstruction Project (ESRP) thereafter. There are 83 schools under construction in six districts as of the end of March 2017.

5. Formulation of Prioritized Reconstruction Project (Programme Grant Aid)

5.1. Selection of Sub-Projects

As for sub-projects on building construction, a list of potential sub-projects was formulated by collecting information on facilities damaged by the earthquake from the DDCs of the five target Districts and MOUD. Out of the list, basic information was further collected for 66 candidates, which were considered to have suffered major damage and have the possible opportunities for reconstruction through Japanese Grant Aid Projects. The candidates were further narrowed down by excluding district offices and district hospitals which were planned to be reconstructed by the ADB and other development partners. The remaining candidates, including the administrative building of Kathmandu City Hall and facilities of Durbar School, were further evaluated under a 19-item criteria, and taking into consideration the results of discussions with relevant government authorities, costs for reconstruction, balance with sub-projects on Civil Works, the following two hospitals were selected as the final candidates for the Programme Grant Aid.

- Paropakar Maternity and Women's Hospital
- Bir Hospital

As for sub-projects on civil works, interview surveys and site reconnaissance were conducted for roads, bridges, water supply facilities, and local power distribution networks. As a result, sub-projects for local road improvement, large scale landslide protection in Jure, and local power distribution network improvement, etc., were included in the long-list as facilities of possible candidates for Grant Aid Projects. The JICA Project Team conducted a collection survey of basic information for 23 facilities indicated in the long-list. Among the long-listed facilities, facilities not suited to the scale of Grant Aid scheme, and facilities assisted by other donors were eliminated from the selection of Grant Aid Projects, and the short-list was prepared. Short-listed Projects were carefully examined in accordance with the Criteria for selection as a Grant Aid candidate facility, consultation with the relevant ministries and agencies, examination of project cost and consideration of balance with the Construction Project. Thus, the following two sub-projects are proposed to apply for the Programme Grant Aid Project from the candidates for the Civil Work component.

- Rehabilitation of Water Transmission System in Chautara
- Bridge Construction along Barhakilo - Barpak Road

On the other hand, as a result of the adjustment within the upper limit of the grant amount of the Programme, the sites in the Table below were eliminated from the selected sub-projects, but as an alternative, will be implemented by substitute resources such as the local government or the Quick Impact Projects (QIPs).

Table 6 Deleted Components in Consideration of the Total Project Cost

Sub-project	Eliminated Sites	Substitute Resource
Water Transmission System	Thalkharka Transmission Pipe No. 1 and No. 2	GON
	Thalkharka Transmission Pipe No. 3 and No. 4	GON
	Majuwa Transmission Pipe	QIPs
Bridge Construction	Khahare Bridge	QIPs
	Jhyalla Bridge	QIPs

Source: JICA Project Team

5.2. Details of the selected Programme Grant Aid Projects

Details of the three subprojects formulated as Grant Aid Projects in this survey is shown in the table below. Based on the results of this survey, construction work and equipment procurement will be implemented.

Table 7 List of the JICA Grant Aid Projects

Item	Subproject	Implementation Authority	Outline of Facilities
Building Construction and Equipment Procurement	The Subproject of Reconstruction of Paropakar Maternity and Women's Hospital, and Reconstruction of Bir Hospital	Ministry of Health	Paropakar Maternity and Women's Hospital Structure: Reinforced Concrete No. of Stories: 3 Total Floor Area: 5,406m ² No. of Beds: 192 Equipment Procured: Ultrasound Machine, Central Monitoring System, Biochemistry Analyser, etc.
			Bir Hospital Structure: Reinforced Concrete No. of Stories: 3 Total Floor Area: 3,119m ² (Including the Utility Building) No. of Beds: 94 Equipment Procured: Video Endoscope, Haemodialysis unit, Central Monitoring System, etc.
Civil Works	The Subproject of Bridge Construction along Barhakilo-Barpak Road	Department of Road	Ghatte Khola Bridge Bridge Length: 30m Effective Bridge Width: 8m (Carriageway 6m + Sidewalk 1m x 2) Approach Road Length: BP side 39m, EP side 51m Superstructure Type: PC 2 Main Girders
			Rangrung Khola Bridge Bridge Length: 50m Effective Bridge Width: 8m (Carriageway 6m + Sidewalk 1m x 2) Approach Road Length: BP side 60m, EP side 40m Superstructure Type: PC Box Girder
			Daraudi River Bridge Bridge Length: 134m (4@32.5) Effective Bridge Width: 6m (Carriageway) Approach Road Length: BP side 154m, EP side 32m Superstructure Type: PC 2 Main Girders
Civil Works	The Subproject of Rehabilitation of the Water Transmission System in Chautara	Department of Water Supply and Sewerage	Holche Transmission Line Length: L=8.7km, Diameter: 100mm/75mm Pipe Material: Ductile Iron Pipe (HDPE for a part of the temporary section) Thalkharka Transmission Line Length: L=10.9km, Diameter: 150mm/75mm Pipe Material: Ductile Iron Pipe

Source: JICA Project Team

6. Lessons Learnt and the Way Forward

The lessons learnt through component 1 to 3 and further steps for the forward are summarised below.

Table 8 Lessons Learnt and the Way Forward from the Project

<p>Component 1: Various Plan Formulation</p> <p>(1) Kathmandu Valley Resilience Plan (KVRP)</p> <p>KVRP is a comprehensive policy framework based on the concept of Build-Back-Better (BBB) to reduce possible damage from large scale earthquake disasters that may occur in Nepal in the future. It is the first planning document in Nepal which incorporates the concepts of the Sendai Framework for Disaster Risk Reduction addressing to build a resilient society against large-scale natural disasters.</p> <p>One of the important issues for the KVRP is how to link resilience in the government expenditure for development. Currently, there is no single organization in charge of disaster management in Nepal. In addition, KVRP currently does not have legal grounds for its implementation. Under such circumstances, it was strongly recognized that the central government's strong leadership is necessary to realize medium- and long-term measures to promote resilience.</p> <p>KVRP is planned to be positioned as an appendix of the Strategic Development Master Plan (SDMP) to be formulated by the Kathmandu Valley Development Authority (KVDA), and KVDA is a subordinate to the Ministry of Urban Development (MOUD), where its responsibility is up to the preparation of development guidelines.</p> <p>Until now, the importance of KVRP has been confirmed in JCCs and TCs chaired by the National Reconstruction Agency (NRA). In order to advance the resilience of Kathmandu Valley, NRA shall take the lead and coordinate with related ministries and agencies to implement KVRP in the short term. Furthermore, it is necessary to consider the establishment of a permanent organization that has jurisdiction over all disaster management for advancing resilience in the long perspective.</p> <p>(2) Rehabilitation and Recovery Plan (RRP) of the Two Districts</p> <p>Institutionalisation of RRP: In Nepal, RRP are not defined by law, and the process of RRP preparation followed by activities for recovery and rehabilitation in accordance to the plan has not been conventionally applied. Under such circumstances, ensuring the effectiveness of the RRP was a major issue from the beginning of the Project. In this context, the Project Team actively coordinated with MoFALD and the authorities of Gorkha and Sindhupalchok in order to align the formulation of RRP with the PDDP, which is a legally defined development plan. As a result, aspects of RRP have been included in the PDDPs, where implementing the PDDPs will also mean the implementation of RRP. Formulation of RRP are dictated in PFRP. It has started to be understood that the first step in reconstruction is the formulation of plans.</p> <p>Understanding Disaster Risk: In a reconstruction plan, it is necessary not only to restore the physical damage by the disaster but also to consider the risk of future disasters based on the concept of BBB. In the RRP, landslide Hazard Maps were generated to scientifically understand disaster risk and to realise the concept of BBB. Under scientific verification, RRP was developed, including considerations for the risk of future landslides. The importance of the</p>
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Hazard Map was also understood by the Nepalese side, and the technology of a Landslide Hazard Map was transferred through workshops on the utilization of the Hazard Maps and outline of Hazard Map preparation. Further generation of Hazard Maps for other affected areas is currently planned within the budget of Nepal. The understanding on propelling reconstruction based on scientific basis has been deepened for the Nepalese side through RRP preparation.

Understanding the Reconstruction Planning: PDDP is formulated in a bottom-up method, valuing the planning of the process. Not only government officials but also politicians and local residents could gain understanding through the process of formulating RRP together with the PDDP planning. Moreover, the understanding that reconstruction does not aim only at physical reconstruction but also contains a broad concept including the revival of livelihoods and the economy has been deepened as well.

Towards Implementation of RRP: At the final stage of RRP formulation, due to reforms of the local government, the responsibilities and authorities of the Districts were delegated to Municipalities and Rural-Municipalities. Therefore, it is necessary to divide the formulated PDDP/RRP as to fit each local government body. It is hoped that these divisions will be carried out by the Nepalese side and the contents of the RRP will be implemented at an early stage.

(3) Hazard Maps

Development of Hazard Maps: Based on the interpretation of satellite images and confirmation at representing sites, Hazard Maps of the landslide disaster hazards of Gorkha and Sindhupalchok were prepared and handed over to GoN. It was a rare case in JICA's international cooperation projects that completed a Hazard Map at a practical level for a vast area. Such interventions can be considered to be an area to expand in the future.

Since there was no precedent in the work, the Project Team first examined the combination of category and scores in order to increase the discrimination rate of the Hazard Map. Then, the results were explained to the related organizations in Nepal who further provided feedback.

In the course of Hazard Map preparation, the trial and error process was repeated for a considerable time at the initial stage. The relationship between slopes and slope inclination, inclination direction, and geological structure and relationship with the epicentre, which were the final extracted categories, can be considered to be utilised as universal categories to be applied to evaluate slope stability in other areas.

In further opportunities to provide similar Hazard Maps in countries other than Nepal, it will be more effective if analysis will be done after the categories are comprehensively selected with those above as a basis, and by adding other area specific categories in consultation with the organizations related to geology and disaster risk reduction of the target country

For this purpose, it is an important lesson that in the early stages of the project, the procedures and goals of work should be clarified and a system to consult and cooperate with experts from related organizations of the relevant country should be established to create a Hazard Map.

Utilization of Hazard Maps in the Gorkha and Sindhupalchok Districts: When preparing and utilizing Hazard Maps in a specific area, the Hazard Map has to clearly indicate important points of notice such as how the topographic data was utilized, how the map was prepared, and what its applicability and limitations are. The Hazard Maps prepared for the Gorkha and Sindhupalchok Districts already indicate such information, and this practice should be continued for the Hazard Maps which will be developed in the future. Important points to be indicated are as follows:

- Information used as general factors: General factors used are map and landslide information identified from the satellite images captured after the April 2015 Nepal Earthquake.
- Method: Slope failure risks are evaluated for each 50m x 50m square on the overlaid grid and coloured from blue to red in gradation.
- Applicability and limitations: This Hazard Map is for globally indicative purposes only. By overlaying additional information as needed, this Hazard Map can be utilized as a decision making tool for DRR planning. However, for site specific planning or designs, further studies are necessary for reducing the landslide risks.

Preparation of Hazard Maps in the Remaining Nine Districts: In the fiscal year of 2017/18, NRA has budgeted for the development of Hazard Maps in the remaining nine districts, but it is not yet clear when this will be conducted. In order to realize the concept of BBB in the affected areas, it is desirable to develop Hazard Maps as soon as possible. For preparing Hazard Maps for the remaining nine districts, the following process is recommended:

- Overlay satellite imagery, landslide distribution and DEM data provided from JICA to NRA. Divide each district map by 50m x 50m square mesh.
- Calculate slope inclination, slope direction, distance from epicentre and distance from MCT. Analyse the relationship between each factor and landslide.
- Consider other general factors to be introduced in each district if they have high relationship with landslides.
- After deciding the factors to be introduced, determine the weight allocation by using the quantification programme provided to NRA.
- Prepare each hazard map by weighted factors of each district.
- After the completion of Hazard Maps, hold a presentation seminar to review the problems faced in each district and to raise the technical level of each district engineer.

Component 2: Promoting Seismic Architecture and Structures

(1) Seismic Resistant Housing

Policy Making for Housing Design: It was re-recognised that in the process of urgent recovery and reconstruction from earthquake disasters, early recovery and reconstruction of the living environment and building a resilient city for the future is the most important challenge. For this, multiple reconstruction programmes are necessary. These are, for example the formulation and implementation of eligibility analysis systems, grand-in-aid systems for reconstruction of housing, building permit application systems and developing seismic designs for housing.

In the case of reconstruction in Nepal, it took quite a while for the Household Registration for Housing Reconstruction Survey (HRHRS) to re-verify the victims of affected households, and it took until the end of June 2016 to complete the survey in the eleven districts which were heavily affected. The Vol.1 design catalogue for reconstruction of earthquake resistant housings as fixed design was published in October 2015, and then in March 2016, the minimum

requirements for flexible design of masonry structures and RC structure were developed by NRA. However, the completion of Building Inspection Standard Operation Procedure (SOP) was completed in September 2016, and 2,000 engineers as inspectors were newly recruited. The building inspection was finally started after one and a half years had passed since the earthquake.

Although one reason of the delay is that the establishment of NRA took some time, until December 2015, regarding the implementation of an early reconstruction programme, early completion of eligibility survey, formulation of grant-aid system, and establishment of building permit application system and developing seismic design also should have been discussed and conducted simultaneously. Although it is more likely that discussion on developing seismic design draws more attention, the importance of establishing and implementing the institutional framework and implementation structure at the earliest stage must not be neglected.

Design for Seismic Resistant Housing: Not only in this Nepal earthquake but also in past earthquakes around the world, most human casualties are caused by the collapse of buildings, particularly by the vulnerable masonry constructions in developing countries. Most of these buildings are categorized into “Non-Engineered Construction”, which are built by local masons or the house owners themselves.

In Nepal, activities for dissemination of earthquake safer design for Non-Engineered Construction were attempted by the Government of Nepal (GoN) lead by NSET. Seismic resistant construction methods suitable for the land have been adopted as building standards, and based on those standards, the verification of the structure and design proposals have been made. However, many of the construction methods have not sufficiently spread, and the understanding of the seismic resistant method of residents is not enough. This caused many houses to be damaged and collapsed in this earthquake.

In order to build a seismic resilient society, not only buildings should be constructed during the reconstruction assistance period, but also the method and knowledge of seismic resistant building should be instilled to the local people. Particularly in the case of masonry, since it largely depends on the elements of materials and workability, sufficient consideration should be given to locally produced and locally consumed materials. In order to disseminate highly seismic resistant buildings in non-engineered construction in developing countries, it is a prerequisite to technically ensure seismic resistance, but it is also necessary to propose reconstruction houses which are endowed with affordability, feasibility and adaptability.

The Importance of Building Human Resources for Housing Reconstruction: When a disaster affected area is wide spread, the human resource development of engineers involved is inevitable. Technical trainings sessions and workshops should be held for all stakeholders such as government engineers, professionals such as architects and civil engineers, construction workers and house owners to widely disseminate knowledge.

Since government-related engineers who review buildings in various places are temporarily hired after the disaster, young graduate engineers accounted for their majority, and there are only a few engineers with practical experience. Still, their technical ability greatly affects the quality of the rebuilt housing. Technical training is conducted at the central level in Kathmandu and the local level in each district, but because young newly graduated engineers with

scarce practical experience occupy the majority, it is necessary to take sufficient time before implementation. Because there are only a few teachers to lecture in this training, the training of human resources such as ToT is also necessary.

Earthquake safety will not be achieved unless a bottom up approach is taken in which the house owners and common people attain sufficient knowledge, especially in owner driven construction such as non-engineered construction. The first step for disaster risk reduction is to understand the disaster risk. For the dissemination of earthquake resilient techniques, technical matters should be understood not only by masons, but also by house owners. Because housing reconstruction also relates to the financial matters of the house owner, knowledge of the house owner on the necessity of proper construction will directly influence the quality of the construction. In addition, the skill of workers to appropriately implement seismic construction is also very important.

The Process of Seismic Design: To establish a unified standard for seismic resistant construction and widely disseminate this up to the residents where there are a mix of different ways of thinking between implementation partners and NGOs, technical elements related to seismic design must be set step by step from the fundamental principles.

Fixed designs of seismic structures were introduced through the Housing Catalogue, using many images to facilitate easy understanding by local residents and focusing on methods with seismic elements added to conventional construction methods. Further, after the formulation of a common understanding that the seismic construction should be based on NBC 105, Minimum Requirements, where seismic standards were summarised into ten points for flexible design of masonry structures was developed, followed by inspection sheets of masonry. The 'Correction and Exception manual' which consists of exceptional and correctional measures for specific non-compliant cases were also developed. This manual has helped to correspond to field situations of reconstructed houses without compromising the seismic requirements. Through these step by step activities, the regulations of techniques for seismic design were unified and disseminated to people concerned to the reconstruction programme. The important point is to follow the order so as to first solidify the fundamental principles for BBB without the premise of mitigation or compromise, and then consider measures to improve the effectiveness of its implementation.

Structural Analysis: The main structural method in the areas affected by the earthquake is masonry structure using stone and mud mortar. For stone with mud mortar masonry structures, there is not enough elemental property data in the academic field. A considerable amount of time was required to analyse the material property because factors such as the shapes of individual stones influence the load bearing capacity. A full scale shaking table test of a stone with mud mortar masonry structure would be useful to find out the actual behaviour until the structure collapses by earthquakes which is a major cause of human casualty. Japan is one of the leading countries in shaking table tests, and therefore such tests on stone masonry should be conducted utilizing its knowledge.

Network of Research Institutes and Academia: In consideration of future networking of research institutes and academia, particularly with those of Japan, the subject/target such as historical building, engineered construction, vernacular architecture etc., should be made clear. In the academic field in Japan, studies on masonry structure have not progressed compared to other structural methods. Therefore, international studies and literature should be referred to.

(2) Seismic Resistant Schools

The Procedure of Establishment of a Seismic Resistant Building Guideline: Regarding the procedure of the establishment of a seismic resistant building guideline for school reconstruction, the Project followed four phases: damage survey and the analysis, review of existing prototype of school designs, proposal of a seismic resistant building guideline, and design of new school prototypes based on the guideline. These phases should be referred to when implementing similar interventions.

Field Survey on Affected Schools to be Reconstructed: After the commencement of the TPIS-ERP), it has become clear that most of the schools had smaller land for reconstruction than initially expected. This issue could be coped with because the Project Team had proposed 37 prototypes with a range of single to three storeys and also with different sizes of rooms in order to fit for various kinds of lands. On the other hand, ADB had initially proposed only single floor prototypes and therefore had to later prepare multi-floor prototypes, and also had to apply some of the 37 prototypes proposed by RRNE for their project. It is desirable to conduct prior sampling field surveys which include basic information such as access of road, number of students, grade of school, topography of school site and area of land in order to avoid such issues in similar projects in the future.

Component 3: Prioritized Reconstruction Projects (Programme Grant Aid)

(1) Grant Aid Project Formulation Phase

At the initial stage of the formation of potential Grant Aid Projects, it has become evident that other development partners had already started to provide assistance ahead of JICA. Therefore, it was very difficult to identify projects. This was because neither the Project Team nor JICA had the necessary information before hand and considerable time was therefore necessary to obtain such information. In emergency projects, information on the movements of other development partners should be gathered in detail, in parallel with project identification, from the earliest stages of the survey, in order to make the offering of projects faster.

Also, it was difficult to propose well-balanced projects in civil engineering and architecture, with pre-defined target cost of four billion yen as Programme Grant Aid. Making the budget flexible will enable a quick response to combinations of projects. In addition, since the original target projects were formulated using the results of site reconnaissance and before the basic data collection through geological and topographic surveys etc., it was necessary to modify the project based on the results of subsequent surveys. It is necessary to deal with such problems by determining the target project after the basic survey such as topographic and geological surveys as required.

(2) The Handling of Items to be Burdened by the Recipient Country

Since it was just after the disaster, GoN was unable to prepare the necessary budget urgently after the selection of the Grant Aid Projects, and it was also difficult to organise the implementation structure. As a result, considerable time was required for the removal work of existing buildings and the work was not done with due quality. There should be a system that allows flexible handling of work items, where some items to be under the responsibility of recipient countries in normal Grant Aid Projects could be included in the scope of the Japanese side in consideration of the nature of emergency aid projects.

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Abbreviation

Abbreviation	Name
ACDR	Asian Conference on Disaster Reduction
ADDP	Annual District Development Plan
ADB	Asian Development Bank
AEPC	Alternative Energy Promotion Centre
AIN	Association of International NGOs
A/P	Authorization to Pay
B/A	Banking Arrangement
BAPO	Barhabise Area Police Office
BBB	Build Back Better
BCP	Business Continuity Plan
BH	Bir Hospital
BMC	Brick Masonry in Cement mortar
BMM	Brick Masonry in Mud Mortar
BOQ	Bill of Quantity
CBO	Community based Organization
CBS	Central Bureau of Statistics
CCU	Coronary Care Unit
CDE	Chief District Engineer
CDO	Chief District Officer
CM	Confined Masonry
CNDRC	Central Natural Disaster Relief Committee
CNI	Confederation of Nepalese Industries
DACFC	Development Assistance Coordination and Facilitation Committee
DADO	District Agriculture Development Office
DDC	District Development Committee
DDRC	District Disaster Relief Committee
DFAT	Department of Foreign Affairs and Trade
DFID	Department for International Development
DEM	Digital Elevation Model
DEOC	District Emergency Operations Centre
DHM	Department of Hydrology and Meteorology
DMC	Disaster Management Committee
DMG	Department of Mines and Geology
DOE	Department of Education
DOR	Department of Road
DRR	Disaster Risk Reduction

Abbreviation	Name
DPs	Development Partners
DTO	District Technical Office
DUDBC	Department of Urban Development and Building Construction
DWIDP	Department of Water Induced Disaster Prevention
DWSS	Department of Water Supply and Sewerage
ECD	Early Childhood Development
E/N	Exchange of Note
EOI	Expression of Interests
EU	European Union
ERAKV	The Project for the Assessment of Earthquake Disaster Risk for the Kathmandu Valley
ERCP	Endoscopic Retrograde Cholangiopancreatography
ESRP	Emergency School Reconstruction Project
FCAN	Federation of Contractors Association of Nepal
FEM	Finite Element Method
FGD	Focus Group Discussion
FHWA	Federal Highway Administration
G/A	Grant Agreement
GBV	Gender Based Violence
GLOF	Glacial Lake Outburst Floods
GIS	Geographic Information System
GNSS	Global Navigation Satellite System
GOJ	Government of Japan
GON	Government of Nepal
GPS	Global Positioning System
HEC	Hydraulic Engineering Circular
HEC-RAS	Hydrologic Engineering Center - River Analysis System
HFA	Hyogo Framework for Action
HFL	High Flood Level
HM	Hazard Map
HRRP	Housing Recovery and Reconstruction Platform
IAO	Internal Auditing Officer
IBC	International Building Code
IDF	Intensity Duration Frequency
IDPG	International Development Partners Group
IFC	International Finance Corporation
ILO	International Labor Organization
I/NGOs	International Non-Governmental Organization and National Non-Governmental Organization
IOM	International Organization for Migration

Abbreviation	Name
IRC	Indian Road Congress
IS	Indian Standard
JCC	Joint Coordinating Committee
KfW	Kreditanstalt für Wiederaufbau
KVDA	Kathmandu Valley Development Authority
KUKL	Kathmandu Upatyaka Khanepani Limited
KVRP	Kathmandu Valley Resilient Plan
LGCDP	Local Governance and Community Development Program
LDO	Local Development Officer
LDRMP	Local Disaster Risk Management Planning
LWF	Lutheran World Federation
MAF	Mission Aviation Fellowship
MCT	Main Central Thrust
M/D	Minutes of Discussion
MDC	Municipality Development Committee
MFICU	Maternal-Fetal Intensive Care Unit
MOA	Ministry of Agriculture
MOCTCA	Ministry of Culture, Tourism and Civil Aviation
MOEN	Ministry of Energy
MOE	Ministry of Education
MOF	Ministry of Finance
MOFALD	Ministry of Federal Affairs and Local Development
MOFSC	Ministry of Forests and Soil Conservation
MOHA	Ministry of Home Affairs
MOHP	Ministry of Health and Population
MOI	Ministry of Industries
MOICT	Ministry of Information and Communications Technology
MOLE	Ministry of Labor and Employment
MOLRM	Ministry of Land Reform and Management
MOPE	Ministry of Population and Environment
MOPIT	Ministry of Physical Infrastructure and Transport
MOUD	Ministry of Urban Development
MoWCSW	Ministry of Women, Children and Social Welfare
MOWS	Ministry of Water Supply and Sanitation
MP	Member of Parliament
MPPW	Ministry of Physical Planning and Works
MR	Minimum Requirement
MRT	Mandatory Rule of Thumb

Abbreviation	Name
NaPA	National Plan of Action for Safer Building Construction
NBC	National Building Code
NICU	Neonatal Intensive Care Unit
NFN	NGO Federation of Nepal
NPC	National Planning Commission
NRA	National Reconstruction Authority
NRA-SRO	National Reconstruction Authority Sub-Regional Office
NRA-SCO	National Reconstruction Authority Special Contact Office
NRRC	Nepal Risk Reduction Consortium
NSDRM	National Strategy for Disaster Risk Management in Nepal
NUDS	National Urban Development Strategy
OJT	On the Job Training
PAF	Poverty Alleviation Fund
PAPO	Palungtar Area Police Office
PC	Precast Concrete
PDNA	Post Disaster Needs Assessment
PDDP	Periodic District Development Plan
PDRF	Post Disaster Recovery Framework
PM	Prime Minister
PMAO	Planning, Monitoring and Administrative Officer
PMWH	Paropakar Maternity and Women's Hospital
POM	Project Operation Manual
PPR	Peste des Petits Ruminants
P/Q	Prequalification
QIPs	Quick Impact Projects
RC	Reinforced Concrete
R/D	Record of Discussion
RRNE	The Project on Rehabilitation and Recovery from Nepal Earthquake
RRP	Rehabilitation and Recovery Plan
RSLUP	Risk Sensitive Land Use Plan
RTW	River Training Works
SATREPS	Science and Technology Research Partnership for Sustainable Development
SBCU	Special Baby Care Unit
SDMP	Strategic Development Master Plan
SHM	Seismic Hazard Mapping and Risk Assessment for Nepal
SIDA	Structural Integrity and Damage Assessment of Educational Infrastructure in Nepal
SLSC	Standard Least Squares Criterion
SMC	Stone Masonry in Cement mortar

Abbreviation	Name
SMM	Stone Masonry in Mud Mortar
SOP	Standard Operating Procedure
SRO	Sub-Regional Office
TIN	Triangulated Irregular Network
T/N	Technical note
ToT	Training of Trainers
TPIS-ERP	Transitional Project Implementation Support for Emergency Reconstruction Projects
TSC	Technical Standardization Committee
TWG	Technical Working Group
UBC	Uniform Building Code
UMN	United Mission to Nepal
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFPA	United Nations Population Fund
UN-HABITAT	United Nations Human Settlements Programme
UNICEF	United Nations Children's Fund
UNISDR	United Nations Office for Disaster Risk Reduction
UNOPS	United Nations Office for Project Services
UNV	United Nations Volunteers
UNWOMEN	United Nations Entity for Gender Equality and the Empowerment of Women
URM	Un-reinforced Masonry
USAID	United States Agency for International Development
USGS	United States Geological Survey
VDC	Village Development Committee
VSO	Voluntary Service Overseas
WB	World Bank
WCF	World Citizen Forum
WECS	Water and Energy Commission Secretariat
WFP	World Food Programme
WHO	World Health Organization
WS	Workshop
WSSDO	Water Supply and Sanitation Division Office
WUSC	Water Users & Sanitation Committee

Chapter 1 Introduction

1.1 Background of the Project

On 25th April 2015, a magnitude 7.8 earthquake occurred and its epicentre was in Gorkha District, which is approximately 77 km northwest of Kathmandu, the capital city of Nepal. Due to several aftershocks, devastating damage was recorded. The total number of deaths was 8,702, the number of injuries was 22,303; there were approximately 500,000 totally collapsed houses and 260,000 partially collapsed houses. The Government of Nepal (GON) estimated that the total economic damage caused by the earthquake was approximately 7 billion dollars (GDP of Nepal in 2012-2013 was 19.2 billion dollars). In addition, the Asian Development Bank (ADB) estimated the growth of real GDP of Nepal in 2014-2015 (July 2014 – Jun 2015) would be 3.8% which was revised downward by 0.8% as a result of the earthquake. The earthquake has caused serious negative impact to the economy of Nepal.

The GON designated fourteen Districts which comprise 20 % of the population of Nepal as heavily affected areas. According to the assessments by the United Nations (UN) and the GON, these fourteen districts hold more than 90% of the deceased and injured people, heavily affected public facilities and individual housing.

Moreover, more than approximately 3,300 landslides occurred including those on the Tibet side, and the landslides damaged a large number of roads and bridges, which has become a hindrance of rehabilitation and reconstruction.

Responding to the situation, the Japan International Cooperation Agency (JICA) dispatched a fact finding mission to Nepal from 26th April to conduct a needs assessment related to rehabilitation and reconstruction and to develop the contents of urgent projects. On 25th May, GON and JICA jointly conducted a seminar in Kathmandu to introduce the Japanese experience of reconstruction from earthquakes, formulation of reconstruction plans, and examples of reconstruction projects. In this seminar, JICA emphasized the importance of formulating more disaster-resilient national reconstruction plans which reflects the concept of Build Back Better (BBB). This concept which was based on the “Sendai Framework for Disaster Risk Reduction 2015-2030” adopted by the Third United Nations World Conference on Disaster Risk Reduction held in Sendai in March 2015, and “Sendai Cooperation Initiative for Disaster Risk Reduction” stated by the Japanese government, asserts that the timing before the rehabilitation and reconstruction phase conceals the opportunity to

develop a more resilient society than the pre-disaster phase. Many participants from the Nepal side appreciated the ideas.

Based on the results of the fact finding mission, seminar, and multiple meetings with GON, JICA had started in preparation for extending further assistance in Technical Cooperation, Grant Aid and Bilateral Loan. In response to the official request from GON to the Government of Japan, JICA held further discussions with the Ministry of Finance (MoF) and National Planning Commission (NPC), and both GON and JICA agreed upon the details and position of this project, in which this project plays a fundamental role in whole development inventions of JICA, as on the Record of Discussion (R/D) on 15th June 2015. Since the National Reconstruction Authority (NRA) was formulated on 25th Dec 2015, the counterpart of this project was changed to NRA from NPC as on amendment of R/D on 4th March, 2016.

1.2 Purpose and Scope of the Project

The purpose of the Project is to comprehensively support the process of early rehabilitation and reconstruction of the affected areas and the formulation of a disaster resilient nation and society by referring to the experience and lessons learned of the disasters and reconstruction in Japan.

The Project is designed to implement a prioritized reconstruction project to fill the demand-supply gap which arises during the transition from a humanitarian assistance phase to rehabilitation and reconstruction. The prioritized project will be implemented in the early stage of the Project with consideration on the participation of the residents. At the same time, the Project is designed to develop additional projects such as Programme Grant Aid and Bilateral Loan Projects. For the above-mentioned purposes, the Project will conduct information collection, preparation and project management of prioritized reconstruction projects, project formation and technical assistance (including design and cost estimation) to implement aid projects promptly.

1.3 Outputs of the Project

Output 1: Formulation of national level and district level plans

- Setting of expected disaster (Setting expected earthquake disaster and risk assessment based on the result of “The Project for Assessment of Earthquake Disaster Risk for Kathmandu Valley in Nepal” and expected landslide hazard by formulation of landslide hazard map)
- Formulation of Kathmandu Valley Resilient plan (KVRP)
- Formulation of Rehabilitation and Recovery Plan (RRP) in two districts
- Institutional capacity development for the formulation and implementation of the above-mentioned plans and designs

Output 2: Promotion and dissemination of seismic resistant buildings and structures

- Investigation for the necessity of updating codes for seismic resistant housing, buildings such as schools, infrastructures such as roads and bridges, and lifelines
- Formulation of a guideline for seismic resistant housing and school buildings (herein after the seismic resistant building guideline)
- Investigation of a subsidy system and mechanism for disseminating a seismic resistant building guideline
- Human resource development for seismic resistant housing and school buildings (Including developing curriculum and textbooks, and the implementation of training programme)

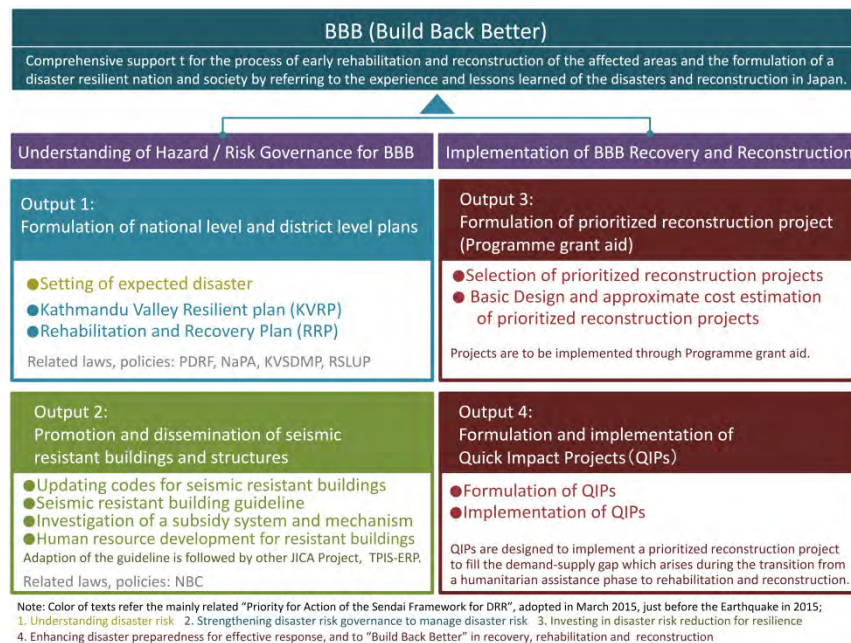
Output 3: Formulation of prioritized reconstruction project (Programme Grant Aid)

- Selection of prioritized reconstruction project plans
- Design and Prepare approximate cost estimation of the prioritized reconstruction project plans

Output 4: Formulation and implementation of Quick Impact Projects (QIPs)

- Formulation of QIPs
- Implementation of QIPs

The relationship of outputs and its contribution for achieving the project goal, BBB, is summarized as following figure.



Source: JICA Project Team

Figure 1.3.1 Contents and relationship among Outputs for achieving BBB

1.4 Project Counterpart Organizations

- 1) National Reconstruction Authority (NRA)
- 2) Ministry of Urban Development (MoUD)
- 3) Ministry of Federal Affairs and Local Development (MoFALD)
- 4) Ministry of Finance (MoF)
- 5) Ministry of Home Affairs (MoHA)
- 6) Ministry of Physical Infrastructure and Transport (MoPIT)
- 7) Ministry of Education (MoE)
- 8) Ministry of Health (MoH)
- 9) Department of Urban Development and Building Construction (DUDBC)
- 10) Kathmandu Valley Development Authority (KVDA)
- 11) Sindhupalchok District and Gorkha District Government

1.5 Target Area of the Project

- 1) Kathmandu Valley (Kathmandu District, Lalitpur District, Bhaktapur District)
- 2) Two Districts (Sindhupalchok District and Gorkha District)

1.6 Position of This Report

This report is one of the final reports to be prepared through the Project, and summarizes the activities of Output 1 to 3, which were implemented during July 2015 to September 2017. Regarding to Output 4, another final report will be submitted separately in November 2018.

1.7 Activities of the Project

Activities (excluding Output 4) implemented in this project are listed in chronological order in Table 1.7.1.

Table 1.7.1 Chronology of the project (excluding Output 4)

	Component	Main Activities
Jul-Sept, 2015	All	Submission of ICR, Explanation to Counterpart Organizations Explanation of project at JICA Seminar (10 th July) Weekly Meeting
	Component 1	Collection of Existing Data/Information (policies/codes/guidelines, administrative plans, frameworks related to rehabilitation and reconstruction) Status Analysis on Road Bridges and Water Supply and Sewerage Status Investigation on Protection and Conservation of Cultural Heritages Confirmation of the Development of SDMP, Preparation of the Development of the Kathmandu Valley Resilience Plan (KVRP) Preparation and Conduction of Simple Social Survey (Social Status of two Districts, Damage Status, Needs of the Residents etc.) Preparation and Conduction of Landslide Survey, Development of GIS data Purchase of Satellite Images, Development of Ortho Images Confirmation of the Development of PDDP, Discussion and Preparation of Rehabilitation and Recovery Plan of two Districts

	Component 2	<p>【Housing】 Site Survey (Damage, Characteristics of Damaged Architecture) Review of POM Study on Minimum Requirements (MR) for Housing Reconstruction Formulation of MR for Cement Mortar Masonry and Mud Mortar Masonry in the (Technical Working Committee) Meeting Selection of JICA Model (Cement Mortar Masonry) Design and Structure Examination of the JICA Model Presentation of Housing Reconstruction Prototype by each Donor, Review of Prototypes by TWC Preparation of the Construction of Demo Models Interview to Bank on Loans and Survey on branches Preparation of the production of training video Development of Housing Reconstruction Pamphlets (Seismic Resilience Guidelines and Manuals)</p> <p>【Schools】 Site Survey (Damage, Characteristics of Damaged Architecture) Collection and Review of the Standard Design of DoE Study and the Seismic Design Criteria of Prototypes (Review of ADB Designs by JICA and DoE, Modification by ADB) Development and Submission of 1st Batch Primary School Prototype Design Development of 1st Batch Secondary School Prototype</p>
	Component 3	<p>【All】 Site Survey and Interview in Kathmandu, Bhaktapur, Lalitpur, Sindhupalchok and Gorkha Study on Criteria to Select Sub Projects Development of Long Lists of Candidates of Grant Aid Projects Selection of Projects under the Criteria (Architecture: Bir Hospital and Paropakar Maternity and Women’s Hospital) (Civil: Rehabilitation of Water Transmission System in Chautara, Bridge Construction along Barhakilo-Barpak Road) Outline Design, Outline Project Cost Estimation, Development of a Survey Report on the Grant Aid Projects</p> <p>【Architecture】 Survey and Discussion on Design of Bir Hospital Survey and Discussion on Design of Paropakar Maternity and Women’s Hospital</p> <p>【Civil】 Understanding of Water Supply Facilities and Power Distribution Facilities Collection of Information of Rural Road Development Plans, and Water Supply Plans</p>
Oct-Dec, 2015	All	1 st Domestic Supporting Committee (Long Term Rehabilitation Support and Measures for Future Disasters, Discussion of Issues on Housing Reconstruction 4 th December)
	Component 1	Preparation of Detailed Social Survey Landslide Interpretation and GIS Data Update Information Collection from the Survey Department Building GIS Database of Kathmandu Valley Discussion on KVRP Compiling Legal Systems and Plans Information Collection and Site Survey of Water Supply and Sewerage Study on Shelters and Emergency Transport Network
	Component 2	<p>【Housing】 Design Catalogue for Reconstruction of Earthquake Resistant Houses Volume 1 (17 Types, Masonry (Stone, brick) + Mortar (Cement, Mud) 11 Types of DUDBC and 6 Types of JICA) Structural Analysis of other 11 Types Published in the Catalogue Preparation of the Construction of Demo Models Preparation of the production of training video Completion of Manual for Masons and Guidebooks for Residents, Start of Training by Yen Loan Project Submission of Structural Calculation Documents of JICA Model (1 Storey, 2 Storey) to TWC</p> <p>【School】 Completion and Submission of 1st Batch Secondary School Prototype Study and Confirmation of Seismic Design Criteria of the Prototype Development and Submission of Primary School Furniture List Review of Structural Design of ADB Primary School Design Transfer to Yen Loan (School)</p>

	Component 3	<p>【Architecture】 Interview to 2 Hospitals (Facility, Function, Arrangement) Discussion with MOHP, DUDBC (Handling of EIA etc.) Design, and Development of Perspective Additional Cost Estimation</p> <p>【Civil】 Site Survey and Discussion with DoR on the Bridges in Gorkha (Road Alinement, Conditions) Site Survey and Discussion with DWSS on Water Supply in Sindhupalchok Outline Design and Outline Cost Estimation of Bridges and Water Supply Preparation of IEE Acquisition</p> <p>【All】 End of Most of Grant Aid Project Formation Activities</p>
Jan-Mar, 2016	All	2 nd Domestic Supporting Committee (Technical Discussion on the conformance of MR to NBC 105, 5 th February)
	Component 1	Preparation and Conduction of Detailed Social Survey (Participatory Resource Map, Focus Group Discussion, Housing Sample Household Survey) Study on Landslide Hazard Maps Study on Earthquake Hazards Survey on Orientation Point for Hazard Maps (Adjustment Calculation for the Final Map) Development of Topographic Map, Confirmation of Copyright of Topographic Map, Site Survey) Update of KVRP Study on Open Space, Discussion with KVDA, Request of Support on the Disaster Management Park Discussion with the Community on the Disaster Management Park Information Collection and Adjustment on Cultural Heritages and Tourism Sector Development of Equi-time Diagram for Safe Housing Reconstruction Study on Road Access and Depot Point for Safe Housing Reconstruction Signing of MoU on RRP Preparation of Community Based Risk Reduction/Management Activities
	Component 2	【Housing】 Structural TWG Meeting with NRA based on the Structural Analysis of 17 Models in the Housing Catalogue TWG Meeting on Vol2 Housing Catalogue in DUDBC Observation of Enrolment Camps Formulation of MR of RC and Masonry in the Technical Standardization Committee Production of MR Posters
	Component 3	【All】 Submission of Survey Report on the Grant Aid Projects 【Architecture】 Preparation of Existing Foundation Survey of 2 Hospitals Preparation of Demolishment of Bir Hospital 【Civil】 Start of IEE Acquisition Works
Apr-Jun, 2016	All	1 st Anniversary Commemoration Seminar (25 th April) Handover of Landslide analysis to NRA 1t JCC (Confirmation of the Importance of the KVRP, 22 nd June) Bi-Weekly Meeting
	Component 1	Study on the Handling of Environment and Social Consideration in the Planning Finalization of Landslide Survey Results Study and Discussion on the Disaster Management Park Status Survey of Emergency Transport Network in Kathmandu Valley Participation in PDDP Workshops in 2 Districts Community Based Risk Reduction/Management Workshop Study on Community Based Tourism Development
	Component 2	【Housing】 Architecture Inspection (Development of Inspection Manual) Structural Analysis of MR Model and other Low Cost Models Production of Training Video Transfer to Yen Loan Project
	Component 3	【Architecture】 Demolish of Bir Hospital, Submission of the Technical Note Existing Foundation Survey

Jul-Sept, 2016	All	3 rd Domestic Supporting Committee (Next Step for the Planning, Issues on Housing Reconstruction, 5 th July)
	Component 1	Input of the RRP to PDDP WS, Sector Meetings
	Component 2	【Housing】 Preparation of Pamphlets for Residents
	Component 3	【Architecture】 Conclusion of Amendment Technical Note
Oct-Dec, 2016	All	1 st Knowledge Co-Creation Programme
	Component 1	Preparation and Conduction of Interview on KVRP Discussion on Land Ownership of the Disaster Management Park Input of the RRP to PDDP WS, Sector Meetings, Result Analysis, Revision of RRP Tourism WS and Result Analysis in Barpak
	Component 2	【Housing】 Finalization of Training Video Printing and Distribution of Pamphlets for Residents (Yen Loan Project)
Jan-Mar, 2017	All	2 nd Knowledge Co-Creation Programme 4 th Domestic Supporting Committee (Next Step for the Planning, Issues on Housing Reconstruction 24 th March)
	Component 1	1 st Technical Committee (Importance of KVRP, Need of Additional Discussions, Finalization Schedule, 8 th February) 1 st ToT on Hazard Maps (Utilization of Hazard Maps, 24 th January – 3 rd February) Handover of Hazard Maps to NRA (3 rd February) 2 nd ToT on Hazard Maps (Outline of Hazard Map Preparation, 28 th February – 10 th March)
	Component 2	Submission of Revised Training Video to NRA
	Component 3	【Civil】 Approval of IEE of Bridges
Apr-Jun, 2017	All	2 nd JCC (Confirmation of Relevant Organizations for the Implementation of RRP, KVRP 20 th April) 2 nd Anniversary Commemoration Seminar (26 th April)
	Component 1	2 nd Technical Committee (Study on Measures for the Results of the Vulnerability Assessment (ERAKV), Discussion on Implementation, 6 th April) Submission of Final Version of KVRP (Appendix of SDMP) MoU on Disaster Management Park Submission of RRP of Gorkha to Gorkha DDC Comment on PDDP in Gorkha Submission of RRP of Sindhupalchok to Sindhupalchok DDC RRPs will be Included into the Annual Plan of Each Rural Municipality
	Component 3	【Architecture】 Construction of Test Well at Bir Hospital 【Civil】 Approval of IEE for Water Supply
Jul-Sept, 2017	All	3 rd Knowledge Co-Creation Programme

Source: JICA Project Team

1.8 Technical Committee (TC) in Japan

The members of TC in Japan were appointed as follows. Four meetings have been held as of date and the outlines are shown in Table 1.8.1.

Members of TC in Japan

- Satoshi Nishikawa Committee Leader (Disaster Management / Resilience)
- Yuji Ishiyama Committee Member (Seismic Resistant Building)
- Masahiko Murata Committee Member (Rehabilitation and Recovery Plan)
- Hiroshi Kaneko Committee Member (Building Engineering)
- Akio Mizutani Committee Member (Building Code)
- Hiroyasu Shingai Committee Member (Urban Plan)
- Shigeki Unjo Committee Member (Infrastructure / Structure standard)
- Yasuo Ishii Committee Member (Landslide)

Table 1.8.1 Outline of TC in Japan

SN	Date	Participants (person)	Agenda
1 st	4 th December 2015 10:30 - 13:30	<ul style="list-style-type: none"> • Member of TC : 8 • Ministry of Land, Infrastructure and Transport : 2 • JICA : 10 • Study Team : more than 4 	<ul style="list-style-type: none"> • Outline, Issues and Future schedule of the Project • The situation of affected house, outline of Nepalese government's and each donor's support, and various issues in housing support
2 nd	5 th February 2016 17:00 - 18:45	<ul style="list-style-type: none"> • Member of TC : 4 • Ministry of Land, Infrastructure and Transport : 2 • JICA : 11 • Study Team : more than 5 	<ul style="list-style-type: none"> • Structural calculation method and Results of JICA model housing
3 rd	5 th July 2016 13:00 - 16:00	<ul style="list-style-type: none"> • Member of TC : 6 • JICA : 16 • Study Team : 15 	<ul style="list-style-type: none"> • Progress and Future Measures of Component 1 (Plan formulation), Component 2 (Housing)
4 th	24 th March 2017 12:30 - 14:30	<ul style="list-style-type: none"> • Member of TC : 7 • JICA : 18 • Study Team : 13 	<ul style="list-style-type: none"> • Present situation report on Component 1 (plan formulation), Component 2 (housing), Component 3 (bridge, water headrace and hospital), Component 4 (QIPs)

Source: JICA Project Team

1.9 Knowledge Co-Creation Programme in Japan

Knowledge Co-Creation Programmes in Japan were conducted in order to strengthen the capacity of rehabilitation and recovery from earthquake through sharing knowledge and experience with GON officials under support and cooperation from local and central governments of Japan. The outline is shown in Table 1.9.1.

Table 1.9.1 Outline of Knowledge Co-Creation Program in Japan

SN	Schedule	Participants (Person)	Objective	Activities
1 st	27 th November 2016 – 7 th December 2016 (Including moving date)	<ul style="list-style-type: none"> • NRA : 4 • KVDA : 1 • DUDBC : 1 • Local government : DDC (Gorkha, Sindhupalchok) : 2 each ➤ Total : 10 	<ul style="list-style-type: none"> • Developing an understanding about the cooperation of related organizations in resilient plan. • Developing an Understanding about the Rehabilitation and Recovery Plan and implementation process after the disaster. 	<ul style="list-style-type: none"> • Resilient Plan of National level, Resilient Plan and Regional Revitalization of Prefecture level and City level. • Cooperation with private enterprises. • Rehabilitation and Recovery Plan and implementation process of each local government. • Site inspection
2 nd	7 th March 2017 – 16 th March 2017 (Including moving date)	<ul style="list-style-type: none"> • NRA : 2 • MoFALD : 1 • MoHA : 1 • MoF : 1 • Local government : DDC (Gorkha, Sindhupalchok) : 1 each, WCO (Gorkha, Sindhupalchok) : 1 each, DADO (Gorkha, Sindhupalchok) : 1 each, Barpak VDC : 1 ➤ Total 12 	<ul style="list-style-type: none"> • Sharing the current Nepalese situation of rehabilitation and recovery in Sendai Disaster Reduction Future Forum 2017. • Developing an understanding about the Rehabilitation and Recovery Plan and implementation process after the disaster. • Developing an understanding about the idea of "disaster prevention" for future disasters. 	<ul style="list-style-type: none"> • Role of National level (Reconstruction Agency), prefecture level, city level and community level. • Cooperation with private enterprises. • Site inspection.
3 rd	11 th September 2017– 19 th September 2017 (Including moving date)	<ul style="list-style-type: none"> • NRA : 4 • MoUD : 1 • MoPIT : 1 • MoF : 1 • Local government : Lalitpur Municipality : 1, DDC (Sindhupalchok) : 1, WCO (Gorkha, Sindhupalchok) : 1 each, DLSO (Gorkha) : 1 ➤ Total 12 	<ul style="list-style-type: none"> • To Understand the Present Situation of the Rehabilitation and Efforts from the Area Affected 1 year ago • To Understand the Process of the Rehabilitation and Problems from the Area Affected 20 years ago 	<ul style="list-style-type: none"> • Transition of earthquake countermeasures, • Specific cases after the Great Hanshin-Awaji Earthquake, • Dissemination of self-help / public aid and mutual assistance, • Specific measures such as landslide and livestock, • Site inspection in Kobe City and Kumamoto prefecture

Source: JICA Project Team

1.10 Publicity Activities

Project news updates were prepared for the JICA website and facebook of JICA Nepal Office.

The project news updates on the JICA website target Japanese citizens and the Japanese media, and were posted in Japanese.

- Holding Community disaster prevention seminar (22th August 2015)
- Agreement on components related to "Rehabilitation and Recovery plan from Nepal earthquake (Programme Grant Aid)" (21st September 2015)
- Women's social participation support in rural areas through rebuilding of female exchanges training centre (10th November 2015)
- Confirmation of Quick Impact Projects (QIPs) candidate (6th February 2016)
- Commencement ceremony of female exchanges training centre in Chautara Municipality, Sindhupalchok District (18th April 2016)
- Supporting for improving capacity of regional technicians through rebuilding Village Development Committee Office – Holding first practical training - (17th August 2016)
- Holding the 1st JCC (7th September 2016)
- Reinforcement of health and hygiene services through reconstruction of hospitals - Reconstruction of Ampipal Hospital affected from earthquake! - (7th September 2016)
- Implementation of 1st Knowledge Co-Creation Program (10th January 2017)
- First facility completion! – Handover ceremony of Thokarpa VDC – (13th January 2017)
- Landslide Hazard Map – Mapping • Handover to NRA • Implementation of TOT (Training of Trainers) – (2nd February 2017)
- Regional reconstruction by women in disaster area – For the women's cooperative establishment – (10th March 2017)
- Starting of the distribution goats! – For sustained livelihood reconstruction – (10th March 2017)
- Wrap up outcomes of activities and sharing them with local stakeholders - For completion of agricultural production project - (18th April 2017)
- Holding the second JCC (20th April 2017)
- Holding a memorial seminar for "Build Back Better" for 2 years from the Great Earthquake (26th April 2017)
- Utilization of project outcomes - Rehabilitation and Recovery Plan of Sindhupalchok District - (30th June 2017)
- A child goat is born! - Support for livelihood improvement by breeding goats through women's cooperative - (29th September 2017)

Chapter 2 Overview of the Target Areas and Damage by Earthquake

2.1 Overview of the Target Areas

2.1.1 Geographic Feature

Nepal is a landlocked country, surrounded by India and China. It is located in the middle of the Hindu-Kush Himalayan Region with decreasing elevations from north to south: the highest altitude is 8,848 meters from the mean sea level at Mt. Everest in the north and the lowest is 60 meters at Jhapa in the south. Nepal is known for three geographic regions, i.e., Mountain, Mid-hill and Terai.

The Himalayas is the highest mountain ranges in Nepal, and it is considered as one of the most active fragile mountain ranges in the world. This is because it still has been rising through the continental collision between the Indian and Eurasian Plates, and the rocks of the Himalayas are geologically weak. The frequent seismic movement and monsoon rainfalls make the mountain range even more prone to landslides.

(1) Kathmandu Valley

Kathmandu Valley (KV), with a land area of 72,000 ha, is a valley located in the Middle Eastern part of Nepal and consists of Kathmandu District, Lalitpur District and Bhaktapur District. The valley is surrounded by mountains and has plain lands and smooth hill. Bagmati River traverses through the centre of the valley.

The valley is the most densely populated areas in Nepal which accommodate approximately 10% of the population and is the centre of the politics and economic activities in Nepal.

(2) Gorkha District

Gorkha District is in Gandali Zone under Western Development Region and situated from mid-hill area to Himalayan area in the north. The district covers a range from accessible areas to most remote areas, and is located between the Marsyandi River in the South and China boundary in the north, and between the latitude of 27 degree 15 minutes to 28 degree 45 minutes north and from the latitude of 84 degree 27 minutes to 84 degree 58 east. The elevation ranges from 228 meters above sea level at Marsyandi river bank to 8,156 meters above sea level at Mt. Manaslu in the north. The total area of the district is 3,610 km².

As the Himalayas and high mountains are located in the northern part of the district, there is less possibility of agriculture in those areas. In the district, 0-15 degree slope has covered 10,390

hectares, whereas 15-30 degree slopes cover 42,058 hectares. Slopes of 30 + degree cover 308,552 hectare which accounts 85.5% of total land area. As land with slopes more than 30 degree is not suitable for agricultural work, only less than 15% of the land is suitable for agriculture in Gorkha District. Nevertheless, some kinds of crops such as upland paddy, finger millet, maize, soybean and fruits such as orange, banana, litchi etc., are being produced in such steep slope land.

(3) Sindhupalchok District

Sindhupalchok District, having a land area of 2,542 km², is the biggest district among the 19 districts in the Central Development Region and it covers 1.73% of the area of Nepal. This district is situated 86 kilometres far from Kathmandu in east/north direction. The altitude ranges from 746 meters (2,450 feet: Sunkoshi river bank of Sangachowk VDC) above from sea level to 7,083 meters (23,238 feet: Langpoghyan peak). The altitude of the district headquarter, Chautara, is 1,418 meters. The average east-west width of the district is 49.38 km; whereas, the north-south length is 53.06 km. The district is bounded by Dolakha District and Tibet in east; Nuwakot and Rasuwa Districts in west; Rasuwa District and Tibet in north and Kavrepalanchowk, Kathmandu and Ramechhap Districts in south.

On the basis of its geographical structure, the district can be classified in 4 groups; 1) Himalayan region (16,000 to 23,238 feet: 4,877 to 7,083 m), 2) Mountain region (7,000 to 16,000 feet: 2,134 to 4,877 m), 3) Hilly region (5,000 to 7,000 feet: 1,524 to 2,134 m), and 4) low land plain region (2,450 to 5,000 feet: 747 to 1,524 m). As Himalayan and high mountains are located in northern part of the district, there is less possibility of agriculture in those areas. In regards to land slope situation of this district, maximum area has been covered by 20-30 degree slope (37.5%), and in accordance with, 24.6% by 30-40 degree slope, 22.5% by 10-20 degree slope.

2.1.2 Climate

There are various climate types in Nepal. The World Meteorological Organization (WMO) describes that the Kathmandu Valley (KV) is in a mild subtropical climate with an average high temperature of around 27C from April to September and the average low temperature of below 5C from December to February (WMO 2014). There are four seasons in KV, winter, spring, summer and fall (rainy season). During the rainy season, the KV experiences an average rainfall of 20cm to 35cm (WMO 2014). Although spring is mild, summer can be humid and winter can be severe and cold.

In Gorkha District, with the presence of geographical diversity including altitude, the district is divided to several climate zones. They are; a) tropical climate, b) sub-tropical climate, c) cool-temperate climate and d) alpine climate. The rain season is generally from June to July and the average rain fall in Gorkha District is around 1,500mm.

Also with a large differential of altitude in Sindhupalchok District, the district is classified in 4 types of climate zones; a) Semi-tropical climate (2,450 to 7,000 feet: 747 to 2,134 m), b) Sub-tropical climate (7,000 to 13,000 feet: 2,134 to 3,962 m), c) Alpine climate (13,000 to 16,000 feet: 3,962 to 4,877 m), and d) Nival/Himalayan (Himali) climate (above 16,000 feet: 4,877 m). The rainy season is generally from June to August, and the average annual rain fall in Sindhupalchok District is 1,615mm. The maximum average temperature is 32.5 degrees Celsius and the minimum average temperature is 5 degrees Celsius.

2.1.3 Population ¹

According to the National Census, Nepal had a total population of 26.5 million in 2011 and the overall annual growth rate was 1.44% during the period between 2001 and 2011.

The total population of the KV was about 2.5 million in 2011, which include 1,700,000 in Kathmandu District, 305,000 in Bhaktapur District and 468,000 in Lalitpur District. The KV occupies 9.5% of the national population. The population figures increased significantly in the last decade especially in the KV. The annual population growth rates were 6.12% in Kathmandu District, 3.51% in Bhaktapur District and 3.86% in Lalitpur, which were significantly higher than the national average of 1.44% during the period (CBS, 2011).

The population densities of KV in 2011 are: 44.16 people per hector for Kathmandu District, 25.66 people per hector for Bhaktapur District, and 12.16 people per hector for Lalitpur District (CBS, 2011). In 2001, Kathmandu Metropolitan City (KMC) was the only municipality with a population density of more than 100 people per hector. However, in 2011, the number of municipalities/VDCs with a population density of more than 100 people per hector increased to seven municipalities/VDCs. They are KMC (197 people per hector), Bhaktapur Municipality (125 people per hector), Lalitpur Sub-metropolitan City (LSMC) (146 people per hector), and four other VDCs. Most of them are located around KMC, and Bhaktapur Municipality is the only one located relatively far from KMC.

As for Gorkha District, the Census 2011 estimated that the population was about 271,000 while the population of male and female was about 121,000 and 150,000. The household number is 66,458 and the number of people per household is 4.89. According to the Census 2011, the forecasted population of Gorkha District in 2021 is about 243,000. In 2031, the population of Gorkha District is forecasted to decrease to 195,000.

In Sindhupalchok District, the Census 2011 estimated that the population is about 288,000 while the population of male and female is about 138,000 and 149,000. The household number is 66,635 and

¹ Due to the reorganization of local governments in 2017, the population of each municipalities and districts has recently fluctuated.

the number of people per household is 4.32. According to the Census 2011, the forecasted population of Sindhupalchok District in 2021 is about 295,000. In 2031, the population of Sindhupalchok District is forecasted to increase to 307,000.

2.1.4 Composition of Ethnic Groups

Nepal is known for its multi-ethnic, -linguistic, and -religious cultures and societies. In the Census 2011, 125 caste/ethnic groups were reported. Among those, the largest number of the population is ethnically classified as Chhetri (4.4 million or 16.6% of the total population), followed by Brahman-Hill (12.2%), Magar (7.1%), Tharu (6.6%), Tamang (5.8%), Newar (5.0%) and so on.

In the KV, the caste/ethnic composition of each district is slightly different from the national average. All three districts in the KV seem to have larger ratios of Brahman-Hill and Newar population than Chhetri.

In Gorkha District, the population of Brahman-Hill and Chhetri population seems to be higher than that of the other caste/ethnic groups, with a relatively higher rate of Magar in the population. On the other hand, Chhetri and Tamang population is relatively higher in Sindhupalchok District, followed by Brahman-Hill and Newar.

2.1.5 Counterpart Agencies and Development Policies

The counterpart agencies of the Project are as indicated in section 1.4 of this report. The followings are the major development plans and policies related to the target areas of the Project.

(1) National Level (Including KV)

1) Fourteenth Three Year Plan (2016/17 – 2018/19)

According to a material prepared by the NPC in January 2017, the Fourteenth Three Year Plan sets its objective as “Socioeconomic transformation and rapid poverty reduction through high economic growth with productive employment and just distribution”, and its goal is “to graduate to a Middle Income Country by 2030 – as welfare state with social justice”. In order to materialize its objective, the following strategies are applied:

1. Increasing Output (through agricultural transformation and expansion of tourism, industries and SMEs).
2. Developing Infrastructure (energy, road and air transport, information and communication, and rural-urban and transnational connectivity).
3. Social Development (high and sustainable improvement in human development with focus on social development, social security and social protection).
4. Good Governance (through economic, social and governance reforms; efficient and

accountable public finance; fair, transparent and people-friendly public service; protection and promotion of human rights).

5. Promoting Cross-Cutting Sectors (gender equality, inclusion, environmental conservation, utilization of science and technology and institutional capacity).

2) KVDA Strategic Development Master Plan (SDMP) 2015-2035

KVDA drafted the Strategic Development Master Plan and the plan is in the process of obtaining approval from the government. The Master Plan addresses the needs of a ‘new’ envisioned KV, considering the existing and emerging trends of urbanization, environment and the current socio-political and economical situations.

In the context of disaster management KVDA developed the Comprehensive Physical Development Plan of KV which includes the following components:

Table 2.1.1 Contents of KVDA Comprehensive Physical Development Plan of KV

Comprehensive Physical Development Plan of KV	
1.	Regeneration of Historic Core & Compact Settlement Area
2.	Management of Urban Sprawl with the up-gradation and expansion of urban infrastructure
3.	Development of New Towns with the provision of new urban infrastructure
4.	Preservation of Natural Resources, Cultural and Religious Heritages, Agricultural Land
5.	Development of Integrated Urban Services Centre
6.	Environmental Protection and Management
7.	Management of Open Spaces, Parks, Barren Land
8.	River Basin Protection and Management
9.	Disaster Risk Reduction and Management
10.	Public Private Partnership in Infrastructure Development and Management
11.	Promotion and Utilization of Renewable Energy

Source: JICA Project Team based on SDMP 2015 -2035

The Project coordinated with KVDA to develop the Kathmandu Valley Resilient Plan in line with the development plan of KV.

3) National Urban Development Strategy (NUDS), 2015

MOUD compiled the National Urban Development Strategy in 2015. The objective of the National Urban Development Strategy (NUDS) is to develop medium and long term strategic vision of a desirable national/regional urban system based on the existing trends and regional resource potentialities. In the context of disaster management, “4.3.1 Urban Safety and Resilience”, describes the major issues of urban development as follows: 1) Internalization of safety and resilience issues in urban development and management, 2) Building codes not in place or not enforced in all municipalities and 3) Low level of resilience to different types of hazards. Also the NUDA set an Urban Infrastructure Investment Milestone that “100 % municipalities with Disaster Risk Management Plan (DRMP) to increase resilience and preparedness for possible risks”.

Table 2.1.2 Strategy for assuring Urban Safety and Resilience under the NUDS

Desirable condition		Indicator
Physically, socially, economically, environmentally and culturally safe and resilient urban areas.	Urban areas with operating fire brigade, number and distribution of designated evacuation areas and safe community shelters, water reservoir tank, enforcement of building code.	
	Data availability (hydrological data, water source, etc.) and early warning systems in place	
	Numbers and distribution of community buildings like hospitals and schools.	
	Operating guidelines that guide/prohibit location of settlements	
		Monitoring system that checks status of defined indicators.

Strategies	Activities	Lead/Supporting agency
S48. Promote multi-hazard approach in dealing with disasters including climate change	Identify high-risk areas in all urban areas based on available information.	MoUD and Municipalities
	Develop rapid hazard appraisal technique to identify hazards and prepare multi-hazard map of all urban areas.	
	Incorporate disaster risk management component in urban development plans	
	Generate information on climate change in urban areas of different ecological regions	

Source: National Urban Development Strategy in 2015

4) Planning Norms and Strategy 2013

Planning Norms and Strategy 2013 developed by DUDBC prescribes the standard for securing a Disaster Management Centre in Kathmandu City, whose population is more than 300,000, as a necessary facility.

(2) District Level Planning

According to the “Guidelines for Formulation of District Disaster management Plan, 2069 BS” issued by MOFALD, each district led by DDC should develop a District Disaster Management Plan in cooperation with District Natural Calamity Relief Committees.

As prescribed in the Local Self-governance Act, each district shall formulate annual and periodic development plans for the development of its district. The items to be included in the Periodic District Development Plan (PDDP) are as follows:

1. Geographical, economic and natural heritages of the District and present uses.
2. Possibilities of production in various sectors on account of comparative cost benefit.
3. Areas comprising backward castes, tribes and poorer people and various development works done or required to be done in such areas.
4. Income-generating and skills-oriented development works for the women and children.
5. Description of the completed projects under various sectors and provision for their operation and maintenance.

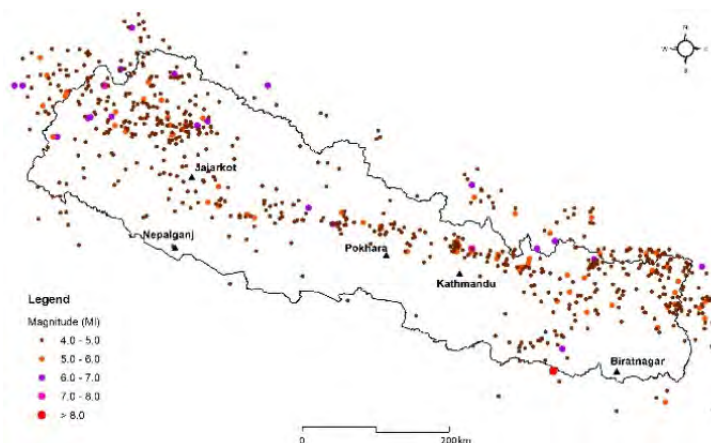
6. Various sectoral short-term and long-term developments works on the basis of development possibility.
7. Plans on human resource development in various sectors to be formulated by the local people themselves.

2.1.6 Past Experience of Disaster

(1) Earthquake Disaster

The National Seismic Centre under the Department of Mines and Geology indicated that one of the oldest earthquakes recorded in Nepal occurred in 1255. The record reported that the earthquake destroyed “many houses and temples and killing one third to one fourth [of the] population in the KV” (National Seismic Centre 2011). This was followed by earthquakes that occurred in 1408, 1681 and 1810. Although, most of the historical records did not specify the number of casualties and damaged buildings, one of the largest earthquakes occurred in 1833, which had the estimated magnitude of 7.0, and killed about 7,500 people around the KV. It is also estimated that more than 4,000 houses were destroyed in Kathmandu, Bhaktapur, Patan, and Banepa, and about 18,000 buildings were damaged across the country.

Since the 1800s, at least 20 large earthquakes occurred in Nepal². The largest earthquake in the history of Nepal occurred in 1934 with a magnitude of 8.3. Although the epicentre was in eastern Nepal, 4,300 people were lost their lives in the KV (the total death by the earthquake was 8,500). It also damaged more than 2 million buildings including temples, out of which, 81,000 buildings were completely destroyed. Even in Kathmandu, a total of 55,000 buildings were affected and 12,500 of them were completely destroyed.



Source: JICA Project Team (The Project for Assessment of Earthquake Disaster Risk for the Kathmandu Valley)

Figure 2.1.1 Location of Past Earthquakes (earthquakes (> 4.0 ML) recorded between 1994 and August 2013)

² Research Centre for Disaster Mitigation of Urban Cultural Heritage of Ritsumeikan University and the Institute of Engineering of Tribhuvan University

(2) Flood and Landslide

Nepal is prone to landslides and flooding due to its geological and geographical features. There are more than 6,000 rivers and streams which flow with high velocity through the steep and high-angle topography in the country, and the land is covered by unstable soil such as black clay. Additionally, the Himalayan ranges which are covered with snow and intense rainfall during the rainy season worsens the situation, particularly in the Inner-Terai Valleys. Every year, a number of people, agricultural lands and products, and human settlements are being damaged by floods and landslides. For instance, “Nepal experienced a devastating flood in the Terai region in 1993, which took the life of 1,336 people and affected 487,534 people” (MoFALD 1999). Additionally, the flooding in 1999 caused an economic loss of NPR 360 million, while 9,000 families and more than 177 hectares of agricultural lands were affected.

2.2 Damages by the Nepal Earthquake and Efforts for Reconstruction

2.2.1 The Situation of Damages by the Nepal Earthquake

In reaction to the Nepal earthquake, the Government of Nepal conducted a Post Disaster Needs Assessment (PDNA) under the support of international development partners in order to estimate the overall situation of damage.

(1) Human Damage

Within Nepal, 8,702 lives were lost due to the earthquake, and the number of injuries has counted up to more than 20,000. A District-wise breakdown of casualties and injuries as reported in the PDNA is indicated in the table below. In the districts of the Target Area (Gorkha, Sindhupalchok, Kathmandu, Lalitpur and Bhaktapur), a total of 5,601 lives were lost and 8,601 were injured, which accounts for a significant portion of those in the 31 disaster affected districts.

Table 2.2.1 Numbers of Loss of Lives and Injuries indicated in the PDNA

Place	Death				Injured
	Male	Female	Unknown	Total	
Sindhupalchok	1,497	1,943	0	3,440	2,101
Kathmandu	621	600	1	1,222	1,218
Nuwakot	459	627	0	1,086	662
Dhading	340	393	0	733	952
Rasuwa	287	310	0	597	7,949
Gorkha	213	230	0	443	1,179
Bhaktapur	118	215	0	333	3,052
Kavrepalanchowk	129	189	0	318	229
Lalitpur	67	107	0	174	1,051
Dolakha	84	85	1	170	61
Ramechhap	16	23	0	39	135
Makawanpur	16	17	0	33	771
Okhaldhunga	10	10	0	20	230
Sindhuli	5	10	0	15	1,571
Total of 14 districts	3,862	4,759	2	8,623	21,161
Moderately affected 17 districts	25	19	0	44	1,142
Other districts	12	23	0	35	
Total	3,899	4,801	2	8,702	22,303

Source: Nepal Earthquake 2015 – Post Disaster Needs Assessment

Note: Highlighted parts indicate data of the Target Area

(2) Estimated Disaster Effects

The PDNA describes the situation of damage including the estimated monetary amount in four pillars; 1) Social sectors, 2) Productive sectors, 3) Infrastructure sectors, and 4) Cross-cutting sectors, which further consist of relevant sectors. The estimated amount of damage indicated in the PDNA for entire Nepal is indicated in the table below. The total amount of damage is estimated to be NPR 17,124 Million. This accounts for approximately 0.9% of the GDP (Current Price) in fiscal year 2013/4, which was NPR 1,964,540 Million (Statistical Year Book 2015, CBS, 2014).

Table 2.2.2 Amount of Damage Estimated in the PDNA

Sectors	Disaster Effects (NPR million)			Distribution of Disaster Effects (NPR million)		Losses in personal income (NPR million)
	Damages	Losses	Total	Damages	Losses	
Social Sectors	355,028	53,597	408,625	363,248	45,377	-
Housing and Human Settlements	303,632	46,908	350,540	350,540	-	-
Health	6,422	1,122	7,544	1,394	6,150	-
Education	28,064	3,254	31,318	2,365	28,953	-
Cultural Heritage	16,910	2,313	19,223	8,948	10,274	-
Productive Sectors	58,074	120,046	178,121	158,079	20,043	17,124
Agriculture	16,405	11,962	28,366	25,813	2,553	4,603
Irrigation	383	-	383	-	383	-
Commerce	9,015	7,938	16,953	16,953	-	2,667
Industry	8,394	10,877	19,271	19,271	-	3,654
Tourism	18,863	62,379	81,242	75,105	6,137	6,200
Finance	5,015	26,890	31,905	20,937	10,969	-
Infrastructure Sectors	52,460	14,323	66,783	17,281	49,502	-
Electricity	17,807	3,435	21,242	15,569	5,673	-
Communications	3,610	5,085	8,695	1,712	6,983	-
Community Infrastructure	3,349	-	3,349	-	3,349	-
Transport	17,188	4,930	22,118	-	22,118	-
Water and Sanitation	10,506	873	11,379	-	11,379	-
Cross-Cutting Issues	51,872	1,061	52,933	1,755	51,178	-
Governance	18,757	-	18,757	-	18,757	-
Disaster Risk Reduction	155	-	155	-	155	-
Environment and Forestry	32,960	1,061	34,021	1,755	32,267	-
Total	517,434	189,027	706,461	540,362	166,100	17,124
Total (USD million)*	\$5,174	\$1,890	\$7,065	\$5,404	\$1,661	\$171

Source: Nepal Earthquake 2015 – Post Disaster Needs Assessment

Note: Conversion of currency is done in the PDNA. Thus, the exchange rate is different with that applied in other parts of this report

Furthermore, the PDNA indicates the district-wise breakdown of the estimated monetary amount of the damages in certain sectors. The district-wise breakdown of damage indicated in the PDNA for the 14 “highly affected districts” as declared by the Government of Nepal is shown in the table below. The damages in the commerce and industry sectors are extremely high in Kathmandu, while relatively high damages were also observed in Bhaktapur and Lalitpur. With the exception of cultural heritage and irrigation, relatively high amounts of damage were observed in all sectors in Sindhupalchok, which suffered the highest human damage. In Gorkha, which was the epicenter of the earthquake, relatively high damages were observed in the sectors of agriculture and health.

**Table 2.2.3 Estimated Damages of the Highly Affected Districts Indicated in the PDNA
(NPR million*)**

	Health	Cultural Heritage**	Agriculture	Irrigation	Commerce	Industry	Water and Sanitation	Losses in Personal Income
Sindhupalchok	559	18	5,979	13	824	512	988	1,540
Kathmandu	296	987	898	1	6,218	7,125	372	2,195
Nuwakot	332	90	2,902	43	729	573	570	1,311
Dhading	431	4	6,954	60	1,064	1,081	644	1,168
Rasuwa	218	4	490	26	116	254	107	180
Gorkha	503	8	1,693	72	743	225	559	1,239
Bhaktapur	115	345	502	0	790	1,009	326	594
Kavre	272	26	614	19	1,216	1,430	519	1,058
Lalitpur	174	223	396	1	1,247	2,249	256	614
Dolakha	465	6	1,432	24	652	278	1,226	1,086
Ramechhap	221	4	425	0	486	503	1,085	526
Makawanpur	320	2	608	29	582	1,762	525	435
Okhaldhunga	106	-	1,564	14	216	154	96	253
Sindhuli	229	4	1,006	3	319	128	75	398

Source: Nepal Earthquake 2015 – Post Disaster Needs Assessment

*The amount of Damage and Loss indicated in the PDNA has been added and rounded after the decimal point.

**The PDNA indicates the effect in cultural heritage in USD. Therefore, the amount was converted into NRP based on the exchange rate applied in this report (JICA standard rate as for Oct. 2017)

Note: Highlighted parts indicate data of the Target Area

For reference, the table below indicates the Gross National Income (GNI) of the districts comprising the Target Area, which are estimated in the Nepal Human Development Report 2014 prepared by the UNDP.

Table 2.2.4 Comparison of Estimated GNI and Figures Indicated in the PDNA

Place	Estimated GNI (NRP million)	Estimated Earthquake Effect Indicated in the PDNA (NRP million)*	Rate of Estimated Earthquake Effect within Estimated GNI
Kathmandu	215,590	18,092	8.4%
Lalitpur	39,658	5,161	13.0%
Bhaktapur	18,793	3,680	19.6%
Sindhupalchok	12,601	10,433	82.8%
Gorkha	14,291	5,042	35.3%

*Figures indicated are the sums of the district-wise data indicated in the PDNA (see Table 2.2.3) and does not represent the entire damage within the districts (the figures do not include items on which district-wise breakdown is not given)

2.2.2 Framework of Reconstruction

In response to the Nepal Earthquake, the Government of Nepal formulated a legal and policy framework for the reconstruction from the earthquake.

(1) Draft Disaster Management Act

The government initiated the draft Disaster Management Act to detail the roles of stakeholders including non-government organizations' roles, and to align with the National Strategy for Disaster Risk Management 2009 which the Relief Act did not encompass.

The Act prescribes the formation of the National Council for Disaster Management, headed by the Prime Minister and its members are mainly composed of Ministers of disaster related agencies. The role of the Council is to develop long-term disaster management policies, programmes and approval of disaster management related policies. As implementing body of disaster management related activities, the Act prescribes the Executive Committee headed by the Minister of Home Affairs. The Executive Committee consists of a secretary or director general level of each disaster management related agencies. The Executive Committee is the focal point of coordination with international support for disaster management as a coordinating body.

In relation to reconstruction and recovery, the Act prescribes the Central Natural Disaster Relief Committee (CNDRC) to conduct works related to disaster recovery. The head of the Committee is the Minister of MOUD and the members consist of the secretaries and managing directors of the related agencies, NRCS and the representative of the bank.

The Act requires not only at the government level but at the level of public agencies, industrial and commercial entities to be involved in disaster management related activities such as providing local resources, training for employees about disaster management, and engagement in rescue and relief resource distribution activities.

As for the local government level, the Act prescribes the CDO as the disaster response controller of the district level and assigns the CDO to lead the works related to disaster response. CDO is also the commander for the security related agencies such as the Fire Department, Nepal Police and Nepal Army in case of a disaster. The Act also requires to establish a Regional, District and Local Disaster Management Committee in every region, district and VDC.

(2) Bill on Reconstruction of the Damaged Structures Affected by the Earthquake

The government proposed a bill to establish Nepal Reconstruction Authority (NRA) as the leading agency for the reconstruction from the earthquake. The bill prescribes that NRA will remain for five years and will be updated depending on the progress of the reconstruction. The bill also prescribes the establishment of the National Reconstruction Committee (NRC) and the Steering Committee, both of which are chaired by the Prime Minister, and also other committees with its member and together with their qualifications.

The NRA has been established on the legal basis of the Act relating to the Nepal Reconstruction Programme, 2072(2015) and will remain for five years. The Act prescribes that “In case the reconstruction project is not completed within five years, the authority will get a year extension or policies can be developed for another related authority to take over the project.

Table 2.2.5 Major roles and Responsibilities NRA

Major roles and responsibilities NRA
<ul style="list-style-type: none"> ➤ Verify the damage and create a list of damaged areas ➤ Develop, approve and manage prioritized reconstruction programs and action plans ➤ Develop necessary agencies and supervision for reconstruction projects ➤ Responsible for operational and financial arrangement for housing development and settlement issues ➤ Coordinate with stakeholders related to reconstruction among GON, donor agencies(NGO, INGO), and CSO to implement the programs ➤ Capacity building for the stakeholders of reconstruction activities ➤ Fiscal arrangement of the programs and activities for reconstruction.

Source: JICA Project Team based on the Bill on Reconstruction of the Damaged Structures Affected by the Earthquake

The Steering Committee is developed under the NRA. The roles and responsibilities of the Steering Committee are to; 1) approve the policies regarding the project prepared by the executive committee, 2) guide the working committee in order to increase the project effectiveness, 3) approve the budget, and 4) approve the organizational structure of the authority.

(3) Post-Earthquake Recovery and Reconstruction Policy

In response to the earthquake in April 2015, NPC drafted the Post-Earthquake Recovery and Reconstruction Policy to envisage a guideline for the reconstruction and recovery from the damage from the earthquake. The objectives and the approaches of the Policy are shown as follows.

Table 2.2.6 Objectives and strategies of Post-Earthquake Recovery and Reconstruction Policy (1/2)

<p>Objective 1 Improvement of the existing safe settlements and relocating the dangerous settlements for safety as well as recovery and reconstruction of fully or partially damaged residential homes</p>
<p>Strategy</p> <ul style="list-style-type: none"> ➤ It shall encourage the methods of construction by oneself. ➤ It shall make a maximum utilization of local materials and skills ➤ There shall be balance between the earthquake resilient construction methods and financial support by the government ➤ Uniformity shall be maintained during the deliverance of support to the earthquake affected families ➤ Residential homes in urban areas shall be properly managed ➤ An extensive public awareness shall be promoted in teaching the methods of constructing earthquake resilient structures. ➤ Relocation from the settlement shall be based on the extensive geographical and geological survey and studies. ➤ New settlement shall be developed on the basis of land-use planning. ➤ Community houses shall be constructed for an emergency purpose in the urban location.

Table 2.2.6 Objectives and strategies of Post-Earthquake Recovery and Reconstruction Policy (2/2)

Objective 2	
Recovery and reconstruction of social and physical infrastructures, community and government buildings	
Strategy	
<ul style="list-style-type: none"> ➤ There shall be an optimum use of local architecture, construction materials and skills at the central and district level during the reconstruction of government buildings. ➤ Safe and multistore buildings shall be constructed under the concept of integrated administrative building while constructing the government building at urban area. ➤ Safety measures shall be adopted with understanding the probable risks of flood and landslides while reconstructing the physical and social infrastructure in earthquake affected areas. 	
Objective 3	
Restoration of historical settlements, renovation of cultural monuments as well as retrofitting and reconstruction	
Strategy	
<ul style="list-style-type: none"> ➤ Renovation and retrofitting shall be the first priority for partially damaged and unsafe historical buildings and structures. ➤ International organizations shall be involved to take the recovery and reconstruction initiatives of world heritage sites, but the local means and resources shall only be mobilized to recover and reconstruct such sites. ➤ Recovery and revival of old and historical urban areas shall begin by the Building Integration Method. 	
Objective 4	
Protection and uplifting of women and children, marginalized and impoverished populations of the earthquake affected areas	
Strategy	
<ul style="list-style-type: none"> ➤ The health service, employment based skills and training programs shall be implemented based on the willingness and needs of the people to uplift the condition of earthquake affected women, children, marginalized and impoverished people ➤ Cooperatives, saving and credit groups shall be mobilized to enhance market access of the goods and services produced by economically weak, marginalized and deprived groups ➤ Special attention shall be paid to the issues of social security, basic health, maternal health, child health and adolescent health 	
Objective 5	
Redesign and improve the productive sector to extend economic and livelihood opportunities	
Strategy	
<ul style="list-style-type: none"> ➤ Livelihood opportunities shall be re-established immediately. ➤ Financial relief shall be arranged to the cottage industries and small entrepreneurs. ➤ Tourism services and facilities shall be re-established 	

Source: Post-Earthquake Recovery and Reconstruction Policy

The Policy also envisages cross-cutting issues such as DRR, PPP, gender issues, Environment Conservation and Climate Change Adaptation, Publicity and Training on Safe Construction Procedures.

Table 2.2.7 Work Plan of Post-Earthquake Recovery and Reconstruction Policy

	Description	Responsible Agency	Supporting Agency	Date of implementation	Remarks
1	Establishment of Reconstruction Authority	Government of Nepal		2015/8/16	
2	Formulation of Recovery and Reconstruction Policy	NPC	Ministries Concerned	2015/9/17	

	Description	Responsible Agency	Supporting Agency	Date of implementation	Remarks
3	Approval of Recovery and Reconstruction Policy	Consultation Committee for National Reconstruction		2015/10/2	
4	Formulation of region based plan and programs	Concerned ministries and agencies	NPC	2015/10/17	Formulated programme shall be implemented in 5 years.
5	Approval of plan and program	Reconstruction Authority	NPC	2015/12/1	Approval of 5-year reconstruction plan.
6	Provision of budget for Reconstruction Authority	MOF	Reconstruction Authority	2015/12/8	Provision of Reconstruction Fund
7	Release of budget in district level organizations	Reconstruction Authority	Ministry of Finance	2015/12/30	Release of budget based on the approved annual program
8	Implementation of annual program	Gov't agencies, Donors, NGOs, Cooperatives, Social Organizations & Volunteer groups	Concerned DAO and DDC	2016/5/13	Budget amounts are received on annual basis after the approval of annual programs under the approved five-year reconstruction plan.

Source: Post-Earthquake Recovery and Reconstruction Policy

2.2.3 Current Conditions of Reconstruction Works

The tables below are the summary of reconstruction works implemented by the development partners and line agencies in Gorkha and Sindhupalchok District.

Table 2.2.8 Breakdown of the reconstruction works implemented in Gorkha District

	Line agencies	Donors	INGO	LNGO
Infrastructure/physical development	59	n.d.*	30	19
Social Sector	n.d.*	n.d.*	146	85
Economic Sector	n.d.*	n.d.*	44	1
DRR and Environment	n.d.*	n.d.*	53	0
Institutional Development	n.d.*	n.d.*	33	28

Note: *No detailed data was available

Source: JICA Project Team based on the information from DDC

Table 2.2.9 Breakdown of the reconstruction works implemented in Sindhupalchok District

	Line agencies	Donors	INGO	LNGO
Infrastructure/physical development	45	10	2	5
Social Sector	n.d.*	33	132	159
Economic Sector	n.d.*	7	20	49
DRR and Environment	n.d.*	5	3	2
Institutional Development	n.d.*	3	--	-

Note: *No detailed data was available

Source: JICA Project Team based on the information from DDC

2.3 Social Survey

A series of social surveys were conducted in the districts of Gorkha and Sindhupalchok in order to understand basic information at the VDC level and to utilize this in examining the contents of assistance through the Project. The surveys were conducted in two steps. The first step was the Quick Survey, targeting 21 VCDs (fourteen VCs in Gorkha and seven VDCs in Sindhupalchok) which were selected as candidate VDCs for support through the Project, with the aim of understanding the general situation and access to local natural and social resources and damages caused by the earthquake. The Quick Survey was conducted mainly through interviews to individuals and relevant government authorities during August to September 2015. The second step was the Detailed Survey, which had the aim to collect more detailed information on the situation of recovery from the earthquake, and those related to the reconstruction of housings. This was conducted during January to February 2016, targeting a total of fourteen VDCs (two VDCs in Gorkha and twelve VDCs in Sindupalchok). The target VDCs in both surveys indicated in the following tables were selected through discussions with JICA Nepal Office.

Table 2.3.1 Target VDCs of the Quick Survey

	Gorkha District		Sindhupalchok District
1	Taple VDC	15	Chautara VDC (Chautara municipality)
2	Bungkot VDC	16	Sanusiruwari VDC (Chautara municipality)
3	Khoplang VDC	17	Pipaldanda VDC (Chautara municipality)
4	Barpak VDC	18	Kubhinde VDC (Chautara municipality)
5	Ghyachok VDC	19	Irkhu VDC
6	Simjung VDC	20	Thulo Sirubari VDC
7	Muchhok VDC	21	Melamchi VDC (Melamchi municipality)
8	Hansapur VDC	22	Talamarang VDC (Melamchi municipality)
9	Kharibot VDC	23	Sindhulkot VDC (Melamchi municipality)
10	Aaru Aarbang VDC	24	Bansbari VDC (Melamchi municipality)
11	Tandrang VDC	25	Shikharpur VDC (Melamchi municipality)
12	Pandrung VDC	26	Jyamire VDC (Melamchi municipality)
13	Panchkhuwa Deurali VDC	27	Fatakshila VDC (Melamchi municipality)
14	Takukot VDC	28	Barhabise VDC
		29	Mankha VDC
		30	Maneshwnara VDC
		31	Ramche VDC
		32	Sangachok VDC

Source: JICA Project Team

Table 2.3.2 Target VDCs of the Detailed Survey

	Gorkha District		Sindhupalchok District
1	Bungkot VDC	3	Chautara VDC (Chautara municipality)
2	Barpak VDC	4	Kubindhe VDC (Chautara municipality)
		5	Pipaldanda VDC (Chautara municipality)
		6	Sanusiruwari VDC (Chautara municipality)
		7	Melamchi VDC (Melamchi municipality)
		8	Talarang VDC (Melamchi municipality)
		9	Sinduhkot VDC (Melamchi municipality)
		10	Bansbari VDC (Melamchi municipality)
		11	Shikharpur VDC (Melamchi municipality)
		12	Jyamire VDC (Melamchi municipality)
		13	Phatakshila VDC (Melamchi municipality)
		14	Barhabise VDC

Source: JICA Project Team

2.3.1 Overview of VDCs

(1) Natural Resources

1) Forest

All surveyed VDCs have a number of forests. The majority are Community Forests (CFs), which belong to and were managed by the local community, while others are classified as Kabiliyati (lease) Forest, which is leased from the government to the community for a period of 30-40 years, and some are Ward Forests, which are handed over from the government to the ward. According to Focus Group Discussions (FGDs), all types of forests are making a significant contribution to the livelihood of the community by providing them with firewood, timber, fodder, food items such as fruit, nuts, plants and herbs, as well as protecting water sources, enhancing wild animals and birds, and preventing landslides. Forests are managed by the Forest User Groups, which will be discussed under community organizations.

2) Rivers and Streams

There are rivers, streams and rivulets in most of the surveyed VDCs. Rivers and streams often make natural boundaries of Wards, VDCs and Districts.

In Gorkha District, Barpak VDC is rich in water resources; with Daraudi River which makes a natural border from Ghyachok VDC in the west, and Rangrung Khola which has a big water volume even in the winter season. Barpak also has several waterfalls. Bungkot VDC, on the other hand, has only a few smaller streams flowing through the VDC.

In the Sindhupalchok District, Chautara Cluster has Bramayani River in Kubhinde VDC, Barhabise VDC is partially surrounded by Sunkoshi and Bhotekoshi Rivers and have several streams are

flowing through the VDC. Barhabise VDC also has several waterfalls. Melamchi Cluster has Indrawati and Melamchi Rivers, which meet at Melamchi and becomes Indrawati thereafter.

3) Water Sources

Water sources are important assets to the daily life of the people. All surveyed VDCs found several springs and wells from which water is led to stone taps, reservoirs and tanks.

Barpak VDC in Gorkha seems to have sufficient drinking water while in other areas only the lower belts that lie in the river basin have enough water supply but the upper belts of the VDCs are often dry and often experience a shortage of water, especially in the dry season.

According to the FGDs, all surveyed VDCs except Kubhinde VDC in Chautara Cluster have water tanks for drinking water, from which water is led to different taps through pipes. Some VDCs also have water reservoirs for irrigation. Some communities, in Bungkot VDC in Gorkha and Fatakshila, Chautara, Kubhinde, Pipaldanda and Barhabise VDCs in Sindhupalchok, are said to be facing water scarcity after the earthquake.

4) Stone Mines

There are stone and sand mines and crushers in some of the VDCs. They are important for housing construction as well as road construction and protection from landslides. According to the FGDs, stone is available locally in most surveyed areas. In the Gorkha District, there are two stone mines in Bungkot VDC and one in Barpak VDC. In the Sindhupalchok District, Barhabise VDC has fifteen stone mines that operate occasionally as per the need of villagers, and Pipaldanda VDC in Chautara Cluster also has some stone mines.

(2) Social Asset

1) Government Offices

All surveyed VDCs have a VDC Office (or Municipal Office and Ward Office for the Municipality) and at least one health facility. In addition, some VDCs have agriculture and/or veterinary service centre, post office, police and other government offices.

2) Schools

All surveyed VDCs have government education facilities up to Higher Secondary school (up to Grade 12) level except Pipaldanda, Jyamire and Shikhapur VDCs where they have schools up to Secondary School (up to Grade 10). In addition, Chautara has Chautara Multiple Campus and Melamchi has the Indrawati Multiple Campus where students can study up to Bachelor's level. Many of the VDCs, especially in urbanized areas such as Chautara, Barhabise and Melamchi, also have several private schools where the teaching medium is in English.

3) Road Network

All VDCs are connected with road network and most VDCs are accessible by vehicle up to the centre of the VDC all year round. However, roads to Barpak VDC in Gorkha and Sindhulkot, Shikharapur and Jyamire in Melamchi Cluster often pose problems due to landslides in the rainy season. On the other hand, road conditions within the VDC are often problematic and some are not passable during the rainy season. The road condition of each VDC as of August 2015 is shown in Table 2.3.3.

Table 2.3.3 Access to and within the VDC as of August 2015

District	SN	VDC	From District HQ to VDC Centre		Wards Reachable from VDC Centre by 4WD	
			Transportation in Dry Season (Time)	Transportation in Rainy Season (Time)	Dry Season	Rainy Season
Gorkha						
	1	Bungkot VDC	4WD (0:25)	4WD (0:25)	all	2, 3, 5
	2	Barpak VDC	4WD (4:00)	4WD + walk (6:30)	1, 2, 3, 4	none
Sindhupalchok						
	3	Chautara VDC	4WD (0:00)	4WD (0:00)	all	all
	4	Sanusiruwari VDC	4WD (0:45)	4WD (0:45)	all	1, 2, 3, 4,5
	5	Pipaldanda VDC	4WD (0:25)	4WD (0:25)	all	all
	6	Kubhinde VDC	4WD (0:15)	4WD (0:15)	all except 1	all except 1
	7	Barhabise VDC	4WD (2:45)	4WD (3:05)	all	all
	8	Melamchi VDC	4WD (2:10)	4WD (2:30)	all	2, 3, 5, 6
	9	Talamarang VDC	4WD (2:35)	4WD (2:55)	all	1, 2, 6, 7, 9
	10	Sindhulkot VDC	4WD (2:45)	4WD + walk (3:30)	all	2, 3, 6, 7
	11	Bansbari VDC	4WD (1:50)	4WD (2:10)	all	all except 4
	12	Shikharapur VDC	4WD (2:00)	4WD + walk (3:30)	all	all except 1 and 9
	13	Jyamire VDC	4WD (2:45)	4 WD + walk (3:20)	all	none
	14	Fatakshila VDC	4WD (1:50)	4WD (2:10)	all	1, 5, 8

Source: JICA Project Team

(3) Household and Population

The number of households and population, number and percentage of Dalit, highly marginalized and marginalized³ ethnic groups based on 2011 Census are shown in Table 2.3.4.

³ Nepal Federation of Indigenous Nationalities (NEFIN) classifies 56 indigenous ethnic groups into five categories, i.e. “Advanced (2)”, “Disadvantaged (14)”, “Marginalized (19)”, “Highly marginalized (12)” and “Endangered (9)”. From the view point of social consideration special attention should be given to HHs belonging to “Endangered” and “Highly marginalized” groups as well as Dalit. Government of Nepal follows this classification when they take social consideration measures.

Table 2.3.4 Number of HH, Population and Marginalized Groups

VDC	No. of HH	Population			Dalit	Highly Marginalized	Marginalized
		Male	Female	Total			
Bungkot	1,601	2,628	3,632	6,260	981 (15.7%)	0	0
Barpak	1,069	2,204	2,781	4,985	217 (4.4%)	0	0
Chautara	1,618	2,907	3,045	5,952	254 (4.3%)	27 (0.5%)	1,008 (16.9%)
Kubhinde	693	1,447	1,562	3,009	247 (8.2%)	0	583 (19.4%)
Pipaldanda	787	1,498	1,873	3,371	352 (0.4%)	0	822 (24.4%)
Sanusiruwari	779	1,462	1,812	3,274	116 (3.5%)	0	714 (21.8%)
Barhabise	1,683	3,519	3,598	7,117	407 (5.7%)	66 (0.9%)	1,692 (23.8%)
Melamchi	1,179	2,531	2,699	5,230	340 (6.5%)	303 (5.8%)	1,502 (28.7%)
Talamarang	716	1,487	1,654	3,141	221 (7.0%)	0	1,374 (43.7%)
Sindhulkot	681	1,490	1,635	3,125	876 (28.0%)	0	882 (28.2%)
Bansbari	1,102	2,395	2,661	5,056	213 (4.2%)	828 (16.4%)	1,932 (38.2%)
Shikhapur	583	1,242	1,322	2,564	359 (14.0%)	278 (10.8%)	283 (11.0%)
Jyamire	1,199	2,670	2,883	5,553	413 (7.4%)	169 (3.0%)	1,758 (31.6%)
Fatakshila	894	2,138	2,148	4,286	295 (6.9%)	1,041 (24.3%)	892 (20.8%)

Source: 2011 Census, CBS

According to the 2011 Census, none of the surveyed VDCs have people from endangered ethnic groups. However, all VDCs in Sindhupalchok have people from highly marginalized or marginalized groups. Highly marginalized groups living in the surveyed VDCs are Danuwar, Majhi and Thami, and marginalized groups are Tharu, Tamang and Gharti/Bhujel. In all the surveyed VDCs, a varied number of Dalit are also present. A high ratio of Dalit is found in Sindhulkot VDC (28.0%) in Sindhupalchok.

(4) Livelihood and Economic Activities

According to the FGDs, agriculture is the main stay of the economy in all the surveyed VDCs. In most places, people grow rice, wheat, barley, finger millet, maize, potato and some vegetables for self or local consumption. Many are also involved in small scale animal husbandry of goats, pigs and poultry. In Barpak, some people keep sheep and weave *bhakku* (thick hand woven cloth) from the wool which is occasionally sold at local markets.

Some villagers are also engaged in small business such as shops, flour mills, sand and stone mines, guest houses and tea shops, tailors, and handicraft. Some also work as wage labourers and porters when there are opportunities. Many say that agriculture alone is not enough to support the living, even in villages. In Chautara, Barhabise and Melamchi there are some larger businesses in the bazaar area including wholesale shops, dairy production, iron grills, paper production, etc.

(5) Community Organizations

There are different community organizations in all the surveyed VDCs. Community Forest User Groups, Women or Mother Groups, Savings and Credit Cooperatives, and Child and Youth Clubs are most common.

1) Community Forest User Groups

As mentioned before, there are different types of forests though there seems little difference in its management and utilization pattern. Each community forest is managed by the group which uses the forest. Members are normally required to pay a nominal membership fee and in turn they have access to forest products such as timber, firewood, food items within the agreed rule. In most VDCs, people are actively involved in forest management through afforestation, forest fencing to protect from illegal logging, fire protection and so on.

2) Cooperatives

There are numerous co-operatives of different activities in the surveyed VDCs. According to the FGDs the main cooperatives are saving and credit, agriculture, and dairy cooperatives, and among them saving and credit cooperatives are the most active. Through the cooperative people deposit savings and receive loans when needed. Some cooperatives encourage members to use the loans as investment of income generating activities such as purchasing livestock animals, vegetable seeds, or equipment needed for income generation.

3) Women Groups

According to the FGDs the objective of women groups are to empower women, reduce domestic violence and social discrimination, and encourage women to engage in local cultural programmes and economic activities. Some of the women groups are engaged in savings and credit activities, and some are involved in income generating activities such as skill-training, provision of livestock animals and others. According to some FGC participants although there are many women groups most are unregistered and are limited within the Ward in its membership and activity.

4) Child and Youth Club

All the surveyed VDCs have multiple child and youth clubs and some are actively involved in social activities. The objectives of such clubs are for the promotion of sports and education, health and hygiene, and environmental protection. Members are local children and youth in the area. They sometimes organize sports, cultural and social events.

(6) Vulnerable Community

1) Who are Vulnerable

As mentioned earlier there are people who are from “highly marginalized” ethnic groups in some of the surveyed VDCs in Sindhupalchok. For example, in Jyamire VDC in the Melamchi Cluster, there are some Danuwar and Majhi HHs and according to the villagers, many of them have no land and are at low economic status; Danuwar families often work as hired farm labourers while Majhi families normally live on the river bank and are engaged in fishing; children of both Danuwar and

Majhi often drop out from schools and start working at a young age in order to support families; some young people of Danuwar went abroad for work but when they came back to the village they resumed the similar jobs as their parents. According to the Social Mobilizer and villagers, there is no social discrimination against them nor Dalit as it used to be in the past.

According to the FGDs, people also consider that living in a high risk area of landslides and cracks after the earthquake vulnerable and feel that they should be relocated as soon as possible. There are many communities and individual HHs, especially in Barpak and Barhabise VDCs, who need to be resettled. They also discussed that vulnerable individuals are: orphans, elderly persons who have no care givers, persons with disability or chronic illness, people with HIV, single women with no financial means, those mistreated by their husbands or in-laws, and so on.

2) Challenges Faced by Women

According to the FGDs women are facing challenges at home as well as in the community. They discussed that some women suffer domestic violence or neglecting caused by husband's living with another woman, and that some uneducated and jobless women are often ignored and mistreated by their husband, in-laws and by the community. In some VDCs people also discussed that child marriage, early pregnancy, child trafficking are causing lots of suffering to girls and women. Women also discussed that there is strong social and family pressure to have a son, which causes hardship to women. One woman in Jyamire VDC said that, "My husband told me that he will marry another girl if I give birth to another daughter. I already have three daughters."

They also discussed the causes of such discrimination and came up with factors such as male dominating culture, men's alcoholism, villagers' lack of awareness, lack of understanding in the family, ineffective implementation of laws which protect women, women's low level of education, and lack of confidence on the women's side.

3) Possible Way-Out for Improvement

According to the FGDs, those who are still living at high risk areas after the earthquake should be relocated to a safe area as soon as possible, and for orphans, the elderly and disabled, if needed, they should be taken care of at appropriate care homes.

They discussed that in order to minimize discrimination against women, it is important to educate women including reproductive health, as well as training for income generating activities and employment. They also discussed that women are working on agricultural land, going to the forest to fetch firewood, carrying manure, knitting bags, and making local beverages to sustain their livelihoods, thus if agriculture production is improved through irrigation and other means, it will help women, and also income generating activities such as making vegetable farming, livestock

rearing, making bio-briquette for clean cooking and bio-charcoal for soil improvement, etc., could be the best options to empower women as well as the community.

(7) Impacts of the Earthquake

1) Main Impacts

The number of death and persons injured due to the earthquake and the number of totally and partially damaged houses are shown in Table 2.3.5.

Table 2.3.5 Earthquake Damage Status

Local Body	Population (2015)	Death	Persons Injured	No of Houses	Totally Damaged	Partially Damaged
Bungkot VDC	11,056	2	7	1,824	1,634	120
Barpak VDC	7,790	70	167	1,380	1,353	7
Chautara Municipality	15,797	243	100	na	6,488	257
Barhabise VDC	10,241	29	66	na	1,977	168
Melamchi Municipality	31,815	98	242	na	5,904	296

Source: DDRC

The damage from the earthquake was severe and visible in every site visited during the survey. Among them, the damage experienced by the people of Barpak VDC, the epicentre of the Gorkha earthquake, was devastating. Almost all of the houses were shattered to the ground and many landslides and cracks were created, forcing people to abandon their homes. The village became isolated as the only road which leads to the district headquarters became impassable due to landslides.

In September 2015, many people who lost their houses were living in temporary shelters, which they built with whatever materials they were given or salvaged from the debris. Some were staying in the damaged houses covering them with tarpaulin or patching them with CGI sheets and others were still living under tents.

According to the FGDs, the main impacts of the earthquake are human casualties, heavy damage to houses, schools, health facilities, and water supply facilities, to count a few. The experience of death and destruction in the community as well as recurrent aftershocks caused psychological problems to many, especially children. The earthquakes occurred at the time of paddy field cultivation and disrupted their farming practice as people had other preoccupations and they were afraid of aftershocks, which resulted in shortages of food in some areas. Farmers also lost livestock which were important assets for many of the families.

Women groups discussed about the difficulties they faced after the earthquake, especially while living in the communal shelter, where girls and women were sometimes molested or even raped when they were changing clothes, taking a shower, or using a toilet. They also said that pregnant

women and women with small children are suffering due to lack of health care and hygienic environment. Women in some VDCs also have to walk a long way to collect water as the water supply system was damaged.

Children and youth said that although schools are reopened, many temporary classrooms are not adequate as they are small and dark; you can hear voices from the adjoining classrooms; in the winter months it was so cold as the wind kept coming in; the school doesn't have enough teaching and learning materials; at home it is also difficult to study as the house is congested with joint families, etc. They said that some children had left the village as they were not sure when the school might be rebuilt.

2) Need of Relocation

According to the FGDs, many areas, especially Barpak and Barhabise VDCs, are at a high risk of landslides triggered by the earthquakes, and those HHs on or close to the high risk area need to be relocated. Among those HHs, some have already shifted to other places as a temporary measure either to live with their relatives or to live on rented or public land. Many of the FGD participants addressed that there is an urgent need that these people still living at a high risk area be relocated, and the government should find and allocate a suitable plot to each community.

3) Progress of Recovery

Regarding the recovery from the earthquake, from the observation by the survey team as well as from the FGDs, it seems that no significant progress has been made in most of the VDCs during the period of August 2016 to January 2017. In many VDCs, debris from damaged buildings and houses are still not cleared and many people are still living in temporary shelters and under tents.

A small number of people have taken the initiative and started building their houses. For example, in Barpak around 30-40 houses are being built using stone and wood with CGI roofs to make them lighter thus lessening the possibility of causing heavy casualties in the event of another earthquake (as of January 2016). Some families in Melamchi and Chautara have also started rebuilding their houses. However, they are exceptional and the majority are still waiting for the government guidelines on housing reconstruction and the subsidy of NPR 200,000, which the government announced for distribution for housing reconstruction to those who lost their houses. Apart from the "promised subsidy", very little information is shared not only to ordinary villagers but also to VDC Secretaries and Social Mobilizers. Several people said that they will build whatever house is possible within the money they get from the government, expecting that the subsidy will be given in one instalment without any conditions.

According to the FGDs, masonry training was organized in Bungkot VDC in Gorkha by OXFAM and in Chautara Municipality by JICA. FGDs in Bungkot and Chautara discussed that the training

was good but not enough to train an adequate number of masons needed for the reconstruction of the area and it should be continued for a larger number of masons as well as those who want to learn the skill.

4) Plan of Reconstruction

According to the FGDs, housing reconstruction is at the most concern and importance for the majority of people in all VDCs. They discussed that the government should provide clear guidelines as soon as possible so that people can start rebuilding the houses before the rainy season. They also discussed the importance of earthquake resilient building techniques to be disseminated on a large scale and technical support by the government and other organizations to build strong houses should be accelerated. Another topic that many FGDs discussed was that many families need further financial support on top of the NPR 200,000 subsidy to rebuild their houses, and the government should facilitate such support from donors and I/NGOs. People in different VDCs said that without financial and technical support from the government and other organizations, many people will end up rebuilding their houses in the traditional way using stone and mud without any earthquake resilient techniques, as it is already happening here and there.

From the FGDs with youth, it seems that they are keen to take an active role in the reconstruction of the community. They discussed that they can create awareness and disseminate earthquake resilient building techniques to community people or even support building houses for people with difficulty such as elderly and disabled people if they are oriented and trained properly.

In addition, in Barpak where many communities are facing a risk of landslide, they discussed the need of a geological survey in several areas in order to determine their suitability for housing construction and that it is important for the government to allocate suitable public land to those who have to be relocated. They also discussed the need of road repair and construction in order to transport building materials to different areas of Barpak.

(8) Housing Construction

As mentioned before, housing reconstruction is one of the biggest concerns of most villagers. In this regard, the main concerns of people are: lack of clear guidelines from the government on earthquake resilient building techniques, the reconstruction subsidy, and the relocation and resettlement of people who lost their land or are living at high risk areas; how to manage procurement and transportation of building materials, especially in remote areas like Barpak; slow progress of road repairs and construction which is needed before the housing reconstruction; and the need of orientation and training on earthquake resilient building techniques on a massive scale. Some VDCs also raised the issue of land ownership; in Talamarang in Chautara Municipality, there are some landless people (called “*sukumbasi*” in Nepali) who lost their houses in the earthquake and

many wondered if and how they will be helped by the government for the reconstruction of their houses; and in Fatakshila in Melamchi Municipality some areas belong to traditional Pashupati Guthi (a trust associated with Pashupatinath Temple whose legal status is unclear) and people wondered if they can rebuild the houses on Guthi land without land ownership.

1) Information on Housing Construction

According to the FGDs most people have not received sufficient information on housing construction and many were not aware of the housing models the government published. Only a few people, especially youth, said they saw the drawings which are displayed at VDC and DDC Offices or on TV and newspaper.

2) Manpower for Housing Reconstruction

According to the FGDs, masons and labourers are available in most areas but they are not well-trained and are only used to build with mud-mortar, thus they should be trained on earthquake resilient techniques. For building houses family members should also work along with hired labourers to reduce the cost as well as to keep an eye on the progress.

In some areas, masonry training was organized by different organizations. In Gorkha, from Bungkot VDC 23 masons were trained by OXFAM and another 13 by CRS, while in Barpak no such training has yet been conducted. In Sindhupalchok, about 40 masons in Chautara Municipality were trained by JICA, and another masonry training sessions were also organized in Melamchi Municipality by the Red-Cross and Plan Nepal. However, during the FGDs many people said that community level orientation and further training on earthquake resilient building techniques should be organized in order to raise the awareness of villagers and train many more masons and villagers to build stronger houses.

3) Purchase and Transportation of Building Materials

According to the FGDs in most surveyed areas, stone and timber can be collected locally and sand and aggregate can be obtained from a crusher or sand mines at the riverside. For the transportation of building materials, some trucks and tractors are locally available in all the fourteen surveyed VDCs.

4) Measures to Reduce Building Cost

FGDs discussed how to reduce building costs and came up with: reuse stone, brick, wood and other materials salvaged from damaged house or debris; maximize the use of local materials such as timber from the community forests, stone from local a stone mines and sand from the local rivers; purchase, transport and storing of building materials as a group at lower cost; do-it-yourself as much as possible after taking skill-training; and organize “perma”, a communal work sharing system, which was traditionally the way for building houses.

FGDs also discussed some possible measures that the government can do to reduce the building cost such as tax exemptions for building materials and subsidies for material transportation to a certain collection centre.

5) Support for the Vulnerable

For some people such as the elderly, disabled or chronically ill, it is difficult to build a house. According to the FGDs, there were two main opinions: some argued that it is the responsibility of the government to support those vulnerable as others are also earthquake victims who are facing a big challenge of rebuilding their own houses while others, especially young people, discussed that those people should be supported communally and their houses can be built through “perma” communal work sharing, organized by the VDC or Ward Citizen Forum (WCF) and several youth club members said they can also mobilize young people to work as volunteers to build houses for them. In Shikapur VDC, people further discussed that a committee should first be formed with ward representatives and they should identify most vulnerable families in each Ward whose houses were destroyed, and then organize a “perma” in each Ward.

6) Strategies for Households Not Accessible by Tractor

According to the FGDs, although the road connects most wards within the VDCs, some communities are off the road network. For example, in Barpak VDC most wards except Ward 6, 7 and 8 have communities which are off the road and the FGD estimated about 440 HHs in total which are more than a five minutes’ walk from the roadside. In Barhabise VDC in Sindhupalchok, all wards except Ward 2 have such communities with over 850 HHs that require more than five minutes’ walk from the roadside.

For those off-the-road HHs, tractors cannot carry building materials to the building sites. According to the FGDs, for many communities it is possible and preferable to repair or construct roads by widening existing trails so that tractors can pass. If such measures are not possible, they said materials should be carried using wheel barrows if the road condition allows or carried by people as normally done by hiring porters and labourers. Some suggested that it can also be done using “perma”, a communal work sharing system, and it is sometimes done by making a human chain to pass the goods in turn to the destination. In Barpak, people suggested the use of donkeys which can carry up to 100kg.

2.3.2 Main Results of Sample HH Interview Survey (Detailed Survey)

The Project conducted the interview survey at 30 HHs per the 14 target VDC with a total of 420 HHs. For this survey, the Project did not apply random sampling to cover households of different Wards as well as different economic status. The number of sample HHs were determined in proportion to the number of HHs in each Ward and in each VDC, 30 HHs were selected consisting

of 10 HHs each from the high, middle and low economic status. The main interviewees were interviewed at their houses. The interview was conducted with the HH head as much as possible, and if HH head was not available, HH members responded to the interview. The overview of the target and result of the interview are as follows:

(1) Summary of the Target

The following are the summary of respondents:

- Out of 420 respondents 304 (72%) are men and 116 (28%) were women.
- Out of 420 respondents 380 (90%) were HH head. The remaining 40 were: HH's wife (24), son (10), daughter (5) and daughter-in-law (1).
- Out of 420 HHs surveyed 83 (20%) were female-headed HHs. Of the 83 HHs, 51 (61%) were of low economic status.
- Out of 420 HHs surveyed 65 (15%) belong to Dalit or highly marginalized ethnic groups. They were Dalit (50), Danuwar (8) and Majhi (7). Out of these 65 respondents 50 (77%) were of low economic status.

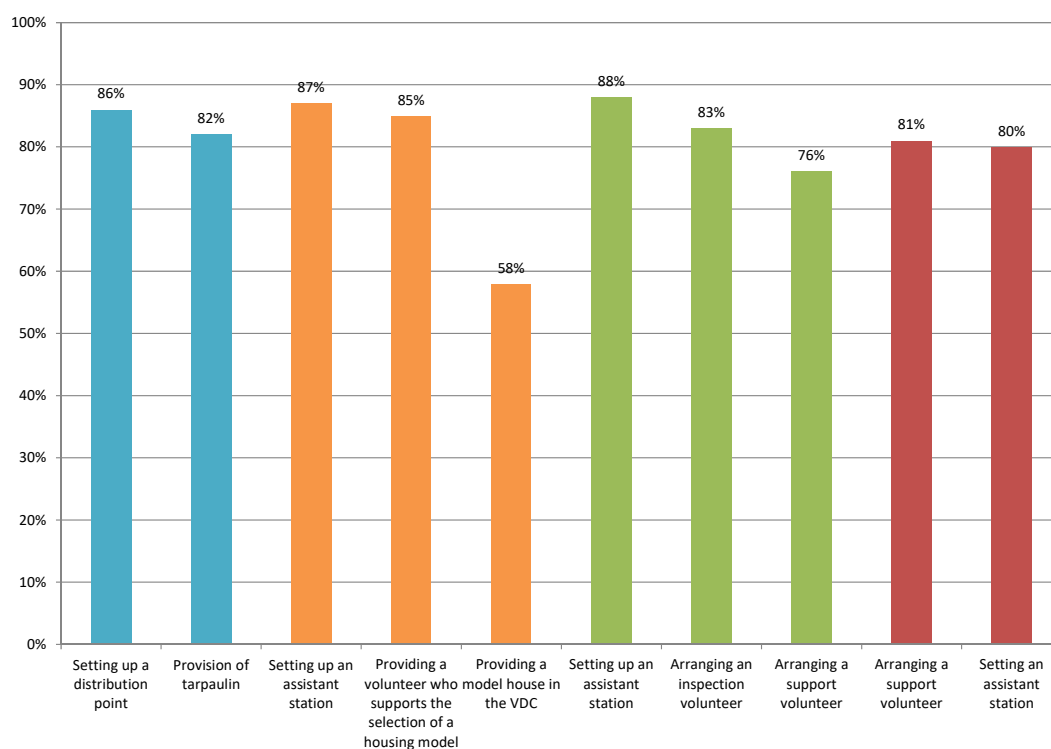
(2) Main Results

The following are main results from the HH Survey. However, it should be noted that the below results are only from the very limited number of 420 sample HHs and they may not show the real tendency of the entire communities.

1) Condition and Consciousness Concerning Housing Reconstruction

- Out of 420 HHs interviewed 408 (97%) were to rebuild their houses, ten were to repair the house and two said they will stay in a temporary shelter as they have no money to rebuild the house.
- Among the 408 HHs who were to reconstruct the house, only six have started the work at the time of the survey.
- Among the 408 HHs who were to rebuild their houses, 250 (61%) think they can manage while the rest do not. There is considerable difference between VDCs: 93% of respondents in Barhabise and more than 70% of those four VDCs in Chautara Cluster responded that they can manage while only 25% in Bungkot and 34% in Barpak responded they can manage.
- According to the respondents who have not started reconstruction, the main reasons for not starting were: financial constraints (74%), waiting for government guidelines including reconstruction subsidy norms and process (45%) and not knowing how to build earthquake resilient houses (32%).
- Regarding housing construction, the respondents are concerned about; finance (81%), technical knowledge (65%), lack of water (39%), shortage of masons or trained masons (21%), getting materials (19%), and government policies/decisions (10%).

- The majority of the respondents have to demolish (96%) and/or clear debris (99%) in order to reconstruct or repair the house.
- When asked what are their sources of information on housing construction, out of 420 respondents, 267 (64%) said that they have not received any information concerning housing reconstruction. Others mentioned neighbours (23%), government offices (4%), and radio (4%), NGO (3%), as their information source.
- For the support of the transportation of materials, most respondents preferred setting up a distribution point (86%) and provision of tarpaulin (82%). For the selection of a housing design, the most preferred support was: setting up an assistant station (87%), providing a volunteer who supports the selection of a housing model (85%), and providing a model house in the VDC (58%). For the construction of houses, many found it helpful in setting up an assistant station (88%), arranging an inspection volunteer (83%), and arranging a support volunteer (76%). For getting subsidies and loans, many respondents across the VDCs found the following useful; arranging a support volunteer (81%) and setting an assistant station (80%).



Source: JICA Project Team

Figure 2.3.1 Expected Support for Housing Reconstruction

2) Cost Aspect of Housing Reconstruction

- The estimated cost of rebuilding the house ranged from NPR 80,000 to 10,000,000. Out of 408 respondents who are to rebuild the house, 63 (15%) estimated less than NPR 500,000, 170 (42%) between NPR 500,000 and 1,000,000, and 160 (39%) over NPR 1,000,000. The

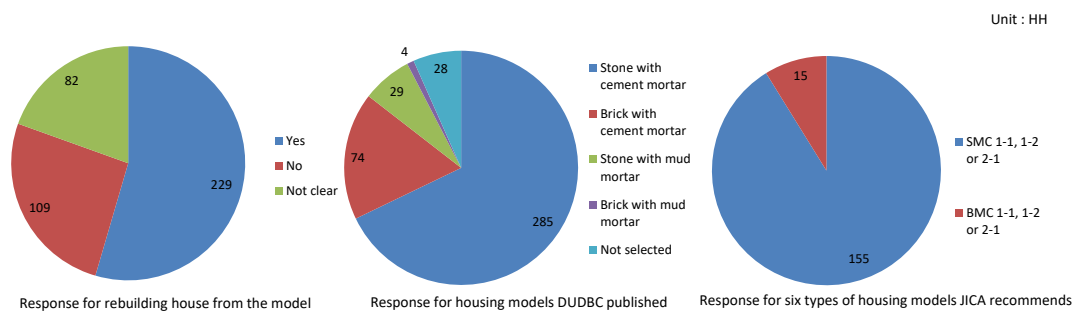
average estimated cost was NPR 1,034,000. The average differs considerably among VDCs. For Sindhulkot the average is NPR 675,000 while that of Chautara is over NPR 2,000,000, nearly three times of the former. It also differs between different economic groups; the average is NPR 1,480,000, NPR 1,034,000 and NPR 546,000 for groups of high, middle and low economic status, respectively.

- Among the 408 HHs who are to rebuild the houses, 160 (39%) have less than Rs100,000 to spend for rebuilding the house, 194 (48%) have between NPR 100,000 and NPR 500,000 and 52 (13%) have more than NPR 500,000. The average is NPR 225,000 though it varies from zero to five million. Out of 160 HHs who have less than NPR 100,000, 109 say they have no money at all to spend. The average among VDCs ranges from NPR 112,000 in Fatakshila to NPR 601,000 in Chautara. The difference is even bigger among different economic groups: the average is NPR 434,000, NPR 205,000 and NPR 36,000 at groups of high, middle and low economic status.
- Cement is only available at certain places. Gorkha Bazaar caters for not only the Gorkha area such as Bungkot but also for Barpak, which is about 60 kilometres away. For those who live in the Chautara area, Chautara or Banepa are the nearest. Barhabise and Melamchi also have their market places at their centre where cement can be purchased. The price of cement (50 kg) has more or less doubled due to the border closure of late 2015 from NPR 700-750 to NPR 1000-1300. For those who live far from the market places, the cost of transportation is added and the price becomes considerably high.

3) Condition and Consciousness on Seismic Resistant Housing

- Majority (97%) of respondents think they can build a stronger house than the previous one. Many are aware that the use of cement will strengthen the house and the use of concrete blocks, RCC or rebar will also make it stronger. They are eager to learn new techniques to build earthquake resilient houses. In the target areas, many respondents experienced or witnessed devastating damages caused by the collapse of heavy stone walls. Recounting this experience, many respondents mentioned that building a one-story house or a wooden house will be useful to avoid heavy casualties in the event of another earthquake.
- Out of 420 HHs, 311 (74%) said they have used cement before although only 245 (58%) responded that they know how to use cement. Some NGOs supported communities in the area are to build outdoor latrines using cement before and after the earthquake, so many have used cement on that occasion. However, some respondents explained that the actual work was done by masons and they are not confident about how to mix or use it properly.
- Knowing that cement makes the house twice as strong, 363 HHs (87%) said they intend to use cement though some were not sure if they can afford it or not. 53 HHs responded that they will not use cement due to high cost or difficulty in transporting it to the building site, especially in Barpak.

- Out of 420 HHs, 206 (49%) have heard about the housing models that DUDBC published and 138 HHs (33%) have actually seen them (the survey was conducted in January-February 2016). The ratios of respondents who have heard or seen the models differ from VDC to VDC. For example, 70% of the respondents in Shikhapur have seen the models while in Pipaldanda only 10% of respondents have seen them.
- The ratio of respondents who saw the housing models is 49%, 36% and 14% of high, middle, and low economic group, respectively. Major information source of the housing models was the government office (DDC, Municipal Office, or VDC) followed by radio and neighbours.
- When asked if they are to build a house from the model, 229 (54.5%) said “yes”, 109 (26%) said “no” and 82 (19.5%) said “they don’t know”. Those who said “no” include twelve respondents who will not rebuild the houses. The reasons for not building a house from the model were mainly two: either the cost is too high or none of the model suits their choice. In urban areas such as Chautara and Melamchi, several respondents explained that they want to build a house which caters for their business purposes in addition to their residence. For those people, the models published are not suitable.
- Looking at the seventeen housing models DUDBC published, out of 420 respondents 285 (68%) selected models with stone with cement mortar (SMC), 74 (18%) selected brick with cement mortar (BMC), 29 (7%) selected stone with mud mortar (SMM) and four (1%) selected brick with mud mortar (BMM).
- JICA recommends six types of housing models, i.e. SMC 1-1, 1-2 and 2-1, and BMC 1-1, 1-2 and 2-1 for their resilience. The number of respondents who selected SMC 1-1, 1-2 or 2-1 were 155 (37%) and those who selected BMC 1-1, 1-2 or 2-1 were 15 (4%). Altogether 170 respondents (40%) selected one of these six models. The ratio of respondents who selected these six models by the three economic groups (each 140 HHs) is 35 (25%), 52 (37%) and 83 (59%) at high, middle and low economic group, respectively.
- For the reasons for selecting a particular model, the majority of respondents cited its strength, style and space, followed by materials and cost.



Source: JICA Project Team

Figure 2.3.2 Tendency Towards Residential Models

Chapter 3 Digital Map Information

3.1 Satellite Imagery Preparation and Geo-Information Collecting

When a disaster occurs, the latest geographic information indicating actual situation is necessary to identify the wide range of damaged area and situation quickly and also to support the subsequent preparation of the “recovery and reconstruction plan”. After the earthquake, the latest geographical information was the map of scale 1 / 25,000 (Analog method, scale 1 / 50,000 for mountain part), published in 2001 by the Survey Department (SD) of Nepal.

Under this situation, the JICA Project Team carried out disaster damage identification by photointerpretation using satellite images and digital topographic map data creation (“Reconstruction Support Map”) for Kathmandu Valley. Moreover, integrated geographic information such as various thematic maps and elevation data models were shared with related organizations as a base map for the recovery and reconstruction planning.

Identification of disaster situation by satellite image

- Acquire information of disaster damage area

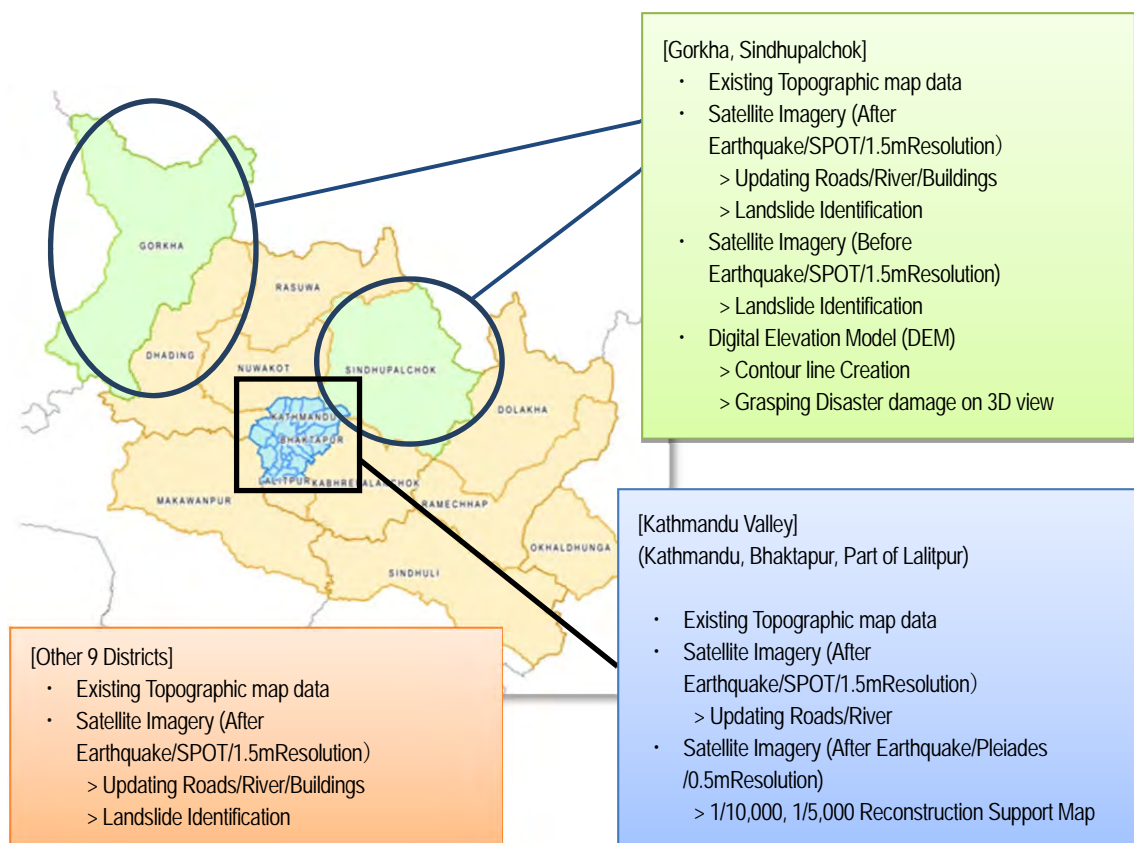
Existing information collection and elevation data model creation

- Identification and analysis of hazard area

Preparation of Kathmandu Valley Reconstruction Support Map for recovery and reconstruction plan, and Hazard Map

- Preparation of geographic information sharing with related organizations

In this activity, the Project Team had coordinated with the Nepal Geo-Information from the Survey Department (SD) of Nepal. For further effective utilization of the Geo-Information, the Project Team Requested SD of Nepal and the Nepal Mapping Committee to scrutinize the Kathmandu Valley Reconstruction Support Map.



Source: JICA Project Team

Figure 3.1.1 Collected Information in Each District

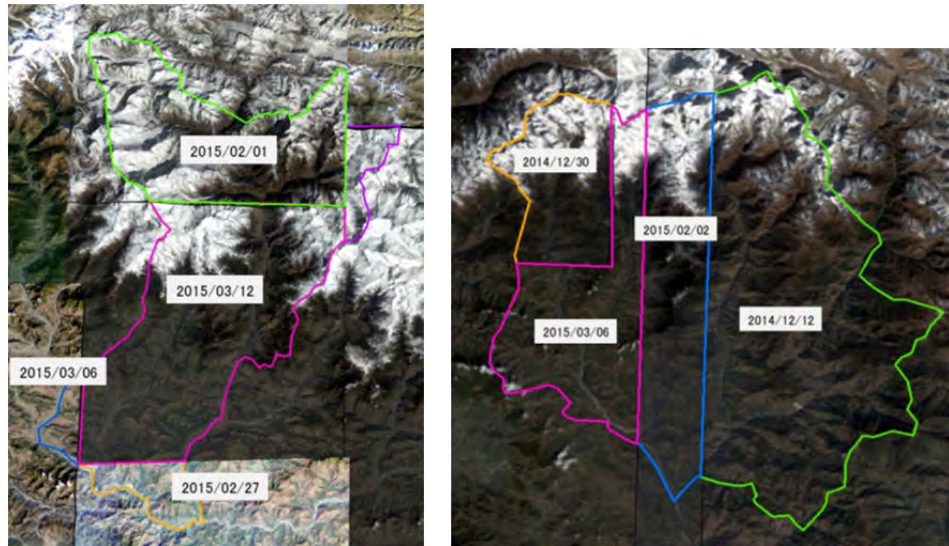
Table 3.1.1 List of Satellite Imagery and Geo-information

Work	Data	Area	Situation	Remarks
Kathmandu Valley Reconstruction Support Map	Satellite Imagery Pleiades	Kathmandu Valley 721 sq. km	Purchased	Stereo image 0.5m Resolution
Landslide Identification	Satellite Imagery SPOT After Earthquake	14Districts Project Area 22,771 sq. km	Purchased	Image 1.5m Resolution Archive (May 2015 -)
	Satellite Imagery SPOT Before Earthquake	Gorkha Sindhupalchok 6,130 sq. km	Purchased	Image 1.5m Resolution Archive (- March 2015)
Hazard map	Existing Topographic map Survey Department(SD) Nepal Vector data	14Districts Project Area 22,771 sq. km	Purchased	SHP Format Attribute information (1992) 1/25,000 (Partially1/50,000)
Geo-information updating of the project area	Existing Topographic map SD Nepal Raster image	14Districts Project Area 22,771 sq. km	Purchased	Tiff Format (1992) 1/25,000 (Partially1/50,000)
	Existing Topographic map SD Nepal Printed map	Gorkha Sindhupalchok 44Sheets	Purchased	(1992) 1/25,000 (Partially1/50,000)
	Digital Elevation Model (DEM) Before Earthquake	Gorkha Sindhupalchok 6,130 sq. km	Purchased	World Digital 3D Terrain Data 5m Index Archive (2011)

Source: JICA Project Team

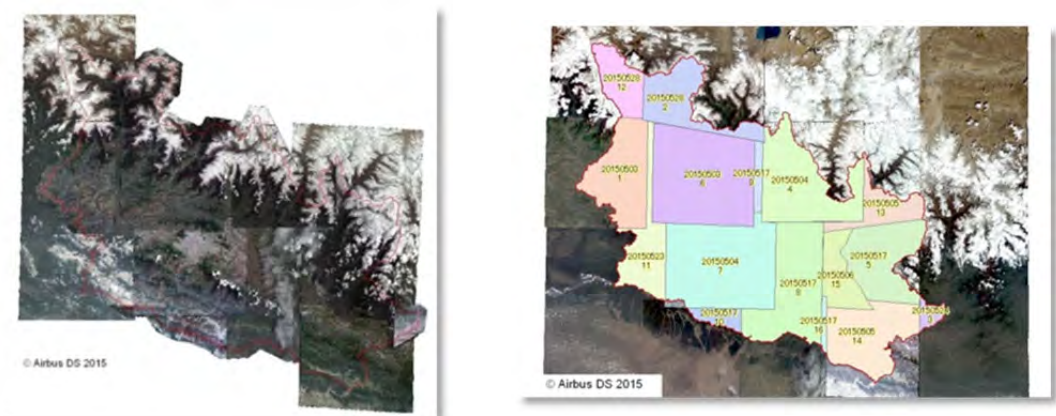
The archived Satellite Imageries of before and after the earthquake were purchased and were utilized to understand the damage from the earthquake. For example, the landslides before the earthquake and the landslides after the earthquake were categorized with the imageries.

Since the Geo-information of the existing topographic map of SD Nepal is too old to utilize for the project activities, Geo-information updating from satellite imageries were carried out to acquire the information of road, rivers and buildings in the Target Area.



Source: JICA Project Team based on Airbus DS 2015

Figure 3.1.2 Satellite Imagery SPOT (Before the Earthquake) Scene Area



Source: JICA Project Team based on Airbus DS 2015

Figure 3.1.3 Satellite Imagery SPOT (After the Earthquake) Scene Area

Table 3.1.2 List of Satellite Imagery SPOT (Before the Earthquake)

No	File name	Date
1	DS_SPOT6_201412300445200_FR1_FR1_FR1_FR1_E085N28_01546	2014/12/30
2	DS_SPOT6_201502010441050_FR1_FR1_SE1_SE1_E085N29_01871	2015/02/01
3	DS_SPOT6_201502270441199_FR1_FR1_SE1_SE1_E085N28_01790	2015/02/27
4	DS_SPOT6_201503060436156_FR1_FR1_SE1_SE1_E085N28_03170	2015/03/06
5	DS_SPOT6_201503060436156_FR1_FR1_SE1_SE1_E085N28_03170	2015/03/06
6	DS_SPOT6_201503060436407_FR1_FR1_SE1_SE1_E084N28_04307	2015/03/06
7	DS_SPOT7_201412120434184_FR1_FR1_SE1_SE1_E086N28_03251	2014/12/12
8	DS_SPOT7_201502020434147_FR1_FR1_SE1_SE1_E086N27_04550	2015/02/02
9	DS_SPOT7_201503120441425_FR1_FR1_SE1_SE1_E085N28_01871	2015/03/12

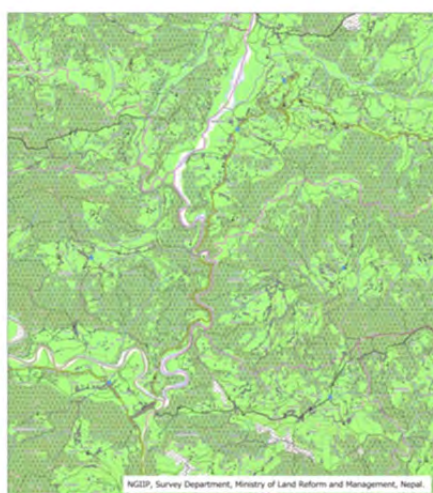
Source: JICA Project Team based on Airbus DS 2015

Table 3.1.3 List of Satellite Imagery SPOT (After the Earthquake)

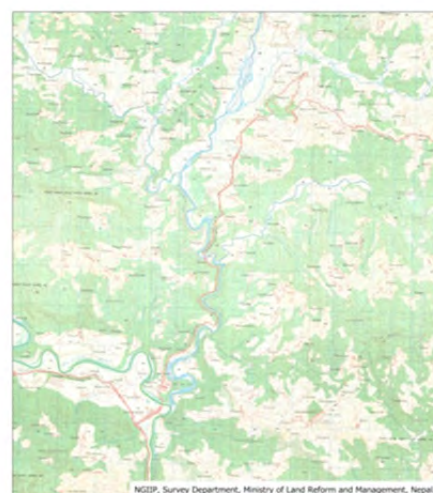
No	File name	Date	No	File name	Date
1	01_PSH_27-20150503044127170778	2015/05/03	8	10_PSH_231-20150517043431018544	2015/05/17
2	02_PSH_202-20150528044606508462	2015/05/28	9	11_PAN_129-20150523043450673363P	2015/05/23
3	03_PSH_333-20150524042903123835	2015/05/24	10	13_PSH_56-20150505042520187194	2015/05/05
4	04_PSH_231-20150504043209163947	2015/05/04	11	08-09-16_PSH_231-20150517043313448632	2015/05/17
5	05_PSH_231-20150517043218049824	2015/05/17	12	12_PMS_202-20150528044620920106	2015/05/28
6	06_PSH_27-20150503044057258839	2015/05/03	13	14_PMS_56-20150505042659007897	2015/05/05
7	07_PSH_231-20150504043324414248	2015/05/04	14	15_PMS_260-20150506041726928537	2015/05/06

Source: JICA Project Team based on Airbus DS 2015

For the existing topographic map data, information with various attributes (e.g. Public Facilities, Roads, Administrative Boundaries, Land use, Vegetation, etc.) were summarized on GIS so that it can be utilized in other tasks. Then, thematic maps for Risk areas and Resettlement Plans, Accessible VDCs, and Statistical data were created.



*Symbolized on GIS

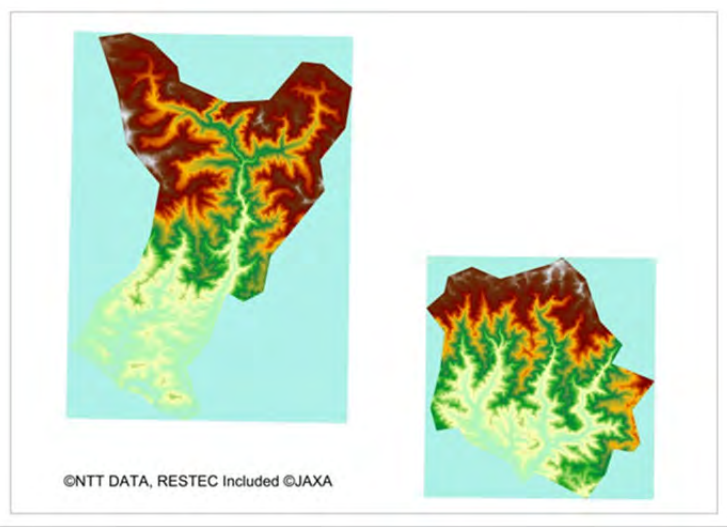


*Raster Image

Source: JICA Project Team based on SD Nepal

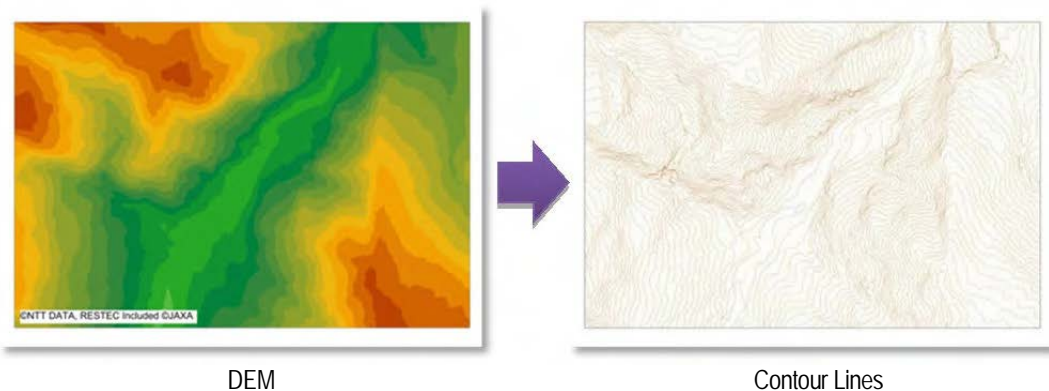
Figure 3.1.4 Existing Topographic Map Data

For the Digital Elevation Model (DEM), contour lines were extracted from DEM by GIS so that it can be utilized as a base map for various thematic maps and Slope analysis in the risk areas.



Source: JICA Project Team based on NTT DATA

Figure 3.1.5 Digital Elevation Model (DEM) in Gorkha and Sindhupalchok



Source: JICA Project Team based on NTT DATA

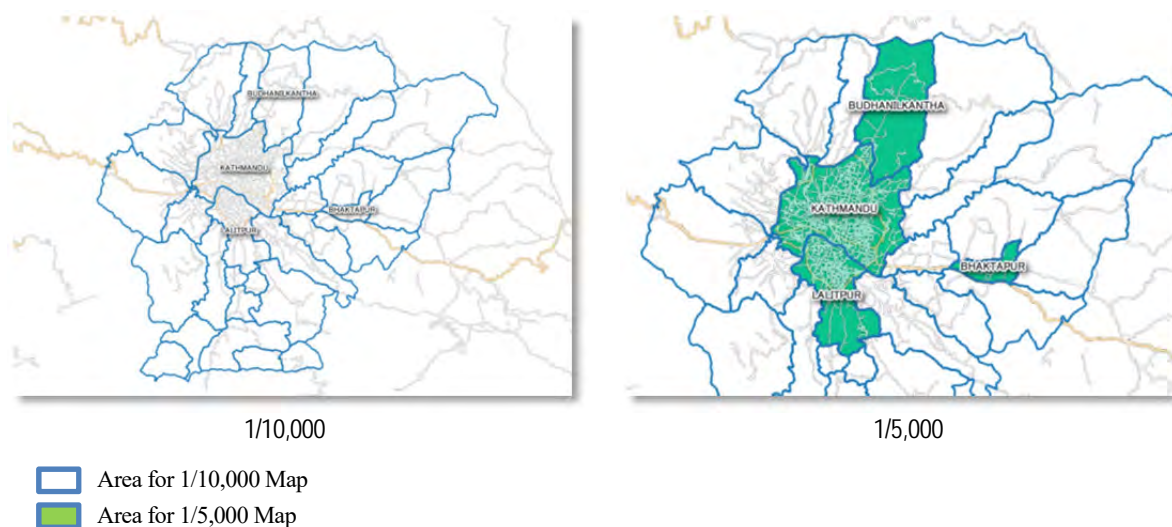
Figure 3.1.6 Contour Lines Extracted from DEM

3.2 Kathmandu Valley Reconstruction Support Map

3.2.1 Preparation of Maps

The Reconstruction Support Map was prepared with the new Satellite Imagery taken in November 2015. The 1/10,000 scale imagery has been utilized for the Kathmandu Valley and the 1/5,000 scale for the specific city area in Kathmandu Valley.

- 1/10,000: 721 square km ->Kathmandu Valley
- 1/5,000: 121.38 square km ->Bhaktapur/Lalitpur/Kathmandu/Budhanilkantha



Source: JICA Project Team

Figure 3.2.1 Target Area of Kathmandu Valley Reconstruction Support Map

3.2.2 Specification

Regarding the mapping work, work specifications were drafted based on the specifications of the “Survey Operation Manual of JICA (for the National Base Map), 2011, JICA”. The specification along with planning documents was authenticated by the SD Nepal and the Nepal Mapping Committee in March 2016.

Table 3.2.1 List of Survey Standard for the Mapping Work (1/2)

Reference Ellipsoid (Spheroid)	WGS_1984 a = 6378137.0 m f = 1/298.257223563
Projection System (WGS1984_UTM_Zone_45N)	WGS1984_UTM_Zone_45N Projection parameters: Scale factor: 0.9996 at the central meridian Latitude of origin: 0° 0' 0" North Central Meridian: 87° 00' 00" East False Easting: 500,000 m False Northing: 0.00 m
Projection System (Lambert Conformal Conic Projection)	Lambert Conformal Conic Projection parameters: Latitude of origin: 28° 22' 40.920996" North Central Meridian: 84° 00' 00" East Standard Parallel1: 27° 00' 00" North Standard Parallel2: 29° 45' 00" North False Easting: 500,000 m False Northing: 500,000 m
Height Standards	Existing BM in Kathmandu (Based on Indian ocean MSL)
Ground Control Points	Horizontal Control: 12 points (X,Y,Z) GNSS/GPS Static method (Accuracy: Standards deviation 0.2m) Vertical Control: 12 points (Approx. Distance 200km) Differential Levelling (Accuracy: Standards deviation 0.2m)

Table 3.2.1 List of Survey Standard for the Mapping Work (2/2)

Aerial Triangulation	Satellite Imagery: 10 stereo pairs GCP Tolerance of Residual: (Horizontal: Standards deviation 1.0m ; Maximum 2.0m) (Height: Standards deviation 1.25m ; Maximum 2.5m) Tie Points: More than 6 Points per 1 scene Tie Points Tolerance of Residual: (Standards deviation 0.5m ; Maximum 1.0m) Adjustment Calculation : Bundle Method
DEM	DEM: Grid Interval 35m (Elevation Accuracy 2.5m)
Digital Orth photo	Horizontal Accuracy 3.5m

GNSS: Global Navigation Satellite System in a generic name of positioning system using satellite such as GPS, GLONASS, GALILEO.

Source: JICA Project Team

3.2.3 Copyrights of the Map

Regarding the copyrights of the maps, the JICA Nepal Office offered the Survey Department (SD) of Nepal to confirm the following conditions of the Map:

1. The Map produced in the Project belongs to both of SD Ministry of Land Reform and Management, Government of Nepal and JICA.
2. SD and JICA keep the master-copy of the Map.
3. JICA agreed to allow SD to modify, update or convert the Map. Copyright on the updated, modified or converted Map belongs only to SD.
4. JICA agreed to allow SD to provide the Map to public with an appropriate price.
5. SD agreed to allow JICA to provide the Map to a person or organization in Japan who agreed to the conditions indicated as follows:
 - a) Not use the Map for any profitable purpose
 - b) Not transfer the Map to any other people or organization
 - c) Only use for the purpose applied to JICA

Table 3.2.2 List of Geo-Information for the Map

Feature Class	Feature Name	Acquisition method
Road	Highway/ Road/ Road narrow/ Road GIS/ Footpath/Trail/Track	Photo-interpretation
Road Facility	Bridge/ Bridge narrow/ Bridge small/ Suspension Bridge/ Pedestrian overpass/ Road Tunnel/ Road Tunnel narrow/ Runway	Photo-interpretation Field Verification
Building	Bus Terminal/ Commercial/ Factory/ Fire Station/ Health Post/ Hospital/ Petrol Station/ Police Station/Post/ Power/Transformer Station/ Building/ School/ Monument/ Chimney/ Administrative Government office/ Military/ Community Centre/ Stadium	Field Verification
Religious Building	Hindu temple/ Stupa/ Mane/ Church/ Mosque/ Cemetery/ Crematorium/ Buddhist temple	Field Verification
Other Structure	Quarry/Mining/ Ruin building/ Wall	Photo-interpretation
Contour	Index/ Intermediate/ Supplementary	Photo-interpretation
Topography	Embankment/ Cutting/ Cliff/ Depression/ Spot elevation	Photo-interpretation
Vegetation	Cultivation/ Forest/ Plantation/Orchard/ Grass/ Bush/Bamboo/Scattered	Photo-interpretation

Feature Class	Feature Name	Acquisition method
	tree/ Single tree/ Barren Land	
Hydrography	River/ Streams/ Canal/ Pond or lake/ Water Tower/ Water Tank	Photo-interpretation
Utility	High Tension line/ Pylon	Photo-interpretation Existing Information Field Verification
Administrative area	International Boundary/ Region/ Zone/ District/ VDC or Municipality/ Ward/	Existing Information
Designated Area	National Parks or Wild Life Reserves/ Park/ Waste Site	Photo-interpretation Existing Information Field Verification
Annotation	Road name/ River name/ Mountain name/ Facility name/ Other name	Existing Information Field Verification

Source: JICA Project Team

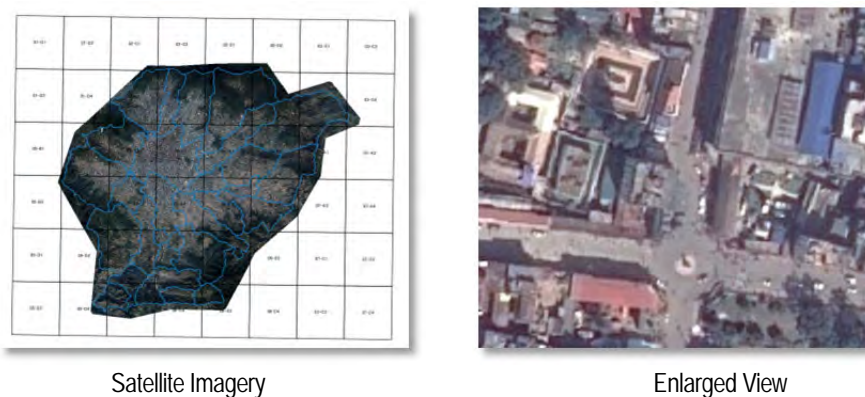
3.2.4 Satellite Imagery

The Satellite Imagery, which covers the Target Area (721 sq. km), was taken.

Table 3.2.3 List of Specification of Satellite Imagery

Type of Satellite	Pleiades
Photography Time	November 2015
Products	Panchromatic: 50cm Multispectral: 2m Colour: 50cm (merge) Bundle: 50cm panchromatic; 2m multispectral
Imagery format	DIMAP V2 format containing either a JPEG 2000 or a GeoTIFF

Source: JICA Project Team



Source: JICA Project Team based on © 2015CNES – Distribution Airbus DS

Figure 3.2.2 Satellite Imagery « Pleiades »

3.2.5 Subcontract

Field surveys including GCP Survey, Field Verification, and Field Completion have been implemented by a local company under the supervision of the Project Team. For the contract with the local company, a survey company nomination list was made from the information of local consulting companies considering company conditions, such as equipment, experience, and

engineers. The contract company was selected through competitive bidding.

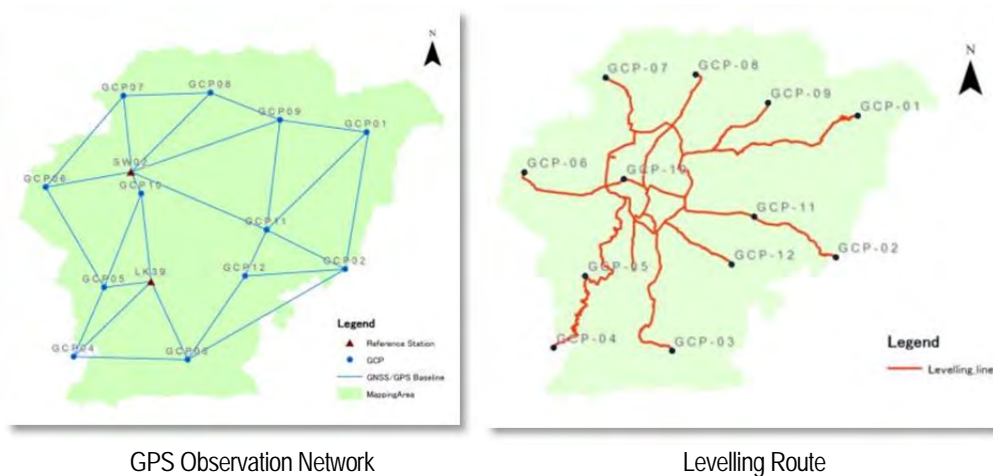
3.2.6 GCP Survey

In order to create a map from Satellite Imagery, the relationship between image space and real ground space needed to be identified. For this purpose, Ground Control Points (GCP), which are the actual points appearing in the image, and has known ground coordinates and elevation, are to be used. GCP Survey is a field work for installation and measurement coordinates and elevation by GNSS & Levelling of the GCP.

Table 3.2.4 List of GCP Survey Work Methods

No.	Contents	Method	Quantity	Remarks
1	GNSS	GNSS Static	12 points	Observation for new 12 GCPs for Horizontal and Vertical control.
2	Levelling	Differential Levelling	12 points approx. 200km	Observation for new 12 GCPs for Elevation.
3	Calculation	Network Adjustment	12 points	Baseline Analysis/ Fully Constrained Network Adjustment

Source: JICA Project Team



Source: JICA Project Team

Figure 3.2.3 GCP Survey Observation Plan

3.2.7 GPS

In order to determine the Horizontal control / coordinates of GCP, GPS observation was implemented. GNSS receivers at stations receive signals from four or more satellites simultaneously during a same time observation, or a session, for several hours.

Table 3.2.5 List of GCP Coordinates and Accuracy

GCP Name	Latitude	Longitude	Ellipsoidal Height	Horizontal Position		Height Position	
				Standard Deviation	Tolerance	Standard Deviation	Tolerance
gcp01	27° 44' 58.71088"	85° 29' 48.31828"	1754.8769	0.0125	0.1000	0.0242	0.2000
gcp02	27° 38' 28.30969"	85° 28' 45.48620"	1467.2054	0.0141	0.1000	0.0269	0.2000
gcp03	27° 34' 04.71652"	85° 20' 24.95291"	1473.2790	0.0139	0.1000	0.0257	0.2000

GCP Name	Latitude	Longitude	Ellipsoidal Height	Horizontal Position		Height Position	
				Standard Deviation	Tolerance	Standard Deviation	Tolerance
gcp04	27° 34' 08.74177"	85° 14' 20.57883"	1777.8803	0.0141	0.1000	0.0238	0.2000
gcp05	27° 37' 27.59992"	85° 15' 54.90726"	1491.6070	0.0052	0.1000	0.0098	0.2000
gcp06	27° 42' 10.52928"	85° 12' 42.91290"	1370.6420	0.0076	0.1000	0.0157	0.2000
gcp07	27° 46' 33.81961"	85° 16' 48.23876"	1373.7212	0.0118	0.1000	0.0237	0.2000
gcp08	27° 46' 45.89007"	85° 21' 26.92401"	1388.7277	0.0117	0.1000	0.0231	0.2000
gcp09	27° 45' 30.83724"	85° 25' 10.93479"	1333.8038	0.0111	0.1000	0.0225	0.2000
gcp10	27° 41' 56.08697"	85° 17' 49.76490"	1240.3625	0.0073	0.1000	0.0149	0.2000
gcp11	27° 40' 17.36205"	85° 24' 32.34925"	1261.3875	0.0122	0.1000	0.0241	0.2000
gcp12	27° 38' 05.01920"	85° 23' 25.42717"	1350.0532	0.0142	0.1000	0.0269	0.2000

Source: JICA Project Team

3.2.8 Levelling

In order to determine the Vertical control or elevation of GCP, Differential Levelling was implemented. The levelling route is tied/looped/opened with existing stations. The observation result is evaluated from the disclosure of the Double-run.

Table 3.2.6 List of Ground Control Point Elevation and Accuracy

Station from	Station to	Distance [km]	Elevation [m]	Closure Error [m]	Tolerance [m]
BM100-266-3	BM08	31.05		-0.002	0.223
BM15	BM115-017.1	0.10		0.000	0.013
BM05	BM115-075	0.12		0.006	0.014
BM19	BM115-107	1.05		0.001	0.041
BM100-266-3	BM100-273	3.21		-0.011	0.072
BM100-266-3	GCP10	2.39	1288.352	-0.004	0.062
BM22	BM11	3.35		-0.001	0.073
BM100-266-3	BM04	3.82		-0.003	0.078
BM22	BM18	6.00		-0.004	0.098
BM23	BM07	2.28		0.001	0.060
BM13	SW-02	1.38		-0.002	0.047
BM20	GCP01	20.10	1798.500	-0.021	0.179
BM21	GCP09	9.04	1378.827	0.011	0.120
BM05	GCP11	6.21	1306.722	0.000	0.100
GCP11	GCP02	8.53	1512.437	-0.003	0.117
BM06	GCP12	7.11	1396.055	0.010	0.107
BM07	GCP03	14.23	1522.155	0.011	0.151
BM08	LK-39	4.07		-0.004	0.081
BM10	GCP05	18.25	1540.748	-0.027	0.171
GCP05	GCP04	11.40	1828.366	-0.012	0.135
BM11	GCP06	7.96	1419.507	0.006	0.113
BM16	GCP07	7.27	1419.791	-0.007	0.108
BM18	GCP08	5.48	1433.734	0.002	0.094

Source: JICA Project team

3.2.9 National Survey Control Points

The Kathmandu Valley Reconstruction Support Map must consider the significant shifts of the locations of the existing national survey control points due to the earthquakes. According to the SD of Nepal, after the earthquakes, the existing survey control points in Kathmandu City have been inspected by GNSS observation with Continuous Operating Reference Stations (CORS) installed in neighbouring countries. As a result, 1m - 2 m shifts from the original positions have been confirmed.

The shift of the national survey control points means that existing Bench Marks for reference point of elevation have been moved as well. Because the elevation was determined from a reference point in India, verification of the elevation from India is required.

Re-calculation for the survey control points to revise the coordinates and elevations is planned by the SD of Nepal using the national budget. Actually, it is difficult to implement and revise these items during this Project. Therefore, it has been authenticated by the Nepal Mapping Committee that the Kathmandu Valley Reconstruction Support Map will be implemented in the following method.

For the Horizontal control, or XY coordinates, two existing national survey control points were selected as reference stations of GNSS observation, and the tentative coordinates were provided based on CORS, by the SD of Nepal for the Mapping Project.

For the Vertical control or Elevation, [BM 100-266.3] located in Kathmandu City, was selected as a starting point of Levelling observation, and other existing reference points were observed based on this starting point in order to inspect the shifts by the Earthquakes.

Table 3.2.7 List of Inspection Result of Reference Bench Marks (Elevation)

Station	Elevation by Observation [m]	Survey Dept. Records [m]	Difference [m]
100-266.3	1285.808	1285.808	-
115-075	1292.516	1292.557	0.041
100-273	1294.236	1294.217	-0.019
115-017.1	1296.343	1296.389	0.046
115-107	1307.204	1307.266	0.062

Source: JICA Project Team

As a result, a maximum 6.2cm difference in comparison with the Elevation Records of the SD of Nepal has been confirmed. This is sufficient accuracy for the 1/5,000 scale map, considering that within 1.66 m height accuracy, [Standard Deviation] is required.

3.2.10 Aerial Triangulation

Digital Aerial Triangulation provides the Digital Elevation Model and the Digital Orth photo, through measurement of image coordinates of control points and tie points through the digital photographic survey method, and adjustment calculation to obtain the exterior orientation parameters, which are sensor location and attitude, or the rational polynomial coefficient (RPC) of the Satellite Imagery.

Table 3.2.8 List of Quality Control of Aerial Triangulation

Item	Residual		Tolerance	
	Standard Deviation	Maximum	Standard Deviation	Maximum
GCP Horizontal Position	0.03 m	0.12 m	1.0 m	2.0 m
GCP Height	0.03 m	0.04 m	1.25 m	2.5 m
Tie Points	0.17 pixel	1.0 pixel	0.5 pixel	1.0 pixel

Source: JICA Project Team

3.2.11 Field Verification (Identification and Completion)

All the specified features and annotations were verified and identified in the field, and information of the category and the position to be given on the map as attribute information were acquired. Field verification, which is a process during map creation using aerial photo images or satellite images (hereinafter referred to as images), is carried out to identify obscure features on images, hidden parts, shape measurement of features, pricking of targets marking the positions on images, and things that are not captured on images such as place names and facility name. This work has been carried out by local subcontractor supervised by Project Team experts.



Tablet for data collection



Interview in the field

Source: JICA Project Team

Figure 3.2.4 Field Verification Work

3.2.12 Digital Plotting / Compilation

In order to acquire Digital map information from stereo interpretation on satellite imagery, stereo model of satellites imagery was created from the results of aerial triangulation. After digital plotting, digital compilation was carried out to modify some errors. During digital plotting and compilation, the result of the above mentioned field verification was used as reference information. Digital map information was acquired based on map symbol specification and field verification results.

3.2.13 Data Structuration

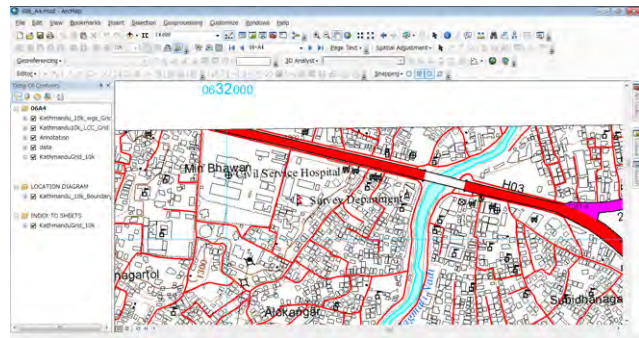
The map data that was created in the digital compilation was structured in the available digital format on GIS as a GIS database.

3.2.14 Map Symbolization

All the features were represented by map symbols according to the map symbol regulation on GIS. Moreover, in comparison to the normal topographic map symbols, the symbols and map layout of the Reconstruction Support Map is a simple symbolic representation in consideration of urgency and convenience. Inspection of the draft of the symbolized map has been completed by SD Nepal with comments that include errors, suggestions and advice. Based on the comments from SD Nepal, the final map modification work has been carried out, and then completed.



Digital Photogrammetric System



Map Symbolization

Source: JICA Project Team

Figure 3.2.5 Mapping Process Image

3.2.15 Schedule

Official submission of the final maps and digital map data to the Nepal Mapping Committee through SD Nepal is required to be authenticated. In the discussion with the Nepal Mapping Committee, the SD Nepal agreed that the other JICA projects may use the data from the Kathmandu Valley Reconstruction Support Map.

3.3 Landslide Identification and Geo-Information Updating

For preparing the Hazard map, identification of landslides and update of Geo-information, including roads, rivers, and streams, building points, were implemented with Satellite Imagery by photo interpretation.

For identification of landslides, landslide areas were acquired by photo interpretation in 3D polygonal data on 3D satellite imagery with DEM. Acquired landslide polygons were categorized into “Before the earthquake”, “After the earthquake”, “Accumulated area”, and “Dammed area”, so that it can be utilized for the Hazard Map and risk area analysis.

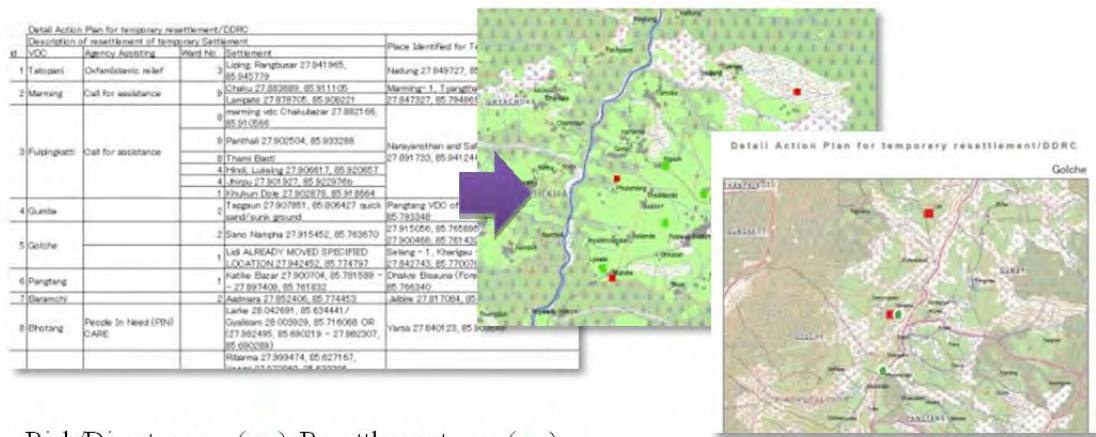
3.4 GIS Activities

Thematic maps were created on GIS based on the various geo-information collected from related organisations.

3.4.1 Resettlement Area

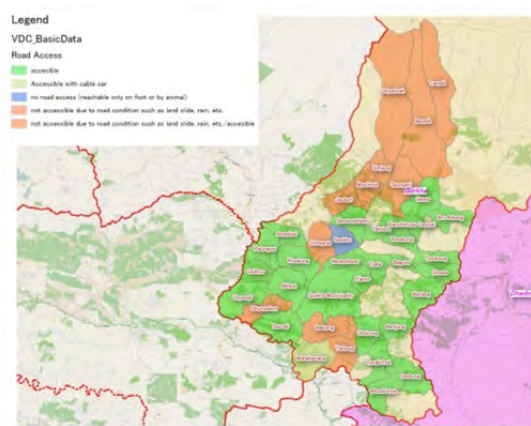
The thematic maps of the resettlement plan indicating Risk/Disaster areas and Resettlement areas were created based on the resettlement plan list provided by the DDRCs (District Disaster Relief Committees) in the Districts of Gorkha and Sindhupalchok.

By using the village name attribute information from the existing topographic map data, the respective position of risk/disaster areas and resettlement areas were plotted on the map for the management of resettlement plans.



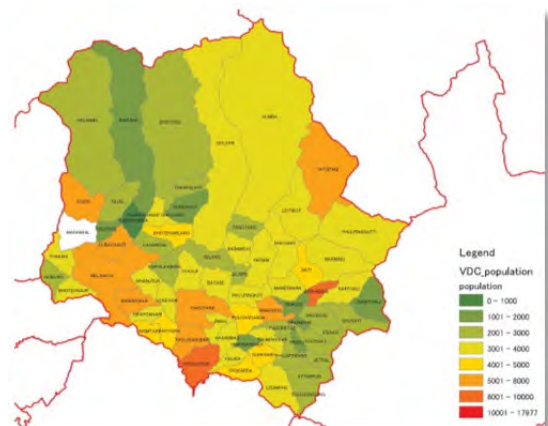
Source: JICA Project Team based on DDRC documents

Figure 3.4.1 Risk/Disaster Area and Resettlement Area



Source: JICA Project Team

Figure 3.4.2 Accessible VDCs



Source: JICA Project Team

Figure 3.4.3 Population Statistics

3.4.2 Social Map on GIS

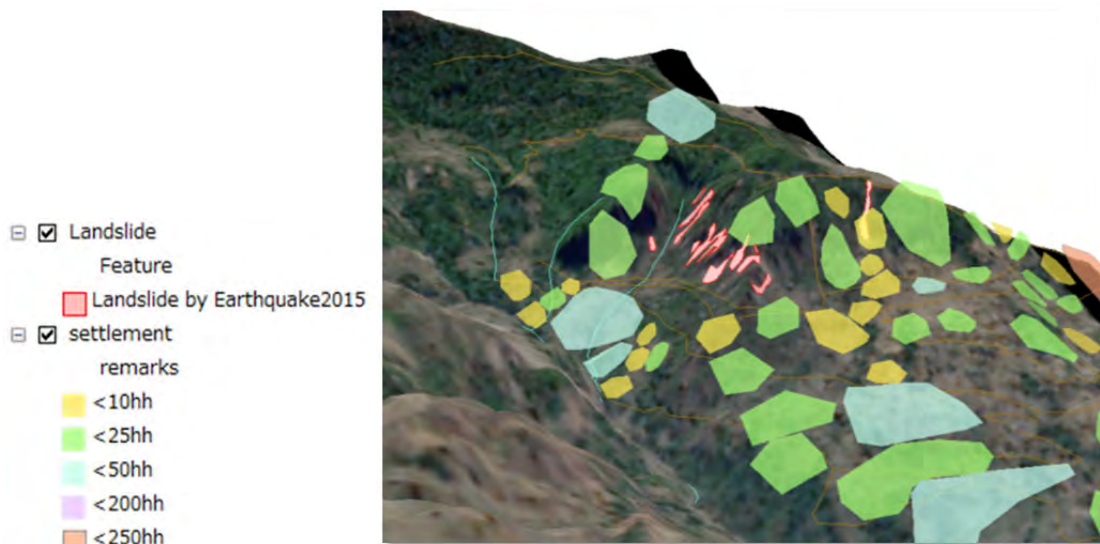
The social resource maps prepared through the social survey under the Project were digitalized on GIS. This can be fully utilized for the Hazard Maps and reconstruction planning with its valuable Geo-Information such as natural resources, public facilities, and road conditions, number of households, landslide locations, and candidate site for materials storage and so on.



Source: JICA Project Team

Figure 3.4.4 Social Map

The information of the Settlement location and Number of Households based on the social map can be overlaid with the landslide area of 3D Satellite Imagery using DEM on GIS.



Source: JICA Project Team based on Airbus DS 2015

Figure 3.4.5 Settlement Information with Landslide on 3D view

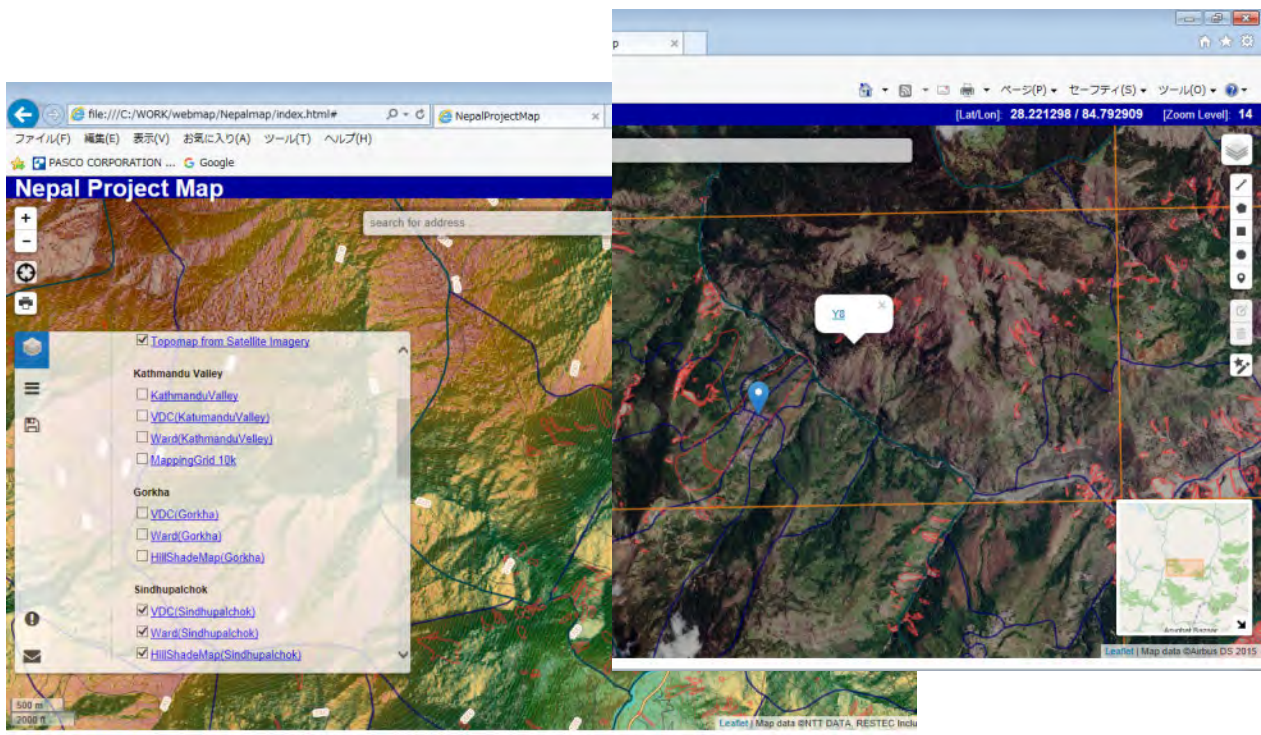
Table 3.4.1 List of Social Map

No.	VDC	District
1	Bungkot	Gorkha
2	Barpark	Gorkha
3	Barhabise	Sindhupalchok
4	Chautara	Sindhupalchok
5	Kubhinde	Sindhupalchok
6	Pipaldanda	Sindhupalchok
7	Sanusiruwari	Sindhupalchok
8	Melamchi	Sindhupalchok
9	Fatakshila	Sindhupalchok
10	Jyamire	Sindhupalchok
11	Talamarang	Sindhupalchok
12	Sindhulkot	Sindhupalchok
13	Shikharpur	Sindhupalchok
14	Bansbari	Sindhupalchok

Source: JICA Project Team

3.4.3 Web Map Viewer

The Geo-information such as Satellite Imagery, landslide area, DEM, and other collected Geo-Information should be shared so that it can be utilized for other activities. In order to share the Geo-Information without special software (GIS), a browser-based map viewer has been developed.



Source: Airbus DS 2015, NTT DATA, prepared by the JICA Project Team

Figure 3.4.6 Collected Geo-Information on Web Map Viewer

Chapter 4 Preparation of Landslide Hazard Map and Activities to Facilitate its Utilization

4.1 Generating Policy

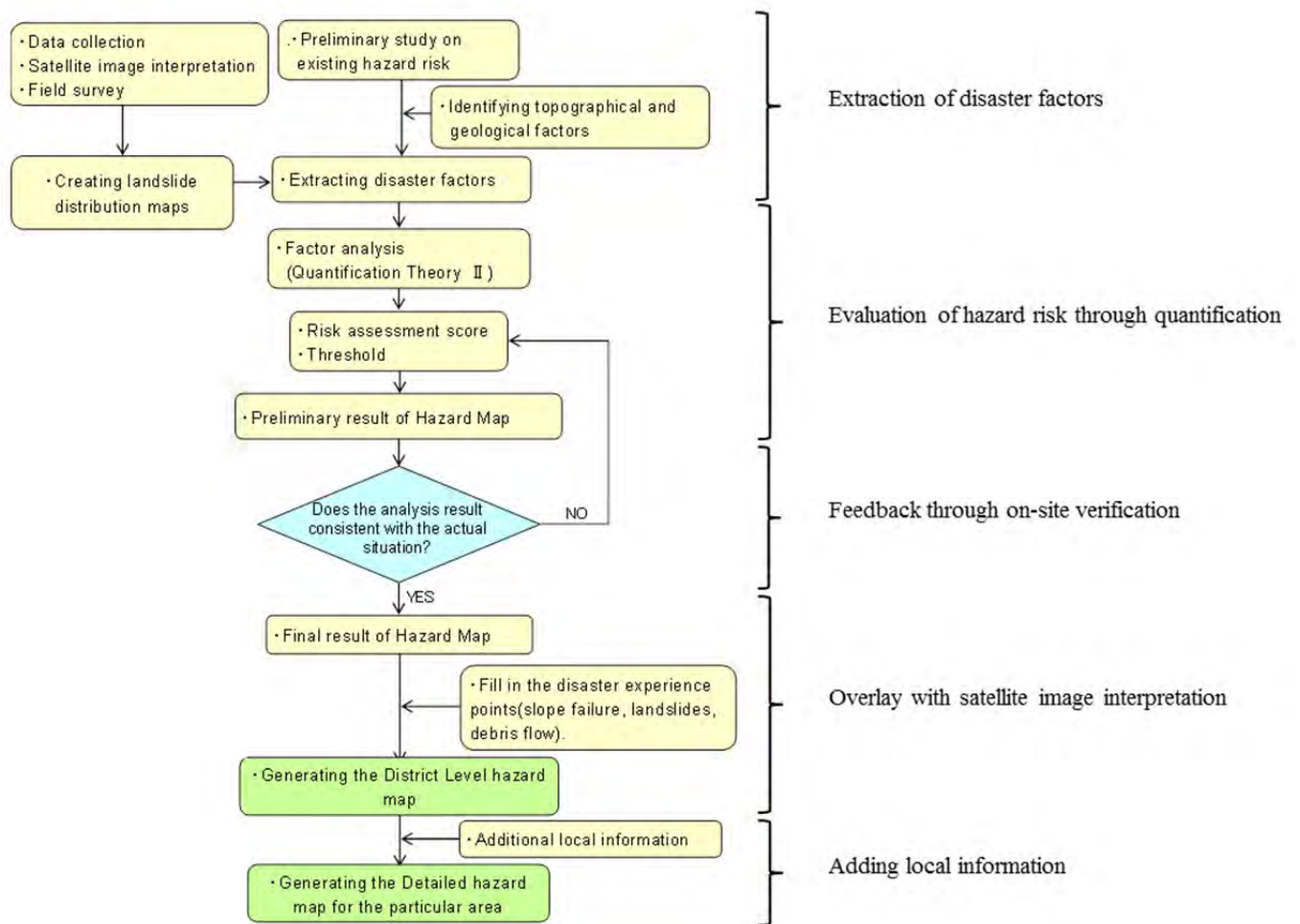
The Landslide Hazard Maps prepared by this Project consist of two types: the District Level Landslide Hazard Map and the Detailed Landslide Hazard Map in a particular area. The District Level Hazard Map is to be utilized for indicating landslide risk areas at the level of districts or for relatively large administrative boundaries. The Detailed Landslide Hazard Map can be used for relatively small areas such as villages or communities.

The prepared Hazard Maps can be used for the preparation of the Rehabilitation and Recovery Plans to be prepared in the two districts of Gorkha District and Sindhupalchok District in order to materialize the concept of Build Back Better through the following:

- Basic data for land use planning
- Utilization and evaluation for residential relocation plan
- Application for road infrastructure reconstruction plan
- Area planning for provincial reconstruction and disaster prevention plan
- Enlightenment of local residents

4.2 Generating Process

Figure 4.2.1 shows the generating process of the Landslide Hazard Map. The main works are shown on the right side of the figure.

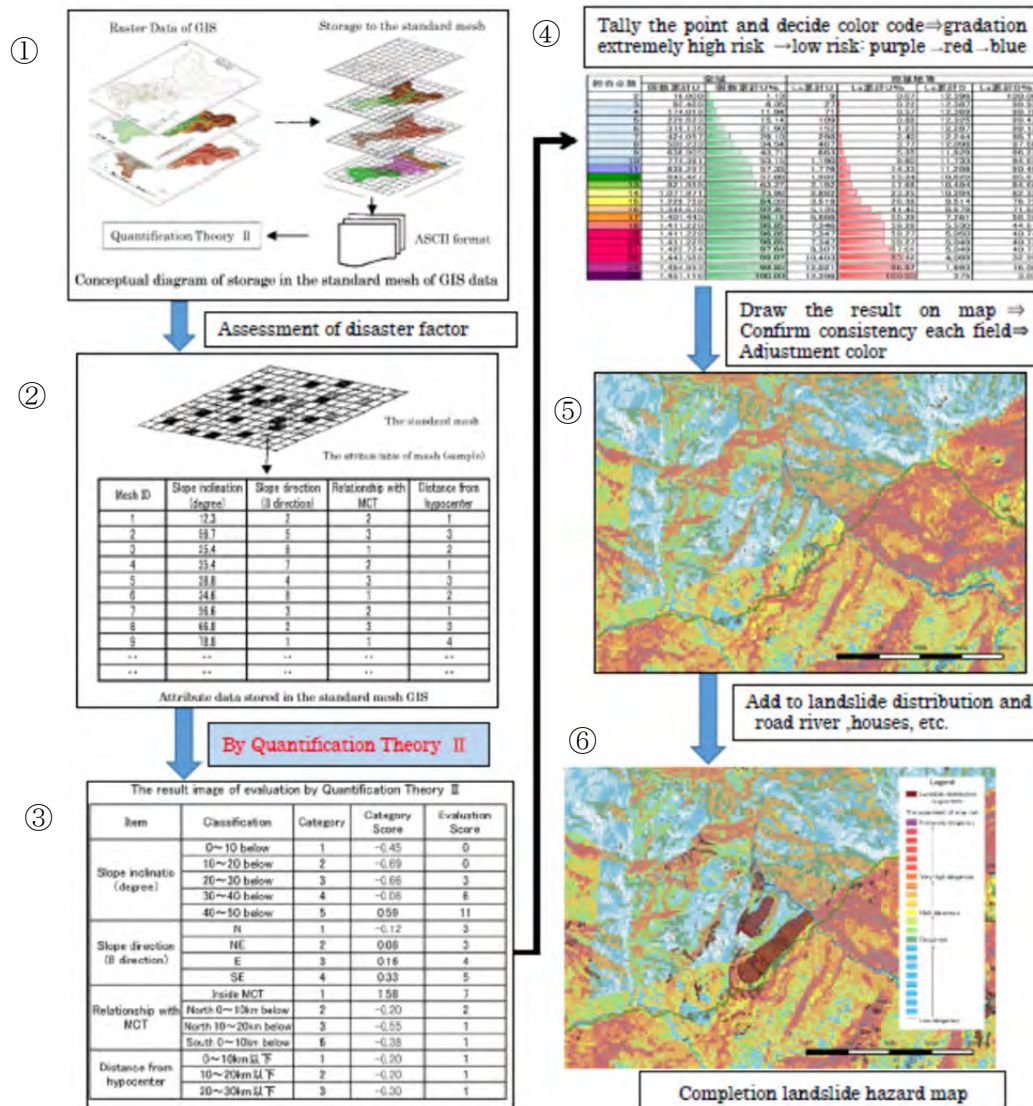


Source: JICA Project Team

Figure 4.2.1 Flow of Development of the Landslide Hazard Maps

Figure 4.2.2 shows the generating process of the Landslide Hazard Map. The main works for each part are listed below:

- ① Overlay of factors related to collapse
- ② Evaluation of each mesh by each factor
- ③ Factor Analysis by Quantification Analysis
- ④ Setting of colour codes of each mesh by the evaluation points
- ⑤ Colour classification depending on the risk degree of mesh overlaid on maps
- ⑥ Addition of other information (legend, site information)



Source: JICA Project Team

Figure 4.2.2 Flow of Development of the Landslide Hazard Maps Using GIS

4.3 Extracting Factors for Hazard Analysis

Generally, the predisposition factors of landslides include topographical and geological elements such as slope inclination, undulation, slope shape, land use, geological distribution and geological structure. Trigger factors of landslides include earthquake elements such as the magnitude of earthquake, distance from the epicentre and rainfall factors. In accordance with the results of the review as indicated in Table 4.3.1, the following factors are utilized for analysis in this Project.

- Inclination angle of slope
- Inclination direction of slope
- Relationship with fault zone
- Distance from the epicentre

Table 4.3.1 Disaster Factors to be Analysed and Extraction Results

Adopted factor in general	Adaptability review for this study	Result
Slope inclination	Effective	○
Amount of undulation	Important factor but similar to slope inclination	×
Slope shape	Difficult to classify	×
Land use	Difficult to grasp in the whole region	×
Geology	Base rocks have almost same hardness. It is difficult to grasp surface geological map in the whole region	△*1
Geological structure	MCT (Main Central Thrust) exists in the centre of each district and it forms geological weak belt.	○*2
Distance from epicentre	Effective	○

Source: JICA Project Team,

*1 : Hardness of targeted rocks do not depend on rock type.

*2 : Risk factors of distance from MCT and slope direction will have high relations with geological structure.

For extracting high risk points related to slope failure, the predisposition factors and trigger factors of the collapse cause were analysed using GIS. There are many predispositions to affect the slope collapse in existence. However, taking the topographical and geological conditions of the area as mentioned above into consideration, the following factors were selected:

- Terrain factors: slope incline, slope direction, differences of elevation, water catchments terrain, ruggedness, land use status.
- Geological factors: type of geology, geological structure, namely fault, strata, joints.

Many landslides were triggered apparently by the earthquake, and the trigger factors are the position of the epicentre and magnitude of the earthquake. Among these factors, those to be utilized for analysis and with information available in this project are as follows:

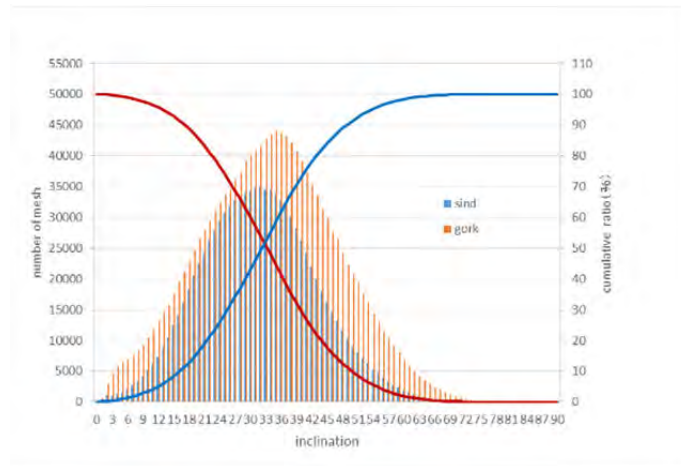
- Slope Incline: Incline information is available by using GIS data generated in Project.
- Slope direction: Available from GIS data. Geology of the study area consists mainly in schist type rocks, so that direction of slope surface would reflect the geological structure, and is valid information.
- Type of geology and geological structure: Released 1/1,000, 000 scale geology map covers the whole of Nepal (Nepal Government, 2004). The Target Area is located on the boundary where the Indian Plate sinks beneath the Himalayas. The earthquake is considered to be generated by the fault which was activated at that time.
- Position of the epicentre and the magnitude of the earthquake.
- The magnitude of the quake directly affects slope failure. For this reason, the distance from the epicentre and the magnitude of the earthquake are important factors related to slope failure analysis.

In order to verify the relationship between these items and slope failure, each of these factors were examined.

4.3.1 Slope Incline

(1) The whole Area

For this analysis, the whole area is divided into a 50m mesh. Figure 4.3.1 shows the aggregate maximum slope of each mesh. The total area of the Gorkha District and Sindhupalchok District is about 6,150 km² and the total mesh number is 2.46 million. 90% of the slope areas hold 15 degrees or more inclination and 30 degrees or more steep area are about 60%.

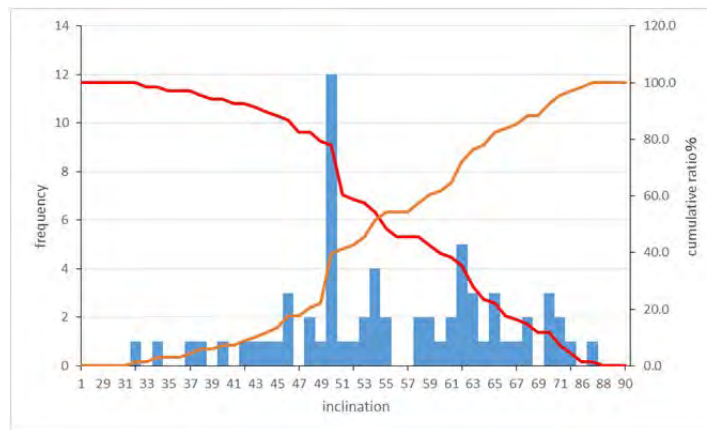


Source: JICA Project Team

Figure 4.3.1 Aggregate Maximum Slope of Each Mesh

(2) Failure Slope

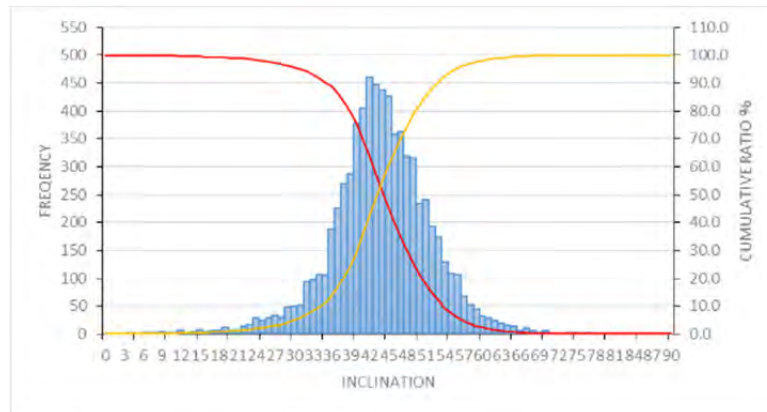
Figure 4.3.2 shows the aggregate of the site investigation results as a histogram. Every landslide point of its slope inclination is evaluated at 1-degree increments.



Source: JICA Project Team

Figure 4.3.2 Collapsed Slope Aggregation Results from Field Survey

For satellite image identification results, the incline degree of each collapse area is defined as an average inclination of every 10 m mesh which exists within the slope failure. Figure 4.3.3 shows the histogram analysis result.



Source: JICA Project Team

Figure 4.3.3 Collapsed Slope Aggregation Results from Satellite Image Identification

The incline of the site investigation result is 31 degrees to 70 degrees, and more than 90% includes 43 degrees or more. Otherwise, the incline of satellite image is 4 degrees to 77 degrees, and more than 95% includes 30 degrees or more. The reason why the satellite identification analysis result shows a more loose incline than the field survey result is considered to be that the satellite image includes not only the slope plain but also includes the deposition surface of the collapse.

4.3.2 Slope Direction

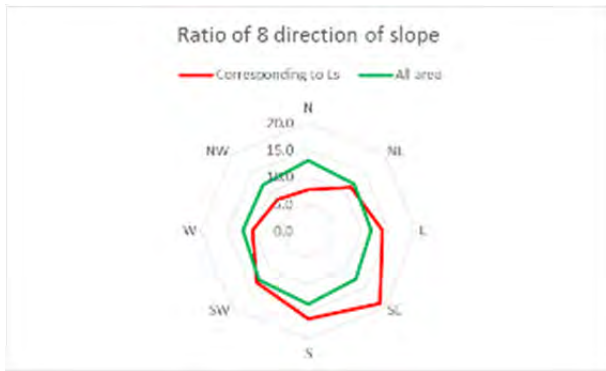
Every landslide slope direction is divided into eight directions and each collapsed slope is statistically processed to compare its tendency of slope direction in each district

In each district, the slope collapse of the South-East direction (S-E) holds a large proportion; especially in Sindhupalchok District, the tendency is higher. The reason why the S-E direction holds a high proportion is considered to be the influence of geological structures, such as the strike and⁴ dip of schistosity plain or joint surface or the fault and fold structure of strata.

According to the analysis released by the Tokyo University Earthquake Research Institute, the fault rupture proceeded from the epicentre to the east-southeast direction. This fact is consistent with the slope directions with many cases of slope failure.

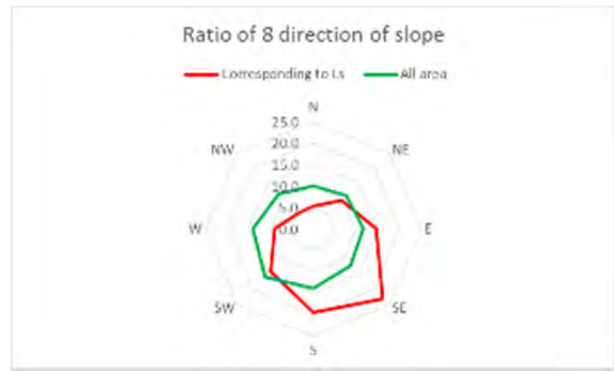
Figure 4.3.4 and Figure 4.3.5 show the proportion of slope direction and presence of landslides. These slopes of S-E direction received relatively large damage caused by the earthquake.

⁴ Earthquake Research Institute, The University of Tokyo “Gorkha Earthquake in 2015 (Nepal)”
<<http://taro.eri.u-tokyo.ac.jp/saigai/2015nepal/index.html>>



Source: JICA Project Team

Figure 4.3.4 Proportions of Slope Direction (Gorkha District)



Source: JICA Project Team

Figure 4.3.5 Proportions of Slope Direction (Sindhupalchok District)

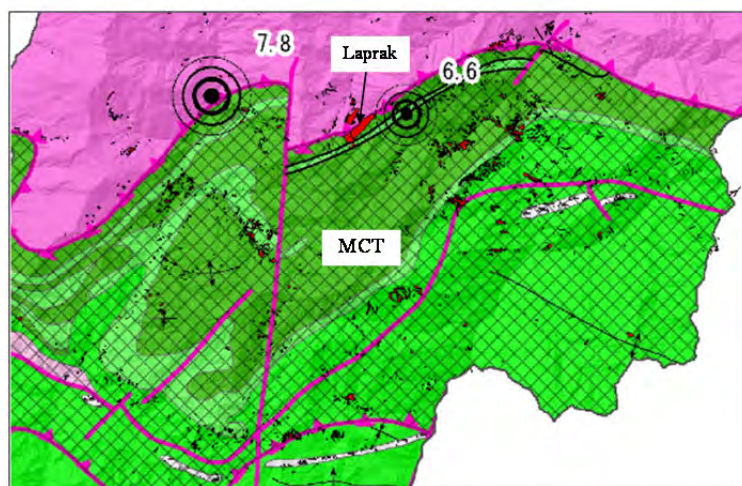
4.3.3 Geology and Geological Structure

The geology of the two districts mainly features Precambrian crystalline schist. Figure 4.3.7 shows the geology map in Gorkha District and Figure 4.3.8 shows that of Sindhupalchok District. The red dots in the figures are the location of landslides.

(1) Geology, geological Structure and Slope Collapse in Gorkha District

The Main Central Thrust (MCT) is located slightly south of the centre of Gorkha District with approximately 20 km width and stretches in the E-W direction. Slope failures occur within and around the MCT.

The epicentre for the M 7.8 and M 6.6 earthquakes were located along the northern side of the MCT boundary. In fact there are large scale deep landslides in Laprak and slope collapses in the vicinity of these epicentres (see Figure 4.3.6).



Source: 1:1,000,000 geological map of Nepal, 2004 edited by JICA Project Team, data of magnitude of earthquake and epicentre is from USGC: Search Earthquake Archives.

Figure 4.3.6 Enlarged View of Geology in Central Gorkha District

Table 4.3.2 shows the relation between the MCT and landslides. Regarding the northern area of the MCT, the geology of this area consists of crystal schist and gneiss and the number of slope failure is relatively few. In the southern side of the MCT, the geology of this area consists of Phyllite, quartzite, sandstone, etc., and the number of slope failures is rare. So as to describe above, the major landslides are distributed in the MCT area.

Table 4.3.2 Relations between MCT and Landslide (Gorkha District)

The number of 50m-mesh	All area	Corresponding to Ls
Inside of the MCT	203,516	8,611
The north side of the MCT	899,895	3,168
The south side of the MCT	315,431	617
total	1,418,842	12,396

Ratio of 50m-mesh (%)	All area	Corresponding to Ls
Inside of the MCT	14.3	69.5
The north side of the MCT	63.4	25.6
The south side of the MCT	22.2	5.0
total	100.0	100.0

Source: JICA Project Team

(2) Geology, geological Structure and Slope Collapse in Sindhupalchok District

The MCT exists in the south of the centre of the district with a curved shape. There are several thrust faults within the MCT, and landslides tend to be distributed along with these faults. Table 4.3.3 shows the relation between the MCT and landslides. There are many landslides in the north of the MCT. Otherwise there is less distribution of landslides in the Southern side.

Table 4.3.3 Relations between MCT and Landslide (Sindhupalchok District)

The number of 50m-mesh	All area	Corresponding to Ls
Inside of the MCT	143,533	5,438
The north side of the MCT	621,204	20,549
The south side of the MCT	216,610	3,553
total	981,347	29,540

Ratio of 50m-mesh (%)	All area	Corresponding to Ls
Inside of the MCT	14.6	18.4
The north side of the MCT	63.3	69.6
The south side of the MCT	22.1	12.0
total	100.0	100.0

Source: JICA Project Team

4.3.4 Distribution of Epicentres and Scale of Earthquake

In the geology map of Figure 4.3.7 and Figure 4.3.8, earthquakes occurred from April 21 to May 16, 2015 with the magnitude 4.5 or more are shown. Obstructions are as follows.

- The MCT is located slightly south of the centre of Gorkha District with approximately 20 km width and stretches in E-W direction. Slope failures have occurred within and around MCT.
- In Gorkha District, earthquakes with Magnitude 5 or more occurred four times. Among them, many slope failures have been distributed in the vicinity with earthquakes of Magnitude 7.8 and Magnitude 6.6
- In Sindhupalchok District, earthquakes with Magnitude 5 or above occurred several times. In terms of the relationship with the MCT, many landslides occurred where the epicentre is not so near in the northern area of the MCT. On the other hand, there were many epicentres but landslides occurred less in the southern area of MCT. A clear correlation between the distribution of epicentre and slope failure was not observed in Sindhupalchok District.

4.4 Slope Failure Analysis by Quantification Theory

4.4.1 Analysis Method

For assessing the risk of slope failure in a broad area, it is necessary to evaluate which hazard factors affect the risk level quantitatively in advance. Statistical methods such as multivariate analysis are used for analysis. Study on generating Landslide Hazard Maps by this method has been conducted in Japan⁵ since the 1990's. The Project Team decided to utilize the multivariate analysing method called Quantification Theory 2 for extracting the high-risk slope area in this Project.

In this approach, the analysis target is divided by mesh. Based on the relationship between each factor and the presence of collapse, the slope failure risk of each mesh is determined. The analysing process is as follows.

- Each factor is subdivided to certain ranges.
- Each mesh is evaluated as 1: failure exists, 2: failure does NOT exist.
- Each mesh is evaluated in consideration of the correlation between each factor and collapse

Size of one mesh has been decided to be 50 m × 50 m, and the numbers of generated meshes are 12,396 in the Gorkha District and 29,540 in Sindhupalchok District.

The summed up values represent the risk degree of each mesh. Generally, these calculated numbers are relatively small for practical use, so that these normalized values are enlarged (e.g. 20 times) and converted to the Evaluation Point by using following calculation formula.

$$\text{Evaluation Points} = \frac{|\text{Category score} - S \text{ min}|}{|S \text{ max} - S \text{ min}|} \times 20$$

S max: the maximum value of the scores in each category
S min: the minimum value of the scores in each category

⁵ Development and application of slope collapse hazard map creation method based on GIS quantification theory. Jour. Japan Soc. Eng. Geol., Vol. 49, No.1, pp.2-12, 2008

Table 4.4.1 Categorization of Disaster Factors related to Slope Failure

Item	Classification	Category
Slope inclination (degree)	0~10 below	1
	10~20 below	2
	20~30 below	3
	30~40 below	4
	40~50 below	5
	50~60 below	6
	60~70 below	7
	70~80 below	8
	80~90 below	9
Slope direction (8 direction)	N	1
	NE	2
	E	3
	SE	4
	S	5
	SW	6
	W	7
	NW	8
Relationship with MCT	Inside MCT	1
	North 0~10km under	2
	North 10~20km under	3
	North 20~30km under	4
	North 30km or more	5
	South 0~10km under	6
	South 10~20km under	7
	South 20~30km under	8
Distance from epicenter (distance from the epicenter of magnitude 4.8 or more earthquake)	0~10km below	1
	10~20km below	2
	20~30km below	3
	30km or more	4
Presence of slope failure	exist	1
	NOT exist	2

Source: JICA Project Team

4.4.2 Analysis Results

Details of the analysis results by the analysis programme are shown in Appendix 4-1. Regarding the adequacy of the analysis result, it is evaluated by the positive discrimination ratio; that is, "Was it able to evaluate the mesh where landslides occurred correctly as a landslide?" and the results are as follows.

- Positive Discrimination Ratio of Gorkha District = 80%
- Positive Discrimination Ratio of Sindhupalchok District = 74%

Generally, it is recommended to aim at a discrimination ratio of 80% or more in the Quantification Theory 2 analysis, but as in a case analysed from four distinctly different categories like in this project it could be said that a sufficiently high accuracy was attained.

The score obtained by the Quantification Theory 2 is shown in Table 4.4.2.

The score in the table shows the category-wise scores calculated based on the Quantification Theory 2. The primary Evaluation Points have been calculated by normalizing the score value and setting the maximum value to 20 points. The final Evaluation Points are modified from the primary evaluation point in consideration of the local circumstances and scores of other categories. The correspondence between the analysis results in each category and the field survey results was as follows.

- As for the gradient evaluation point, it was 0 at slopes less than 20 degrees, the peak of the evaluation point appears at the slope of 40 degrees or more but less than 70 degrees, and it is the same trend as the field investigation result shown in 4.3.1. It is in harmony with the fact that the frequency distribution of the gradient and the number of areas with sediment movement is normally distributed.
- Regarding the evaluation points in the slope direction, it is higher mainly in the SE direction in both Gorkha District and Sindhupalchok District. Both groups are in harmony with the relatively large number of sediment moving sites on the slope in the southwest direction.
- As for the evaluation points of the relationship with MCT, the point is markedly higher in Gorkha District with a difference of five points or more in the MCT, whereas in Sindhupalchok District it is higher by about one in the MCT. This is consistent with the tendency of sediment moving areas to concentrate in MCT within Gorkha District.
- As for the evaluation point of the distance from the epicentre, it is 1 point or 0 point at any distance in Gorkha District, and there is little difference. In Sindhupalchok District, the closer the seismic source is, the higher the evaluation score is. It is possible that the influence of aftershocks is likely to be involved in Sindhupalchok District.

In the following tables and figures, larger values represent higher risks of slope collapse. From low score to high score, particular evaluation colours are allocated in accordance with each risk level such as from white to light blue → blue → yellow green → yellow → orange → red → violet.

In these tables, “Cumulative relative frequency” means piled up figure of each occupancy rate (%) from the lowest range to targeted range, so that it shows total occupancy rate (%) at the targeted range.

Table 4.4.2 and Table 4.4.3 indicate the relation between the total score and occurrence of landslides in Gorkha District. Similarly, Figure 4.4.1 indicates the relation between the total score and incidence of landslides.

Table 4.4.2 Risk Range and Colour Allocation (Gorkha District)

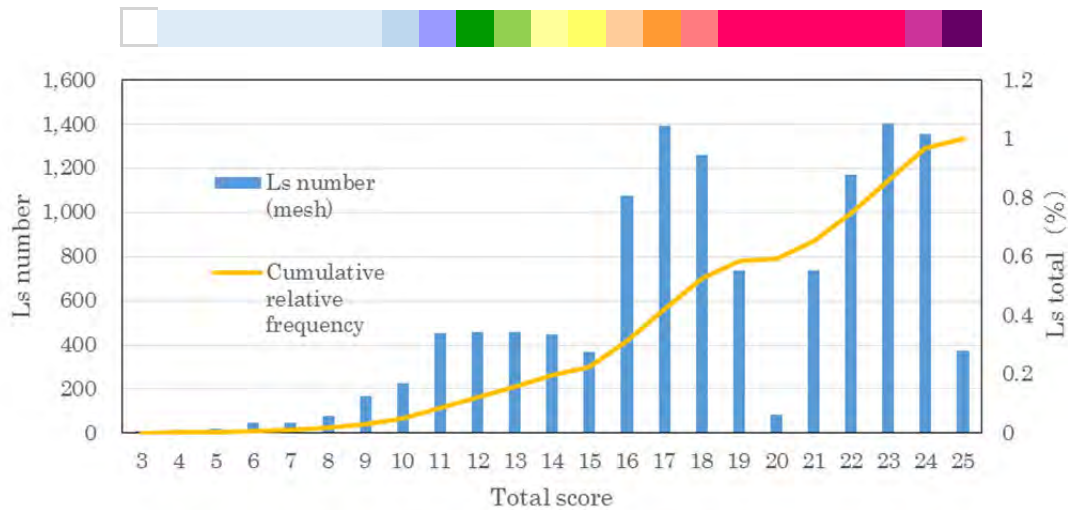
Range of colour	Total points (Gorkha District)	Cumulative relative frequency	Situation in the field
White~Blue <i>Low risk~</i>	3~11	About 9% cumulative relative frequency	Mainly incline 20 degrees or less, gentle slope
Yellow green~Yellow <i>Medium risk~</i>	12~16	9%~31% cumulative relative frequency	Incline 20 to 30 degrees, normal slope
Orange~Red <i>High risk~</i>	17~23	31%~86% cumulative relative frequency	Incline more than 30 degrees , sharp terrain
Red~Purple <i>Very high risk~ Extremely high risk</i>	24~25	Above 86% cumulative relative frequency	Incline more than 30 degrees, very sharp terrain reflects geological conditions of the Gorkha District.

Source: JICA Project Team

Table 4.4.3 The Result of Total Score in Gorkha District

Total Score	Number (mesh)	Ls number (mesh)	Ls totals	Cumulative relative frequency
3	10,486	7	7	0.06%
4	46,899	15	22	0.18%
5	71,018	21	43	0.35%
6	63,532	48	91	0.73%
7	80,612	48	139	1.12%
8	97,043	78	217	1.75%
9	92,054	168	385	3.11%
10	116,244	224	609	4.91%
11	137,727	451	1,060	8.55%
12	86,091	457	1,517	12.24%
13	57,245	460	1,977	15.95%
14	64,961	450	2,427	19.58%
15	95,652	367	2,794	22.54%
16	154,462	1,078	3,872	31.24%
17	133,534	1,391	5,263	42.46%
18	73,419	1,264	6,527	52.65%
19	27,712	736	7,263	58.59%
20	2,538	84	7,347	59.27%
21	9,339	741	8,088	65.25%
22	12,495	1,174	9,262	74.72%
23	12,405	1,404	10,666	86.04%
24	9,485	1,355	12,021	96.97%
25	2,163	375	12,396	100.00%
Total	1,457,116	12,396		

Source: JICA Project Team



Source: JICA Project Team

Figure 4.4.1 The Result of Total Point in Gorkha District

Table 4.4.4 and Table 4.4.5 indicate the relation between the total score and occurrence of landslides in Sindhupalchok District. Similarly, Figure 4.4.2 indicates the relation between the total score and incidence of landslides.

Table 4.4.4 Risk Range and Colour Allocation (Sindhupalchok District)

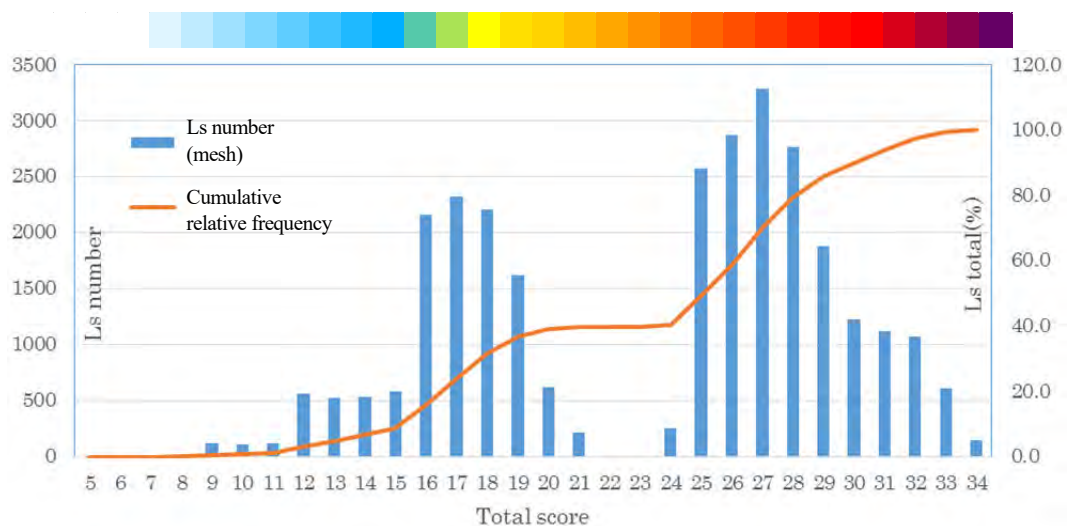
Range of colour	Total points (Sindhupalchok District)	Cumulative relative frequency	Situation in the field
White~Blue <i>Low risk~</i>	5~11	About 6% cumulative relative frequency	Mainly incline 20 degrees or less, gentle slope
Yellow green~Yellow <i>Medium risk~</i>	12~16	6%~34% cumulative relative frequency	Incline 20 to 30 degrees, normal slope
Orange~Red <i>High risk~</i>	17~19	Total relative frequency is 34%~86%.	Incline more than 30 degrees, sharp terrain
Red~Purple <i>Very high risk~Extremely high risk</i>	20~30	Total relative frequency is above 86%	Incline more than 30 degrees, very sharp terrain reflects geological conditions of Sindhupalchok District.

Source: JICA Project Team

Table 4.4.5 The Result of Total score in Sindhupalchok District

Total score	Number (mesh)	Ls number (mesh)	Ls totals	Cumulative relative frequency
5	828	0	0	0.00%
6	1,604	0	0	0.00%
7	1,129	0	0	0.00%
8	10,919	3	3	0.01%
9	37,448	123	126	0.43%
10	40,890	111	237	0.80%
11	42,153	119	356	1.21%
12	96,974	565	921	3.12%
13	92,837	523	1,444	4.89%
14	67,293	538	1,982	6.71%
15	49,278	580	2,562	8.67%
16	103,555	2,163	4,725	16.00%
17	88,778	2,328	7,053	23.88%
18	69,627	2,207	9,260	31.35%
19	36,745	1,620	10,880	36.83%
20	14,318	621	11,501	38.93%
21	6,332	214	11,715	39.66%
22	1,231	8	11,723	39.69%
23	1,676	4	11,727	39.70%
24	16,050	257	11,984	40.57%
25	46,438	2,573	14,557	49.28%
26	40,801	2,873	17,430	59.00%
27	39,809	3,283	20,713	70.12%
28	31,954	2,762	23,475	79.47%
29	21,959	1,884	25,359	85.85%
30	12,570	1,225	26,584	89.99%
31	10,594	1,120	27,704	93.78%
32	7,614	1,075	28,779	97.42%
33	3,622	611	29,390	99.49%
34	862	150	29,540	100.00%
Total	995,888	29,540		

Source: JICA Project Team



Source: JICA Project Team

Figure 4.4.2 The Result of Total Point in Sindhupalchok District

Table 4.4.6 Results of Scoring of Item and Category by Quantification Theory 2

Item	Classification	Category	Gorkha				Shindhupalchok			
			Category score※1	Primary evaluation point ※2	Final evaluation point ※3	Remarks	Category score※1	Primary evaluation point ※2	Final evaluation point ※3	Remarks
Slope inclination (degree)	0~10 or less	1	-0.45	2	0	*The 10 degrees or less slope was evaluated 0 in accordance with local situation *The evaluation points 20 to 30 were considered to be point3 as same as Shindhupalchok.	-0.89	2	0	*The 20 degrees or less slope was evaluated 0 in accordance with local situation
	10~20 or less	2	-0.69	0	0		-0.81	2	0	
	20~30 or less	3	-0.66	0	3		-0.71	3	3	
	30~40 or less	4	-0.06	6	6		-0.07	7	7	
	40~50 or less	5	0.59	11	11		1.30	16	16	
	50~60 or less	6	0.67	12	12		1.90	20	20	
	60~70 or less	7	0.51	11	11		1.60	18	18	
	70~80 or less	8	0.14	7	7		0.75	12	12	
80~90 or less	9	0.12	7	7	0.00	0	0			
Slope direction (8 direction)	N	1	-0.12	5	3	*Comparing the field survey results and analysis results, modified evaluation points should be evaluated as around 1/2 of the primary evaluation point because the influence by the slope direction was confirmed to be relatively low.	-0.30	6	3	*Comparing the field survey results and analysis results, modified evaluation points should be evaluated as around 1/2 of the primary evaluation point because the influence by the slope direction was confirmed to be relatively low.
	NE	2	0.08	7	3		-0.06	7	4	
	E	3	0.16	8	4		0.20	9	4	
	SE	4	0.33	9	5		0.68	12	6	
	S	5	0.13	7	4		0.25	9	5	
	SW	6	-0.08	5	3		-0.15	7	3	
	W	7	-0.22	4	2		-0.29	6	3	
Relationship with MCT	Inside MCT	1	1.58	20	7	*According to the actual condition of the fault affects, evaluation points were reduced to 1/3 of the primary ones. For the others, the evaluation score was reduced to 1/2. *Regarding to the distance 10 km or more from the south side, the evaluation point was adjusted from the surrounding situation.	0.39	10	5	*According to the actual condition of the fault affects, evaluation points were reduced to 1/2 of the primary ones. *Regarding to the distance 10 km or more from the south side, the evaluation point was adjusted from the surrounding situation.
	North 0~10km below	2	-0.20	4	2		0.05	8	4	
	North 10~20km below	3	-0.55	1	1		0.16	9	4	
	North 20~30km below	4	-0.46	2	1		-0.18	6	3	
	North 30km or more	5	-0.43	2	1		-1.16	0	0	
	South 0~10km below	6	-0.38	3	1		-0.16	6	3	
	South 10~20km below	7	0.04	7	1		-0.59	4	2	
South 20~30km below	8	0.44	10	0	0.00	0	0			
Distance from hypocenter	0~10km below	1	-0.20	4	1	*Since the influence on the slope collapse was seem to be small, the evaluation point 1 was uniformly set.	0.06	8	3	*Evaluation score was set to be 1/2 to 1/3 of the primary evaluation point as well as MCT factor and slope direction factor.
	10~20km below	2	-0.20	4	1		-0.03	7	2	
	20~30km below	3	-0.30	3	1		-0.94	1	1	
	30km or more	4	—	0	0		0	0	0	
※1: Analysis results based on Quantification Theory 2 ※2: Evaluating score was modified to proportional distribution and its maximum value 20. ※3: Evaluating score was modified based on field situation and disaster record.										

Source: JICA Project Team

4.5 Generating the District Level Landslide Hazard Map

4.5.1 Risk Indication

Scoring processes for each mesh as described in section 4.4 were carried out in the whole area of Gorkha District and Sindhupalchok District and the District Level Landslide Hazard Maps were prepared. Figure 4.5.1 shows the District Level Landslide Hazard Map of Gorkha District and Figure 4.5.2 shows that of Sindhupalchok District.

4.5.2 Points to be Noted in Utilization of Hazard Maps

For the general use of newly prepared Landslide Hazard Maps, it is necessary to clearly note important information such as;

- Utilized terrain information
- Generating process
- Applicable scope and its limit

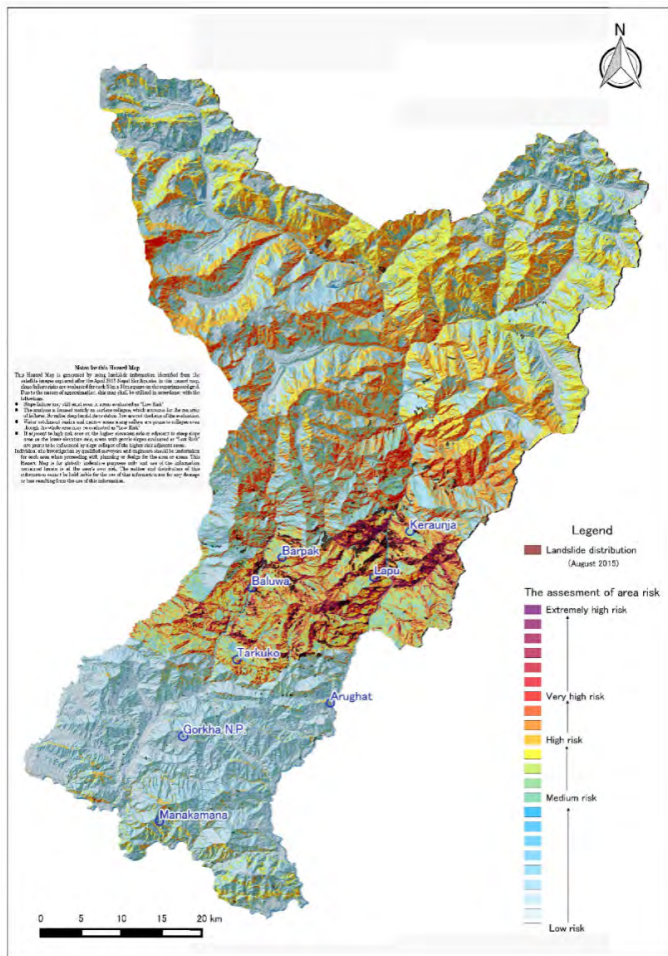
For this reason, notes for the Landslide Hazard Map was determined and displayed in each map as follows.

Notes for this Hazard Map

This Hazard Map has been Prepared by using landslide information identified from the satellite images captured after the April 2015 Nepal Earthquake. In this Hazard Map, slope failure risks are evaluated for each 50m x 50m square on the superimposed grid. Due to the small scale topographic map, this map shall be utilized in accordance with the followings.

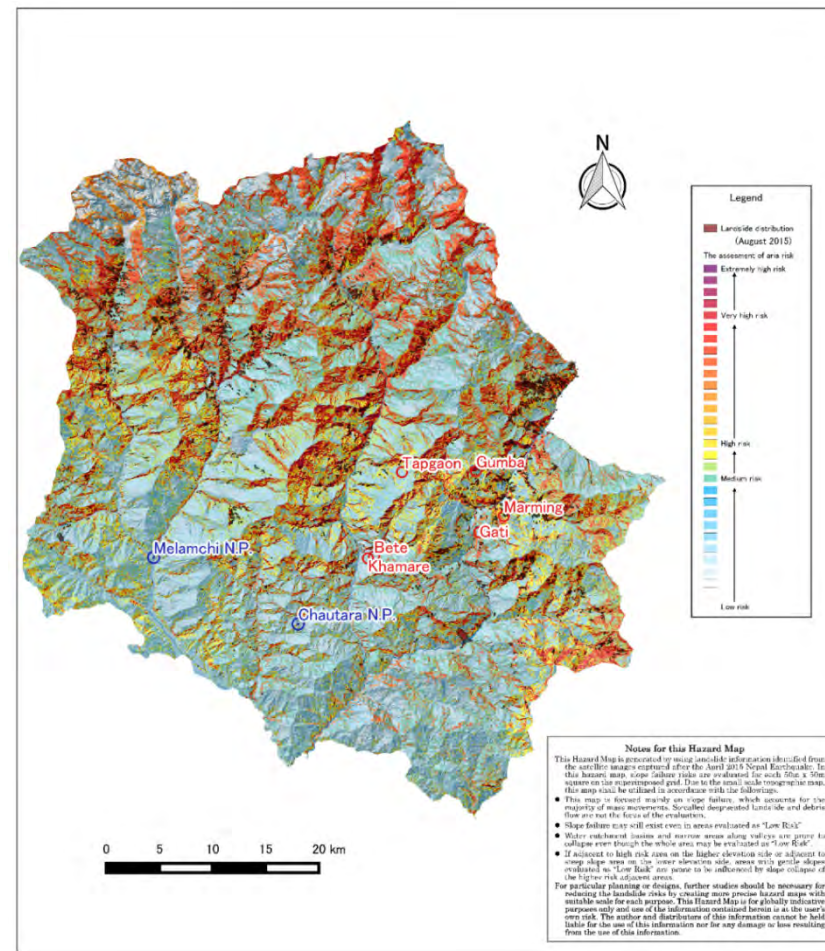
- This map is focused mainly on slope failure, which accounts for the majority of mass movements. So-called deep-seated landslide and debris flow are not the focus of the evaluation.
- Slope failure may still exist even in areas evaluated as “Low Risk”
- Water catchment basins and narrow areas along valleys are prone to collapse even though the whole area may be evaluated as “Low Risk”.
- If adjacent to high risk area on the higher elevation side or adjacent to steep slope area on the lower elevation side, areas with gentle slopes evaluated as “Low Risk” are prone to be influenced by slope collapse of the higher risk adjacent areas.

For particular planning or designs, further studies should be necessary for reducing the landslide risks by creating more precise Hazard Maps with a suitable scale for each purpose. This Hazard Map is for globally indicative purposes only and use of the information contained herein is at the user’s own risk. The author and distributors of this information cannot be held liable for the use of this information nor for any damage or loss resulting from the use of this information.



Source: JICA Project Team

Figure 4.5.1 Landslide Hazard Map of Gorkha District



Source: JICA Project Team

Figure 4.5.2 Landslide Hazard Map of Sindhupalchok District

4.5.3 For the Utilization of Slope Disaster Hazard Map in Nepal

Through the above described works, the planned Hazard Map of Gorkha District and Sindhupalchok District have been finalized. Once the target area is determined the existing landslide areas can be displayed and future risk can be indicated. For example, by adding new information such as road plan the map can be used as a tool for administrative decision making.

In order for the Nepalese side to make effective use of this Hazard Map as slope disaster prevention tool, they should acquire GIS operating skill at a certain level. It is also necessary to understand the composition, basic idea, application and limitation of this Hazard Map.

Specifically, the most important things are to extract disaster factors and qualitatively evaluate them as shown in 4.3, convert them to quantitative evaluation by using the quantification theory as shown in 4.4 and to understand the applying limit and its responsibility as shown in 4.5. Such capabilities have been acquired by some training sessions provided through the Project, to which NRA engineers attend on their own will. The items in need are summarized as follows:

- Confirm the process for preparing Hazard Maps and understand the important points when using existing Hazard Maps. Understand the layer structure and expression technique in existing general Hazard Maps. Acquire basic knowledge when preparing and using Hazard Map.
- Acquire general knowledge on various geographical information necessary for the preparation of GIS and Hazard Map. Understand accuracy and structure of the landslide distributions prepared by the Project with superimposing landslide identification results on existing satellite images.
- Understand the materials, namely; satellite image, modified topographic map, field survey outline, and the layer structure used for Hazard Map preparation.
- Understand topographical and geological features that the Project examined when preparing the Hazard Maps.
- Understand the method of reflecting the extracted condition in Hazard Maps and the reflecting result.
- Understand the precision limit when using Hazard Maps and points to be noted for its utilization.
- Superimpose the additional information as required, so that the Hazard Maps can be utilized as a decision making tool for disaster risk reduction planning.

4.6 Generation of Detailed Landslide Hazard Map in Particular Areas

Detailed Landslide Hazard Maps in particular areas in this Project are defined by a combination of the enlarged District Level Hazard Maps and detailed field survey results.

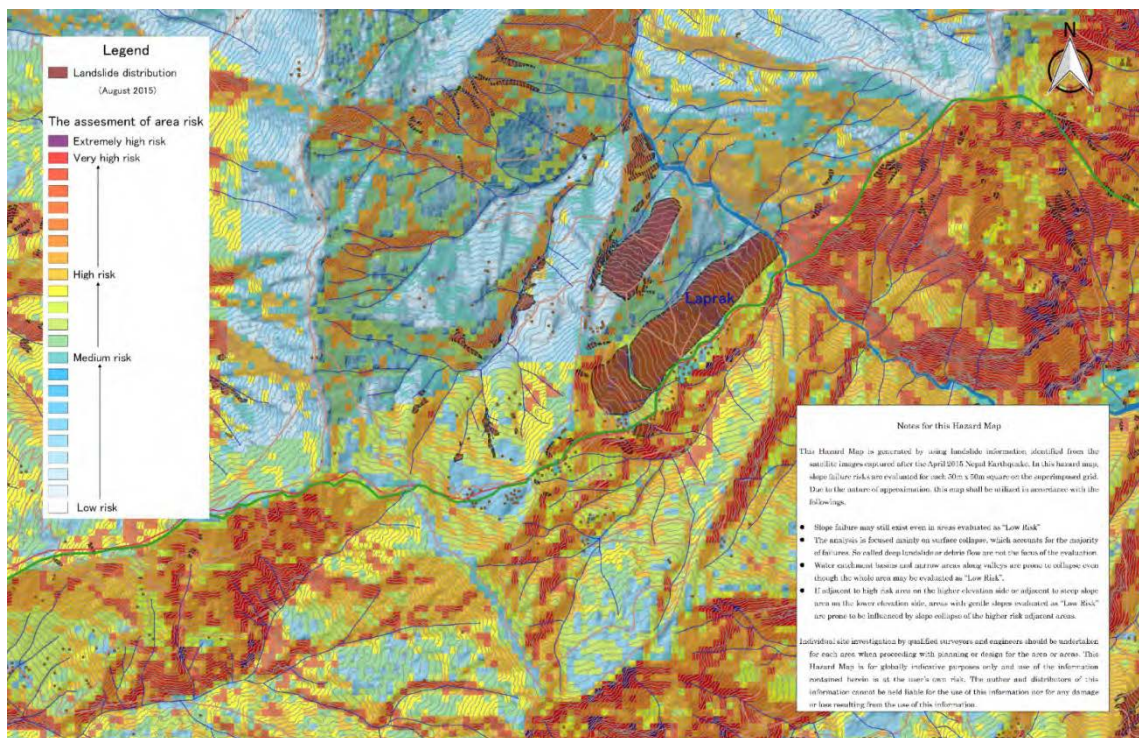
4.6.1 Detailed Hazard Map in Gorkha District

Laprak VDC in Gorkha District was designated as the area for preparing the Detailed Landslide Hazard Map. Figure 4.6.1 is the enlarged Landslide Hazard Map of the district level and Figure 4.6.2 shows the Detailed Landslide Hazard Map in Laprak.

In evaluating the Laprak VDC landslide situation, view exchange meeting was held on the site with the survey team dispatched from NRA.

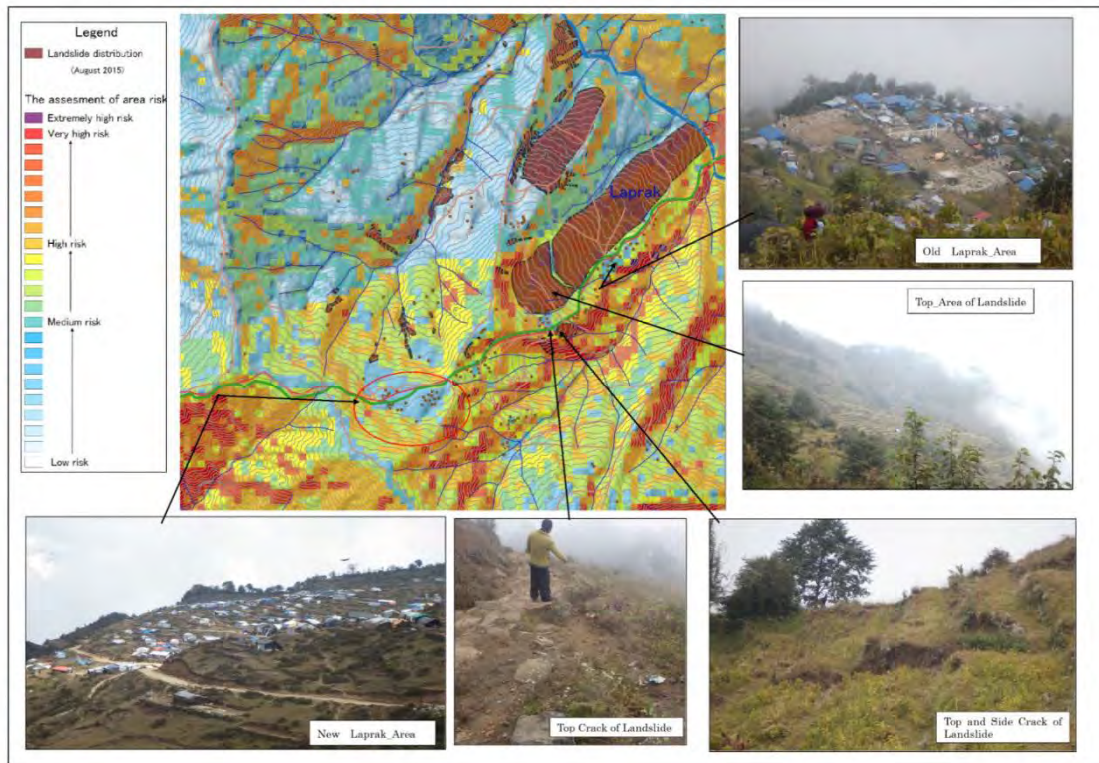
4.6.2 Detailed Hazard Map in Sindhupalchok District

Tatopani VDC in Sindhupalchok District was designated as the area for preparing Detailed Landslide Hazard Map in a Particular Area. Figure 4.6.3 is the enlarged Landslide Hazard Map of the district level, and Figure 4.6.4 shows the Detailed Landslide Hazard Map in Tatopani.



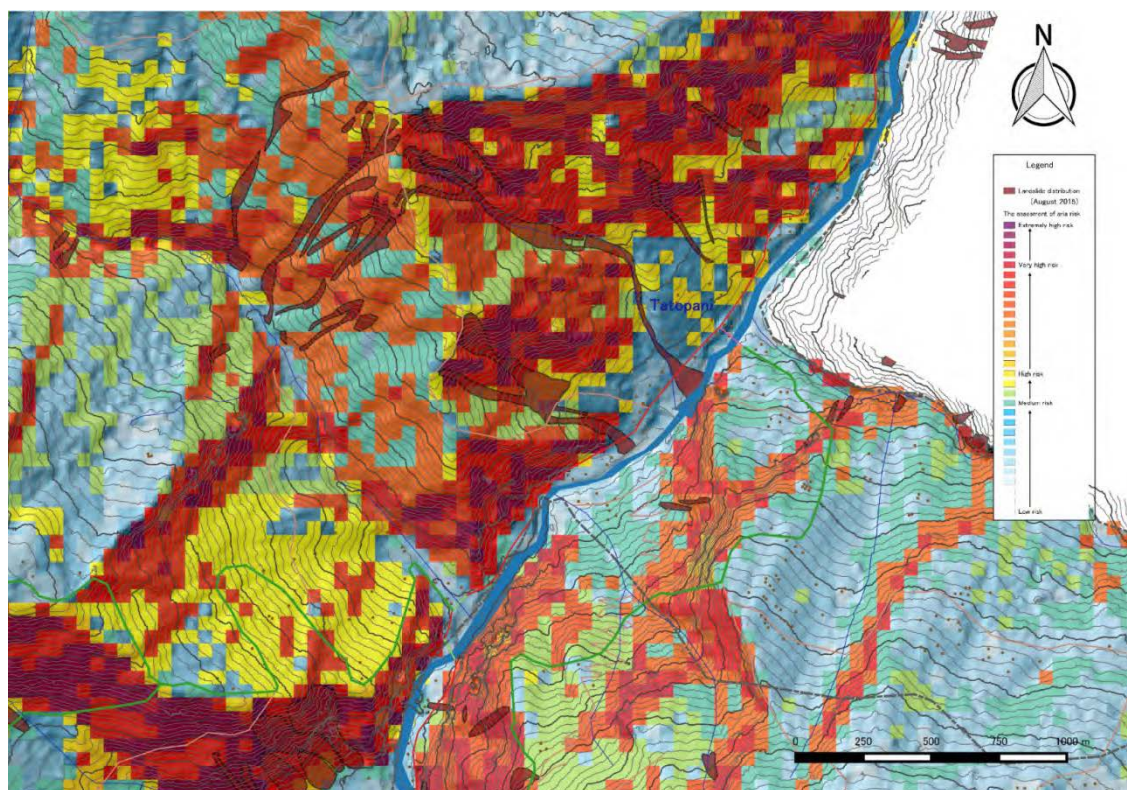
Source: JICA Project Team

Figure 4.6.1 Enlarged Landslide Hazard Map in Laprak (Gorkha District)



Source: JICA Project Team

Figure 4.6.2 Detailed Landslide Hazard Map in Laprak (Gorkha District)



Source: JICA Project Team

Figure 4.6.3 Enlarged Landslide Hazard Map in Tatopani (Sindhupalchok District)

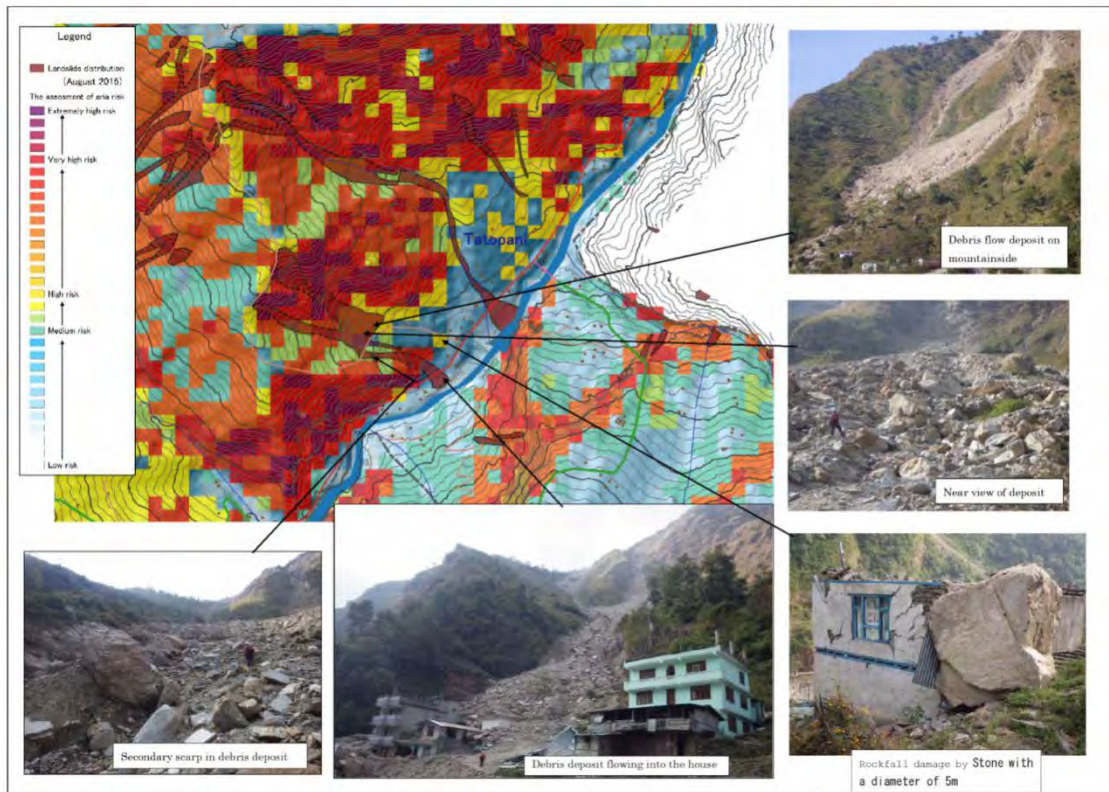


Figure 4.6.4 Detailed Landslide Hazard Map in Tatopani (Sindhupalchok District)

4.7 Utilization of Prepared Hazard Maps and Its Expansion to the Remaining Nine Districts

The Hazard Maps of Gorkha District and Sindhupalchok District were finalized in August 2016. At the time of its handing over, NRA requested the Japanese side to transfer the following knowledge to the Nepalese side, so that the Nepali side can effectively utilize the Hazard Maps for rehabilitation and recovery from the Nepal Earthquake.

- (1) Introduction to generating Hazard Map for slope disaster prevention: To understand the basic concept, structure, and basic knowledge on Hazard Maps.
- (2) Utilization of Hazard Map for slope disaster prevention: To acquire abilities to use Hazard Map as a decision making tool for policy panning by superimposing additional information to existing Hazard Maps.
- (3) Looking ahead to next stage: that NRA prepares Hazard Maps of the remaining nine districts.

4.7.1 Proposing the Workshop for Utilizing Prepared Hazard Map

Through a series of discussions held between the NRA, JICA and the Project Team, the importance of knowledge transfer to the relevant staff of NRA was reconfirmed, in order to facilitate the appropriate use of the Hazard Maps by NRA in the two districts of Gorkha District and Sindhupalchok District, as well as preparation of new Hazard Maps for the other districts affected by the earthquake. It was further agreed that two series of workshops, each with the duration of two weeks; 1) workshop on Hazard Map utilization, and 2) workshop on Hazard Map preparation, will be held for transferring the necessary knowledge.

The outline of the workshops agreed, together with the timetables of the workshops on Hazard Map utilization and Hazard Map preparation are indicated in the following:

(1) Summary of Workshops

Title	(1) Workshop 1 : Utilization of the Hazard Maps 2 weeks from mid-January 2017 (2) Workshop 2: Introduction on Preparation of the Hazard Map 2 weeks from mid-February 2017
Target	(1) 20 people (Bachelor degree of Civil engineering, Geology or Geotechnics with working experience in a related field) (2) 10 people (Master degree of Civil engineering, Geology or Geotechnics with at least 10 years working experience in a related field. Bachelor degree with above mentioned majors with working experience is also considerable) : 9 participants are supposed to work for preparation of the hazard map in nine earthquake damaged districts
Venue	– NRA and field visit
Input from the Project Team	– 1 Expert on Hazard Map – 1 Expert on GIS

(2) Timetable for Workshop on Hazard Map Utilization

Day	Title	Contents
1	Introduction	– Background, Purpose, and the contents of the Workshop – Operating demonstration using the HM prepared by RRNE and other HMs prepared by the trainers as reference materials for imaging the goal of this workshop.
2-3	Understanding of the geological and geotechnical characters and their relationship with a landslide	– The geological and geotechnical characters of Nepal, Gorkha District and Sindhupalchok District – How terrain slope, MCT, geological structure, the slope direction, and the distance from the epicentre are considered in the hazard maps
4-8	Practice on selection and analysis of the factor causing a landslide *this will include the field survey	– How the factor causing a landslide was selected and analysed for preparation of the Hazard maps – Weighting of the each factor – Quantification of the risk
9-10	Consideration points and example of utilization in Japan	– Limitation of the accuracy of the hazard map – Example of utilizing hazard maps in Japan. – Utilizing the hazard map for the Rehabilitation an Recovery Plan

(3) Timetable for Workshop on Hazard Map Preparation

Day	Title	Contents
1	Introduction	<ul style="list-style-type: none"> – Background, Purpose, and the contents of the Workshop – Operating demonstration using the HM prepared by RRNE and other HMs prepared by the trainers as reference materials for imaging the goal of this workshop.
2-3	Understanding of the geological and geotechnical characters and their relationship with a landslide	<ul style="list-style-type: none"> – The geological and geotechnical characters of Nepal, Gorkha District districts and Sindhupalchok District – How terrain slope, MCT, geological structure, the slope direction, and the distance from the epicentre are considered in the hazard maps
4-8	Practice on selection and analysis of the factor causing a landslide *this will include the field survey	<ul style="list-style-type: none"> – How the factor causing a landslide was selected and analysed for preparation of the Hazard maps – Weighting of the each factor – Quantification of the risk
9-10	Consideration points and example of utilization in Japan	<ul style="list-style-type: none"> – Limitation of the accuracy of the hazard map – Example of utilizing hazard maps in Japan. – Utilizing the hazard map for the Rehabilitation an Recovery Plan

Furthermore, work items and man power required for the process are as follows:

Table 4.7.1 Expected Amount of Work Required for Preparation of Hazard Maps in the Remaining Nine Districts

Item	Contents
① Collection of materials	<ul style="list-style-type: none"> – Preparation of a landslide distribution map of before and after the 2015 earthquake – Collection and Editing of the digital elevation (DEM) data – Preparation of a topographic map
② Factor analysis of landslide ③ Factor analysis in each region - Evaluation score by quantification - Threshold analysis ④ Preparation of Tentative Hazard Map	<ul style="list-style-type: none"> – Review of the relationship between topography or geology and earthquakes – Grouping areas with similar geographical and geological condition and analysing by group – Setting of an evaluation point by the quantification analysis for each region – Defining the threshold – Preparation of temporary hazard maps
⑤ Field survey for confirmation	<ul style="list-style-type: none"> – Filed survey in some pilot areas – Confirmation of the consistency between the tentative Hazard map and local condition
⑥ Completion of the risk display map ⑦ Completion of Landslide Hazard Map	<ul style="list-style-type: none"> – Modification of the tentative hazard map considering the result of the survey for summarizing as the risk display map – Completion of the Landslide Hazard Map by adding landslide type including debris flow, shallow landslide and deep landslide
⑧ Preparation of the manual for each district	<ul style="list-style-type: none"> – Preparing the manual, showing the relationship between terrain, geology and landslides and classified risk indication, in each district

Source: JICA Project Team

4.8 Workshop on Hazard Map Utilization

4.8.1 Objectives

The main objective of the Workshop on Hazard Map Utilization was to transfer know-how on the basic knowledge and know-hows for utilizing the Hazard Maps. Thus, this workshop aims to make

the participants understand regarding the contents in Hazard Maps, their application and limitation so that it would be easy for them to pass the information to other Engineers and also to make recommendation to land holders and public as a whole.

4.8.2 Participants in Workshop for Hazard Map Utilization

A total of nineteen staff members from relevant government organizations have participated in the Workshop for Hazard Map Utilization. The participants mainly consisted of civil engineers from the two earthquake affected districts; Gorkha District and Sindhupalchok District. In addition, several specialists on geology, land survey and soil management have participated from the central organizations in Kathmandu. The details of the participants are indicated in Appendix 4-2.

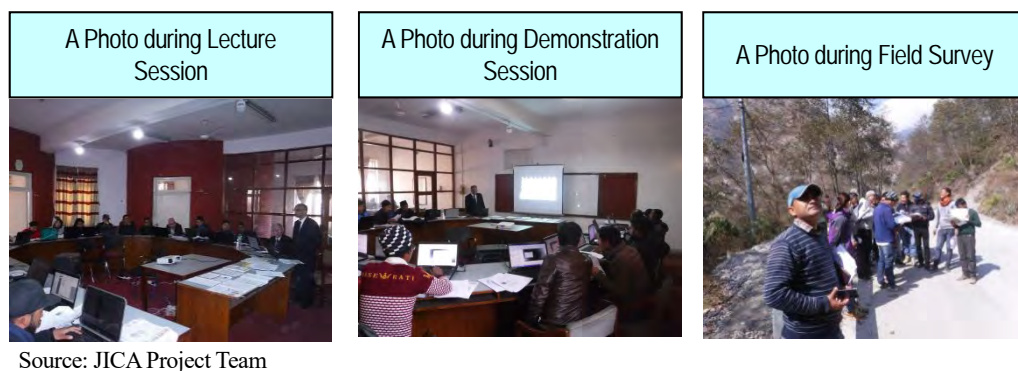


Figure 4.8.1 Photos of the Lecture, Demonstration, and Field Survey during the Workshop on Hazard Map Utilization

4.8.3 Contents of the Workshop

Necessary coordination and preparation of materials were done prior to the Workshop on Hazard Map Utilization. A part of the data comprising the hazard map of Sindhupalchok District was utilized for exercise material for training on GIS. The materials used were modified as required and distributed to the participants.

The 10-day workshop, consisting of lectures, hands-on training and field work started on 22 January 2017 and ended on 2 February. Excluding the field surveys, the workshop was basically carried out by having lectures in the morning time and hands-on training in the afternoon. Detailed workshop agendas are indicated in Appendix 4-2.

4.8.4 Achievements and Outcomes

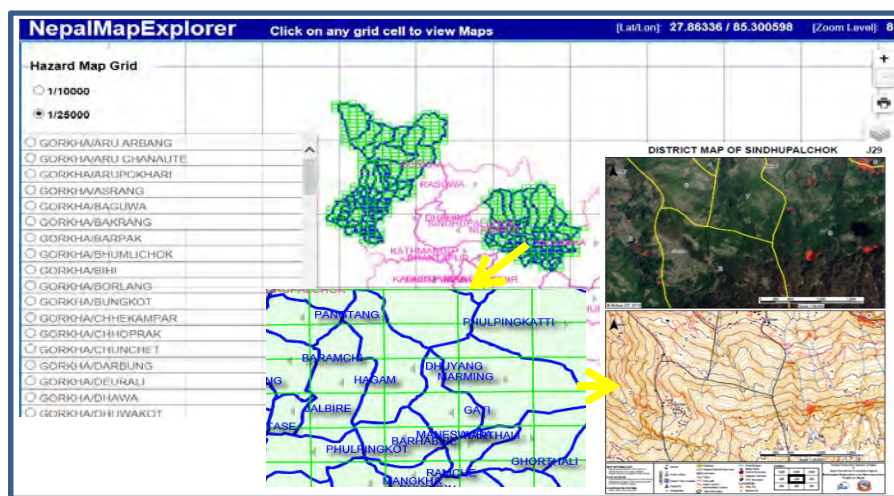
In the workshop, the participants compared the situations of existing landslides in the districts of Gorkha District and Sindhupalchok District with Hazard Maps and analysed the relations with the risk levels indicated. Through this process, the participants learned about the contents of the Hazard Maps, as well as their potentials and means for utilization.

The results of the workshop are as follows:

(1) Introduction

In-house lecture: The outline of items to be learned through the workshop were introduced, namely; process of Hazard Map preparation, structure of Hazard Maps, information layers, topographical and geological features, factors to be reflected, limitations in resolution, overlay with other information. The situation of Hazard Map utilization in Japan was also introduced.

Practical training: The user interface of the area map display system for the hazard Maps prepared for Gorkha District and Sindhupalchok District by RRNE was introduced.



Source: JICA Project Team

Figure 4.8.2 User Interface Landslide Area Map display System (“NepalMapExplorer”)

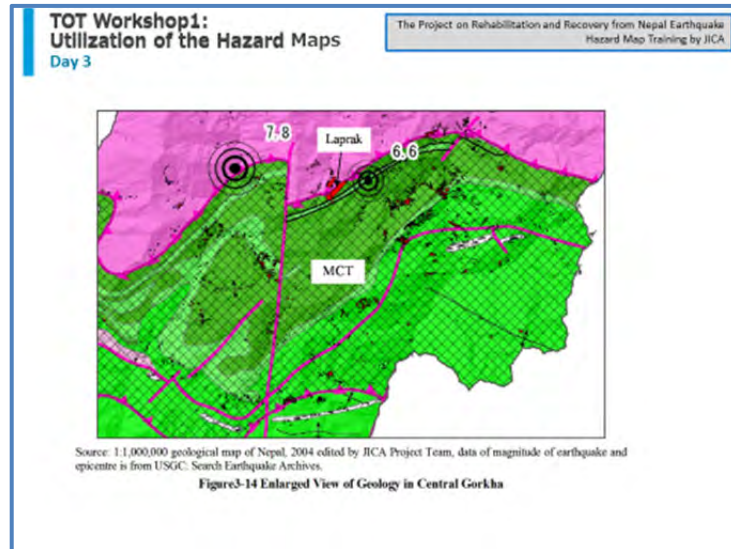
(2) Factors related to Landslides

In-house lecture: Results of examination by the Project Team have shared with the participants, namely; topography/geology overview and earthquake overview, classification of the landslide by collapse properties, satellite image identification.

Practical training: Trainings were conducted on displaying GIS data on QGIS, and formulation and utilization of special data related to landslide such as slope and slope direction from Digital Elevation Model (DEM).

(3) Analysis of Landslide Related Factors

In-house lecture: Explanations were done for field survey analysis methodology and result, incline analysis, slope direction analysis, and geology/geo-structure analysis



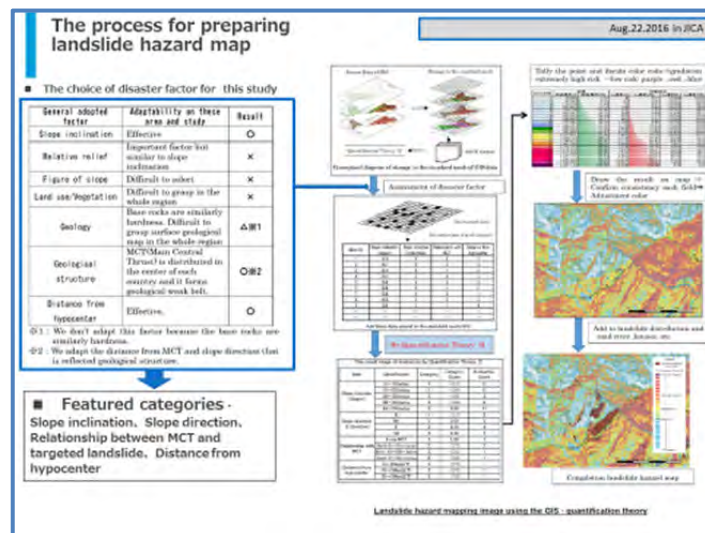
Source: JICA Project Team

Figure 4.8.3 A Sample of Geology/Geo-structure Analysis

Practical training: Operation in QGIS for creating features, adding attributes and buffering which are used during spatial analysis were practiced.

(4) Generating Landslide Hazard Map

In-house lecture: General policies for preparation of Hazard Maps, generating process, extracting factors for hazard analysis, and quantification for weighing factors.



Source: JICA Project Team

Figure 4.8.4 Process for Preparing Landslide Hazard Map

Practical training: Delineation of landslide area and other features on the SPOT satellite data were practiced.

(5) Field Survey / Utilization of Hazard Map in Consideration of On-Site Conditions

Field survey: Field surveys were conducted in four sites in order to understand what factors are reflected in Hazard Maps and what their limitations are through the comparison of the information on Hazard Maps and on-site realities.

(6) Hazard Map Utilization

Lecture: Lectures were provided on risk indication, displaying necessary notices, generation of detailed landslide Hazard Maps. Means for utilizing Hazard Maps for DRR activities were also introduced.

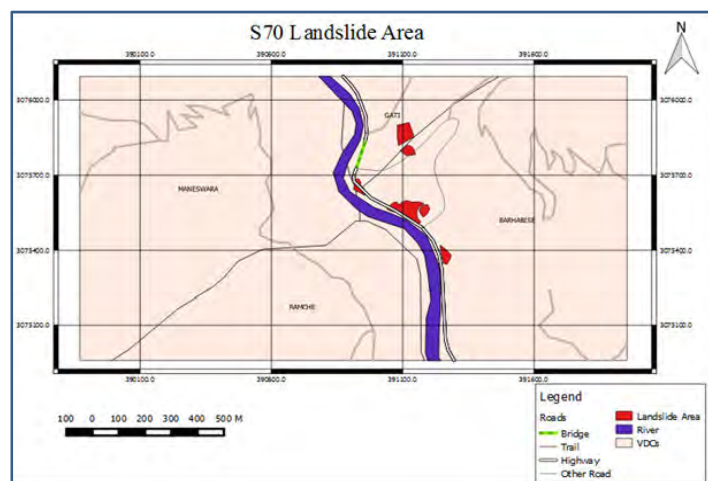


Source: JICA Project Team

Figure 4.8.5 Measures for DRR Jointly Prepared by the Participants and Lecturers

(7) Formulation of GIS Layouts

Practical training on the operation of QGIS in order to prepare print layouts and print outs of GIS data was conducted.



Source: JICA Project Team

Figure 4.8.6 A Sample of Map Layout Created in QGIS

4.8.5 Evaluation of the Workshop

The participants actively participated in the workshop and were able to understand the contents of the Hazard Maps prepared for Gorkha District and Sindhupalchok District, together with their potentials and applicability.

The 19 participants evaluated the workshop as follows:

Table 4.8.1 Evaluation of Participants in Workshop on Hazard Map Utilization

SN	Criteria	A+ : Consistently exceeds expectations	A- : Frequently exceeds expectations	B+ : Meets expectations	B- : Occasionally fails to meet expectations	C : Consistently fails to meet expectations
1)	Timeliness to Class	17	2	-	-	-
2)	Self-motivation	5	12	2	-	-
3)	Understanding Concepts	2	8	9	-	-
4)	Grasping Image Processing Steps	1	5	12	1	-
5)	Team Approach	2	6	10	1	-
6)	Improvement Potential	2	11	6	-	-
7)	Ability for Future Application	3	10	6	-	-
Overall Rating		2	13	4	-	-

Source: JICA Project Team

The following table indicates the results of a questionnaire survey conducted to understand the response of the participants to the workshop.

Table 4.8.2 Response of Participants Regarding Workshop on Hazard Map Utilization

Question	Excellent	Good	Normal	Poor
Q1. How do you feel about the knowledge gained in this workshop regarding:				
i) Slope Disaster	4	13	2	-
ii) The importance of Geology and Soil condition in grasping hazard condition	1	15	3	-
iii) Field survey	2	8	8	1
iv) The Hazard Map of Gorkha District & Sindhupalchok District prepared under the Project	1	13	5	-
v) How to grasp the image of localized Hazard area	1	15	3	-
vi) Introduction of Satellite image including SPOT	2	14	3	-
vii) Working with GIS data in QGIS Software	5	12	2	-
viii) Use of GIS information in utilizing the prepared Hazard Map and grasping localized hazard condition	3	13	3	-

Source: JICA Project Team

The above workshop is considered to have provided the participants with knowledge on how to operate the hazard maps of the two districts prepared through the Project. Furthermore, the participants were able to understand how to evaluate the future risks of potential landslide disasters

and to utilize these results for decision making in further infrastructure development and considering possible relocation of local residents.

In the workshop, the participants have shown strong interest in receiving practical proposals regarding coordination with engineers, mainly from the district level, and specialists, mainly from the central level, in disaster response. It is strongly advised that the knowledge obtained in the workshop will be well utilized at the times of future landslide hazards.

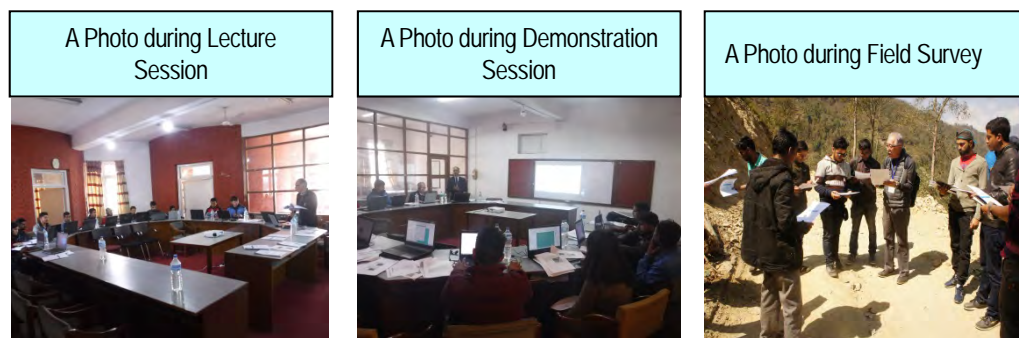
4.9 Workshop on the Outline of Hazard Map Preparation

4.9.1 Objectives

The objective of the Workshop on the Outline of Hazard Map Preparation was to have NRA staff to attain the knowledge and skills for preparation of Hazard Maps as well as updating GIS database.

4.9.2 Participants

A total of 13 staffs from relevant government organizations have participated in the Workshop on Outline of Hazard Map Preparation. The participants mainly consisted of civil engineers from the two earthquake affected districts; Gorkha District and Sindhupalchok District. In addition, several specialists on geology, land survey and soil management have participated from the central organizations in Kathmandu. The details of the participants are indicated in Appendix 4-2.



Source: JICA Project Team

Figure 4.9.1 Photos of Lecture, Demonstration, and Field Survey of Workshop on the Outline of Hazard Map Preparation

4.9.3 Contents of the Workshop

Necessary coordination and preparation of materials were done prior to the Workshop on the Outline of Hazard Map Preparation. Participants, schedule and venue was prepared in consultation with NRA. A part of the data comprising the hazard map of Sindhupalchok District was utilized for exercise material for training on GIS. The materials used were modified as required and distributed to the participants.

The 10-day workshop, consisting of lectures, hands-on training and field work started on 28 February 2017 and ended on 10 March. The Hazard Maps prepared through the Project were used as training material for the workshop. Excluding the field surveys, the workshop was basically carried out by having lectures in the morning time and hands-on training in the afternoon. Detailed workshop agendas are indicated in Appendix 4-2.

4.9.4 Achievements and Outcomes

Through this workshop, the participants have obtained knowledge on information to be collected for the preparation of Hazard Maps in the nine target districts, the means for evaluating the collected information and techniques to incorporate them into the Hazard Maps.

(1) Introduction

In-house lecture: Lecture was provided on the differences between common information to be indicated in Hazard Maps and information that can be understood by overlaying different information. In addition, the contents of the Hazard Maps prepared for Gorkha District and Sindhupalchok District were reviewed to form a common understanding on Hazard Maps to be prepared for the nine districts.

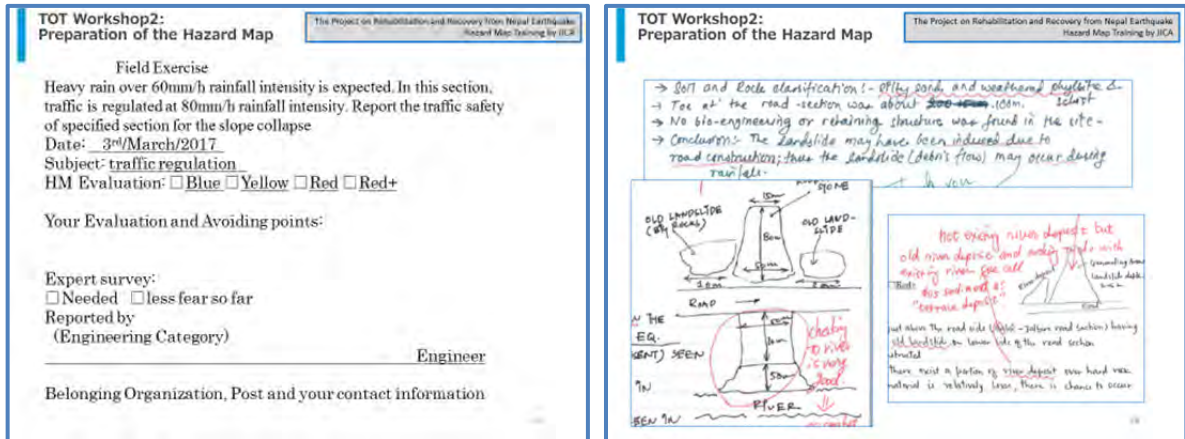
Practical training: The user interface of the area map display system for the Hazard Maps prepared for Gorkha District and Sindhupalchok District by the Project was introduced. The same content with the previous workshop was repeated to introduce the techniques to the newcomers and to refresh the learnings for those who participated in the previous workshop.

Operation of QGIS software was practiced through identifying landslide areas on satellite images and by acquiring data geographical on roads and rivers. Means to use geographical information on the internet, such as DEM and other publicly disclosed geographical data was also introduced.

The information necessary for preparing Hazard Maps, such as roads, rivers, and buildings and housings, and the importance of updating such information were also learned in the workshop.

(2) Field Survey

Field survey: All participants evaluated the risk of slope collapse and means for securing safety of traffic through on-site preparation of evaluation sheets at Balephi-Jalbire road near Chautara city. Furthermore, the actual situation was reviewed based on the evaluation results of all participants.

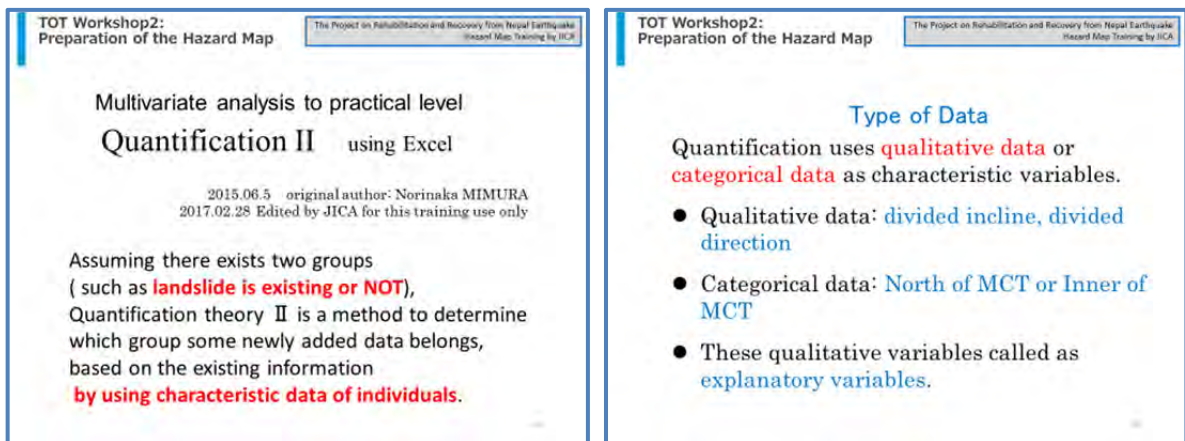


Source: JICA Project Team

Figure 4.9.2 Field Survey Evaluation Sheet and Sample of Evaluation

(3) Preparation of the Hazard Map in the Pilot Area

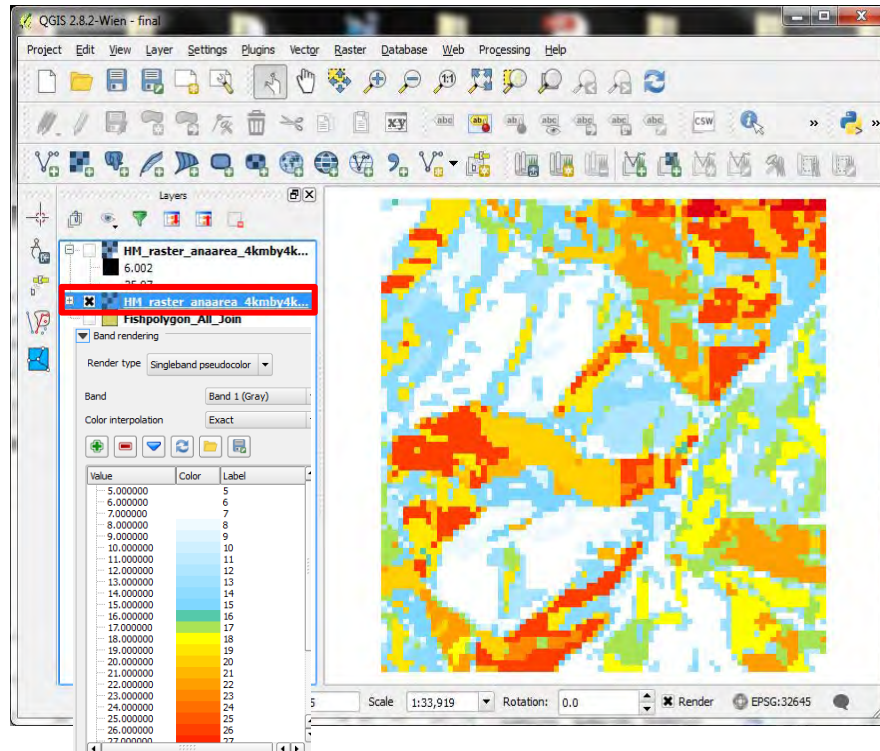
In-house lecture: Prioritization of factors to be reflected in the Hazard Map and means of weighing the factors based on quantification theories were introduced.



Source: JICA Project Team

Figure 4.9.3 Exercise for Weighing Factors Based on Quantification

Practical training: Step-wise preparation of Hazard Maps using QGIS and Quantification software were practiced. Taking into consideration the limited time for the workshop, the methods used for the preparation of Hazard Maps in Gorkha District and Sindhupalchok District were applied.



Source: JICA Project Team

Figure 4.9.4 Sample Hazard Map of the Pilot Area Created with QGIS

4.9.5 Evaluation of the Workshop

Similarly with the Workshop on Hazard Map preparation, the participants actively participated in all activities, and were able to learn necessary techniques for preparing Hazard Maps.

The 13 participants evaluated the workshop as follows:

Table 4.9.1 Evaluation of Participants in Workshop on the Outline of Hazard Map Preparation

SN	Criteria	A+ : Consistently exceeds expectations	A- : Frequently exceeds expectations	B+ : Meets expectations	B- : Occasionally fails to meet expectations	C : Consistently fails to meet expectations
1)	Timeliness to Class	11	1	1	-	-
2)	Self-motivation	5	6	2	-	-
3)	Understanding Concepts	3	7	3	-	-
4)	Grasping Image Processing Steps	3	4	6	-	-
5)	Team Approach	4	5	4	-	-
6)	Improvement Potential	3	8	2	-	-
7)	Ability for Future Application	3	6	4	-	-
Overall Rating		4	7	2	-	-

Source: JICA Project Team

The following table indicates the results of a questionnaire survey conducted to understand the response of the participants to the workshop. Many of the participants were found to have sufficient

understandings on quantification and operation of QGIS for the preparation of Hazard Maps.

Table 4.9.2 Response of Participants Regarding Workshop on the Outline of Hazard Map Preparation

Question	Excellent	Good	Normal	Poor
Q1. How do you feel about the knowledge gained in this workshop regarding:				
i) Selection of factors for creating landslide hazard Map	3	10	-	-
ii) Field Survey	7	6	-	-
iii) Introduction of Satellite image including SPOT	10	3	-	-
iv) Working with GIS data in QGIS Software	3	9	1	-

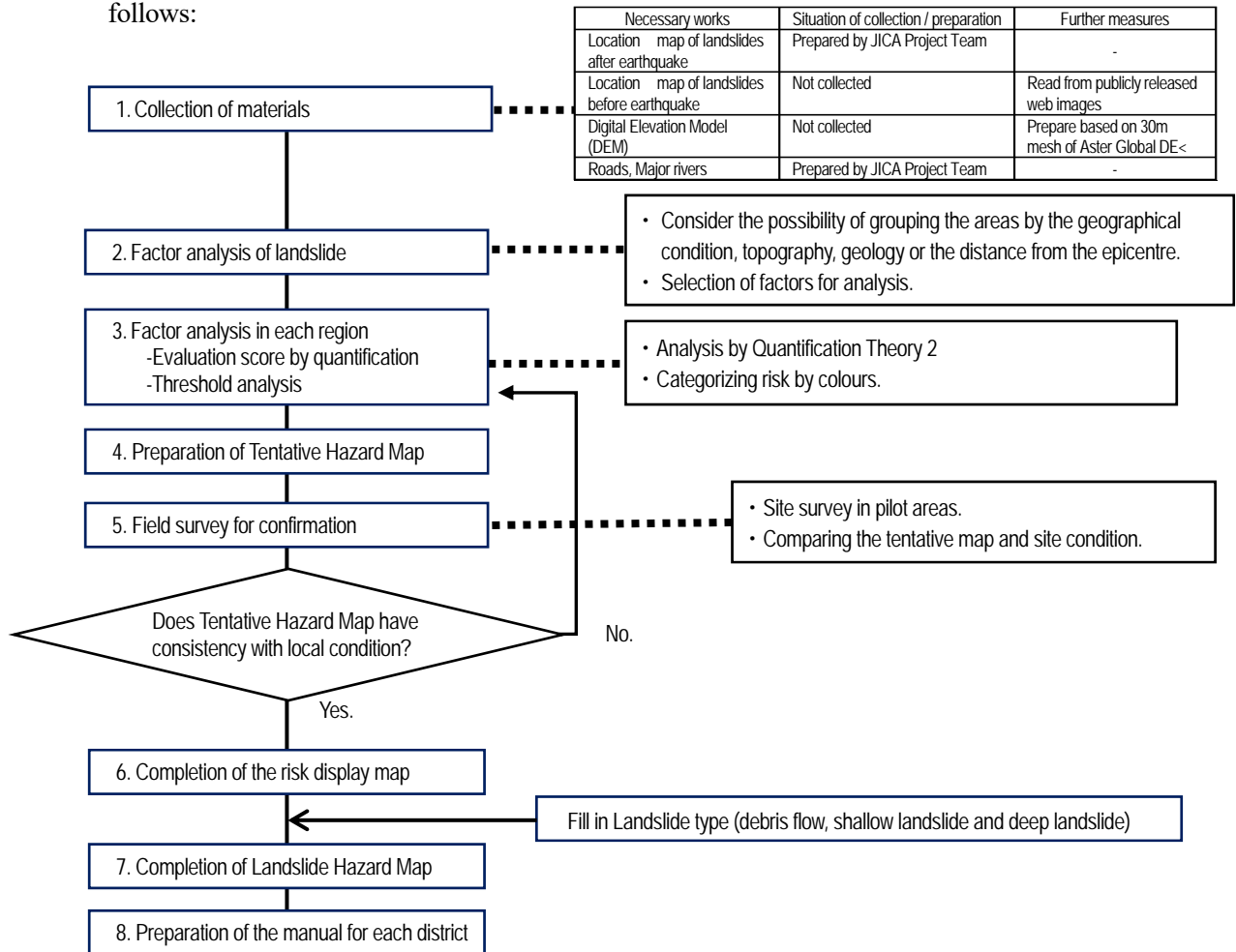
Source: JICA Project Team

The above workshop was considered to have provided the participants with knowledge on how to prepare Hazard Maps in the nine target districts using the satellite images provided by the Project Team and applying the basic procedures taken for the hazard maps of the two districts prepared through the Project, and further taking into consideration the different characteristics of landslide hazards in the respective target districts.

Furthermore, the participants conducted on-site evaluation on the schemes for coordination among engineers, mainly from the district level and specialists, mainly from the central level in disaster response proposed in the Workshop for Hazard Map Utilization. All results of evaluation were reviewed in the following days. Through this process, the participants were considered to have obtained knowledge on more practical means for coordination.

4.10 Flow for Formulating Landslide Hazard Maps in the Remaining Nine Districts

The expected flow of works for the preparation of Hazard Maps in the remaining nine districts by the NRA engineers who participated in the workshops described in the above sections are as follows:



Source: JICA Project Team

Figure 4.10.1 Work Flow for the Preparation of Hazard Maps in Nine Districts

Chapter 5 Community Based Disaster Risk Reduction/Management (CBDRR/M) Activities in Landslide Prone Areas

5.1 Background

Nepal is characterized by rugged topography, variable climatic conditions, complex geological structures with active tectonic process and continued seismic activities. Therefore, landslides, which occur frequently in the hilly areas of Nepal mostly during the monsoon season, are one of the main natural disasters. Infrastructures such as roads and irrigation canals built without proper planning and protection measures can be damaged and washed away by frequently occurring landslides. The Project Team conducted the CBDRR/M activities in the Districts of Gorkha and Sindhupalchok, as the risk of landslides has been increased in those districts due to the earthquake in 2015 and subsequent aftershocks.



Source: JICA Project Team

Figure 5.1.1 Characteristic Farm Village

5.2 Review of CBDRR/M in Nepal

The National Strategy for Disaster Risk Management (NSDRM) was promulgated in 2009 based on the Hyogo Framework for Action 2005-2015 (HFA). Multiple occasions were organized to solicit the view of governmental and non-governmental agencies, local bodies, academic institutions, private sector, UN agencies, I/NGOs, and Civil Society Organizations (CSO). The long term vision of the strategy is to build disaster-resilient communities in Nepal.

The Department of Water Induced Disaster Prevention (DWIDP) under the Ministry of Irrigation (MOI) is responsible for taking effective prevention measures against water induced disasters, and conducting studies and research on floods, landslides, and earthquakes.

To make Disaster Risk Management (DRM) a part of the development process at the local level, MOFALD developed the Local Disaster Risk Management Planning Guidelines (LDRMP). This focuses on enhancing the engagement of local bodies and communities in the prevention and mitigation initiatives at the community level. With the support and initiation of NGOs, Disaster Management Committees (DMCs) have been formed at the VDC level. Under the Nepal Risk

Reduction Consortium (NRRC), 1,000 targets VDCs were chosen as target areas for CBDRR/M projects.

The Disaster Management Plans were formulated in 2012 in Gorkha District and in 2011 in Sindhupalchok District based on the “Guidance Note of Disaster Preparedness and Response Planning” formulated by MOFALD in 2011. The District Emergency Operation Centre (DEOC) had been established under the District Administrative Office in 36 districts by 2013 under the MOHA Act. Regional and municipal level Emergency Operation Centres in each region and five municipalities are in the process of establishment. In Gorkha District, DEOC was established in January 2016, after the earthquake. Four polices are mainly involved in DEOC. Till now 300 events were held on the community level and they provided Emergency Operation Support to communities. Chief District Officer (CDO) is the Chairperson of DEOC and the CDO gives the orders during the Emergency operation time. The DEOC can just inform and coordinate with the related team.

District/Municipal/VDC level DRM Committees are to develop and enhance the performance capabilities of Community Based Organisations (CBO) to carry out DRM activities at community levels. CBOs will be imparted training on local early warning systems, relocation to safe places, first-aid, search and rescue, and putting out fires.

In Nepal, Early Warning System (EWS) for floods in seven major river systems, two Glacial Lake Outburst Floods (GLOF), three landslides, and five comprehensive EWS had been developed before the 2015 Earthquake.

Along the Priority 3 “Use knowledge, innovation and education to build a culture of safety and resilience at all levels” of HFA, the following activities are being done;

- High school level curricula has been developed and implemented with regard to DRM/CRM
- Undergraduate/graduate level programmes have developed and implemented in the universities
- Staff College and Local Development Training Academy has been imparting DRM courses to government officials
- Yearly observance of National Earthquake Safety Day is held on January 15th or 16th.

5.2.1 CBDRR/M Activities

MOFALD has conducted the Integrated CBDRR/M with the support of IFRC. It is called Flagship 4 of NRRC, and it aims to have CBDRR projects covering 1,000 VDCs/municipalities over 5 years.

The minimum characteristics were developed over several Flagship 4 workshops in consultation with the GON, I/NGOs, NGOs, and CBOs. The followings are the nine minimum characteristics from the Flagship 4.

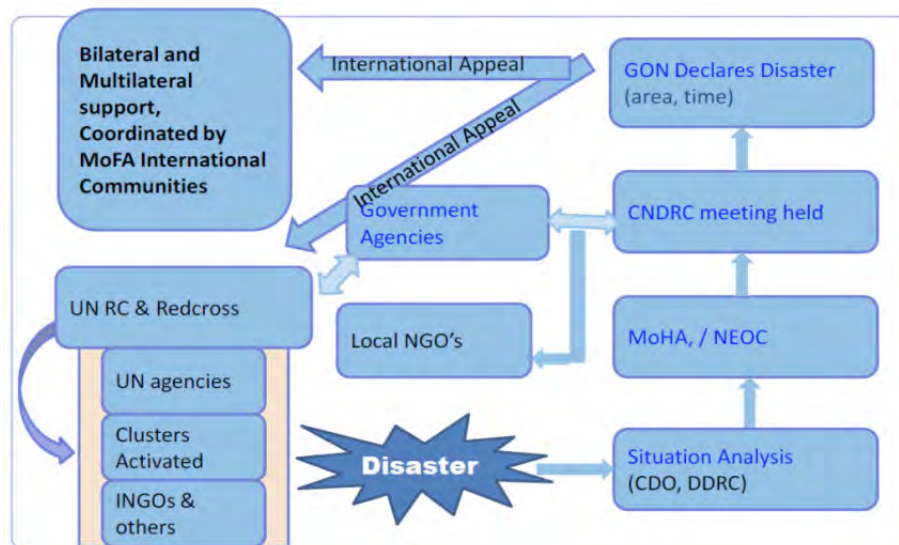
- Organizational Base at VDC/Ward and Community Level
- Access to DRR Information
- Multi-hazard Risk and Capacity Assessments
- Community Preparedness and Response Teams
- Disaster Risk Reduction/Management Plan at VDC/Municipality Level
- Disaster Risk Reduction/Management Fund
- Access to Community Managed Disaster Risk Reduction Resources
- Local Level Risk/Vulnerability Reduction Measures
- Community-based Early Warning Systems

5.2.2 Lessons Learnt from the Earthquake

According to the MOHA presentation at Asian Conference on Disaster Reduction (ACDR) 2016 in Thailand in February 2016, the following points are mentioned in relation to CBDRR/M which was learnt through the 2015 Earthquake:

- Helipads in rural areas and in each village.
- Emergency warehouse and adequate stockpiling of appropriate supplies and equipment.
- One window system for rescue and relief to distribute food and non-food items in remote areas.
- Call centre in each village and GIS based integrated information system.
- Community based approach encouraging communities and the utilization of social networks in recovery process.

After the earthquake, MOHA proposed national mechanisms for emergency response as shown in the following figure.



Source: MOHA

Figure 5.2.1 National Mechanism for Emergency Response Proposed by MoHA

Positive aspects after the earthquake were reported as follows:

- More than 1,000 engineers and social mobilizers have been mobilized for the collection of digital information of households and damage of houses.
- It was noted that strong political will and continuous dialogue with the affected people are the most important aspects.
- Self-reliant and motivated urban youth who were victims of earthquake were active in rescue and relief activities.
- Social harmony has become great example, so theft and robbery did not occur.

5.3 Objectives of the CBDRR/M activities

The objective of the CBDRR/M activities of the Project is to show the model case of CBDRR/M activities in landslide prone areas including awareness raising activities and establishment of information transmission system with the District Emergency Operation Centre (DEOC) which was newly established driven by the occurrence of the earthquake, by utilizing the Hazard Maps explained in Chapter 4. The lessons learnt from the activities were reflected to the Rehabilitation and Recovery Plan in Gorkha and Sindhupalchok.

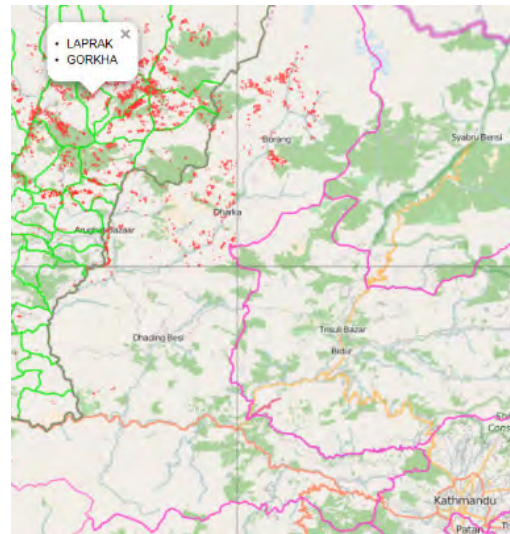
5.4 Record of the CBDRR/M Activities

5.4.1 Target Area

The pilot communities of the CBDRR/M activities were decided based on the difference of the possible landslide type and the village type. In Gorkha District, Laprak VDC, where still landslides has been occurring, and half of villagers has moved to the other villages based on the information of landslide prone topography, was selected. And in Sindhupalchok District, Kerabari, Syaule VDC where most residents moved to the adjacent village after the earthquake, was chosen.

(1) **Laprak VDC, Gorkha district**

- Population : 2,161
Source: Census 2011, CBS
- The number of deaths : 21
- The number of injuries : 65
- The number of missing : 1
- Damage to the buildings : 649
(Almost 100% of all buildings)
Source: Gorkha DDC, 2015

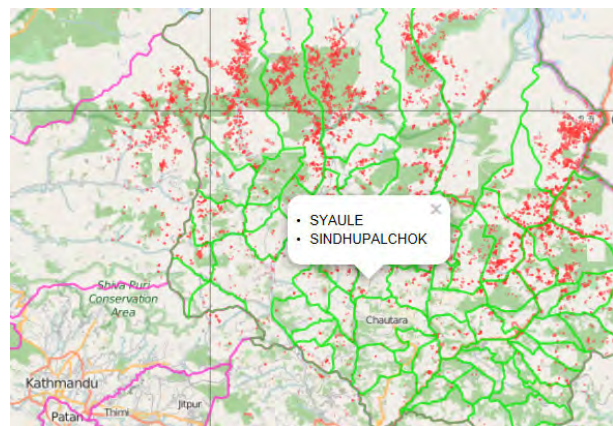


Source: JICA Study Team

Figure 5.4.1 Location of Laprak

(2) **Kerabari, Syaule VDC, Sindhupalchok**

- Population : 3,630
Source: Census 2011, CBS
- The number of deaths : 55
- The number of injuries : 57
- The number of missing : 4
- Damage to the buildings : 1,875
(Almost 100% of all buildings)
Source: Sindhupalchok DDC, 2015



Source: JICA Study Team

Figure 5.4.2 Location of Kerabari

5.4.2 Contents of CBDRR/M Activities

(1) **Understanding the Hazard**

Local people are living with many natural disaster risks, but usually they do not realize that the disaster can be reduced or prevented. Besides understanding about hazards, this step is also expected to help organize the core CBDRR/M group in the community.

Therefore, the mechanism of landslide was explained by a landslide project in the community seminars on 18th and 19th August 2015 in Laprak. The poster shown on the seminar has been utilized after the seminar for residential WS by the community.

(2) Understanding the Risk in the Community

After understanding the hazard information about landslides, understanding the risk is the next step. The Hazard Map is effective to the community not only for understanding the situation but also for sharing information to reduce their risk by adding evacuation routes, evacuation places, deposit storage, etc.

It is an important step to develop risk maps in collaboration with local communities, local governments, and projects after understanding the provided Hazard Maps. Community people know well about the local situations during their daily life, so their opinion should be reflected in the risk map after confirmation. The discussion for developing the risk map is effective to share knowledge and experiences. The workshop was held on 19th April 2016 in Laprak and on 23rd April 2016 in Kerabari. The developed risk map by the community was shared by participants. However, the map is only one piece of paper and it is hard to share with other community people and the local government. To utilize the community based risk map with all of community members, or with the local governments, the created map should be digitized and integrated to GIS. An integrated map can be shared as web based GIS, and multiple stakeholders can utilize it. It is also effective in case of an emergency response with its identified evacuation routes, shelters, etc.

(3) Installation and Operation of the Measurement Equipment for Landslide Monitoring and Rain Gauge

Prediction and forecasting of landslide phenomenon is difficult. Landslides may occur even after the implementation of landslide countermeasure work. By continuously monitoring the target area to detect the landslide phenomenon at an early stage, risk of landslides can be mitigated. For that sense, continuous monitoring in target areas is important for early detection of landslide phenomenon.

During the rainy season, continuous raining or heavy rain in short time are possible triggers of landslides. During the landslide community seminar in Kerabari, 22nd August 2015, the Project Team introduced the importance of measuring rainfall, and how to utilize it for landslide early warning. The reliable criteria for the occurrence of landslides are not clarified due to lack of continuous rainfall measurement in Nepal. However, referring to the landslide at Jure in August, 2014, participants agreed to set an alert in case of more than 140 mm/12 hours of rain.

When the follow-up mission was conducted on 29th March 2016, the rain gauge and EWS was not working due to the disconnection of the system cables caused by heavy wind. For sustainable measurement, the Project Team proposed a more simplified system. It consists of a storage tank and buzzer system. The community leader takes daily notes for the amount of rainfall. If the rain exceeds 140 mm/12 hours, it is the trigger of evacuation.

When community people find a new crack or when there is a tendency that cracks will spread, it will help to subsequent correspondence to visualize the degree of change in the crack.

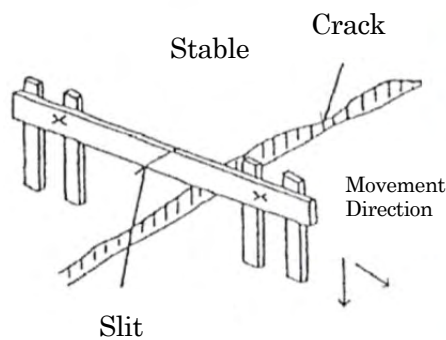
The method of measuring the extent of cracks is basically to set a point for observation on both sides of the crack, and to measure the distance between the points.

A wooden stake was installed in which a crack is observed. By the movement of the break, uplift and subsidence of the crack of the spread and terrain can be found.



Source: JICA Project Team

Figure 5.4.3 A Part of Used Rain Gauge



Source: NPO Nagano Jisuberi boushi kouji kai, JICA Project Team

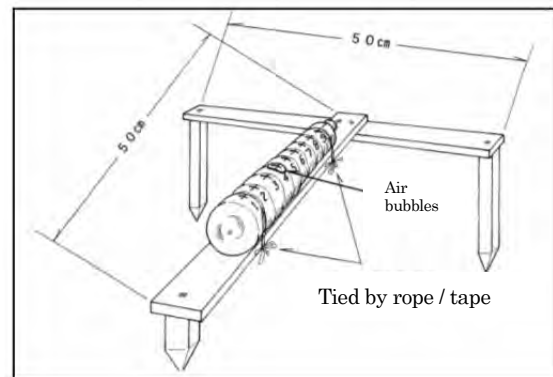
Figure 5.4.4 Simplified Extension Meter

Unfortunately, one extension meter installed at the top of cliff in Kerabari was broken. In case of installations near the road, a fire screen will be necessary.

A ground inclinometer using the plastic bottles is one of the simplified equipment to identify ground angles.

A PET bottle containing air bubbles inside on a combination of two plates with their length of about 50 cm is the equipment for the ground inclinometer. The inclination can be recorded by the movement situation of the bubble.

As same as the above equipment, one ground inclinometer installed at the top of a cliff in Kerabari was broken due to a prank by local students. In the case of installations near the road, fire screens will be necessary.



Source: NPO Nagano Jisuberi boushi kouji kai, JICA Project Team

Figure 5.4.5 Simplified Ground inclinometer

(4) Development of Disaster Information Transmission System

Although the system that issues evacuation advisory through the DEOC from the national and local governments is under preparation, if the landslide precursor phenomenon is detected, the residents need to promptly make a decision for evacuation action regardless of whether or not an evacuation is recommended from the authority.

In this Project, persons in charge of observing and recording the data from rain gauge and landslide observation instrument were assigned in each pilot site. They will regularly record the date from the instrument under the supervision of the community leader. If an abnormal value is observed, it will be instructed that the person in charge shall promptly report to the DDRC, and the DEOC through the VDC secretary.

In the training, 1) residents reported the noticed landslide precursor phenomenon to the CBO or the community leader in charge of the early warning system, and 2) the community leader reported the precursor phenomenon and evacuation to the VDC secretary. Then, 3) the VDC secretary communicated to the DDRC and 4) the DEOC, and the residents evacuated under the command of the community leader. This procedure and information flow was documented and archived within the community. This training was conducted on April 19th in Laprak and on 23rd in Kerabari. DMCs are not installed in Sindhupalchok District and Gorkha District, and therefore, evacuation information from the community was transmitted to DEOC and DDRC via VDC secretary or assistant secretary. Confirmation of these information transmission routes and creation of emergency contact network at each VDC was introduced as a case to be disseminated to other VDCs in the district.

(5) Setting Evacuation Site and Route

Before a disaster might occur, major evacuation routes and evacuation shelters/places should be confirmed among the local people. If people recognize pre-landslide phenomenon or hear the evacuation orders from the community leader, they should begin evacuation. If people are in the high risk area without an evacuation route, people should consider remaining on a ridge rather than in a valley in order to avoid the falling rocks and debris flow.

(6) Evacuation Drill

Evacuation drills are necessary not only for recognizing safe routes and places for evacuation, but also for gathering information of pre-landslides, measurement data, evacuation orders from the government, etc.

The evacuation drills were conducted in collaboration with DWIDP, DTO, and local communities on 19th April 2016 in Laprak, and on 23th April 2016 in Kerabari. Community leaders played a lead role to involve their communities. During the evacuation drill, participants confirmed the safe routes to evacuation shelters/places. Also, the evacuation routes and shelters/places authorized by landslide specialists can be shared to other residents who did not participate in the training through posters. The community leaders will be able to conduct the next evacuation drill with other community members in the future, and these kinds of training sessions will be useful in case of the real event. If the EWS established by the government is working in the future, the evacuation methods should be modified.

The table below is the lessons learned from the activities in the two pilot sites.

Table 5.4.1 Lessons Learned and Recommendation of the CBDRR/M Activities

Pilot site	Lessons learned	Recommendation
Kerabari	Only a part of residents participate in evacuation drills	Residents who do not participate in evacuation drills should be prohibited to work in landslide prone areas.
Kerabari	Observation equipment was damaged by child's mischief	Conduct awareness raising activities of observation instruments, and the community should reinstall them in case of damage.
Kerabari	The district's social mobilizer never visited Kerabari	Stipulate social mobilizers to support community activities and participate in CBDRR/M activities.
Laprak	The elderly do not want to relocate to a safe new village	Link observation and evacuation behavior so that evacuation can be made to a temporary shelter when landslide signs are observed.
Laprak	Work lodge is installed in the landslide risk area	Especially in the rainy season, conduct awareness raising activities not to stay in the work lodge in the landslide prone area.
Laprak	Laprak VDC Secretary lives within the Gorkha Bazar	Transfer information via assistant secretary and active youth.
Laprak	Social mobilizer does not participate in disaster drills	Support community activities.

Source: JICA Project Team

(7) Follow-up Activities in Sindhupalchok District

When the Project Team re-visited Syaule VDC on 10th of February 2017, the cracks at the ridge of the hill were observed to have enlarged substantially and it appeared that the risk of landslide was high. In order to share the situation with stakeholders and investigate the conditions of the high risk area, the Project Team conducted a survey in Ward No.8 (Kerabari), Syaule VDC with WCF members in the ward. During the survey, the Project Team found that the villagers fed cattle under the high risk area because there are no other sources of livelihood for them. The Team informed the risk of the landslide to the villagers and WCF members and shared the result to the VDC secretary and DDRC for further observation. The results of the site visit and observations were introduced in the RRP as a lesson learned from the CBDRR/M activities and as a necessity for the countermeasure of landslides by utilizing the hazard map.



Source: JICA Project Team

Figure 5.4.6 Enlarged crack in Ward No.8 Syaule VDC, Sindhupalchok

Chapter 6 Kathmandu Valley Resilient Plan (KVRP)

6.1 Overview of Kathmandu Valley Resilient Plan (KVRP)

6.1.1 Necessity of KVRP

Nepal is a disaster prone country due to its geographical, geomorphic and meteorological features, including earthquakes, landslides and flooding. Large scale disasters have happened in the past. Most recently, the Nepal Earthquake 2015 caused tremendous human loss and enormous economic, social and cultural damage in the country.

In order to avoid repeating efforts for the recovery and reconstruction from damages, it is important to make preparations for large scale disasters in advance during normal time. This is particularly important in the Kathmandu Valley, which is the capital region, administrative, cultural and economic centre of the country, with a total population of over 2.5 million.

In light of the lessons learned from the Nepal Earthquake 2015, a comprehensive measure against large scale disasters with the possibility of the worst case scenarios would be significantly important. These measures are not only limited within the scope of narrowly defined disaster prevention or reconstruction, but also included a far-sighted development policies for the Kathmandu Valley with an eye on the distant future.

6.1.2 Objectives of the KVRP

Resilience is defined as “the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions”⁶. Resilience is, therefore, a comprehensive notion on disaster management, rather than narrow scope of disaster prevention or reconstruction.

Following this definition, the KVRP has the following objectives:

- The KVRP is a comprehensive policy framework for disaster prevention and mitigation in preparation for large scale natural disasters that may occur at any moment.
- The KVRP includes vulnerability assessment to large scale natural disasters, and sets priorities and proper measures in advance, with the aim of building land and society resilient to large scale natural disasters.

⁶ 2009 UNISDR Terminology on Disaster Risk Reduction”, Geneva, May 2009. Sendai Framework for Disaster Risk Reduction 2015 – 2030, p. 9.

- In order to avoid repeating efforts for the recovery and reconstruction from tremendous damage after large scale disasters, the KVRP is a preparation of the Build-Back-Better (BBB) concept for large scale disasters in advance during normal times.
- The KVRP is an overall development guideline for the Kathmandu Valley promoting resilience-related policies and measures.

6.1.3 Basic Principles and Goals of KVRP

Mainstreaming disaster risk reduction in the development process is the main task of the KVRP. In this process, existing policies and initiatives, plans and programs should be integrated into the concept of disaster risk management. The KVRP is applied to the concept of “BBB” to understand the underlying risks and build appropriate measures for national and local governments.

Damages from large-scale disasters vary depending on the preparedness of society. In order to avoid repeating efforts over years for the recovery and reconstruction from tremendous damage caused by large-scale disasters, it is important to make preparations in advance during normal times. In order to promote initiatives for building Kathmandu Valley resilience, the KVRP adopts four (4) basic principles⁷:

- i. Prevent human loss by any means;
- ii. Avoid fatal damage to important functions for maintaining administration as well as social and economic systems;
- iii. Mitigate damage to property of the citizenry and public facilities; and
- iv. Achieve swift recovery and reconstruction.

Through proactively promoting public-private initiatives for building Kathmandu Valley’s resilience to secure social and economic systems that will never become dysfunctional in any event, the lives and property of residents, industrial activities and economic growth can be protected, and at the same time, both the Kathmandu Valley and local governments and the private sector may also be able to enhance their capacity to address changes in circumstances and increase their productivity and efficiency. Such initiatives will also contribute to the government’s economic growth strategy by cultivating new markets and expanding investments.

Therefore, the government of Nepal including relevant ministries and agencies such as KVDA, in collaboration with local governments and the private sector, needs to commit to promoting actions for building Kathmandu Valley’s resilience comprehensively.

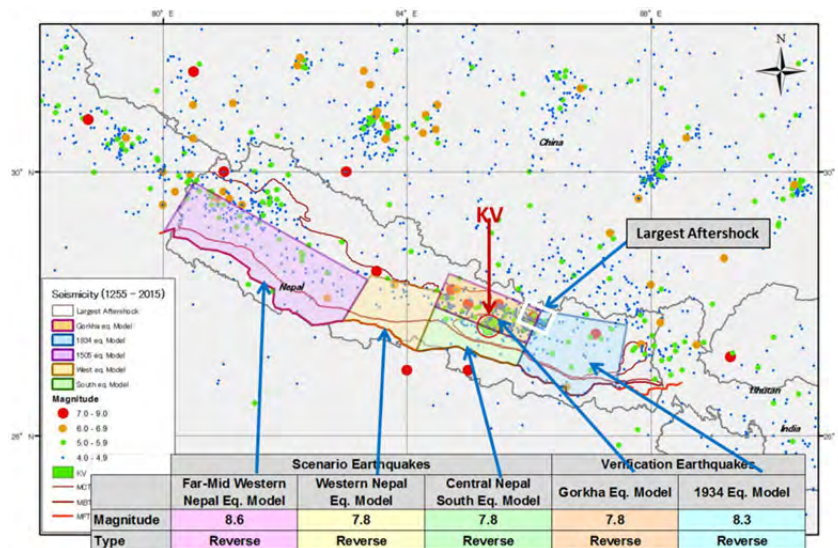
⁷ Fundamental Plan for Natural Resilience – Creating a Strong and Resilient Country, June 3, 2014, Cabinet Decision, Government of Japan, P. 4.

6.1.4 Target Year of KVRP

The plan proposes a comprehensive policy framework for disaster prevention and mitigation in preparation for large-scale natural disasters that may occur at any moment. As this plan will be attached as an appendix to the Strategic Development Master Plan (SDMP), the time frame of the plan is aimed to be 18 years (2017 – 2035). Monitoring and updating of plan should be conducted every five years by the KVDA with the participation of relevant stakeholders.

6.1.5 Vulnerability Assessment

Under the eight operational goals, the KVRP identifies a number of worst case scenarios that should never happen in the Kathmandu Valley. The envisaged natural disaster risk analysis in the KV has been based on the results of the JICA Project for the Assessment of Earthquake Disaster Risk for the Kathmandu Valley (ERAKV). Accordingly, the Central Nepal South Scenario Earthquake with correction factor ($\times 2/3$) is selected as the scenario earthquake in the ERAKV. The KVRP has followed the same scenario earthquake and analysis envisaged disaster risk in the KV.



Source: JICA Project Team

Figure 6.1.1 Scenario Earthquake and Fault Model

The KVRP identifies 33 worst case scenarios. The key proposals are selected from the five worst events as a priority area⁸ for improvement for the next 20 years. The five worst events are as follows:

- A large number of casualties due to large-scale and multiple collapses of buildings and infrastructure.
- A large number of casualties due to the collapse of facilities used by the general public.
- A large number of casualties due to the lack of evacuation facilities.

⁸ They were selected to realize basic goals such as protection of human life, preservation of social, economic and administrative systems, prevention of damage expansion, and prompt recovery from large-scale natural disasters

- Isolation of many settlements for long periods due to the interruption of the transportation network.
- Long term stagnation of the tourism industry due to damage to important cultural and historical heritage sites.

The operational goals and worst case scenarios are shown in Table 6.1.1.

Table 6.1.1 Worst-Case-Scenarios

Fundamental Goals		Operation Goals		Worst events that should never happen
I. Prevent human loss by any means. II. Avoid fatal damage to important functions for maintaining administration as well as social and economic systems. III. Mitigate damage to property and facilities and prevent expansion of damage. IV. Achieve swift recovery and reconstruction.	1	Protect human lives even in the event of a large-scale natural disaster.	1	A large number of casualties due to large-scale and multiple collapses of buildings and infrastructure.
			2	A large number of casualties due to the collapse of facilities used by the general public.
			3	A large number of casualties due to the delay of evacuation caused by the failure of information transmission.
			4	A large number of casualties due to the lack of evacuation facilities.
	2	Ensure prompt rescue and first-aid activities and provision of medical care from immediately after a large-scale natural disaster.	1	Prolonged suspension of the supply of food, drinking water and other vital goods.
			2	Isolation of many settlements for long periods due to the interruption of the transportation network.
			3	Difficulty of rescue and emergency response activities due to significant damage to relevant organizations.
			4	Prolonged suspension of energy supply for emergency response activities including medical services.
			5	Paralysis of medical services due to damage and lack of medical facilities and personnel.
			6	Outbreak of epidemics or infectious diseases in disaster-affected areas.
	3	Secure administrative functions of federal and local governments from immediately after a large-scale natural disaster.	1	A decline in public safety due to damage to police facilities and personnel.
			2	Serious traffic accidents due to lack of traffic control.
			3	Dysfunction of the federal government due to significant damage in their facilities.
			4	Deterioration of the functions of local governments due to significant damage to their personnel and facilities.
	4	Secure information communication functions from immediately after a large-scale natural disaster.	1	Paralysis of information communication systems due to the suspension of power supply.
			2	Circumstances where disaster information cannot be delivered promptly due to the suspension of TV and radio broadcasting.
	5	Prevent functional disturbance in economic activities (including supply chains) even after a large-scale natural disaster.	1	Decline in companies' productivity caused by disruption of supply chains.
			2	Suspension of energy supply necessary for social economic activities.
			3	Long term stagnation of the tourism industry due to damage to important cultural and historical heritages
			4	Dysfunction of major transportation networks due to damage by a disaster
5			Fatal damage to major airports caused by a disaster	

Fundamental Goals	Operation Goals	Worst events that should never happen
		6 Circumstances where dysfunction of financial services occurs.
		7 Stagnation of stable food supply.
6	Secure lifelines (electricity, water, sewerage and fuel) and economic activities even after a large-scale natural disaster.	1 Suspension of power supply networks and oil supply chains.
		2 Prolonged suspension of water supply,
		3 Prolonged suspension of sewage treatment facilities.
7	Prevention of any uncontrollable second disaster.	1 Traffic paralysis due to the collapse of buildings along emergency roads.
		2 Large-scale spread and leakage of hazardous materials caused by a large-scale natural disaster.
		3 Expansion of damage due to the devastation of farmland and forests
8	Develop conditions that enable swift recovery and reconstruction of local society and economy even after the occurrence of a large-scale natural disaster.	1 Delay of recovery and reconstruction work significantly due to the delay of treatment of disaster waste.
		2 Delay of recovery and reconstruction work significantly due to shortage of personnel.
		3 Delay of recovery and reconstruction works significantly due to collapse of local communities.
		4 Delay of recovery and reconstruction work significantly due to damage to core infrastructure.

Note) The 33 worst case scenarios were chosen from the "Fundamental Plan for National Resilience - Creating a Strong and Resilient Country -" formulated by the Japanese government in 2014, with reference to the regional characteristics of Nepal, especially the Kathmandu Valley. The highlighted cells are the priority fields selected to achieve fundamental goals such as protection of human life, preservation of social, economic and administrative systems, prevention of damage expansion, and to promote swift recovery from large-scale natural disasters.

Source: Fundamental Plan for National Resilience – Creating a Strong and Resilient Country, Japanese Government, 2014; and JICA Project Team

6.1.6 Countermeasures to Avoid the Worst Scenarios

The KVRP proposes measures to avoid the above five worst case scenarios for each of the following sectors.

- 1) Housing and Building
- 2) Urban Planning and Land Use
- 3) Open Space and Emergency Evacuation Space
- 4) Transportation Network
- 5) Lifelines (Water Supply and Sanitation)
- 6) Tourism and Cultural Heritages
- 7) Social Consideration on Disaster Management
- 8) Capacity Development on Disaster Management
- 9) Partnership with Relevant Organization and Private Sector

Worst case scenarios, priority measures and key proposals for each of the above sectors are indicated in the following⁹.

⁹ The KVRP with detailed descriptions is attached to this document (Appendix 6-1).

【Housing and Building】

Worst case scenario	Priority measure	Key proposal
A large number of casualties due to large-scale and multiple collapses of buildings and infrastructure.	<ul style="list-style-type: none"> Promote earthquake-resistant structural measures in the urban area Develop structural safety measures regarding houses and buildings along arterial roads 	<ul style="list-style-type: none"> Designation, diagnosis, and retrofitting of Vulnerable Buildings Designation of Vulnerable Urban Area
A large number of casualties due to the collapse of facilities used by the general public.	<ul style="list-style-type: none"> Promotion of safe building construction Strengthening earthquake-resistant measures in the facilities used by the general public 	<ul style="list-style-type: none"> Examination of National Building Code (NBC) and Revision Enforcement of NBC and Capacity Building of Local Government Officers Improve Capacity of Construction Companies, Carpenters and Masons Awareness for Construction of Seismic Resistant Building
Long term stagnation of the tourism industry due to damage to important cultural and historical heritages.	<ul style="list-style-type: none"> Earthquake-resistance measures at hotels and tourism spots 	<ul style="list-style-type: none"> Examination of National Building Code (NBC) and Revision Enforcement of NBC and Capacity Building of Local Government Officers Improve Capacity of Construction Companies, Carpenters and Masons Awareness for Construction of Seismic Resistant Building

【Urban Planning and Land Use】

Worst case scenario	Priority measure	Key proposal
A large number of casualties due to large-scale and multiple collapses of buildings and infrastructure.	<ul style="list-style-type: none"> Identification of vulnerable areas Setting priority areas for promoting resilience Area planning in priority areas 	<ul style="list-style-type: none"> Development Measures in Suburban Areas <ul style="list-style-type: none"> →Strengthening of buildings →Land pooling project in urban expansion areas →Ensuring safety of the area along proposed outer ring road →Ensuring redundancy of access roads to settlements Development Measures in Urban Areas <ul style="list-style-type: none"> →Promotion of BBB Concept in Urban Development →Promotion of Mixed Use Land Pooling project Land Use Control in Hazardous Areas of Liquefaction and Landslide
A large number of casualties due to lack of evacuation facilities.	<ul style="list-style-type: none"> Promotion of the preparedness of an evacuation plan 	<ul style="list-style-type: none"> Promotion of Non-structural Measures
Isolation of many settlements for long periods due to the interruption of the transportation network.	<ul style="list-style-type: none"> Ensure emergency road network connecting with remote areas 	<p>【Emergency Transportation Road】</p> <ul style="list-style-type: none"> National Emergency Transportation Road Primary Emergency Transportation Road Secondary Emergency Transportation Road <p>【Management of Emergency Transportation Road】</p> <ul style="list-style-type: none"> Emergency Patrol Emergency Information Communication Elimination of Road obstacles
Long term stagnation of the tourism industry due to damage to important cultural and historical heritage sites.	<ul style="list-style-type: none"> Promotion of safety measures in historical areas 	<ul style="list-style-type: none"> Development Measures in Historical Area <ul style="list-style-type: none"> →Designation of Historical Conservation Area →Area planning in historical conservation area →Strengthening of individual building →Rebuilding traditional housing of "Choka"

【Open Space and Emergency Evacuation Space】

Worst case scenario	Priority measure	Key proposal
A large number of casualties due to large-scale and multiple collapses of buildings and infrastructure.	<ul style="list-style-type: none"> • Develop structural safety measures • Strengthen seismic-resistant measures in public facilities • Development of a cooperation system in disaster management • Development of temporary shelters/evacuation facilities 	<ul style="list-style-type: none"> • Designation, diagnosis, and retrofitting of Vulnerable Buildings • Designation of Vulnerable Urban Areas
A large number of casualties due to the lack of evacuation facilities.	<ul style="list-style-type: none"> • Preparation of emergency evacuation plan • Development of an evacuation open space • Preparation of a management plan for the evacuation facilities 	<ul style="list-style-type: none"> • Main Disaster Management Base • Regional Disaster Management Base • Special Disaster Management Open Spaces →Evacuation Open Space at District Level →Evacuation Open Space at Community Level

【Transportation Network】

Worst case scenario	Priority measure	Key proposal
A large number of casualties due to large-scale and multiple collapses of buildings and infrastructure.	<ul style="list-style-type: none"> • Identification of infrastructure vulnerable to disaster • Develop structural safety measures 	<ul style="list-style-type: none"> • Conduct retrofitting and rebuilding of the bridge for emergency transportation roads
Isolation of many settlements for long periods due to interruption of transportation network.	<ul style="list-style-type: none"> • Ensure the emergency road network connects to remote areas • Develop transport information system 	<p>【Emergency Transportation Road】</p> <ul style="list-style-type: none"> • National Emergency Transportation Road • Primary Emergency Transportation Road • Secondary Emergency Transportation Road <p>【Management of Emergency Transportation Road】</p> <ul style="list-style-type: none"> • Emergency Patrol • Emergency Information Communication • Elimination of Road obstacles

【Lifelines (Water Supply and Sanitation)】

Worst case scenario	Priority measure	Key proposal
Prolonged suspension of the supply of food, drinking water and other vital goods.	<ul style="list-style-type: none"> • Reinforcement of water supply system 	<p>【Water Supply】</p> <ul style="list-style-type: none"> • Storage of a minimum required amount of water to protect human lives in case of disaster • Preparation of a water supply plan for recovery immediately after a natural disaster • Water supply facilities with earthquake-resistance <p>【Sewerage】</p> <ul style="list-style-type: none"> • Strengthening of the existing sewerage systems against earthquake disasters • Emergency recovery and repair of the existing sewerage facilities after a disaster • Implementation of a business continuity plan (BCP) in sanitation service • Emergency sanitation for temporary/semi-permanent toilets provided in camps and evacuation facilities

【Tourism and Cultural Heritages】

Worst case scenario	Priority measure	Key proposal
Long term stagnation of the tourism industry due to damage to important cultural and historical heritage sites.	<ul style="list-style-type: none"> • Promotion of safety measures in cultural and historical heritage sites • Earthquake-resistance measures at hotels • Dissemination of safety plans to tourists • Providing awareness programmes of safety measures for tourism business operators 	<ul style="list-style-type: none"> • Establishment of Information Network among Relevant Organizations • Dissemination of Safety Information to Visitors • Development of Local Community(s) • Development of the Operational Handbook for Rehabilitation of Cultural Heritage Sites • Human Resource Development • Necessity of Disaster Prevention Plan of Historical Conservation Area

【Social Consideration on Disaster Management】

Worst case scenario	Priority measure	Key proposal
-	-	<ul style="list-style-type: none"> • Identification of Vulnerable People in the Target Area • Communication and Information Sharing • Coordination with Non-governmental Organizations (NGOs)

【Capacity Development on Disaster Management】

Worst case scenario	Priority measure	Key proposal
-	-	<ul style="list-style-type: none"> • Capacity Development of Disaster Management Organizations • Improvement of Disaster Management Technology • Promotion of Disaster Management at Community Level • Human Resources Development in Public Organizations • Promotion of Self-help Efforts • Promotion of Disaster Education • Establishment of Information Dissemination System

【Partnership with Relevant Organization and Private Sector】

Worst case scenario	Priority measure	Key proposal
-	-	<ul style="list-style-type: none"> • The Public and Private Partnership • Utilization of Resources in the Private Sector • Preparation of Business Continuity Plans (BCP)

6.2 Meetings with Relevant Government Institutions in Formulation of KVRP

6.2.1 Consultative Content with Key Institutions

The Project Team conducted a series of meetings with key stakeholders in the Nepal Government to discuss the KVRP. The list of meetings with key stakeholders and the contents of discussions are summarized in Table 6.2.1. Through the series of meetings with key institutions, the following issues regarding KVRP were pointed out:

- Importance of formulation of KVRP to reduce damages caused by large-scale natural disaster.
- KVRP is a preparation of the Build-Back-Better (BBB) concept for large scale earthquake disasters in advance during normal times to avoid repeating efforts for the recovery and reconstruction from tremendous damage after the disasters.

- Importance of establishment of emergency road network and evacuation open space to minimize damages and to promote swift recovery and reconstruction.
- Roles and responsibilities of institutions in disaster management, including MoHA, MoUD, MoPIT, KVDA, MoFALD, MoS, NDA and others.
- Importance of vulnerability assessment to large-scale natural disaster and results of risk assessment conducted by ERAKV.
- Function of KVRP, which is a supportive document of long-term Strategic Development Master Plan (SDMP) for Kathmandu Valley prepared by KVDA.
- Variety of countermeasures to reduce damages from large-scale natural disaster, including structural and non-structural measures, self-help efforts, mutual assistance and public help,

Table 6.2.1 List of Meetings with Key Institutions in Formulation of KVRP

Name of Institution	Date of Meeting	Discussion Agenda	Contents of Discussion
MoH	September 20, 2016	Collecting information	<ul style="list-style-type: none"> • Collecting information on damage and safety measures for hospitals
DUDBC	September 20, 2016	Discussion about NaPA	<ul style="list-style-type: none"> • Relationship with the National Plan of Action for Safer Building Construction (NaPA) was discussed. The opinion on NaPA from DUDBC was NaPA is unclear, not practical, and earthquake part is missing, so cannot be implemented.
MoE	September 21, 2016	Collecting information	<ul style="list-style-type: none"> • Collecting information on disaster education in schools • Collecting information on teacher training in DRR • Collecting information on the role of school as evacuation site
MoPE	September 21, 2016	Collecting information	<ul style="list-style-type: none"> • Explanation of KVRP • Collecting information on the role of the Ministry after a disaster: MoPE is for policies and strategies only
KVDA, KOTI, MPIT, MUDN, ESCAP	September 22-23, 2016	Meeting on Transportation Systems	<ul style="list-style-type: none"> • Presentation at the Expert Group Meeting on Planning and Assessment of Urban Transportation Systems
MoPIT	November 21, 2016	Request for support of formulation of KVRP	<ul style="list-style-type: none"> • Discussion on counter measures for MoPIT
MoHA	November 21, 2016	Request for support of formulation of KVRP	<ul style="list-style-type: none"> • Discussion on counter measures for MoHA: Mainly for rescue and response • Discussion on Disaster Management Park in Open space designated by MoHA, Lalitpur Ward-8
MoUD/CLPIU, DUDBC	November 22, 2016	Request for support of formulation of KVRP	<ul style="list-style-type: none"> • Discussion on counter measures for MoUD/CLPIU, DUDBC : relations with the building code and NaPA • Confirmation on the utilization of the result of the risk assessment prepared by the JICA ERAKV Project
NRA	November 22, 2016	Request for support of formulation of KVRP	<ul style="list-style-type: none"> • Discussion on counter measures for NRA: NRA is not a direct implementing agency but it can coordinate and facilitate the process. After NRA, a New DM Authority has been proposed as initial discussion.
KVDA	November 23, 2016	Request for support of formulation of KVRP	<ul style="list-style-type: none"> • Discussion on counter measures for KVDA: Building by-laws and open spaces are developed by KVDA and enforced by municipalities. KVRP is mentioned in KV SDMP
MoS	November 24, 2016	Request for support of formulation of KVRP	<ul style="list-style-type: none"> • Discussion on countermeasures for MoS: • MoS suggested to add on page no.40, Operation Goal:2 under the point 2.1 as follows: • No. 1.Develop and strengthen the capabilities of Public Enterprises in disaster response. • No. 2.Coordinate and liaise with the private sector in disaster response.

Name of Institution	Date of Meeting	Discussion Agenda	Contents of Discussion
MoCTCA	November 24, 2016	Request for support of formulation of KVRP	<ul style="list-style-type: none"> Discussion on countermeasures for MoCTCA
MoFALD	November 27, 2016	Collecting information	<ul style="list-style-type: none"> Discussion on counter measures for MoFALD: Local and community capacity development for disaster management. Shared information on the National Conference on National Strategy for Resilient Urban Communities (NSRUC) on 28 November, 2016 (Monday) as related to the document of MoFALD Importance of integration among all sectoral ministries is highlighted: NSDRR - MoHA, NUDS- MoUD, Periodic plans – MoFALD etc.)
MoIC	November 29, 2016	Collecting information	<ul style="list-style-type: none"> Collecting information of MoIC: Recent EQ 2015 radio Nepal, Nepal Television and national media were instrumental to communicate messages to the public.
MoPIT	November 30, 2016	Discussion about KVRP	<ul style="list-style-type: none"> Discussion on the designation of an emergency road network by MoPIT
DUDBC	November 30, 2016	Discussion about KVRP	<ul style="list-style-type: none"> Discussion was focused on building codes, by-laws and its enforcement, based on the previous discussion: <ul style="list-style-type: none"> - Building codes to be implement on every house. - 20 years target to enforce building codes in Nepal. Currently five municipalities in Nepal have been selected as pilot areas and others have also started to initiate the plan. - National Plan of Action (NaPA) for safer building is being implemented.
KVDA	December 4, 2016	Collecting information	<ul style="list-style-type: none"> Collecting information on long-term visions and projects of the Outer Ring Road
DWSS	December 5, 2016	Collecting information	<ul style="list-style-type: none"> Discussion on counter measures for DWSS :DWSS is responsible in rural areas, and urban areas of Kathmandu Valley is by the Kathmandu Valley Water Supply Management Board
MoPIT, DOR	December 14, 2016	Confirmation of JICA Project role	<ul style="list-style-type: none"> Confirmation of the relationship among the three JICA Projects Confirmation of the method and output images of the risk assessment of bridges which are to be utilized in KVRP
MoHA	January 14, 2017	Confirmation of TC meeting	<ul style="list-style-type: none"> Confirmation of MoH attendance of Technical Committee meeting to be held in February
TC member :KVRP, NPC etc.	February 8, 2017	Technical committee meeting	<ul style="list-style-type: none"> Confirmation of the importance of the KVRP Understanding of the contents of the KVRP: <ul style="list-style-type: none"> - Objective of the KVRP - Formulation Process and Structure - Vulnerability Assessment to Envisioned Natural Disaster (Scenario Earthquake) - Proposed Countermeasures to reduce Vulnerability to Natural Disasters - Further Schedule
KVDA	February 10, 2017	Collecting information	<ul style="list-style-type: none"> Discussion on the RRNE project component on ' Kathmandu Valley Resilience Plan (KVRP) and process of formulation of KVRP Risk Sensitive Land Use Planning (RSLUP) status SDMP status
MoHA	February 14, 2017	Discussion about KVRP	<ul style="list-style-type: none"> Discussions on measures of KVRP
MoUD	February 14, 2017		
MoED	February 17, 2017		
OPMCM	February 17, 2017		
MoUD	February 23, 2017		

Source: JICA Project Team

6.2.2 The First Technical Committee Meeting

The Technical Committee (herein after referred to as “TC”) for the Project held its first meeting on 8th February 2017. The purposes of the TC meeting are the understanding of the importance of the KVRP and consultation and formulation of the plan.

(1) Participants

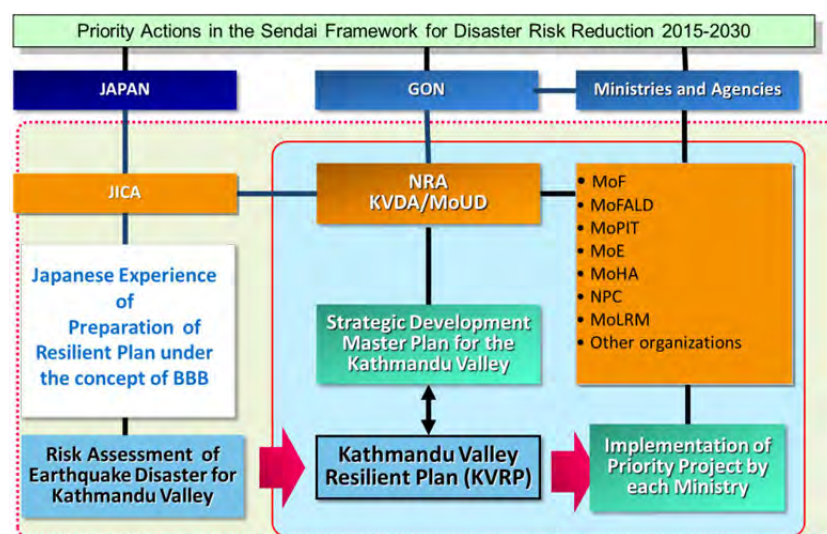
- Technical Committee members: 21 participants
- JICA Staff : 6 participants
- JICA Project Team : 9 participants

(2) Contents of the First Technical Committee Meeting

Firstly, the overview of the KVRP and ERAKV project were presented. The JICA Project Team also proposed counter-measures to reduce vulnerability to natural disasters and discussed in detail including the progress and the next plan for the future. The importance of KVRP was recognized by the TC members and it was agreed that this matter will be continuously discussed in the days to come among JICA, the JICA Project Team, NRA, KVDA and other relevant authorities, including MoUD, NPC, MoHA, and MoFALD. It was also agreed that the TC members will make the presentation about issues of the implementation plan in the next TC meeting.

6.2.3 The Relationship with the Key Stakeholders in the GON

For development of the KVRP, the relationship with the key stakeholders in GON and relevant on-going projects, such as ERAKV conducted by JICA and SDMP for Kathmandu Valley conducted by KVDA are shown in Figure 6.2.1.



Source: JICA Project Team

Figure 6.2.1 Framework for the Development of KVRP

6.3 Way Forward

6.3.1 Status of KVRP

The KVRP was finalized in April 2017 and its contents were shared with the relevant authorities of Nepal in the 2nd Joint Coordination Committee (JCC) held on 20th April 2017. In the Committee, the further actions for rehabilitation and reconstruction from the earthquake to be taken by the relevant authorities were also discussed. The actions raised in the Committee are summarized in the following table.

**Table 6.3.1 Actions to be Taken by Relevant Government Organizations
 (as discussed in the 2nd JCC)**

Organization	Actions related to KVRP
NRA	<ul style="list-style-type: none"> Facilitation of Recovery and Rehabilitation from the 2015 Earthquake with concerned agencies. Utilization of Hazard maps in the 2015 Earthquake affected districts.
MoHA	<ul style="list-style-type: none"> Finalization of Disaster Risk Reduction and Management Bill and develop implementation strategy. Preparation and coordination for BBB Strategic Action Plan formulation and implementation. http://drrportal.gov.np/document/category/ndrrpsap National Emergency Operation Centre (NEOC) to strengthen at province and district level.
MoUD	<ul style="list-style-type: none"> Update of NBC and prepare guidelines and manuals.
KVDA	<ul style="list-style-type: none"> Finalization of RSLUP for KV and prepare SDMP with KVRP as annex.
MoFALD	<ul style="list-style-type: none"> Support local level for compliance of building codes for seismic resistance.
LMC	<ul style="list-style-type: none"> Operation and management of disaster management park.
MoH	<ul style="list-style-type: none"> Facilitation for reconstruction of hospitals. Health Emergence Operation Centre (HEOC) to reorganize at central, province and local hospital level.
MoPIT	<ul style="list-style-type: none"> Establishment of emergency road network in Kathmandu Valley.
MoE	<ul style="list-style-type: none"> School reconstruction. DRRM activities in Education.
MoWSS	<ul style="list-style-type: none"> Safe water and sanitation plan in emergency.

Source: JICA Project Team

As of September 2017, the RLSUP is under review with the cabinet sub-committee and is yet waiting for approval. After official approval of the RSLUP, the formal process for the preparation of the SDMP, to which the KVRP will be incorporated as an appendix, is expected to be started.

6.3.2 Way Forward

Through the series of discussions with the key stakeholders, the GON understood the importance of KVRP. The followings are the actions that should be taken to move the KVRP to the way forward.

- Continuously conduct meetings with the stakeholders and discuss on possible countermeasures to avoid the worst case scenarios. Especially, some action plans which are proposed in Appendix II of the KVRP shall be examined by each ministry. Major stakeholders are:

Table 6.3.2 Major Stakeholders by which the KVRP should be Examined

➤ Ministry of Urban Development (MoUD)	➤ Ministry of Education (MoEd)
➤ Ministry of Physical Infrastructure and Transport (MoPIT)	➤ Ministry of Health (MoH)
➤ Ministry of Home Affairs (MoHA)	➤ Ministry of Energy (MoE)
➤ Department of Urban Development & Building Construction (DUDBC)	➤ Local governments (LGs)
➤ Ministry of Federal Affairs and Local Development (MoFALD)	➤ Office of the Prime Minister and Council of Ministers (OPMCM)
➤ Kathmandu Valley Development Authority (KVDA)	➤ Ministry of Defence (MoD)
➤ Ministry of Culture, Tourism and Civil Aviation (MoCTCA)	➤ Ministry of Water Supply and Sewerage (MoWSS)
➤ Ministry of Supplies (MoS)	➤ Ministry of Industry (MoI)
➤ Ministry of Information & Communications (MoIC)	➤ Ministry of Land Reform and Management (MoLRM)
➤ Department of Water Supply and Sewerage (DWSS)	➤ Kathmandu Upatyaka Khanepani Limited (KUKL)
	➤ Federation of Nepalese Chambers of Commerce and Industry (FoNCCI)
	➤ Federation of Labour and Industry (FoLE)

Source: JICA Project Team

- In accordance to the federalization process propelled by the GoN, the government institutions are currently going under structural reform. There are series of consolidations expected for the central ministries as well as decentralization / delegation of authority to local government institutions, and thus the situation should be carefully monitored.

Chapter 7 Rehabilitation and Recovery Plan of Gorkha and Sindhupalchok

7.1 Framework of Rehabilitation and Recovery Plan (RRP)

7.1.1 Rationale of Integrating the RRP into the Periodic Development Plan (PDDP)

It is essential for the RRP to have legitimacy which prescribes an institutional arrangement, implementation framework, and financial arrangement to assure its implementation. At the beginning of the Project, the Project Team recognized that there is no legal basis of formulating the RRP after a large scale of disaster in Nepal. In order to assure the legitimacy of the RRP, the Project Team suggested MOFALD and DDC of Gorkha and Sindhupalchok that the RRP should be incorporated into the PDDP and both parties agreed to the framework. Integrating the RRP into PDDP is efficient in terms of information collection because the necessary information for formulating these plans overlap with each other.

The Project Team also explained the importance of the legitimacy of the RRP to NRA, and NRA formulated the Post Disaster Reconstruction Framework (PDRF) which has a description on the necessity of formulating RRP at the district level to assure its implementation in the context of promoting reconstruction.

7.1.2 Background of Formulating RRP

Upon discussion with DDCs of Gorkha and Sindhupalchok in the two districts, the Project Team and DDCs of the two districts concluded a Memorandum of Understanding (MOU)¹⁰ for the preparation of the PDDP, in March 2016. The contents of the MOU includes the stipulation that the Project Team should provide technical assistance in order to include the concept of rehabilitation and recovery into PDDP and formulate the RRP by introducing the experience of Japan and its scientific expertise such as the utilization of Hazard Maps. In the MOU, both parties agreed that the Project Team will input the following components in the PDDP.

¹⁰ See appendix of this report.

Table 7.1.1 The JICA Project Team’s Input for the RRP and the PDDP in Gorkha and Sindhupalchok

JICA Project Team’s Input/Expertise in PDDP and RRP	
1.	Rehabilitation and Recovery planning (based on Japan’s Experience of rehabilitation and recovery from natural disasters)
2.	Urban planning
3.	Land use planning
4.	Local administration and organization planning
5.	Community development
6.	Community-based disaster risk management
7.	Purchase of satellite images (resolution 1.5m)
8.	Preparation of topography map by GIS
9.	Field survey on typical landslide disasters caused by the earthquake
10.	Preparation of landslide distribution map by the earthquake
11.	Preparation of landslide Hazard Map (Hazard assessment)
12.	Disaster evaluation and disaster management planning
13.	Social Survey on the earthquake affected areas (VDCs)
14.	Capacity building

Source: JICA Project Team

7.1.3 Framework of Rehabilitation and Recovery in Nepal

(1) Reconstruction Policy

Upon the establishment of the NRA on 25th December 2015, NRA envisaged the Reconstruction Policy which prescribes the policy objectives, priorities by sector and strategies to achieve the objectives. It also prescribes the institutional arrangements from the central government level to the VDC level.

Table 7.1.2 Objectives of Reconstruction Policy

Objectives of Reconstruction Policy	
➤	To reconstruct, retrofit and restore the partial and completely damaged residential, community and government buildings and heritage sites to make them disaster resistant using local technology according to the need.
➤	To revive (re-establishment) the damaged cities and ancient settlement villages by maintaining the original shape with improved structures.
➤	To protect and promote and preserve the vulnerable individual people and community of the quake affected areas.
➤	To develop new alternatives by re-establishing the productive sector for economic opportunity and livelihood.
➤	To study and research on the earthquake, its damages and effects, reconstruction, resettlement, rehabilitation and disaster risk reduction.
➤	To develop integrated and planned settlements.
➤	To resettle the community by identifying the right place on the basis of detailed study.

Source: Reconstruction Policy

The Reconstruction Policy prescribes the requirements of district level. Following articles require the district level arrangement for reconstruction.

Table 7.1.3 Reconstruction Policy Requirements at District Level (extracted)

Reconstruction Policy Requirements at District Level (extracted)
<p>7.5 a) <u>At least one emergency community building would be constructed</u> in all the municipalities of Kathmandu Valley and quake-affected districts headquarters, which could be used as shelters during the disaster and for other various community purposes during normal times.</p> <p>8.5.2 <u>Every district headquarters should construct one model earthquake resistance house.</u> One Building Technology Resource Centre also has to be established in public school, community schools, technical centres or government training centre. These centres should exhibit one traditional house and one earthquake resistance model house so that the people can compare themselves.</p> <p>9.3.2 <u>A district coordination committee will be formed, under the chair of one of the parliamentarians of the district, and chief district officer and local development officer as members of the quake affected district,</u> to coordinate reconstruction and restoration.</p> <p>13.1.2. In memory of the district residents, those who deceased and got injured during the earthquake, <u>an earthquake park shall be constructed in a district headquarters or any appropriated place,</u> in each of the most earthquake affected districts.</p> <p>13.5.2. To monitor from a political level; on the central level parliamentary monitoring and direction committee and on the <u>district level, coordination committee composed of members representing the parliament from the concerned district, Chief District Officer and Local Development Officer, shall be formed.</u></p>

Source: Reconstruction Policy

(2) Post Disaster Reconstruction Framework

GoN and international development partners formulated the Post Disaster Recovery Framework (PDRF) in 21st May, 2016. The PDRF consists of two volumes; the first volume provides an overview of reconstruction policy, institutional arrangement and priority sectors, and the second volume provides sector plans and financial projections. The PDRF defines the specific roles and responsibility of the NRA at the central government level and district level for the implementation of reconstruction works, and the coordination with line agencies and development partners. At the district level, the PDRF prescribes the establishment of NRA Sub-Regional Offices (SRO) and District Coordination Committees (DCC) to coordinate and monitor the activities of reconstruction activities. According to the internal discussion within NRA, the NRA Sub-Regional Office has been abolished and NRA District Office has been established in the fourteen highly affected districts. The function of the District Office is equivalent to that of a Sub-Regional Office¹¹.

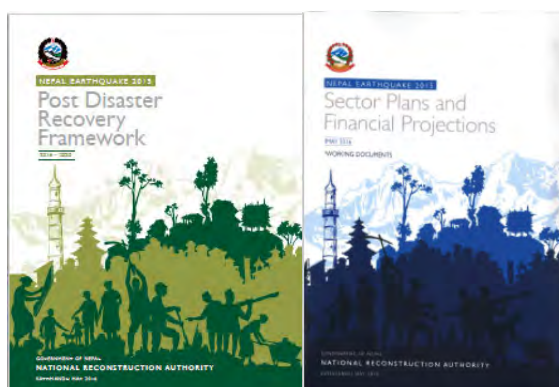
In addition, based on the result of Post Disaster Needs Assessment (PDNA), the PDRF envisions the five-year reconstruction plan which includes budget planning of each sector and long list of the reconstruction projects. The sectors covered by the PDRF are shown in the table below.

¹¹ According to the interview with NRA offices, as of April 2017, there is no regal document to prescribe the roles and responsibilities of the NRA District Office.

Table 7.1.4 Sector classification covered in the PRDF

SOCIAL SECTORS	
Cultural Heritage Education Government Buildings Health	Nutrition Housing and Settlements (Rural) Housing & Settlements (Urban)
PRODUCTIVE SECTORS	
Agriculture & Irrigation	Tourism
INFRASTRUCTURE SECTORS	
Electricity & Renewable Energy Transport, Access and Communication	Water & Sanitation
CROSS-CUTTING ISSUES	
Disaster Risk Reduction Employment & Livelihoods Environment & Forestry	Gender & Social Inclusion Governance Social Protection

Source: PDRF



Source: PDRF

Figure 7.1.1 PDRF

The PDRF requires the preparation of RRP in each of the affected districts. In this context, the integration of the contents of RRP into PDDPs, to which the Project Team is providing support, is considered to be in line with the PDRF.



Source: PDRF

Figure 7.1.2 Recovery Vision and Strategic Objectives of the PDRF

(3) UNDP “Integrated District Recovery and Periodic Planning” (Guidance Note)

In order to promote the formulation of RRP at the district level as prescribed by the PDRF, UNDP, MOFALD, NPC and NRA published the “Integrated District Recovery and Periodic Planning, a Guidance Note” in July 2016. The Guidance Note includes the methodology of integrating the concept of recovery into periodic planning and its step-by-step process. It also includes the institutional and fiscal arrangement of reconstruction projects utilizing the NRA recovery projects and formats to collect necessary information to develop RRP.

On 19th July 2016, MOFALD issued a letter to the fourteen highly affected districts regarding the integration of RRP into their PDDP planning process. In the letter, MOFALD instructed the districts which already formulated PDDP that they should develop RRP as an annex and the districts which are in the process of formulating PDDP that they should integrate RRP as the main content during the PDDP process. In this process, UNDP will provide technical assistance to districts as needed. In Gorkha District and Sindhupalchok District, UNDP held a one day training session for stakeholders to integrate RRP into PDDP process in 4th October 2016 and 22nd September 2016, respectively. As for other highly affected districts, UNDP conducted the same training sessions by April 2017.

(4) Activities of Other Development Partners Related to RRP

From the urgent rehabilitation period from the earthquake, international development partners and I/LNGOs have been formulating clusters and implementing rehabilitation activities through coordination with each other. This framework is being applied at the district level as well as the national level. NRA formulated the Development Assistance Coordination and Facilitation Committee (DACFC) which has functions to monitor and ensure the effectiveness and transparencies of the programmes running with development assistance. Members of DACFC include representation from development partners and NGOs, and will monitor programmes financed by external assistance.

According to PDRF, existing coordination mechanisms such as the Association of International NGOs (AIN), the NGO Federation of Nepal (NFN) and the Housing Recovery and Reconstruction Platform (HRRP) will also be used for NGO coordination. In addition, the International Development Partner Group (IDPG) will provide support to the GoN to help ensure the implementation of the donor-funded activities.

The formulation of PRDF was led by the development partners and I/NGOs based on their hands-on experience during the urgent rehabilitation at each level. Table 7.1.5 describes the list of development partners and I/NGOs prescribed in PDRF as sector lead and teams with government agencies in Nepal.

DFID is supporting the formulation of reconstruction plans in three districts affected by the earthquake, Nuwakot, Rasuwa and Dhading. As of March, 2017, the planning process is ongoing. They will formulate the plan through information collection, surveys in VDCs and workshops with relevant stakeholders in the districts.

Table 7.1.5 PDRF Sector Leads Ministries and Development Partners

	Components/ Sectors	Sector lead Ministries	Sector lead Development Partner	Development Partner Sector Team
Primary Components				
1	Policy	NPC	UNDP	USAID
2	Institutional Framework	NPC	WB	
3	Financial	MOF, NPC	WB	IOM, USAID, CNI
4	Implementation, Communications and M&E	CBS, MOFALD, SD, NPC	UNDP	IOM, USAID, WB, CNI,
Sectors				
1	Housing and Settlements (Rural), Community Infrastructure	MOUD, MOFALD, MOLRM	WB	<i>Housing:</i> JICA,DFID, IOM, UNDP, USAID, UN-HABITAT, UNV, CNI, HRRP, Tear Fund, LWF <i>Community Infrastructure:</i> UNDP,UNOPS, UNV, WFP, PAF
2	Water and Sanitation	DOWS, MOFALD	Embassy of Finland, WB	UNICEF, UNHABITAT, DFID, Practical Action, World Vision, Dan Church Aid, PAF
3	Environment & Forestry	MOPE, MOFSC	UNDP	UNDP
4	Transport and Access, and Communications	MOPIT, MOFALD, MOICT	ADB	WB, WFP, MAF
5	Commerce and Industry	MOI	ILO	DFID
6	Electricity and Renewable Energy	MOEN, MOLRM ,MOPE, AEPC	WB	Practical Action
7	Housing and Settlements (Urban)	MOUD, MOFALD, MOLRM	UN-HABITAT	UN-HABITAT, DFID, UNDP, UNOPS, CNI
8	Cultural Heritage	MOCTCA	UNESCO	
9	Health and Nutrition	MOH	WHO (Health) UNICEF (Nutrition)	IOM, UNFPA, WFP, World Vision
10	Education	MOE, MOFALD	JICA, ADB	UNICEF, UNESCO, UNDP, WB, EU, USAID, DFAT, VSO Nepal, Plan International
11	Government Buildings	MOUD, MOE	ADB	
12	Tourism	MOCTCA	UNDP	IFC, DFID, WFP, CNI
13	Agriculture & Irrigation	MOA, MOIRRIGATION, MOFALD	FAO	DFID, WFP, Practical Action, LWF, PAF
Cross Cutting Themes				
1	Social Protection	MOWCSW, MOFALD	ILO, WB	IOM, UNICEF, UNV, Plan International, LWF
2	Employment & Livelihoods	MOLE	ILO, WFP	UNDP, UNWOMEN, CNI, Tear Fund, Dan Church Aid, PAF
3	Governance	PM, MOFALD	UNDP	IOM, PAF
4	Disaster Risk Management	MOHA	UNDP	ADB, JICA, DFID, IOM, UNICEF, UNFPA, USAID, UNWOMEN, UNV, WFP, Practical Action, Dan Church Aid , Save the Children, PAF
5	Gender and Social Inclusion	MOWCSW	UNWOMEN	ADB, IOM, UNDP, UNICEF, UNFPA, WB, Handicap International

Source: PDRF

As for the district level, the following development partners were engaging in activities related to rehabilitation and recovery in Gorkha and Sindhupalchok District as of November 2016.

Table 7.1.6 Name of Development Partners and I/L NGO in Gorkha District

Community Electricity User National Federation	Livestock Health Training and Counselling service
Phase Nepal	Biswas Nepal
Poor and orphan children rescue centre	Nepal Youth Foundation
Sahas Nepal	Eco- Nepal
Save the Children	Nepal Red Cross Society
Educational Resource and Development	CARITAS
Samagra Bikas Sewa Kendra (Integrated Development Service Centre)	INF
Nepal Dalit Mahila Uthan Sangh	Prayatnashil Community Development Society
Santi ka lagi Nagarik Awaz (TEWA)	Nepal Marti Griha (Nepal Mother Home)
Community Support Group	Partnership for sustainable development
BMDMI	WOREC
MED Nepal	Community Electricity User National Federation
Care Nepal	Phase Nepal
Practical Action	poor and orphan children rescue centre
Subha Awasar Gram	Sahas Nepal
Religh Int	Save the Children
Inhured Nepal	Educational Resource and Development
Village Environment Nepal	Samagra Bikas Sewa Kendra (Integrated Development Service Centre)
CCODER Nepal	Nepal Dalit Mahila Uthan Sangh
Young Life Nepal	Prayatnashil Community Development Society
Heads Nepal	Nepal Marti Griha (Nepal Mother Home)
Himalayan Bible study foundation	Partnership for sustainable development
WOREC	

Source: DDC Gorkha

Table 7.1.7 Name of Development Partners and I/LNGO working in Sindhupalchok District

Beautiful Coffee Nepal	Mahila Atmanivarta Kendra
Build Change	Malteser International
CARE Nepal	MDM-Mission Nepal
Caritas Nepal	Namaste Nepal
Caritas Switzerland	Nepal Red Cross Society
CarNet Nepal	Nepal Hilife Beilngries e V
CDECF	OXFAM
CECI-Nepal	PHASE Nepal
Fair Med	PIN
German Nepal HA	Plan
GMPS	Plan International
Good Neighbor Nepal	Sathi
Helambu Education and Livelihood Partnership (HELP)	Save the Children
Help – Hilfe zur Selbsthilfe Nepal	SEBAC Nepal
Integrated Self-Help Association for Rural Development	Shakti Samuha
JICA	Tuki Sangh Sunkoshi
Li-Bird	UNDP
Living Hope Nepal	Youth Initiatives
Lutheran World Federation	

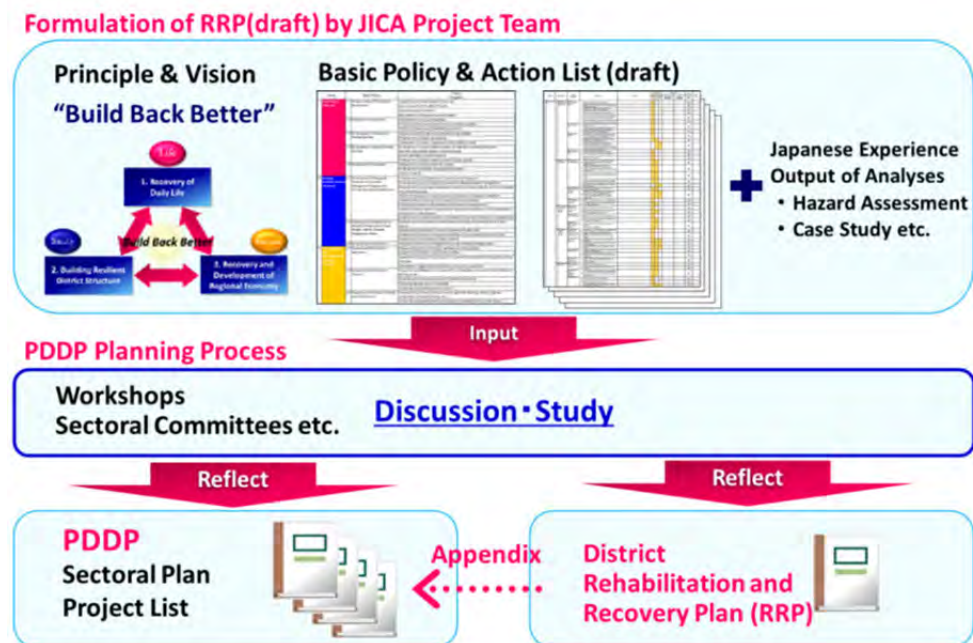
Source: DDC Sindhupalchok

7.1.4 Planning Framework of RRP and PDDP

(1) Integration of RRP into PDDP

The District RRP is formulated through the formulation of the PDDP to be in line with a legally designated plan. Through the process of formulating the RRP, the Project Team provided input from the experience of past earthquakes and reconstruction.

The issues of the RRP were identified through the workshops to investigate the current conditions and cluster workshops in the PDDP planning process. Based on the issues, the policies and programmes for reconstruction were designed. While the PDDP is designed for the coming five years, the RRP targets a longer term as well as short and medium term policies and projects. The long term programme was designed based on the five-year plan developed during the PDDP formulation. The relation between PDDP and the RRP is shown in the figure below.

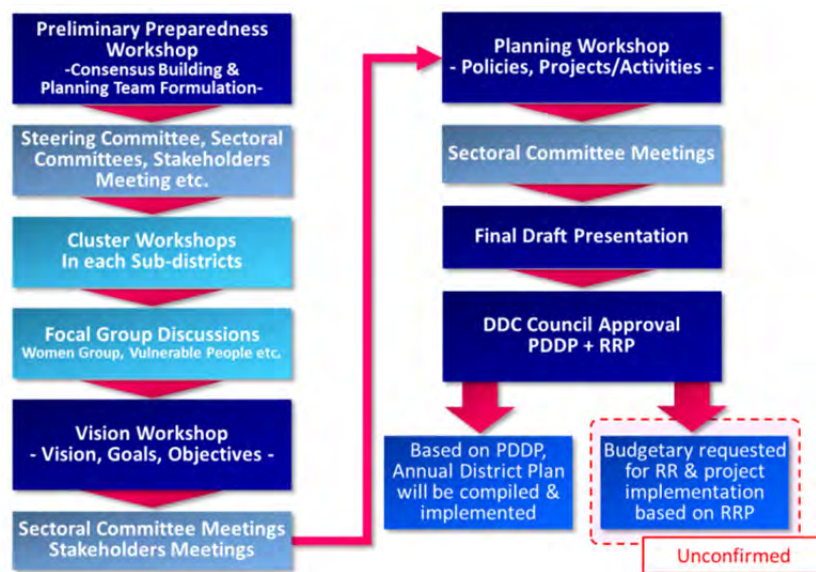


Source: JICA Project Team

Figure 7.1.3 Integration of the Concept of Rehabilitation and Recovery into PDDP

(2) PDDP Formulation Process

In the two districts, the process of formulating the PDDP follows the PDDP preparation guideline issued by NPC. In addition, since the PDDP is designed for the context of rehabilitation and recovery to be included and RRP will be attached as an annex, additional procedures and stakeholders were included in each process. Figure 7.1.4 includes the process of formulating PDDP which integrates with the formulation of RRP.



Source: JICA Project Team

Figure 7.1.4 Planning Flow of PDDP and RRP

As prescribed in the PDDP formulation guideline and TOR for formulating PDDP in the two districts, the district government and PDDP consultant formulated planning committees as shown in the table below. Representatives from NRA are included in each committee for the purpose of coordinating the reconstruction works at national level and district level.

Table 7.1.8 Formation of Planning Committees and its Members

Formation of Committees for PDDP/RRP		Committee Members
Steering Committee		LDO, Chairman of Sectoral Committees, Representative of Political Parties, VDCs Association of Nepal, NGO Federation, Networks of Women, Dalit, Child clubs, Youths, Ethnic Groups, Co-operatives, Bank and Financial Institutions, Marginalized Groups, Differently Capable People's Organizations, Media Group etc.
	Economic Development Committee	District Agriculture Development Officer, Livestock Office, Irrigation Sub-division Office, Small & Cottage Industry, Co-operative and Financial Institutions, Networks of Women, Dalit, NGO Federation, Chamber of Commerce, Media Group etc.
	Social Development Committee	District Education Officer, VDCs Association of Nepal, District Health Office, District Women and Children Welfare Office, District Election Office, Networks of Children, Women, Dalits, Ethnic Groups, Youths, Differently Capable Groups, Third Gender and Media Group etc.
Sectoral Committees	Physical Infrastructure Development Committee	DTO, Road Sub-division office, Irrigation Sub-division Office, Irrigation Sub-division Office, Electricity Authority Office, Municipalities, Representatives of NRA, VDCs Association of Nepal, NGE Federations, Chamber of Commerce, Networks of Children, Women, Dalits, Ethnic Groups, Differently Capable Groups, Third Gender and Media Group etc.
	Forest, Environment and Disaster Management Committee	District Forest Officer, Member from political parties, Office of Soil Conservation, District chapter of FECOFUN, Municipalities, Representatives of NRA, Networks of Children, Women, Dalits, Ethnic Group, Differently Capable Groups, Third Gender and Media Groups etc.
	Institutional Development and Resource Mobilization Committee	District Treasury and Audit Comptroller's Officer, Member from Political Parties, VDCs Association of Nepal, NGO Federation, Chamber of Commerce, Networks of Children, Women, Dalits, Ethnic Group, Youths, Differently Capable Groups, Third Gender and Media Groups etc.

Source: JICA Project Team

Table 7.1.9 Formation of Workshops

Workshops for PDDP/RRP Formulation	Participants
Preliminary Preparedness Workshop (General 1 st WS)	LDO, CDO, NRA-SRO/SCO, Members of Sectoral Committees, DDC Officials, Line Agencies, Parliament Members, VDCs Association, Network of Women, Dalit, Childrem, Youths, Ethnic Groups, Development Partners, Media Group etc.
Cluster Workshops in each Sub-districts	VDC Secretary, Social Mobiliser, VDCs Offices, Women Groups etc.
Focal Group Discussion	Women Group, Marginalized Groups. Children, Elderlies etc.
Vision Workshop (General 2 nd WS)	
Planning Workshop (General 3 rd WS)	LDO, CDO, NRA-SRO/SCO, Members of Sectoral Committees, DDC Officials, Line Agencies, Parliament Members, VDCs Association, Network of Women, Dalit, Childrem, Youths, Ethnic Groups, Development Partners, Media Group etc.
Final Draft Presentation	

Source: JICA Project Team

7.2 Formulating RRP in Gorkha District

7.2.1 Consensus Building and Preparation of Planning in Gorkha District

The Project Team communicated with CDE and LDO of the Gorkha District and shared the necessity for including the actions and ideas of rehabilitation and recovery into the PDDP. The initial discussion on the RRP was conducted on 22nd July 2015 between Gorkha DDC and the Project Team. The contents of RRP were also discussed between the Project Team and officials of MOFALD on 18th August 2015. After serial discussions, all parties including Gorkha DDC, MOFALD and the Project Team came to a mutual understanding to jointly prepare the PDDP for Gorkha District incorporating necessary rehabilitation and recovery aspects with input from the JICA Project Team.

The Project Team and Gorkha DDC concluded the MOU to formulate the PDDP incorporating the RRP on 1st March 2016. The MOU has also incorporated NRA as a stakeholder of PDDP revision with the role of coordination and monitoring of the progress. In addition, according to the proceeding situation, Gorkha DDC and the Project Team a held meeting on 11th August 2016 and decided to amend the completion date of the planning and the timeline mentioned in the MOU. Because of the local reformation and other schedules, the LDO of Gorkha District extended the contract with the PDDP consultant until 28th June 2017, and the PDDP consultant was to submit the draft PDDP in early June for approval. Prior to the finalization of the PDDP, the Project Team has finalized the Draft RRP by the end of April. While finalizing the RRP, the Project Team also suggested the PDDP consultants to integrate the RRP into PDDP and include the viewpoint of reconstruction in the main text of PDDP.

The chronology of meetings and consensus building on preparation of the Gorkha District PDDP incorporating RRP until the Preliminary Preparedness Workshop is as shown in the following tables.

Table 7.2.1 Chronology of Events on Preparation of Gorkha District PDDP and RRP (1/2)

Date	Participants	Contents
15 June 2015	GON (MOF, NPC) GOJ (JICA)	Record of Discussion on the "Project on Rehabilitation and Recovery from Nepal Earthquake" including preparation of the Rehabilitation and Recovery Plans in the Gorkha and Sindhupalchok Districts was agreed upon between the Government of Nepal and Government of Japan through JICA
22 July 2015	Chief District Engineer(CDE) JICA Project Team	Meeting: Discussion on preparing Gorkha District RRP
Aug.-Sep. 2015	JICA Project Team	Social Survey was conducted in 12 VDCs by JICA Project Team
14 Aug. 2015	LDO, CDE JICA Project Team	Meeting: Discussion and agreement for preparation of RRP by JICA, and PDDP incorporating RRP
18 Aug. 2015	MoFALD : : Mr. Chhabi Rijal (Under Secretary), Mr. Jagannath Adhikar (Planning Specialist) JICA Officials JICA Project Team	Meeting: Discussion and agreement for preparation of RRP by JICA, and PDDP incorporating RRP
23 Aug. 2015	CDE, PDDP consultant JICA Project Team	Meeting: Discussion on preparing Gorkha District RRP and PDDP
24 Aug. 2015	CDE JICA Project Team	Meeting: Discussion on preparing Gorkha District RRP and PDDP
25 Aug. 2015	-	1 st Workshop was planned but cancelled
7 Oct. 2015	Acting LDO DDC approx. 10 officials JICA Project Team	Kick-off meeting on preparing Gorkha District RRP with PDDP
27-28 Nov. 2015	CDE, UNDP etc. JICA Project Team	Workshop on "Review of the Humanitarian Response & Strategic Planning for Recovery and Reconstruction in Gorkha" at Pokhara : Discussion on preparing Gorkha District RRP and PDDP with DCE and UNDP etc.
3 Feb. 2016	LDO, CDE (DTO) DDC approx. 10 officials UNDP Gorkha office JICA Project Team	Meeting: Discussion on MOU for preparing Gorkha District RRP and PDDP
24 Feb. 2016	MoFALD: Mr. Chhabi Rijal (Under Secretary), Mr. Khem Raj Joshi (Planning Section) JICA & JICA Project Team	Meeting: Discussion on MOU for preparing the Gorkha and Sindhupalchok Districts RRP and PDDP
30 Feb. 2016	NRA Dr. Bhisma K. Bhusal (Under Secretary)	Meeting: Discussion on preparing Gorkha District RRP and PDDP, and MOU
1 Mar. 2016	NRA, MoFALD, LDO, JICA, JICA Project Team	MOU for preparation of Gorkha District RRP and PDDP with JICA Team was signed by LDO and JICA Project Team, as witness MoFALD and NRA
Mar. 2016	CDE, PDDP consultants JICA Project Team	Meeting: Discussion on preparing Gorkha District RRP and PDDP
Mar. 2016	-	1 st Workshop was planned but cancelled again
29 Apr. 2016	NRA, MoFALD, UNDP, JICA, JICA Project Team	Meeting: In the discussion on "Disaster Recovery Planning Guidebook", NRA Dr. Bhusal reminded JICA initiatives in preparing RRP for Sindhupalchok and Gorkha and signed MoU with DDCs regarding the support in PDDP.
16 May 2016	CDE, LGCDP Officer JICA Project Team	Meeting: Discussion on preparing Gorkha District RRP and PDDP, and procurement of PDDP consultant
18 Mar. 2016	DDC	EOI publication on the consultants for PDDP planning
31 May 2016	NRA Gorkha Sub Regional Office, Chief Mr. Jitendra Basnet (Joint Secretary)	Meeting: Discussion and agreement for preparation of RRP by JICA, and PDDP incorporating RRP

Source: JICA Project Team

Table 7.2.1 Chronology of Events on Preparation of Gorkha District PDDP and RRP (2/2)

Date	Participants	Contents
2 June 2016	NRA Gorkha Sub Regional Office, District Engineer, Mr. Raj Kaji Shrestha) JICA Project Team	Meeting: Discussion and agreement for preparation of RRP by JICA, and PDDP incorporating RRP
2 June 2016	CDE(Mr. Shadev Bhandari) JICA Project Team	Meeting: Discussion and confirmation on preparation of RRP by JICA, and PDDP incorporating RRP
2 June 2016	LDO (Mr. Narayan Acharya) JICA Project Team	Meeting: Discussion and confirmation on preparation of RRP by JICA, and PDDP incorporating RRP
2 June 2016	CDO (Mr. Narayan Bhatta) JICA Project Team	Meeting: Discussion and confirmation on preparation of RRP by JICA, and PDDP incorporating RRP
14 June 2016	Minister for Peace and Reconstruction Members of Parliament CDO, LDO NRA-SRO Chief and CDE DUDBC Division Office CDE (DTO) etc. JICA Project Team	<NRA District Coordination Committee (DCC) at Gorkha> Presentation by JICA Project Team on preparation of PDDP incorporating RRP <u>Discussed and approved preparation of PDDP incorporating RRP with support from JICA</u>
11 Aug. 2016	LDO (Mr. Narayan Acharya) JICA Project Team	Minutes for amendment of MOU for preparation of Gorkha District PDDP/RRP was signed by LDO and JICA Project Team
28 Aug. 2016	PDDP Consultants JICA Project Team	Preliminary Meeting: Discussion and confirmation on preparation of PDDP incorporating RRP
5 Sep. 2016	PDDP Consultants JICA Project Team	Meeting: Discussion on Preliminary Preparedness Workshop and necessary information for formulating PDDP incorporating RRP

Source: JICA Project Team



Source: JICA Project Team

Figure 7.2.1 Meetings with DDC and District Coordination Committee on Formulation of PDDP/RRP in Gorkha District

7.2.2 Formulation of PDDP and RRP in Gorkha District

After the selection of the consultant for formulating the PDDP based on the formal tender process, the formulation process of the PDDP incorporating the RRP has been processed, and the formal planning process was kicked-off in the Preliminary Preparedness Workshop on 7th September 2016. The tentative timeline for formulating the PDDP/RRP in Gorkha District was as shown in the figure below. This schedule has been changed based on the local reformation.

The summary of activities on the formulation of Gorkha District PDDP incorporating RRP after the Preliminary Preparedness Workshop on 7th September 2016, the formal kick-off of the planning process, is as shown in the following tables.

Table 7.2.2 Summary of Planning Activities on Gorkha District PDDP and RRP (1/3)

Date/Events	Participants	Summary of Contents / Discussions
7 Sep. 2016 Preliminary Preparedness Workshop	LDO, PMAO DDC Officials Line Agencies Parliament Members Political Parties I/NGOs Former DDC Chairman UNDP Consultant Other Stakeholders Journalists PDDP Consultants JICA Project Team (Approx. 100 people)	Chairperson: LDO (Mr. Narayan Acharya) <ul style="list-style-type: none"> ➤ Opening remarks from Mr. Satish Bhattarai (PMAO) ➤ Explanation of the programme from LDO ➤ Presentation from PDDP Consultants (Background of the PDDP and its context with the disaster, Overview of the PDDP planning and its relation in disaster situation, Methodology of plan preparation) ➤ Suggestion of formulating sectoral committees by PDDP consultants as follows; <ul style="list-style-type: none"> - Rehabilitation and Recovery Committee - Physical Infrastructure Development Committee - Social Development Committee - Economic Development Committee - Forest, Environment and Disaster Management Committee - Institutional Development and Resource Mobilization Committee ➤ Presentation from UNDP consultant (Guidance note for incorporating recovery planning in PDDP) ➤ Presentation from JICA Project Team (Necessity and Concept of RRP, Framework of PDDP incorporating RRP, Background of JICA Project) ➤ Open discussion with participants ➤ Formulation of Sectoral Committees (The authority to formulate committees was handed to the DDC and it would be formulated with consensus among stakeholders.)
20 Sep. 2016 VDC Secretaries Orientation Programme	DDC(CDE, Officials) VDC Secretaries PDDP Consultants JICA Project Team	Chairperson: Chief District Engineer (Mr. Hom Nath Poudel) <ul style="list-style-type: none"> ➤ Explanation of PDDP planning from PDDP Consultants (Necessity and importance of PDDP, Data collection) ➤ Explanation of RRP planning from JICA Project Team (Necessity and importance of RRP, Planning framework, Data collection) ➤ Open discussion with participants (After the orientation programme, LDO committed to facilitate for the collection of required data.)
1st-4th Dec. 2016 Cluster Workshops (3 clusters)	VDC Secretaries VDC Social Mobilizers Political Parties Illaka Level Offices Community People VDC Organizations School Management Committee Health Post etc. PDDP Consultants JICA Project Team (50-80 people/cluster)	<ul style="list-style-type: none"> ➤ To identify sub-district level problems and issues for planning purpose, Cluster Workshops were held in each of the three clusters, which composed of all VDCs and Municipalities. ➤ Venues of cluster workshops were as follows: 1) Gorkha Bazar, 2) Palungtar Municipality, and 3) Barpak VDC.

Source: JICA Project Team

Table 7.2.2 Summary of Planning Activities on Gorkha District PDDP and RRP (2/3)

Date/Events	Participants	Summary of Contents / Discussions
19th-21st Feb. 2017 Vision and Planning Workshop	LDO, PMAO CDO DDC Officials Line Agencies Political Parties I/NGOs Development Partners Other Stakeholders PDDP Consultants JICA Project Team (87 people, approx. 50 people on each day)	Chairperson: LDO (Mr. Narayan Acharya) <1st Day> ➤ Opening remarks from LDO ➤ Presentation from PDDP Consultants (Workshop objectives, framework of the three days' workshop and district profile and maps) ➤ Presentation from JICA Project Team (Earthquake Damage and Loss) ➤ Discussion and comments on presentation Presentation from PDDP Consultants (Concept of Vision, Goal, Objective, Output and their Linkage) ➤ Presentation from JICA Project Team (Institutional frameworks of reconstruction, concept of RRP, and utilization of hazard map) <2nd Day> ➤ Remarks from CDO and LDO ➤ Open Discussion on Vision and preparation of District Vision ➤ Presentation from JICA Project Team (RRP planning framework, Overview of RRP, sectoral actions in RRP) ➤ Discussion on Actions <3rd Day> ➤ Remarks from LDO and JICA ➤ Group works on RRP (Policy and Actions) ➤ Group works and Presentation on PDDP (Goal, Objective and Actions)
22nd-24th Feb. 2017 Meeting with Line Agencies	DDC, WCO, NEA, DADO, DLSCO, DUDBC, DFO, IRDO, DEO, DRO, IRDO, DWSO, DRO, DHO, GCCI	➤ Meeting: Data and information on damage and reconstruction were collected by JICA Project Team.
13th Mar. 2017 Economic Sector Meeting on RRP	DDC Officials NRA Gorkha DADO GCCCI, Gorkha Hotel Association, Cottage and Small Industries Development Office, Manaslu Conservation Area Office JICA Project Team	➤ Opening remarks from JICA Project Team ➤ Explanation of Landslide Hazard Map by JICA Project Team ➤ Group discussion on utilization of Landslide Hazard Map ➤ Group discussion on RRP (Action Plan in RRP)
13th Mar. 2017 Physical Sector Meeting on RRP	DDC Officials NRA Gorkha DTO, DRO, DUDBC, IDD, Nepal Telecommunication, JICA Project Team	➤ Opening remarks from JICA Project Team ➤ Explanation of Landslide Hazard Map by JICA Project Team ➤ Group discussion on utilization of Landslide Hazard Map ➤ Group discussion on RRP (Action Plan in RRP)
13th Mar. 2017 Economic Sector Meeting on RRP	DDC Officials NRA Gorkha DADO GCCCI, Gorkha Hotel Association, Cottage and Small Industries Development Office, Manaslu Conservation Area Office JICA Project Team	➤ Opening remarks from JICA Project Team ➤ Explanation of Landslide Hazard Map by JICA Project Team ➤ Group discussion on utilization of Landslide Hazard Map ➤ Group discussion on RRP (Action Plan in RRP)

Source: JICA Project Team

Table 7.2.2 Summary of Planning Activities on Gorkha District PDDP and RRP (3/3)

Date/Events	Participants	Summary of Contents / Discussions
14th Mar. 2017 Forest, Environment and Disaster Management Sector Meeting on RRP Institutional Development Sector Meeting on RRP	DDC Officials NRA Gorkha District Soil Conservation Office, DFO, CARE Nepal, Gorkha Municipality, World Vision International, Nepalese Army, Save the Children ICA Project Team	<ul style="list-style-type: none"> ➤ Opening remarks from JICA Project Team ➤ Explanation of Landslide Hazard Map by JICA Project Team ➤ Group discussion on utilization of Landslide Hazard Map ➤ Group discussion on RRP (Action Plan in RRP)
27thApr.2017 Handover of English version of RRP to DCC	DCC Gorkha officials	<ul style="list-style-type: none"> ➤ The JICA Project Team handed over the English version of RRP in both hard copies and soft copies.

Source: JICA Project Team

7.2.3 Workshop for Tourism Livelihood Improvement in Barpak and Lower Manaslu

The workshop for tourism livelihood improvement in Barpak and Lower Manaslu was conducted by the Project Team at Barpak VDC on 28th September, 2016. The outline of the workshop is as shown in the following table.

Table 7.2.3 Outline of Workshop for Tourism Livelihood Improvement in Barpak and Lower Manaslu

Date/Events	Participants	Summary of Contents / Discussions
28 Sep. 2016 Barpak WS for Tourism Livelihood Improvement	Barpak VDC Secretary (Mr. Chet Prasad Amgain) Homestay Committee Women Groups Barpak Tourism Development Committee Dharche Manasulu Tourism Development Committee Hotel/Cottage Owners Forest Community Community People JICA Project Team	<ul style="list-style-type: none"> ➤ BBB Tourism Development Workshop was held in Barpak by JICA Project Team with Barpak VDC and stakeholders. ➤ Group work was conducted based on the Project Cycle Management methodology. <ul style="list-style-type: none"> - Stakeholder Analysis - Problem Analysis - Objective Analysis

Source: JICA Project Team



Source: JICA Project Team

Figure 7.2.2 Barpak Workshop for Tourism Livelihood Improvement at Barpak VDC

Stakeholder analysis, problem analysis and objective analysis was implemented in the workshop with tourism stakeholders. Principal issues and measures raised in the workshop are as follows.

- Reopening of "Tourist Information Centre"
- Reconstruction of "Community Museum"
- Improvement of trails: Lower Manaslu (Darche Danda) and Rupina La routes
- Establishment of a tourism committee
- Creation of tourism awareness among politicians and local government officers
- Implementation of tourism promotion activities
- Fundraising for tourism promotion activities and the tourism committee
- Promotion of accommodation investment in key locations on trekking routes
- Use of Internet for tourism promotion: Facebook, Twitter, free wifi etc.
- Limited liquidation of land
- Environmental issues
- Concerns for "modern houses"
- Concerns for negative images of Barpak: earthquake, landslide etc.

Based on the result of the workshop and some discussions with Ministry of Culture, Tourism and Civil Aviation, Barpak VDC secretary and so on, the activities in the following table were identified to be important for the tourism livelihood improvement in Barpak and Lower Manaslu.

Table 7.2.4 Activities for Tourism Livelihood Improvement in Barpak and Lower Manaslu

Activities	Contents (Ideas)
Improvement of tourist facilities along the Lower Manaslu and Rupina La trekking routes	<ul style="list-style-type: none"> ➤ Improvement/construction of tourist facilities and infrastructure that supplement MoCTCA's trail improvement: water supply, toilette, shelter, information board, signage, viewing deck/tower etc.
Institutional strengthening of local tourism organization	<ul style="list-style-type: none"> ➤ Study trip to learn success stories of community tourism ➤ Participatory preparation of tourist map: identification of tourism resources in an around Barpak to increase the awareness of cultural and natural heritage ➤ Assistance to the preparation of brochures to educate the public, politicians and government officials about the importance of tourism and conservation ➤ Assistance to tourism promotion activities: preparation of tourism promotion brochures/CD/poster etc., development of website/Facebook/Twitter, approach to tour operators/trekking agencies, hosting of tourism event etc. ➤ Assistance to fund raising for local tourism organization and tourism promotion activities: government subsidies, seeking advertisers, sponsorship, corporate social responsibility (CSR), donation etc. ➤ Assistance to investment promotion in key locations along Lower Manaslu and Rupina La trekking routes.
Procurement of equipment to reinstate damaged tourist facilities	<ul style="list-style-type: none"> ➤ Reopening of tourist information centre: procurement of office equipment (computer, printer, desks, brochure racks etc.), and Internet equipment for free wifi zone. ➤ Reopening of community museum: procurement of exhibition equipment (computer, lighting, panels, racks, cases)
Improvement of services and facilities for homestay and accommodation	<ul style="list-style-type: none"> ➤ Hosting of seminars/workshops for tourism-related topics ➤ Tourism training programmes: operation of accommodation, guiding, tourism promotion etc. ➤ Subsidy for the Improvement of accommodation facilities: toilette, hot-water shower

Source: JICA Project Team

7.2.4 Problems, Issues and Potentials from Meetings and Workshops

The problems, issues and potentials on rehabilitation and recovery in the Gorkha District which were discussed in each the cluster workshop and described in VDC Profiles are as shown in the following tables.



Source: JICA Project Team

Figure 7.2.3 Cluster Division for Cluster Workshops in Gorkha District

Table 7.2.5 Problems, Issues and Potentials from Meetings/Workshops in Gorkha (1/5)

Events	Problems	Issues	Potentials
<p><u>Cluster Workshop 1</u> (at Gorkha Bazar)</p> <ul style="list-style-type: none"> - Asrang - Ghyakchokcho - Taklung - Tanglichok - Taple - Darbung - Namjung - Fujel - Bakrang - Bungkot - Borlang - Bhulmichok - Makaising - Manakamana - Gorkha Municipality 	<ul style="list-style-type: none"> ➤ Residents lose time and money due to irregular transportation. People have to stay in the District Headquarters unnecessarily. ➤ People have to go to bigger cities (Pokhara, Chitwan) even for general health services. ➤ Residents discharge septic contents in the street during monsoon time. ➤ Insufficient water supply causing poor sanitation and hygiene. ➤ Children are becoming introverted and entertained by indoor computer games, mobiles. This is decreasing their creativity and health. ➤ Absence of social security to single elderly people, disaster orphans, vulnerable children (at risk) etc. Increasing child labour in city areas. ➤ People have to depend on import dues to low productivity and lack of food security. ➤ Processed foods are being imported due to no value-added food processing. ➤ High chance of internal displacement due to Budhigandaki Hydro power Project due to lack of socio-economic considerations. ➤ Improper waste disposal in city/town area is creating visual discomfort and environment pollution. ➤ Disruption in electricity supply damages electrical appliances. No voltage regulation and proper supply mechanism are applied. ➤ Service delivery is slow and citizens are bound to spend more time and money to get district level services. ➤ Narrow streets and poor connectivity in residential areas in Gorkha Bazar. ➤ High transportation cost incurred. Syndicate in transportation. Dangerous roads and unsafe public transportation. ➤ Students have to go outside the district for higher education. ➤ Lack of technical and skilled manpower. ➤ Construction materials cost is high in rural areas. No cost incentive mechanism for engineers to work in rural areas. 	<ul style="list-style-type: none"> ➤ Lack of regular and all time transportation to different parts of the district. ➤ Lack of specialized health services in the district. Health facilities concentrated in the Bazar Area. ➤ No proper drainage and sewerage in municipality areas. ➤ Small water source (intake) and high water demand. Need to identify new water sources to meet current demand. ➤ No proper space of recreation. Lack of parks, open spaces in the Bazar Area. Diverting children budget in other infrastructure development work. ➤ Lack of rehabilitation provision to orphans and single elderly citizens. Little investment in social security. ➤ Lack of irrigation in arable land. Barren agriculture land due to lack of work force. Seasonal production and no commercialization. ➤ High outflow of district income in purchasing products such as food and clothes. ➤ Relocation of Budhigandaki Hydropower Project affected population in a proper location. ➤ Lack of proper municipal waste collection system and proper dumping/landfill site. ➤ Citizen awareness in waste management is very low. ➤ Lack of controlled power supply and load shedding due to power shortage. ➤ Inter-Agency coordination and information exchange are lacking. Reconstruction work is delayed due to lack of prompt decision. ➤ Lack of access to emergency vehicles during emergency. ➤ Lack of disaster preparedness. ➤ Poor road quality and all 	<ul style="list-style-type: none"> ➤ Timely completion of ongoing road projects (construction of ring road). ➤ Ongoing Large Scale Municipal water supply project. ➤ High tourism potential due to Gorkha Palace, Museum, Manakamana temple. ➤ Ongoing Budhigandaki Hydropower Project. ➤ Gateway to Manaslu Trek and Upper Gorkha Region. ➤ Historic importance, resemble the Nepal Unification campaign of the Great King Prithvi Narayan Shah. ➤ High internal tourism (Rural homestays and historic tourism) ➤ Fertile land in Budhigandaki and Daraudi River valley. High potential of commercial farming, animal husbandry. ➤ Provision of engineers and overseers for technical monitoring. ➤ Operation of river based stone and sand quarry: High internal income. ➤ Large number of I/NGOs and Development Partners investing in post disaster recovery. Opportunity to build district resilient as per the principle of "Build Back Better".

Source: JICA Project Team

Table 7.2.5 Problems, Issues and Potentials from Meetings/Workshops in Gorkha (2/5)

Events	Problems	Issues	Potentials
(continued...)		weather accessibility, creating difficulty in transportation. ➤ Lack of transport linkage among important places. ➤ Lack of higher education facilities within the district. ➤ Government has not taken reconstruction of private housing too seriously. Difficult evaluation criteria and lack of technical supervision.	
Cluster Workshop 2 (at Palungtar VDC) -Kerabari -Kharibot -Gankhu -Ghyachok -Chokprak- -Jaubari -Thalajung- -Deurali -Dhuwakot- -Mirkot -Muchhok -Srinathkot -Simjung -Hansapur -Harmi -Palungtar Municipality	<ul style="list-style-type: none"> ➤ District residents are facing problems in transportation due to lack of all-weather accessibility. This sometime causes a severe problem to ill and sick people to reach medical facilities. ➤ Service delivery has been affected due to loss in government buildings, VDC buildings etc. It takes long time to get even small service for government offices. ➤ Lack of drinking water facilities and supply in surrounding VDCs, especially in Muchhok. ➤ Less agriculture productivity due to lack of proper irrigation facilities/ farmers rely on seasonal irrigation. ➤ Students are facing the problem of severe climate due to lack of permanent buildings. Temporary schools are basically from CGI sheets, with no insulation. ➤ Electricity distribution is not yet reached many VDCs and Wards. People are bound to live with kerosene lights, possibly causing respiratory health problems. ➤ Poor sanitation and hygiene, especially in poor and marginalized communities. ➤ People are living in high risk areas (landslide and flood affected areas). Post-earthquake resettlement planning is not efficient. ➤ High infrastructure development cost and low budget allocation. ➤ Tourism promotion and infrastructure related to tourism is limited. ➤ Interrupted power supply due to an obstruction in the supply system. ➤ Outmigration of productive labour forces to outside the country creates labour shortage for reconstruction. 	<ul style="list-style-type: none"> ➤ Difficult to provide market access to agriculture products. ➤ People have walk long distance to reach their destination in monsoon time. ➤ Government service delivery is inefficient due to lack of proper work place. The efficiency of government officials is also less, as a result, extra time and cost is incurred. ➤ Sources of water like aquifers, wells have been dried due to the earthquake. People are facing water scarcity and have to travel long distance to fetch water. ➤ Lack of private sector investment in irrigation and other public infrastructures. ➤ Delayed reconstruction of education and health facilities. ➤ Lack of political commitments and inter-party conflicts. Infrastructure development has not been done in a priority basis. Political influence is creating an imbalance in development. ➤ Lack of proper sewerage and drainage in town and city areas. ➤ Lack of sufficient drinking water facilities and coverage. ➤ Lack of proper acts and policies to guide resettlement and land acquisition for resettlement. ➤ Sparse settlement and difficult geography. Difficult to provide services to all areas. ➤ Lack of tourism resource 	<ul style="list-style-type: none"> ➤ Copper mine at Dhuwakot. ➤ Historically important tourist places like Ligligkot, Mirkot, Shreenathkot etc., culturally important place of Siddha Gufa, etc. and rural tourism. ➤ Plain land of Palungtar and ongoing Smart City Project in Palungtar Municipality. ➤ Large scale municipal water supply project in Palungtar Area. ➤ Fertile land and high productivity. Existence of commercial farming. ➤ High possibility of operation of agro-collection, processing and marketing centre. ➤ Development of irrigation canal from Daraudi Barrage, high potential of vegetable farming. ➤ River based quarry and existence of large community forests. Such can be used for reconstruction work. ➤ Commercial livestock farming and fish farming at river side. ➤ High electricity production/ potential of hydroelectricity. ➤ Road connectivity is considerably good, but need to be improved

Source: JICA Project Team

Table 7.2.5 Problems, Issues and Potentials from Meetings/Workshops in Gorkha (3/5)

Events	Problems	Issues	Potentials
(continued...)	<ul style="list-style-type: none"> ➤ Agro-products are not getting proper market and price. ➤ Extinction/diminishing local breeds, farming practices, traditional craftsmanship and technologies. ➤ Invasion of modern building construction technology over traditional practices. ➤ Community activities are not held in coordinated manner. ➤ Reconstruction of public infrastructures like temples, community buildings etc., are not prioritized. ➤ Lack of specialized health facilities in government health institutions. ➤ Lack of mental and physical development opportunities for children. ➤ Disaster management has not been identified as an important aspect for development. ➤ Extreme use of consumer goods and improper water management has created environment pollution. ➤ Private sectors are not interested in establishing material centres at rural areas. ➤ Local culture and traditions are slowly invaded by western culture and tradition. ➤ Home delivery (birth) still exists. Expansion of birthing centres and trained manpower is lacking. ➤ Difficult to get approval on second instalments for housing reconstruction. Lack of proper inspection and supervision. ➤ Telecommunication network is not available in all areas 	<p>exploration and promotion of existing resources.</p> <ul style="list-style-type: none"> ➤ Use of wooden poles/ weathered poles due to exposure and easily broken by wind and storm. ➤ Lack of skilled and proper manpower for reconstruction. Incoming labour from India and Terai Area. ➤ Lack of proper storage and marketing mechanism. ➤ Lack of promotion of local breeds and incentive mechanism to protect local skills and technologies. ➤ Potential loss of vernacular building technology and architecture. ➤ Lack of proper community infrastructure and facilities to hold community programmes. ➤ No budget allocation for the reconstruction of community infrastructures. ➤ People have to visit Pokhara or Kathmandu to get better health services. ➤ Lack of proper recreational facilities like parks, play grounds, etc. ➤ Lack of allocation of disaster management funds at the local level. ➤ Lack of awareness to manage environment. Absence of waste collection and management. ➤ People are bound to pay high amount to purchase reconstruction materials. ➤ Lack of knowledge transfer from older generation to younger generations. Lack of realization of the importance of local values and culture. ➤ Coverage of health facilities is minimum. ➤ Strict inspection guidelines, difficult to follow all the processes. Government engineers are not available in village areas. ➤ Telecom service providers are town oriented and focus less on rural and remote areas. 	<p>for all-weather accessibility. It will improve accessibility and provide access to agro- products.</p> <ul style="list-style-type: none"> ➤ Expansion of cash-crops such as, cardamom, fruits (Litchi, Mango, citrus fruits etc.) and medical herb collection / processing. ➤ High literacy rate and coverage of basic education facilities. ➤ Higher education campus/ polytech institute in Palungtar Area.

Source: JICA Project Team

Table 7.2.5 Problems, Issues and Potentials from Meetings/Workshops in Gorkha (4/5)

Date/Events	Problems	Issues	Potentials
<p><u>Cluster Workshop 2</u> (at Barpak VDC) - Aruarbang - Arupokhari - Uhiya - Kerajja - Kashigaun - Gumda - Chumchet - Chekampar - Takumajh, Laku ribot. - Takukot - Thumi - Pandrung - Panchkuwa Deurali - Prok - Barpak - Bihi - Baguwa - Masel - Manbu - Lapu - Laprak - Iho - Samagaun - Sirdibas - Saurpani- - Swara - Dhawa - Tandrang</p>	<ul style="list-style-type: none"> ➤ Very poor road accessibility: Some VDCs are separated by rivers, due to a lack of bridges. People have to take very long routes to commute. Most of the existing roads are earthen, thus these roads cannot be used during the rainy season. Moreover, these roads are also damaged by the excessive use of heavy loaded tractors and blacktop roads are worsened by heavy trucks. ➤ Inefficient transportation due to narrow roads. ➤ Small children and women have suffered from malnutrition. ➤ Some VDC buildings are often flooded and needed to be relocated to a safer location. ➤ Educational infrastructures such as primary schools, boarding schools, high schools, and colleges are damaged by the earthquake. Students are still studying under temporary learning centres or enforced to travel long distances to go to school. ➤ Even after two years after the earthquake, people are still living in temporary shelters; they are suffering from undesirable and harsh weather conditions. ➤ Damaged health facilities have not been reconstructed yet, and also in the absence of sufficient and skilled health personnel, villagers are deprived even from basic health service. In some serious health cases, people have to hire a helicopter to transfer a patient to a nearby hospital or even to the capital city. ➤ Lack of waste management and the absence of a dumping site, is deteriorating the environment of the settlement. ➤ Some settlements, i.e. Laprak, lie in a very high risk landslide zone. Although, the relocation plan of the settlement has already materialized and construction has started, people have shown less interest in moving due to deep rooted religious and cultural value of their old settlement. ➤ Some VDCs have huge problems of drinking water. People have to travel 	<ul style="list-style-type: none"> ➤ Difficult Transportation situation: High transportation cost and no vehicular accessibility during the monsoon season. ➤ Damaged and insufficient agriculture infrastructure results in low crop production. ➤ No proper infrastructure facilities and basic amenities such as hygienic drinking water in shelters. Insufficient number of toilets, etc., for people living in temporary shelters. ➤ The ongoing owner driven construction of the houses has not followed the guideline for safer housing reconstruction. ➤ Some VDC such as Laprak are still inaccessible to the central power supply. Thus it is necessary to extend the power line. ➤ People still rely on traditional agriculture methods; need to adopt modern technology for quality and quantity yields. ➤ The damaged birthing centres need to be reconstructed soon to ensure the safe delivery of new-borns, to ensure health of mother and to conduct regular programmes of nutrition improvement. ➤ Some cases of robbery have been reported, so the need to establish security posts in strategically important locations needs to be addressed. ➤ Insufficient bus frequency; only two bus travel from Barpak - Kathmandu both ways. Inefficient services. ➤ Need to identify settlements at high risk and relocate in safer locations. 	<ul style="list-style-type: none"> ➤ Establishment of a tourist view centre in an ideal location between Barpak and Laprak can attract lots of tourists. ➤ Construction of cultural museum will preserve culture and tradition. ➤ Establishment of an herbs processing centre will increase the employment as well as increase national and international market of herbs. ➤ Construction of community building in Laprak which can accommodate at least 500 people in case of an emergency. ➤ Production of organic farming and fertilizer in Barpak. ➤ Establishment of bank in Barpak will ease and secure financial transaction. ➤ Activity related to homestay promotion and development will certainly increase the flow of tourists. ➤ Possibilities to develop integrated settlement. ➤ Construction of helipads at strategically important locations.

Source: JICA Project Team

Table 7.2.5 Problems, Issues and Potentials from Meetings/Workshops in Gorkha (5/5)

Date/Events	Problems	Issues	Potentials
(continued...)	<p>hours to fetch water.</p> <ul style="list-style-type: none"> ➤ Existing agricultural land is decreasing due to new construction after the earthquake. It is necessary to implement/introduce a strong policy to conserve the arable lands. ➤ No schools are available after high school. Students have to migrate to other places for quality higher education. ➤ Deforestation going on due to new construction of the houses, which may result in landslides. 		

Source: JICA Project Team

7.2.5 District Vision and Goal on PDDP

The District Vision and the Goal on the PDDP of the Sindhupalchok District, which were discussed in the Vision Workshop, are as shown in the following table. The policies and actions have been discussed and elaborated, and reflected into the PDDP incorporating RRP through a participatory planning process. The District Vision and the Goal include key words such as “resilient” and “improvement of lives”, which reflect the concept of “Build Back Better”, the key principle of the RRP.

Table 7.2.6 District Vision and Goal from Vision and Planning Workshop in Gorkha

Date/Events	District Vision and Goal
19 th -20 th Feb. 2017 Vision and Planning Workshop (3 days)	<p>The participants formulated a district Vision, Goal and Objective of PDDP based on the group discussions as follows:</p> <p><u>District Vision:</u> " Beautiful, Equitable and Prosperous Gorkha District through Agriculture, Tourism and Resilient Infrastructure"</p> <p><u>District Goal:</u> "Quantitative Improvement of Gorkha People's Lives and Social, Economic and Human Development "</p> <p><u>Objective:</u> "Development of Social, Economic and Human Aspects of Gorkha People through Equitable, Qualitative Environmentally Balanced Improvement to Ease and Safe Lives"</p>

Source: JICA Project Team

7.2.6 Finalization and Handover of RRP

The RRP for Gorkha District has been finalised through the above process and has been handed over from the Project Team to the DCC. However, it should be noted that certain activities in Gorkha District had to be downscaled and continued due to the influence of the local elections held in May 2017.

Throughout the PDDP formulation process, the Project Team provided input regarding to the key methodology for BBB, for example, utilization of hazard map and other scientific based

information for future planning and DRR activities, and importance of long term planning for reconstruction with robust development. In result of these interactive formulation processes, there are several interactions between the PDDP and RRP such as ideas of BBB, sharing the same vision, and inter-reference of the items in the action list.

Below is the summary of the RRP¹² that was handed over to DCC in July 2017. The same version has been uploaded in the web site of Gorkha DDC.

Title:	Gorkha District BBB Rehabilitation and Recovery Plan 2073/74-2082/83
Planning Period:	10 Years from 2016
Vision:	“Agriculture, Tourism and Resilient Infrastructure are Pillars of Beautiful, Equitable and Prosperous Gorkha”
Basic Principles:	
1. Recovery of Daily Life:	Reconstruction of housings, resuming public services (administrative, health, education, social), improvement of livelihoods for households headed by female and those suffering from poverty
2. Reconstruction of Safer Cities:	Effective use of Hazard Maps, Promotion of reconstruction in safer areas, establishment of DRRM system
3. Revival of Livelihoods:	Recovery of agriculture, tourism, commerce and other industries

The local government structure of Nepal is now undergoing the process of structural reform. Because of the reformation, bodies of budget planning such as PDDP and Annual District Development Plan (ADDP) shifted from the Districts to Municipalities and Rural Municipalities. Furthermore, District Coordination Committees (DCCs) have been established to inherit the coordination functions of the DDCs. In April 2017, it was confirmed through MOFALD that DDCs will no more have the authority to approve budget executions from fiscal year 2017/18. Taking into consideration the proceedings of government reform, MOFALD has recommended the utilization of RRP as reference for the formulation of annual/periodic plan by Municipalities and Rural Municipalities. However, although MOFALD has developed guidelines for annual planning and budgeting, there are not yet guidelines for development of periodic plans for and RRP.

On 24th July 2017, a meeting was held by the DCC with the participation of all chairpersons and mayors of Rural Municipalities and Municipalities of Gorkha District. In this meeting, the RRP was handed over to the chairpersons and mayors.

¹² See Appendix 7-2 for the main text of the RRP

7.3 Formulating RRP in Sindhupalchok District

7.3.1 Consensus Building and Preparation of Planning in Sindhupalchok District

The Project Team communicated with the LDO and relevant officials of Sindhupalchok District since the beginning of the Project and shared the necessity for including the actions and ideas of rehabilitation and recovery into the PDDP. Initial discussion on the RRP was conducted on 21st July 2015 between the Sindhupalchok DDC and the Project Team. The contents of RRP were also discussed between the Project Team and officials of MOFALD on 18th August 2015. After a series of discussions, all parties including the Sindhupalchok DDC, the MOFALD and the Project Team came to a mutual understanding to jointly prepare the PDDP for Sindhupalchok District incorporating necessary rehabilitation and recovery aspects with input from the JICA Project Team.

The Project Team and the Sindhupalchok DDC concluded the MOU to formulate the PDDP incorporating the RRP on 1st March 2016. The MOU has also incorporated the NRA as a stakeholder of PDDP revision with the role of coordination and monitoring of the progress.

The chronology of meetings and consensus building on preparation of Sindhupalchok District PDDP incorporating RRP until the Preliminary Preparedness Workshop is as shown in the following tables.

Table 7.3.1 Chronology of Events on Preparation of Sindhupalchok District PDDP and RRP (1/2)

Date	Participants	Contents
15 June 2015	GON (MOF, NPC) GOJ (JICA)	Record of Discussion on the "Project on Rehabilitation and Recovery from Nepal Earthquake" including preparation of the Rehabilitation and Recovery Plans in Gorkha and Sindhupalchok District was agreed upon between the Government of Nepal and Government of Japan through JICA
21 July 2015	LDO: Mr. Mahesh Barel JICA Project Team	Meeting: Discussion on preparing Sindhupalchok District RRP
Aug.-Sep. 2016	JICA Project Team	Social Survey was conducted in 6 VDCs and 2 Municipalities by JICA Project Team
11 Aug. 2015	LDO JICA Officials JICA Project Team	Meeting: Discussion and agreement for preparation of RRP by JICA, and PDDP incorporating RRP
18 Aug. 2015	MoFALD: Mr. Chhabi Rijal(US), Mr. Jagannath Adhikar (Planning Specialist) JICA Officials, JICA Project Team	Meeting: Discussion and agreement for preparation of RRP by JICA, and PDDP incorporating RRP
27 Aug. 2015	Mr. Anirudra Nepal (DDC Auditing Officer & DDRC Focal Person) JICA Project Team	Meeting: Discussion and agreement for preparation of RRP by JICA, and PDDP incorporating RRP
6 Oct. 2015	LDO: Mr. Krishna Bahadur Shahi, CDE: Mr. Ganeshral Koju, Mr. Anirudra JICA Project Team	Meeting: Discussion for preparation of RRP by JICA, and PDDP incorporating RRP
11 Jan. 2016	DDC: Mr. Rajubhai Shrestha, Mr. Anirudra	Meeting: Discussion on preparing Sindhupalchok District PDDP incorporating RRP

Source: JICA Project Team

Table 7.3.1 Chronology of Events on Preparation of Sindhupalchok District PDDP and RRP (2/2)

Date	Participants	Contents
4 Feb. 2016	DDC: LDO, Planning Officer, Mr. Anirudra, JICA Project Team	Meeting: Discussion on MOU for preparing Sindhupalchok District PDDP incorporating RRP
24 Feb. 2016	MoFALD: Mr. Chhabi Rijal (US), Mr. Khem Raj Joshi (Planning Section) JICA Officials JICA Project Team	Meeting: Discussion on MOU for preparing Gorkha and Sindhupalchok District RRP and PDDP
30 Feb. 2016	NRA Dr. Bishma K. Bhusal (Under Secretary)	Meeting: Discussion on preparing Sindhupalchok District RRP and PDDP, and MOU
1 Mar. 2016	NRA, MoFALD, LDO, JICA, JICA Project Team	MOU for preparation of Sindhupalchok District RRP and PDDP was signed by LDO and JICA Project Team, with MoFALD and NRA as witness
18 Mar. 2016	DDC	EOI publication on the consultants for PDDP planning
29 Apr. 2016	NRA, MoFALD, UNDP, JICA, JICA Project Team	Meeting: In the discussion on "Disaster Recovery Planning Guidebook", NRA Dr. Bhusal reminded JICA initiatives in preparing RRP for Sindhupalchok and Gorkha and signed MoU with DDCs regarding the support in PDDP.
22 May 2016	DDC: Mr. Anirudra(IAO), Mr. Rajendra (PMAO) JICA Project Team	Meeting: Discussion on contents, planning process and collaboration of PDDP consultants on Sindhupalchok District RRP and PDDP
12 June 2016	DDC: LDO, IAO, PMAO PDDP Consultants JICA Project Team	Joint Meeting: Discussion on contents, planning process and the schedule of the Preliminary Preparedness Workshop on Sindhupalchok District PDDP and RRP
12 June 2016	NRA Special Contact Office: Mr. Bhuwaneshwor Lamichhane (Chautara CEO)	Meeting: Discussion and agreement for preparing Sindhupalchok District PDDP incorporating RRP
17 June 2016	PDDP Consultants JICA Project Team	Meeting: Discussion for preparing Sindhupalchok District PDDP incorporating RRP and formulation of Joint Planning Team
20 June 2016	PDDP Consultants JICA Project Team	Meeting: Discussion on Preliminary Preparedness Workshop and necessary information for formulating PDDP incorporating RRP
23 June 2016	DDC PDDP Consultants	Contract agreement between Sindhupalchok DDC and PDDP Consultants
23 June 2016	DDC: LDO, Mr. Anirudra, Planning Officer PDDP Consultants JICA Project Team	Meeting: Discussion on the Preliminary Preparedness Workshop of PDDP incorporating RRP

Source: JICA Project Team



Source: JICA Project Team

Figure 7.3.1 Meetings with DDC and NRA-SCO for PDDP/RRP in Sindhupalchok District

7.3.2 Formulating PDDP and RRP in Sindhupalchok District

After the selection of a consultant for formulating the PDDP, the formulation process of the PDDP incorporating RRP has been processed, and the formal planning process was commenced by holding the Preliminary Preparedness Workshop on 23rd June 2016.

The summary of the activities on the formulation of the Sindhupalchok District PDDP incorporating RRP after the Preliminary Preparedness Workshop on 24th June 2016, the formal kick-off of the planning process, is as shown in the following tables. Finally, PDDP and RRP were officially approved by the District Board Meeting.

Table 7.3.2 Summary of Planning Activities on Sindhupalchok District PDDP and RRP (1/6)

Date/Events	Participants	Summary of Contents / Discussions
24 June. 2016 Preliminary Preparedness Workshop	LDO, CDE, PMAO CDO DDC Officials NRA-SCO Line Agencies Parliament Members Political Parties I/NGOs Former DDC Chairman UNDP Team Other Stakeholders Journalists PDDP Consultants JICA Officials JICA Project Team (Approx. 80 people)	Chairperson: LDO (Mr. Krishna Bahadur Shahi) Facilitator: Mr. Anirudra Nepal (Focal person of PDDP and DDRC) <ul style="list-style-type: none"> ➤ Opening remarks from Mr. Rajendra Nepal (PMAO) ➤ Explanation of the programme from LDO ➤ Presentation from PDDP Consultants (Background, vision, process and output of PDDP) ➤ Formulating sectoral committees by PDDP consultants as follows: <ul style="list-style-type: none"> - Physical Infrastructure Development Committee - Social Development Committee - Economic Development Committee - Forest, Environment and Disaster Management Committee - Institutional Development and Resource Mobilization Committee ➤ Presentation from JICA Project Team (Necessity and Concept of RRP, Framework of PDDP incorporating RRP, Background of JICA Project, Japanese Experience) ➤ Remarks from Mr. Saresh Nepal (Former DDC chair.), Mr. Gokarna Mani Duwadi (CDO), Mr. Sher Bahadur Tamang (MP), LDO ➤ Explanation from PDDP Consultants (Overall work schedule, formulation of committees as follows) <ul style="list-style-type: none"> - Steering Committee - 1 - Sectoral Committee – 5 sectors - Technical committee (Internal task force from DDC) - 1 ➤ Open discussion with participants ➤ Closing remarks from the representatives of all political parties, Mr. Hirabayashi from JICA, LDO
25 June. 2016 Meeting with Local Service Providers	DDC Officials Local Service Providers PDDP Consultants JICA Project Team	<ul style="list-style-type: none"> ➤ Consultant team requested LSPs (Local NGOs working for information collection) to provide information while performing cluster level WS. LSPs agreed to avail information, basically related to poverty mapping. JICA Project Team explained the importance of data & information needed for both RRP and PDDP.
1 July 2016 Meeting with Development Partners, I/NGOs	Development Partners (UNDP, WHO, INGOs etc.) LDO, PMAO Mr. Anirudra (IAO) DDC Officials PDDP Consultants JICA Project Team	Chairperson: LDO (Mr. Krishna Bahadur Shahi) Facilitator: Mr. Anirudra Nepal (DDC Focal person of PDDP) <ul style="list-style-type: none"> ➤ Opening remarks from Mr. Anirudra Nepal (PDDP Focal Person) (Objectives, Overview of preparing the PDDP integrating RRP, Roles and responsibilities of stakeholders, partners and political parties) ➤ Presentation from PDDP Consultant (Background of PDDP and its importance) ➤ Presentation from JICA Project Team (Importance and necessity of RRP and PDDP incorporating RRP, JICA activities after earthquake)

Source: JICA Project Team

Table 7.3.2 Summary of Planning Activities on Sindhupalchok District PDDP and RRP (2/6)

Date/Events	Participants	Summary of Contents / Discussions
(continued...)		<ul style="list-style-type: none"> ➤ Request check list to participants from PDDP Consultants ➤ Explanation from LDO (Importance of PDDP as a guide documents to all stakeholders) ➤ Closing remarks from LDO
26 July 2016 VDC Secretaries Orientation Programme	VDC Secretaries, Municipalities (Chautara, Melamchi) NRA-SCO DDC Officials PDDP Consultant JICA Project Team (Approx. 60 people)	<ul style="list-style-type: none"> ➤ Explanation from PDDP Consultants (PDDP and its legal provision, Data collection checklist) ➤ Explanation from JICA Project Team (Importance of RRP, Planning process, Expected support from VDC secretaries) ➤ Open Discussion (All VDC secretaries agreed to provide requested information as far as possible. VDC secretaries also agreed to facilitate the cluster level WS.)
26 July 2016 Steering Committee Meeting	Line Agencies LDO, IAO DAO DDC Officials Former DDC Chairperson PDDP Consultants JICA Project Team	<ul style="list-style-type: none"> ➤ Meeting was held to discuss further actions and work plan. ➤ Steering committee meeting instructed all the line agencies and stakeholders to provide data and information needed for plan preparation. ➤ Mr. Anirudra (IAO) will be a coordinator of cluster WSs. ➤ Meeting also gave responsibility to Mr. Raju Bhai Shrestha to coordinate with DPs, I/NGOs and UN agencies to collect relevant information from them.
1-10 Aug. 2016 Cluster Workshops (8 clusters)	VDC Secretaries VDC Social Mobilizers District Level Political Parties representing each cluster Illaka Level Offices VDC Organisations School Management Committee Health Posts etc. PDDP Consultants JICA Project Team (50-70 people/cluster)	<ul style="list-style-type: none"> ➤ To identify sub-district level problems, issues and specific potential for planning purpose, Cluster Workshops were held in each 8 cluster, which were formed including all VDCs and Municipalities. ➤ Clusters are as follows: 1)Melamchi, 2) Tipeni, 3) Sipaokhare, 4)Jalbare, 5)Chautara, 6)Barabise Bazar, 7)Khadichour, 8)Thulopakhar ➤ JICA Project Team focused mainly on rehabilitation and recovery issues of the area. In most of the places, local markets for the construction materials were not seen. (For details of problems and issues which were discussed in the meeting, refer to the following table)
23 Aug. 2016 Meeting with DDC	DDC Officials PDDP Consultant JICA Project Team	<ul style="list-style-type: none"> ➤ Meeting: Planning proceedings and the contents of the Vision Workshop were discussed.
24 Aug. 2016 Social Development Committee	District Medical Superintendent District Education Officer District Women and Children Officer NGO Federation, Children Club, Youth Network, DDC Social Development Officer LDO, DAO Other Stakeholders PDDP Consultants JICA Project Team	<ul style="list-style-type: none"> ➤ Consultants presented the issues and problems identified from Cluster WSs. ➤ Social problems and issues were discussed (Health, Education and others). ➤ The main issue in both health and education in the reconstruction was that development partners or supporter have been mainly focusing on building structures and support for internal furniture and equipment is insufficient.
25 Aug. 2016 Institutional Development Committee	DDC Officials Municipality CEO, Treasury Officer PDDP Consultants JICA Project Team	<ul style="list-style-type: none"> ➤ Consultants presented the issues and problems identified from Cluster WSs. ➤ Institutional problems and issues were discussed (Health, Education and others).

Source: JICA Project Team

Table 7.3.2 Summary of Planning Activities on Sindhupalchok District PDDP and RRP (3/6)

Date/Events	Participants	Summary of Contents / Discussions
25 Aug. 2016 Meeting with Community People (Participatory Rural Appraisal)	1) Majhi Community at Bhimtar, Sangachowk VDC (Approx. 60 people) 2) Tamang Community at Gunsar, Syaule VDC (Approx. 40 people) PDDP Consultants JICA Project Team	<ul style="list-style-type: none"> ➤ Explanation from PDDP Consultants and JICA Project Team ➤ Problems and issues of community people were discussed.
28th Aug. 2016 (Morning) Economic Development Committee	District Agriculture Development Office (DADO), District Livestock Office (DLSO), District Cottage and Small Industry Office, District Cooperative Association, Representative from tourism, business & banking sector, DDC & PDDP Consultants	<ul style="list-style-type: none"> ➤ Consultants presented the issues and problems identified from Cluster WSs. ➤ Problems and issues related to economy and livelihood were discussed (Agriculture, Livestock, Tourism, Industries, Banking and Financial sector etc.). ➤ Line agencies and other participants shared their views and issues related to economic sector. ➤ Meeting also decided to facilitate data and information collection process.
28th Aug. 2016 (Afternoon) Forest, Environment and Disaster Management Committee	District Forest Office, District Land Conservation Office, Nepal Red Cross Society, Chautara Municipality, District Administration Office, Nepal Army, Nepal Police, Armed Police Force, NGO Federation, DDC & PDDP Consultants	<ul style="list-style-type: none"> ➤ Consultants presented the issues and problems identified from Cluster WSs. ➤ Problems and issues related to environment, Forest & Disaster Management were discussed. ➤ Line agencies and other participants shared their views and issues related to the sector. ➤ Meeting also decided to facilitate data and information collection process.
29th Aug. 2016 Physical Infrastructure Committee	District Technical Office, DUDBC Division Office, District Irrigation Office, Nepal Telecom, Drinking Water Supply and Sanitation Office, Chautara Municipality, DDC & Consultants	<ul style="list-style-type: none"> ➤ Consultants presented the issues and problems identified from Cluster WSs. ➤ Line agencies and other participants shared their views and issues related to physical infrastructure sector.
30th Aug. 2016 FGD (with Disabled People Children and Youths)	Focus Group (Representatives of Disabled people, Children (District Children Network), and Youths (District Youth Committee)) (Approx. 12 people) DDC & Consultants	<ul style="list-style-type: none"> ➤ FGD was held with Focus Group to identify their specific issues, problems and needs. ➤ Consultants presented the issues and problems identified from Cluster WSs and sectoral meetings. ➤ Problems and issues related to disabled people, children and youths were discussed.
31st Aug. 2016 FGD (with Dalits & Women)	Focus Group (Representatives of Dalit, and Women (District Women Network)) (Approx. 12 people) DDC PDDP Consultant	<ul style="list-style-type: none"> ➤ FGD was held with Focus Group to identify their specific issues, problems and needs. ➤ Consultants presented the issues and problems identified from Cluster WSs and sectoral meetings. ➤ Problems and issues related to Dalits and women were discussed.

Source: JICA Project Team

Table 7.3.2 Summary of Planning Activities on Sindhupalchok District PDDP and RRP (4/6)

Date/Events	Participants	Summary of Contents / Discussions
22 nd Sep. 2016 UNDP Orientation Programme	UNDP LDO, PMAO DDC Officials CDO: Mr. Antar Bahadur Silwal, I/NGOs JICA Project Team (Approx. 40 people)	<ul style="list-style-type: none"> ➤ Opening remarks from Mr. Rajendra Nepal (PMAO) ➤ Explanation of programme objective from UNDP ➤ Explanation on preparing PDDP and RRP from JICA Project Team ➤ Introduction of "Integrated Recovery and Periodic Planning Guidance Note" prepared by UNDP ➤ Closing remarks from LDO
25 th -26 th Sep. 2016 Vision Workshop (2 days)	LDO, CDE, PMAO DDC Officials NRA-SCO Parliament Members Political Parties Line Agencies DAO, I/NGOs, DPs Members of Sectoral Committees Former DDC Chairmen Other Stakeholders Journalists PDDP Consultants JICA Project Team (Approx. 120 people)	<p>Chairperson: LDO (Mr. Krishna Bahadur Shahi) Facilitator: Mr. Anirudra Nepal (Focal person of PDDP and DDRC)</p> <p><1st Day></p> <ul style="list-style-type: none"> ➤ Opening remarks from Mr. Rajendra Nepal (PMAO) ➤ Technical Presentation from Dr. Nani Ram Subedi "Periodic Planning: A Perspective of Climate Change" ➤ Presentation on District Profile from PDDP Consultants ➤ Presentation on Damage and Loss Profile from JICA Project Team ➤ Remarks from Mr. Suresh Nepal (Former DDC Chairman), Members of Parliament (Mr. Agni Sapkota, Mr. Sher Bahadur Tamang, Mr. Amrit Kumar Bohara) ➤ 1st Session Closing Remarks from LDO ➤ Presentation from PDDP Consultants ➤ Presentation from JICA Project Team ➤ Presentation on Vision Setting from Dr. Parap Chatkuli ➤ Open Discussion and Preparation of District Vision <p><2nd Day></p> <ul style="list-style-type: none"> ➤ Open Discussion on Vision District Vision was set as: "Safer, Prosperous and Beautiful Sindhupalchok" ➤ Explanation from PDDP Consultants (Logical Framework Approach, District Problems) ➤ Explanation from JICA Project Team (Rehabilitation and Recovery Vision, Goals, Policies) ➤ Group Work and Presentation (Problem Tree Analysis) ➤ Group Discussion (Sectoral Goals/Objectives)
16 th Nov. 2016 Forest, Environment and Disaster Management Committee	DFO, DLCO, Nepal Red Cross Society, Chautara Municipality, District Administration Office, Nepal Army, Nepal Police, Armed Police Force, NGO Federation, DDC & PDDP Consultants	<ul style="list-style-type: none"> ➤ Opening remarks from JICA Project Team and PDDP consultants ➤ Group discussion on Action Plan in RRP and PDDP
16 th Nov. 2016 Physical Infrastructure Committee	DTO, DUDBC Division Office, DIO, Nepal Telecom, DWSSO, Chautara Municipality, DDC & Consultants	<ul style="list-style-type: none"> ➤ Opening remarks from JICA Project Team and PDDP consultants ➤ Group discussion on Action Plan in RRP and PDDP

Source: JICA Project Team

Table 7.3.2 Summary of Planning Activities on Sindhupalchok District PDDP and RRP (5/6)

Date/Events	Participants	Summary of Contents / Discussions
16 th Nov. 2016 Economic Development Committee	DADO, DLSO, District Cottage and Small Industry Office, District Cooperative Association, Representative from tourism, business & banking sector, DDC & PDDP Consultants	<ul style="list-style-type: none"> ➤ Opening remarks from JICA Project Team and PDDP consultants. ➤ Group discussion on Action Plan in RRP and PDDP.
17 th Nov. 2016 Social Development Committee	District Medical Superintendent, DEO, WCO NGO Federation, Children Club, Youth Network, DDC Social Development Officer LDO, DAO Other Stakeholders PDDP Consultants JICA Project Team	<ul style="list-style-type: none"> ➤ Opening remarks from JICA Project Team and PDDP consultants. ➤ Group discussion on Action Plan in RRP and PDDP.
17 th Nov. 2016 Institution and Resource Development Committee	DDC Officials Municipality CEO, Treasury Officer PDDP Consultants JICA Project Team	<ul style="list-style-type: none"> ➤ Opening remarks from JICA Project Team and PDDP consultants. ➤ Group discussion on Action Plan in RRP and PDDP.
23 rd -24 th Nov. 2016 Planning Workshop (2days)	LDO, CDO, CDE, PMAO DDC Officials NRA-SCO Parliament Members Political Parties Line Agencies DAO, I/NGOs, DPs Members of Sectoral Committees Other Stakeholders Journalists PDDP Consultants JICA Project Team (Approx. 120 people)	<p>Chairperson: LDO (Mr. Krishna Bahadur Shahi) and Mr. Rajendra Nepal (Acting LDO) Facilitator: Mr. Anirudra Nepal (Focal person of PDDP and DDRC)</p> <p><1st Day></p> <ul style="list-style-type: none"> ➤ Opening remarks from Mr. Rajendra Nepal (Acting LDO) and CDO ➤ Presentation from PDDP consultants and JICA Project Team (Planning framework, Concept of RRP, Lessons learned from Japanese/Overseas experiences) ➤ Group discussion on rehabilitation and recovery by five sectors ➤ Group discussion on PDDP by five sectors (Programme, Budget and Responsibility) <p><2nd Day></p> <ul style="list-style-type: none"> ➤ Group discussion ➤ Presentation form each sectoral group ➤ Closing Remarks from LDO
8 th Feb. 2017 Economic Development Committee	DADO, DLSO, District Cottage and Small Industry Office, District Cooperative Association, Representative from tourism, business & banking sector, DDC & PDDP Consultants	<ul style="list-style-type: none"> ➤ Group discussion on PRRP ➤ Group discussion on Rehabilitation and Recovery Plan (Programme and Action Plan on PDDP and RRP)
8 th Feb. 2017 Social Development Committee	District Medical Superintendent, DEO, DWCO, NGO Federation, Children Club, Youth Network, DDC Social Development Officer LDO, DAO Other Stakeholders PDDP Consultants JICA Project Team	<ul style="list-style-type: none"> ➤ Group discussion on RRP ➤ Group discussion on Rehabilitation and Recovery Plan (Programme and Action Plan on PDDP and RRP)

Source: JICA Project Team

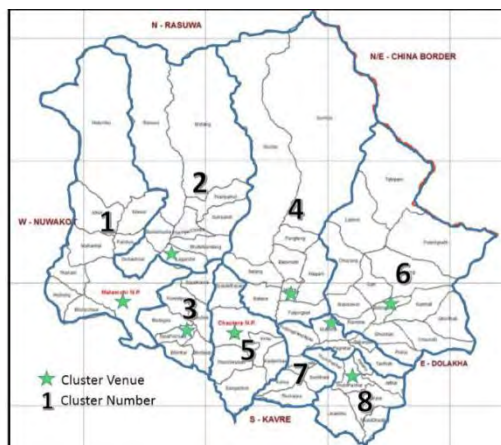
Table 7.3.2 Summary of Planning Activities on Sindhupalchok District PDDP and RRP (6/6)

Date/Events	Participants	Summary of Contents / Discussions
9 th Feb. 2017 Forest, Environment and Disaster Management Committee	DFO, DLCO, Nepal Red Cross Society, Chautara Municipality, DAO, Nepal Army, Nepal Police, Armed Police Force, NGO Federation, DDC & PDDP Consultants	<ul style="list-style-type: none"> ➤ Group discussion on RRP ➤ Group discussion on Rehabilitation and Recovery Plan (Programme and Action Plan on PDDP and RRP)
9 th Feb. 2017 Physical Infrastructure Committee	DTO, DUDBC Division Office, DIO, Nepal Telecom, DWSSO, Chautara Municipality, DDC & Consultants	<ul style="list-style-type: none"> ➤ Group discussion on RRP ➤ Group discussion on Rehabilitation and Recovery Plan (Programme and Action Plan on PDDP and RRP)
10 th Feb. 2017 Institution and Resource Development Committee	DDC Officials Municipality CEO, Treasury Officer PDDP Consultants JICA Project Team	<ul style="list-style-type: none"> ➤ Group discussion on RRP ➤ Group discussion on Rehabilitation and Recovery Plan (Programme and Action Plan on PDDP and RRP)
10 th Feb. 2017 Final Presentation Workshop	LDO, CDO, CDE, PMAO, DDC Officials Parliament Members Political Parties Line Agencies DAO, I/NGOs, DPs Members of Sectoral Committees Other Stakeholders Journalists PDDP Consultants JICA Project Team (Approx. 120 people)	<ul style="list-style-type: none"> ➤ Opening remarks from Chief Guests and JICA Nepal Representative ➤ Presentation of PDDP from PDDP consultants ➤ Presentation of RRP from JICA Project Team ➤ Presentation from LDO (Experience of his Japan Visit) ➤ Open Discussion ➤ Closing Remarks by Chief Guests and LDO
8 th Mar. 2017 Approval of PDDP and RRP (DDC Board Meeting)	Members of District Board Meeting	<ul style="list-style-type: none"> ➤ PDDP and RRP were officially approved by District Board Meeting chaired by LDO.
16 th Apr. 2017 Handover of RRP English Version	DCC Sindhupalchok officers	<ul style="list-style-type: none"> ➤ The JICA Project Team officially handed over the English version of RRP both hard copy and soft copy to DCC Sindhupalchok
3 rd Jul. 2017 Handover of Nepali Version of RRP	DCC -LDO of Sindhupalchok DCC -DRR focal person DCC-Planning officer	<ul style="list-style-type: none"> ➤ Nepali version of RRP were handed over to DCC - LDO, DRR focal person and planning officer. ➤ DCC distributed to all 12 Local Level Rural Municipalities and Municipalities.
14 th Jul. 2017 Finalization of PDDP	DCC Sindhupalchok	<ul style="list-style-type: none"> ➤ DCC finalized the PDDP with the PDDP consultant in Nepali language.
20 th Jul. 2017 Handover of Nepali Version of RRP	DCC Sindhupalchok Mayor/Chair persons of all municipalities and rural municipalities	<ul style="list-style-type: none"> ➤ DCC organized one interaction/ briefing with all Mayor/Chairpersons and Executive Officers of Local level in Chautara. In this event, RRP copies were officially handed over.

Source: JICA Project Team

7.3.3 Problems, Issues and Potentials from Meetings and Workshops

The problems, issues and potentials on rehabilitation and recovery in Sindhupalchok District which were discussed in each meeting and workshop are as shown in the following tables.



Source: JICA Project Team

Figure 7.3.2 Cluster Division for Cluster Workshops in Sindhupalchok District

Table 7.3.3 Problems, Issues and Potentials from Meetings/Workshops in Sindhupalchok (1/11)

Date/Events	Problems	Issues	Potentials
Cluster Workshop 1: 1 st Aug, 2016 (Melamchi Municipality) - Melamchi Municipality - Ichok - Mahankal - Thakani - Haibung - Bhotechaur - Kiwool - Helumbu - Palchowk	<ul style="list-style-type: none"> ➤ Threat of monkey in agriculture, loss of production and farmers are not interested in farming. ➤ Different political parties distribute the projects to influence their voters. ➤ Cases of human trafficking: Especially girls are trafficked to Kathmandu Valley and India as forced sex workers. Poor social and economic condition of the people. ➤ Poor road infrastructure : increased transportation time ➤ Early age marriage is common in rural areas because of old social tradition. (Addition of a member in a family can support in farm works) ➤ River cutting and landslides: Due to lack of river protection after excavation of river based quarries. ➤ Deforestation and forest fire: Due to careless travellers and intentional burning of grasses, forest fires are common. Deforestation, specially illegal tree poaching for firewood and timber (increased after earthquake) ➤ VDC Secretaries are not present in VDC Office/ VDC: Due to excessive work load and frequent reporting to DDC and DAO, VDC secretaries are more interested in staying at district headquarters. 	<ul style="list-style-type: none"> ➤ None of the residents have sufficient annual production ➤ No proper policies for project selection ➤ No people's representative at local level: No local level election since last 17 years. ➤ Increased number of Tripper (big trucks for carrying sand and aggregate) ➤ Unemployment has increased foreign migration for work: Lack of employment opportunities have forced youths to out migrate for employment. ➤ Location of water sources has shifted due to earthquake: the ground shaking due to earthquake have lowered the water sources/ aquifer, in some places water sources have completely dried. ➤ Increased work load to VDC secretaries (responsible to both DAO and DDC) 	<ul style="list-style-type: none"> ➤ High Tourism Potential: Gateway to Helambu / Langtang and Pach Pokhari Trekking Route. ➤ Commercial Farming : Near to Kathmandu ➤ Huge water resources and river based quarry ➤ Locally available construction materials for reconstruction ➤ Fisheries and water based recreations

Source: JICA Project Team

Table 7.3.3 Problems, Issues and Potentials from Meetings/Workshops in Sindhupalchok (2/11)

Date/Events	Problems	Issues	Potentials
<p><u>Cluster Workshop</u> 2: 2nd Aug, 2016 (Tipeni Bazar, Lagarche VDC) - Baruwa - Bhotang - Dubachour - Banskharka - Thampaldhahp - Thanpalkot - Gunsakot - BhoteNamlang - Lagarche</p>	<ul style="list-style-type: none"> ➤ Very poor road accessibility: Most of the roads are earthen and blacktopped roads are worsened by heavy trucks. ➤ High internal Migration: People are moving out of village to nearby town and to Kathmandu in search of proper education (basic reason) and employment. ➤ Poor telecom network and lacks access to communication: District is very remote and telecom companies are not interested to install network towers in the area with less human dominance. ➤ VDC Secretaries are not present in VDC Office/ VDC: Due to excessive work load and frequent reporting to DDC and DAO, VDC secretaries are more interested to stay at district headquarters. ➤ Tourism couldn't rise after Maoist insurgency: formerly, district was a very popular tourist destination and after Maoist insurgency it fell down. Later, internal tourism was flourished but again it decreased after the earthquake. 	<ul style="list-style-type: none"> ➤ Transportation difficult High transportation cost/ no vehicular accessibility during monsoon. ➤ No nearby market for construction materials: except few market centres, most of the area needs to import materials from nearby town of from adjacent district headquarters (Banepa, Kavre District). This will lead residents to build their houses in the same old pattern. ➤ Politicization of every matter (delays decision making): Issues related to public and general interest are often politicized and there is lack of proper coordination and exchange of information. Political parties intend to protect their political interest. ➤ Lack of access to basic health facilities: 1 health post is allocated for 1 VDC. In a larger VDC, people need to walk more than 4 hours to reach Health Post. Absence of health workers and lack of medicine makes the situation even worse. 	<ul style="list-style-type: none"> ➤ Hydropower production ➤ Tourism: Gate way to Pach Pokhari Trekking Route ➤ Organic farming and animal husbandry ➤ Medical Herbs (abundant in mountainous region.)
<p><u>Cluster Workshop</u> 3: 3rd Aug (at Jyamiremane, Sipapokhare VDC) - Nawalpur - Simpalkavre - Kunchok - Badegau - SipaPokhare - Bhotasipa - Bhimtar</p>	<ul style="list-style-type: none"> ➤ Absence of Drinking water sources: The area is dry and few water sources before earthquake dried after earthquake. There is severe water scarcity in this area. ➤ Internal migration to Kathmandu: Most of the residents have migrated to Kathmandu in search of better facilities. ➤ Poor road connectivity (Seasonal road : Inaccessible during monsoon) ➤ High school dropout: Most of the student leave behind their study after 10th grade due to their engagement in farming, early marriage and unable to pass the examination. ➤ Settlements at the risk of landslide: Most of the areas in northern part is in high risk of landslides. Lack of resettlement policies have forced them to reside there. ➤ Induced landslide due to non-engineered road construction and lack of road side protection. ➤ Citizens are not informed about the activities run by local authorities/ local NGOs/ other support agencies 	<ul style="list-style-type: none"> ➤ Water source dried because of earthquake ➤ Lack of irrigation facilities (farmers have to rely on monsoon for irrigation) ➤ Traditional farm practices: Subsistence farming ➤ Lack of identification of places with touristic importance ➤ Difficult to get VDC level services from VDC office due to excessive work load to VDC secretaries (VDC secretaries are assigned to look after more than one VDC) ➤ Lack of monitoring and evaluation of the projects (projects are divided through political bias) ➤ No local government: Local level being run by civil servants only. Local election has not been held for the past 17 years. 	<ul style="list-style-type: none"> ➤ Horticulture (Pomegranate, Mango, Litchi) ➤ Fertile land for farming (Vegetables and Grains) ➤ Water based recreation at low land (bank of Indrawati River) ➤ Possibility of developing integrated settlement: High portion of habitable land

Source: JICA Project Team

Table 7.3.3 Problems, Issues and Potentials from Meetings/Workshops in Sindhupalchok (3/11)

Date/Events	Problems	Issues	Potentials
<p><u>Cluster Workshop</u> 4: 4th Aug (Jalbire VDC) - Gloche - Gumba - Pangtang - Baramchi - Selang - Hagam - Batase - Jalbire</p>	<ul style="list-style-type: none"> ➤ Settlements nearby rivers are in threat of landslide and flood. In the market area nearby the highway, almost all the buildings are constructed above the river. ➤ Agriculture land in threat of landslides: lack of proper terracing and training work. ➤ Low production and no food security: Manual farm practice (traditional way) without using machineries and modern methods. ➤ Youths are not attracted in agriculture (focused mainly on foreign employment) ➤ Home based violence (gender based violence) is common in rural society due to conservative patriarchal practice. Alcohol consumption has also increased the incidents. ➤ Lack of quality education: Teachers involved in politics, lack of teaching skills, proper materials and facilities in the school. ➤ No basic medical facilities nearby. Hospitals are town centric and health posts do not have sufficient medical supplies and manpower. Citizens are bound to lose their lives even by minor sickness. ➤ Electricity leakage and theft: Naked wire transmission system and Electricity Authority has less manpower to look over all district regions. As a result, people use hooks to supply electricity at their home. ➤ Unsafe houses (both public and private): lack of proper construction technology and seismic resistance. ➤ Absence of all-weather road (seasonal roads and poor accessibility) ➤ Deforestation: for fire woods and timber for construction after the earthquake. ➤ Solid waste management is not proper. Especially in a town area people are excessively using finished products. Lack of proper collection and dumping. ➤ Threat of Lightning: settlements are houses are not aware of earthing techniques. ➤ Service provided by the local authority is not efficient (loss of time and money for small work) 	<ul style="list-style-type: none"> ➤ Lack of tourism activities: Very few foreign tourists visiting the district, no homestays and proper hotels in the district. ➤ Lack of identification of proper tourist destination: Most of the places of touristic interest have not been identified/ No tourism development plan. ➤ Modern technologies and farm machineries are not used in agriculture ➤ Lack of technical skills in farming: Farmers are not interested to use modern technology and equipment basically due to poor financial condition. ➤ No subject teachers and teachers are involved in politics ➤ Many school children are out of school: Due to poor financial condition of parents. ➤ Lack of student and girl friendly environment in school ➤ Lack of maintenance and care of public infrastructures (no budget allocation) ➤ Construction materials are expensive (high transportation cost) ➤ Unmanaged and improper settlements ➤ Lack of environment conservation aspects in road construction ➤ Delay in work completion through "Users Committee" ➤ Lack of skilled and well equipped manpower: most of the district productive work force is out of the country for employment. 	<ul style="list-style-type: none"> ➤ Labour forces ➤ Tourism ➤ Medicinal Herbs ➤ Slate stone abundant ➤ Establishment of residential schools ➤ Establishment of disaster management base (logistic hub) - Established already in Jalbire with VDC effort. ➤ Huge forest resource

Source: JICA Project Team

Table 7.3.3 Problems, Issues and Potentials from Meetings/Workshops in Sindhupalchok (4/11)

Date/Events	Problems	Issues	Potentials
<p>Cluster Workshop 5: 7th Aug (Chautara Municipality) - Chautara Municipality - Syaule - Irkhu - Kadambas - Sangachok - ThuloSirubari</p>	<ul style="list-style-type: none"> ➤ Low agro-Production due to traditional farming practice. ➤ Local vegetables cannot compete with imported vegetables as the price of imported vegetables is lower than local ones: local production cost is high. ➤ Loss of small and cottage industries. The earthquake has resulted loss in employment of the locals. This has an impact on livelihood of the residents. ➤ Loss of proper lodging facilities for tourists due to the earthquake. ➤ Obstruction in access due to landslides caused after the earthquake. Especially the transport cost raised significantly. ➤ Waste management in Municipality is not proper. Absence of dumping and waste management site. ➤ Early age marriage: Traditional practice is still common in the district. Especially for a girl child, early age marriage is common. ➤ Gender inequality: Bias is common due to patriarchal social setting. Boys or sons are regarded as care taker of the parents and they are given more priority in education and property. ➤ School drop-out rate high: Most of the students leave behind their study after 10th grade due to their engagement in farming, early marriage and unable to pass the examination. ➤ High rate of religion conversion (social conflict): The Christianity based organizations are intentionally focused in the conversion of religion. ➤ Poor health care services: Deficiency of skilled manpower and medical supplies. It is almost impossible to have check-up through doctors in rural areas. ➤ Electricity leakage and theft: Naked wire transmission system and Electricity Authority has less manpower to look over all district regions. As a result, people use hooks to supply electricity at their home. ➤ Unsafe housing: Without proper construction technology and earthquake resistance ➤ Poor management skill of government and non-government officials 	<ul style="list-style-type: none"> ➤ Traditional farm practices: Subsistence production ➤ Town/city centric banking facilities. ➤ Lack of timely and sufficient supply of improved seeds, agro-machineries etc. ➤ Even the people of district headquarters have to rely on Dhulikhel or Kathmandu for better health services. ➤ Caste based discrimination and untouchability still exists. ➤ Specialized doctors not available in hospital ➤ Lack of medicines (in health institutions) which are meant to be distributed for free ➤ No local election for past 17 years (decision making not in the hand of politicians) ➤ Lack of efficient public service delivery: Government offices have not fully adopted computerized system. Lack of skilled manpower and improved organization management. VDC secretaries are town and district headquarters centric. 	<ul style="list-style-type: none"> ➤ Tourism: Way to Langtang and Pach Pokhari Trekking Route ➤ Medicinal herbs ➤ Forest resources ➤ Good accessibility: Easy market access to local products.

Source: JICA Project Team

Table 7.3.3 Problems, Issues and Potentials from Meetings/Workshops in Sindhupalchok (5/11)

Date/Events	Problems	Issues	Potentials
<p><u>Cluster Workshop</u> 6: 8th Aug (Barabise VDC) - Barabise - Fulpingkatti - Tatopani - Listikot - Marming - Ghumthang - Gati - Maneswora - Ramche - Piskar - Karthali - Ghorthali - Chokati - Dhuskun</p>	<ul style="list-style-type: none"> ➤ Low agro-production: subsistence production/ no food security ➤ Abandoned houses/ high internal migration: Hard rural life and past Maoist insurgency internally displaced huge number of people to bigger cities and Kathmandu. ➤ Loss of market centre after the earthquake (port blockade): Many market centres lost their importance after the earthquake. The major loss is in Nepal China dry port. ➤ Poor telecommunication facilities and networks: Telecom service providers are not interested to spread their service in an area with less human dominance. ➤ Poor road accessibility, increased transportation cost: Both central and local government doesn't focus on upgrading existing tracks/ roads. ➤ Drinking water sources dried up due to the earthquake ➤ Houses at risk of landslides and earthquakes ➤ Increased development cost due to scattered smaller projects. ➤ Impact on education and health and transportation due to displaced settlement. ➤ Prevalence of water borne diseases: Lack of proper treatment for drinking water. People use open source water. ➤ Citizen needs to travel Dhulikhel for good health facilities as service offered by local health institutions are not reliable. ➤ Settlements and houses are at risk of earthquakes and landslides ➤ Poor services from VDC secretaries (VDC secretaries are not regularly in VDC) 	<ul style="list-style-type: none"> ➤ Farmers are unaware of modern farm techniques: most of the farmers rely on traditional farm practice. ➤ Local business is regularly hampered due to frequent road obstruction ➤ Banking and financial services are not available at rural areas ➤ Lack of proper use of medicinal herbs ➤ Lack of proper maintenance and care of public infrastructures ➤ Lack of irrigation facilities ➤ Allocated budget has not been optimally used ➤ Lack of proper monitoring and evaluation through technical manpower. ➤ Proper resettlement policies and actions is lacking ➤ Deforestation for firewood and timber ➤ Lack of proper drinking water and cleanliness ➤ Lack of skilled health workers and proper medical facilities ➤ Temporary toilets after earthquake (unhealthy environment) ➤ Lack of knowledge regarding earthquake resistant construction ➤ One VDC secretary is bound to look after 1+ VDCs, thus he/she is loaded with vast quantities of work at a time. ➤ Lack of necessary manpower at local level offices. 	<ul style="list-style-type: none"> ➤ International border link ➤ Tourism (Rafting, Trekking, Bungee Jump) ➤ Organic coffee and vegetable farming ➤ Livestock farming ➤ High forest resource ➤ Hydropower
<p><u>Cluster Workshop</u> 7: 9th Aug (Mankha VDC) - Mankha - Tauthali - Tekanpur - Sunkhani - Thokarpa - Kalika - Yamunadanda - Fulpingdandanda - Pagretar</p>	<ul style="list-style-type: none"> ➤ No food security: Very less self-production due to traditional farm practice (Majority of district residents). ➤ Frequent road obstruction due to landslide. Earthen roads are not accessible during monsoon. ➤ The earthquake destroyed water supply lines and roads. ➤ Lack of quality education: Teachers involved in politics, lack of teaching skills, proper materials and facilities in the school. ➤ Programmes/ Projects for focused group citizens are not effectively implemented ➤ Threat of landslide in the settlements. Many settlements are situated at landslide prone areas. 	<ul style="list-style-type: none"> ➤ Traditional farm practice with no substitute production ➤ Have to travel to bigger market centre to buy agriculture supplies and equipment ➤ Places of tourist interest have not been identified ➤ Affect in education, health and transportation after the earthquake: People displaced from their original location ➤ Lack of proper physical infrastructures in health and education institutions ➤ Lack of timely maintenance and care of road and other public infrastructure 	<ul style="list-style-type: none"> ➤ High tourism potential (river rafting) ➤ Hydropower generations and river based quarry ➤ Livestock and Vegetable farming, Fisheries etc. ➤ Trading with China

Source: JICA Project Team

Table 7.3.3 Problems, Issues and Potentials from Meetings/Workshops in Sindhupalchok (6/11)

Date/Events	Problems	Issues	Potentials
(continued...)	<ul style="list-style-type: none"> ➤ Electricity theft and leakage: Naked wire transmission system and Electricity Authority has less manpower to look over all district regions. As a result, people use hooks to supply electricity at their home. ➤ Unsafe housing and dwellings: Lack of proper construction technology and earthquake resistance ➤ Syndicate in transportation sector: Transportation service is in the hand of few transport companies and they do not enter other transport service providers to enter. ➤ Forest fire and lightning: due to carelessness and intention to grow new grasses, people put fire in the forest. Lack of earthing technology, houses and settlements are in threat of lightning. ➤ Deforestation for firewood and timber after the earthquake ➤ Unmanaged solid wastes: Especially in the town areas people are excessively using finished products. Lack of proper collection and dumping mechanism. ➤ Consumes lots of time and money to get basic public services from the local level ➤ VDC level projects are implemented without any regulations and priorities: Misuse of budget 	<ul style="list-style-type: none"> ➤ Lack of enforcement provision of building by-laws ➤ Trend of consumerism ➤ Induced landslide due to improper road construction ➤ Lack of quality in public service delivery ➤ Destroyed DVC buildings ➤ I/NGO led works are not effective 	
<p><u>Cluster Workshop</u> 8: 10th Aug (at ThuloPakhar VDC) - ThuloDhading - Lisankhu - Attarpur - Jethal - Petaku - ThuloPakhar - ThumPakhar</p>	<ul style="list-style-type: none"> ➤ No improvement in agro-production and quality: Agriculture based on traditional farm practices and people are less interested in using modern techniques, may be due to lower financial status and youth generation concentrated on foreign employment. ➤ Poor accessibility and increased transportation cost ➤ Poor health facilities: Citizens need to travel Dhulikhel for good health facilities as service offered by local health institutions are not reliable ➤ Quality education is out of reach: Teachers are involved in politics, low focus on student's education and lack of teaching techniques. ➤ High dropout rate: Failure in class examination and early age marriage of girls. ➤ No sufficient drinking water: lack of hygiene and health care. ➤ Social insecurity: violence against children, women etc. are common. ➤ Hill terrain: lack of flat land for integrated settlement planning 	<ul style="list-style-type: none"> ➤ Traditional farm practice with insufficient substitute production ➤ Lack of all-weather road/ lack of maintenance and care ➤ Lack of skilled manpower/ health workers are not frequently available ➤ Teachers are involved in politics ➤ Water sources dried due to the earthquake ➤ Lack of control mechanism for electricity misuse ➤ Lack of settlement planning concept from government sector ➤ Many earthquake victims are not enlisted as beneficiaries to receive grants ➤ No nearby market for construction materials: high price for construction materials ➤ Local body election not held for last 17 years. ➤ Poor governance 	<ul style="list-style-type: none"> ➤ Internal tourism ➤ Potential for organic farming (Potato) ➤ Favourable weather for cardamom (initiated with JICA support) ➤ Animal husbandry ➤ Stone and Magnesite quarry

Source: JICA Project Team

Table 7.3.3 Problems, Issues and Potentials from Meetings/Workshops in Sindhupalchok (7/11)

Date/Events	Problems	Issues	Potentials
(continued...)	<ul style="list-style-type: none"> ➤ Use of Polyethene bags/ plastics/ glasses has increased significantly; as a result, the environment is polluted. ➤ Delay in grant distribution has delayed private housing reconstruction. District residents are bound to stay in a poor condition. ➤ Political decision making is late: To create political consensus amongst many political parties is very difficult. ➤ Delay in public service delivery: Government institutions are not upgraded as per the demand of time. ➤ Political division of development projects and budget: Political parties/ individuals select the projects based on their interest. 	<ul style="list-style-type: none"> ➤ Lack of VDC buildings & other community buildings 	
<p>24 Aug. 2016</p> <p>Social Development Committee</p>	<ul style="list-style-type: none"> ➤ Closure of the schools due to shift of the settlements ➤ Lack quality in education: Teachers are involved in politics, low focus on student's education and lack of teaching techniques. ➤ Need to walk more than 2 hrs to access secondary school: Rural settlements are scattered and government cannot provide school in every settlement. ➤ Lack of subject teachers (less teachers in secondary level, while extra teachers in primary level) ➤ Violence against women is high and cases are not taken to police/court. Basically, violence against women is not taken seriously and society intends to patch-up the matter within the home. Police and administration also do not take such matters in a serious manner. ➤ Health services has not effectively reached to the residents (fewer numbers of health official as the recruitment has not been fulfilled yet) ➤ Increasing patients of non-communicable diseases like heart and kidney disease: Mainly due to unhygienic living and food consumption. ➤ Joint pain and skin disease are common in earthquake victims 	<ul style="list-style-type: none"> ➤ Reconstruction of Education buildings didn't focus on internal furnishing and establishing libraries, laboratories etc. ➤ Less number of school attendances in monsoon season due to obstruction in access. ➤ Lack of technical and higher education in the district ➤ Lack of disabled friendly infrastructures in public buildings ➤ Institutional delivery is still low (Home delivery prevalent) ➤ Psychological counselling to earthquake victims has not focused on individual counselling (only mass counselling) ➤ Medical supplies lacking (gov't medical supplies sufficient for 6 months only) ➤ Increasing number of youths for foreign employment after the earthquake. 	<ul style="list-style-type: none"> ➤ Establishment of residential schools for secondary level ➤ School enrolment can reach up to 100 % ➤ Institutional delivery can reach up to 100 % ➤ School dropouts can be brought down to 0 % ➤ Basic health facilities coverage can spread over the district.
<p>25 Aug. 2016</p> <p>Meeting with Community People (Participatory Rural Appraisal)</p>	<ul style="list-style-type: none"> ➤ Farm lands are under threat of landslide due to excessive excavation of the river quarry (Bhimatar Majhi Gaun). ➤ Most of the community people are not in a position to build their home ➤ Drinking water sources are dried due to the earthquake: Need to travel long distance for fetching water. ➤ Marriage at early age (after the age of 13 for girls) (Common in Tamang Community) 	<ul style="list-style-type: none"> ➤ Children are out of school due to poor financial condition (Bhimtar, Majhi Gaun) ➤ Girls of a young age are going abroad leaving behind their study (Tamang Community). ➤ Lack of market to buy construction materials (Bhimtar, Majhi Gaun) 	<ul style="list-style-type: none"> ➤ High labour force (can engage in construction work) ➤ Engagement of youths in commercial agriculture

Source: JICA Project Team

Table 7.3.3 Problems, Issues and Potentials from Meetings/Workshops in Sindhupalchok (8/11)

Date/Events	Problems	Issues	Potentials
(continued...)	<ul style="list-style-type: none"> ➤ Lack of irrigation and water for drinking after the earthquake (water sources dried) ➤ No food security: Self production doesn't last around the year, due to less land holding (Majhi Community) 	<ul style="list-style-type: none"> ➤ Very few have a high school degree, while people with a university degree are rare. None of the community people are in govt. jobs (except few school teachers) (Majhi Community) ➤ Lack of access in political leadership (Majhi Community). Lack of education and awareness. ➤ Very low social awareness (Especially Majhi Community) ➤ Earthquake victims are not provided with medical facilities for check-up: No provision for rehabilitation for seriously injured victims. 	
26 th Aug. 2016 Institutional Development Committee	<ul style="list-style-type: none"> ➤ Lack of proper coordination mechanism between agencies. Line agencies conduct their activities on their own and sometimes duplication of projects occurs. ➤ Users Committee is meant to generate local employment and ensure quality in development. But these days, contractors are leading the users committee and overtaking the job in the name of the users committee. This has promoted corruption and hampered in the quality of work. ➤ Low internal revenue and tax collection (local government not fully empowered): Sources of revenue has not been identified and taxes and revenue has not been effectively collected. ➤ Development works are not conducted as per stipulated time due to delay in budget flow. 	<ul style="list-style-type: none"> ➤ No NGO desk in DDC to coordinate with I/NGOs and support organizations ➤ I/NGO led work lacks transparency ➤ Users committee, ward citizens forum etc., are not functional as expected. ➤ No budget allocation for maintenance & operation work. ➤ Grant distribution process (for earthquake victims) is not prompt ➤ Local election not held for 17 years. 	<ul style="list-style-type: none"> ➤ Establishment of information desk (customer care) desk at every government office with direct public dealings. ➤ Application of Line Ministry Budget Information System (LMBIS) for prompt budgetary flow. (Possibility)
28 th Aug. 2016 (Morning) Economic Development Committee	<ul style="list-style-type: none"> ➤ Closure of national level industry: Magnesite Factory (Loss of huge economy) closed due to political reason. ➤ Loss of livelihood due to damage on small and cottage industries. This has impacted in people's employment and livelihood. ➤ Damage of tourism infrastructures (Trails and lodging facilities) due to the earthquake. Diminishing tourism. ➤ Lack of market access of agriculture products ➤ No food security: traditional farm practice and less production ➤ Agriculture technicians do not intend to visit rural areas, as a result, farmers bear a huge loss. ➤ Town/city centric banking facilities (citizen deprived of banking services). Bank and financial institutions do not intend to 	<ul style="list-style-type: none"> ➤ Agro supplies and equipment are not available in time. ➤ Difficult market access (due to hill terrain) for selling surplus agro-production ➤ Lack of sources of livelihood ➤ Less awareness regarding the use of modern farm practices and machineries (may be due to low economic status) ➤ Less knowledge/skill regarding the storage of agro-productions ➤ Loss of production due to the lack of technical skills and advice. ➤ Loss of agriculture equipment/ infrastructures/ stores/ loss of livestock (impact on economy of local people) 	<ul style="list-style-type: none"> ➤ Huge water resources ➤ Huge amount of Medicinal herbs ➤ Organic and commercial farming ➤ Livestock farming ➤ Pocket area farming ➤ Hydropower generation ➤ Tourism (Both domestic and international tourism) ➤ Connected with international port (trading)

Source: JICA Project Team

Table 7.3.3 Problems, Issues and Potentials from Meetings/Workshops in Sindhupalchok (9/11)

Date/Events	Problems	Issues	Potentials
(continued...)	<p>provide their service in a rural areas as there is less corporate profit (even due to lack of security).</p> <ul style="list-style-type: none"> ➤ High out flow of youth generations (out low of labour and manpower) in search of employment. ➤ Tourism fallen down; previously due to Maoist insurgency and now due to the earthquake. 	<ul style="list-style-type: none"> ➤ Lack of proper advertisement and identification of tourist areas ➤ Holding of hydropower license (without timely construction) 	<ul style="list-style-type: none"> ➤ Huge river based quarry
<p>28th Aug. 2016 (Afternoon)</p> <p>Forest, Environment and Disaster Management Committee</p>	<ul style="list-style-type: none"> ➤ Settlements are in threat of landslide : Geologically, district is very prone to landslide ➤ Forest encroachment and illegal deforestation after the earthquake ➤ Frequent forest fire ➤ Risk of flood and lightning at some areas ➤ Poaching wild animals for illegal trading. ➤ No/ minimum awareness regarding disaster management ➤ Cities are polluted with plastics/ glasses/ non-degradable wastes ➤ Poor construction of public and private buildings resulted huge loss of life and property 	<ul style="list-style-type: none"> ➤ Capacity building in the mountainous communities with high risk in the post disaster phase ➤ Lack of emergency support fund in the local level ➤ Disaster management in Disaster Risk Reduction (DRR) had not been considered in development planning ➤ Lack of proper use and management of medicinal herbs and forest based resources ➤ Lack of proper management of solid waste 	<ul style="list-style-type: none"> ➤ Mainstreaming DRR in development work ➤ Establishment of disaster management bases and committees at the local level
<p>29th Aug. 2016</p> <p>Physical Infrastructure Committee</p>	<ul style="list-style-type: none"> ➤ Narrow and earthen roads without proper engineering design: Lack of all-weather access ➤ Increased transportation cost. ➤ Increased road accidents due to narrow and sub-standard roads. ➤ Non-Engineered road construction: No proper policy for the construction of rural roads. Even the general public hires bulldozers to construct roads. ➤ Ineffective use of development budget. Allocating very little of the budget even for big projects. (Eg: DDC allocated less than NRs 50,000 for a new track opening project). ➤ Sub-Standard public vehicles; main reason of accidents. Due to a syndicate in transportation, service providers pay less attention in care and maintenance of vehicles. ➤ Damaged water supply, road and irrigation networks due to the earthquake. Lack of irrigation facilities. ➤ Delay in reconstruction of earthquake damaged infrastructures, poor living conditions and sub-standard services. ➤ Engineers deployed by NRA are not available at VDC level. This has created a problem in accessing technical support for the residents. ➤ Dried water sources due to earthquake. Lack of sufficient water for household use. 	<ul style="list-style-type: none"> ➤ Lack of proper maintenance and care of public infrastructures (Road, public buildings, water supply etc.) ➤ Syndicate in transportation sector ➤ Lack of proper control mechanism to the public transportation operators. ➤ Difficult to provide services in the scattered settlements, very high development cost. ➤ Irregular electricity supply although district produces 10 % electricity of the gross national production. ➤ Mobile network is poor at the rural area and communication network has not spread over the district. ➤ Large number of physical infrastructure projects with low budget allocation: lack of continuity of projects ➤ Concept of proper settlement planning has not been envisioned from the government level. ➤ No plans for relocation of the settlement at risk ➤ Pace of reconstruction of public building is very slow 	<ul style="list-style-type: none"> ➤ All whether road connectivity to all VDCs ➤ Planning integrated and compact settlement: safer & resilient reconstruction ➤ Huge amount of construction materials: Based on river quarry ➤ Huge hydropower potential ➤ Drinking water supply to Kathmandu Valley

Source: JICA Project Team

Table 7.3.3 Problems, Issues and Potentials from Meetings/Workshops in Sindhupalchok (10/11)

Date/Events	Problems	Issues	Potentials
(continued...)	<ul style="list-style-type: none"> ➤ Electricity, water supply and irrigation network obstruction due to EQ, landslides and storm fallen trees ➤ High cost for the construction materials: no provision of incentives ➤ Hill terrain: lack of flat land for integrated settlement planning 	<ul style="list-style-type: none"> ➤ Delay in housing grant distribution 	
Aug 30 th 2016: FGD with Disabled People, Children & Youths	<p><u>Disabled People</u></p> <ul style="list-style-type: none"> ➤ Difficult accessibility in public and Govt. buildings: no provision of disabled friendly infrastructures and accessibility. ➤ Deprived of education: Parents are not interested in sending them to school as they do not expect any result. ➤ Poor mental and physical condition as they are not regarded as a normal citizen (Social perception). ➤ Challenges are seen in mainstreaming disabled people in development process. 	<ul style="list-style-type: none"> ➤ Lack of social status and recognition ➤ Lack of skill and training for employment ➤ Lack of support materials and equipment ➤ Issues related to disabled people has not been incorporated in sectoral plans ➤ Policies related to disabled people have not been implemented properly. 	<ul style="list-style-type: none"> ➤ Disabled friendly public infrastructure ➤ Rehabilitation centre for disabled people.
	<p><u>Children</u></p> <ul style="list-style-type: none"> ➤ Using children in illegal & prohibited work ➤ Using children in political activities: This has impacted on their education. ➤ Child labor: Poor economic condition of parents has forced their children to stay out of school and engage in labour work. ➤ Early age marriage: Conservative social tradition (But this trend is in decreasing order) ➤ Malnutrition: Rural society is agrarian and most of the time parents need to work in farm land. As a result, parents give less time to care their children. ➤ Girls are not regularly in school (especially when they have some work in their home and when they are in monthly periodic cycle) ➤ Prevalence of caste and gender based discrimination in school 	<ul style="list-style-type: none"> ➤ Lack of children friendly buildings and infrastructure ➤ Lack of sports facilities and play grounds ➤ Children are not considered as a stakeholder in decision making process. ➤ Trend of going abroad for employment at early age (Below 16 years) ➤ Lack of training and skills for professional development: This has direct impact on the service delivery of civil servants. 	<ul style="list-style-type: none"> ➤ Mainstreaming Child Friendly Local Governance (CFLG) in development process ➤ Involving children in decision making
	<p><u>Youths</u></p> <ul style="list-style-type: none"> ➤ Out migration (for foreign employment) ➤ Youth-Self Employment fund had not been properly utilized. Government have provision of Self-Employment fund and interested youth can take the loan from the fund. This fund is being distributed on the basis of political influence. ➤ Excessive consumption of alcohol by the youths who returned from foreign employment. (Lack of proper utilization of money earned) 	<ul style="list-style-type: none"> ➤ Lack of employment opportunities in local and national level ➤ Youths are not mainstreamed in development process. ➤ Lack of trained and skilled youth going for foreign employment. ➤ Money earned from foreign employment has not been properly used. 	<ul style="list-style-type: none"> ➤ Using youths in development works ➤ Commercial agriculture : involving youths

Source: JICA Project Team

Table 7.3.3 Problems, Issues and Potentials from Meetings/Workshops in Sindhupalchok (11/11)

Date/Events	Problems	Issues	Potentials
Aug 31 st 2016: FGD with Women and Dalits:	<p><u>Dalits</u></p> <ul style="list-style-type: none"> ➤ Many educated Dalit youths are unemployed. Lack of abundant employment options and opportunities. ➤ Prevalence of caste based untouchability and discrimination. (Social stratification and heterogeneity) 	<ul style="list-style-type: none"> ➤ Difficulty in getting employment for Dalits. ➤ Lack of child development centre and child education programme in Dalit settlement ➤ Lack of social awareness in Dalit community ➤ No political access and involvement 	<ul style="list-style-type: none"> ➤ Demolition of caste based system
	<p><u>Women</u></p> <ul style="list-style-type: none"> ➤ Prevalence of violence against women and gender inequality ➤ Early age marriage: Conservative social tradition (But this trend is in decreasing order) ➤ Cases of human trafficking: Especially girls with poor economic conditions and education are taken to Kathmandu and India in the name of better employment. ➤ Daughters are not socially recognized as a part of family as they will leave the home after marriage. Thus, parents give high importance to the son. 	<ul style="list-style-type: none"> ➤ Less participation of women in development planning ➤ Voices to women are not addressed. The projects and programmes related to women are not given so much priority. Regular development projects are often entitled in the name of women. (Eg: A regular road project could be entitled in the name of women focused project by saying, after construction of the road, it will decrease travel time of women) ➤ Problem in finding employment. Most of the employers intend to keep male workers than female. ➤ Lack of access to higher education and opportunities. Most girls get married after their secondary level education. Few get chance to study up to high school. 	<ul style="list-style-type: none"> ➤ Abolish early age marriage ➤ Null human (especially women) trafficking.

Source: JICA Project Team

7.3.4 District Vision and Goal on PDDP

The District Vision and the Goal on the PDDP of Sindhupalchok District, which were discussed in the Vision Workshop, are as shown in the following tables. Policies and actions had been discussed and elaborated, and reflected into the PDDP incorporating RRP through the participatory planning process. The District Vision and the Goal are including key words, “safer” and “build resilience society” which are reflecting the concept of “Build Back Better”, the key principle of the RRP.

Table 7.3.4 District Vision and Goal from Vision Workshop in Sindhupalchok

Date/Events	District Vision and Goal
25-26 Sep. 2016 Vision Workshop (2 days)	After identification of district level major problems and potentials, the participants formulated a district Vision based on the lead sectors they identified. Basically, lead sectors are identified based on district potential. The participants identified the following as lead sectors of the district, - Water resource - Agriculture - Tourism - Trading and Business <u>District Vision:</u> "Safer, Prosperous and Beautiful Sindhupalchok" <u>District Goal:</u> "Establishing inclusive development and equal access to services/facilities for the accomplishment of reconstruction & rehabilitation work and to build resilient society through economic progress".

Source: JICA Project Team

7.3.5 Finalisation and Handover of RRP to DCC

The RRP for Sindhupalchok has been finalized through the above process. The English version of the RRP has been officially handed over to Sindhupalchok District on 16 April 2017. The Nepalese version of the RRP has been handed over to the DCC on 3 July 2017.

Throughout the PDDP formulation process, the Project Team provided input regarding the key methodology for BBB, for example, utilization of hazard maps and other scientific based information for future planning and DRR activities, and importance of long term planning for reconstruction with robust development. In result of these interactive formulation processes, there has been several interactions between the PDDP and RRP such as ideas of BBB, sharing the same vision, and inter-reference of the items in the action list.

Below is the summary of the RRP¹³ that was handed over to the DCC.

Title:	Sindhupalchok District BBB Rehabilitation and Recovery Plan 2073/74-2082/83
Planning period:	10 Years from 2016
Vision:	<i>“Safe, Prosperous and Beautiful Sindupalchok”</i>
Basic Principles:	
1. Recovery of Daily Life:	Reconstruction of housings, resuming public services (administrative, health, education, social),
2. Reconstruction of Safer Cities:	improvement of livelihoods for households headed by female and those suffering from poverty
3. Revival of Livelihoods:	Effective use of Hazard Maps, Promotion of reconstruction in safer areas, establishment of DRRM system
	Recovery of agriculture, tourism, commerce and other industries

The local government structure of Nepal is now undergoing the process of structural reform.

¹³ See Appendix 7-3 for the main text of the RRP

Because of the reformation, bodies of budget planning such as PDDP and Annual District Development Plan (ADDP) shifted from district to Municipalities and Rural Municipalities. In April 2017, it was confirmed through MOFALD that the DDC will no more have the authority to approve budget executions from fiscal year 2017/18. Taking into consideration the proceedings of government reform, MOFALD has recommended the utilization of RRP as reference for the formulation of annual / periodic plan by Municipalities and Rural Municipalities. However, although MOFALD has developed guidelines for annual planning and budgeting, there are not yet guidelines for development of periodic plans for and RRP.

On 20 July, the DCC distributed the RRP to all chairpersons and mayors of the Rural Municipalities and Municipalities of Sindhupalchok. The contents of the plan were briefed to the relevant authorities of the Municipalities and Rural Municipalities on the same day.