

## **CHAPTER 2**

### **BASIC CONCEPT OF THE STUDY**

## 2. BASIC CONCEPT OF THE STUDY

### 2.1 Background of Disasters in Nepal

Disasters frequently and severely affect not only the national economy, but also the people's livings in rural areas of Nepal. According to the Ministry of Home, the disaster loss of assets due to disasters in 1985 amounted to 20% of that year's Gross Domestic Product (GDP) and the earthquake of 1988 alone caused damage equivalent to 7% of the GDP in that year.

In the case of the 1993 disaster, the total amount of damage excluding indirect damage is estimated at 3.18 billion Nepalese rupees, which is equivalent to 1.7% of the GDP of 177 billion Nepalese rupees in 1993/94. The damage amount is also equivalent to about 12% of the national fiscal budget including foreign assistance. According to the National Planning Commission (NPC), it is said that the 1993 disaster delayed the national economic development for twenty years, which is very severe and discouraging for the Nepalese people.

Such frequent disasters discourage economic activities in Nepal, but the disasters are the results of previous development activities by the people. For example, the Prithivi Highway and Kulekhani Hydropower Stations were severely damaged by the 1993 disaster and they seriously affected the economic activities in Nepal. Those important infrastructures were constructed in 1974 and 1988 respectively, and if the same natural hazard had occurred twenty years before, no damage could have occurred to those infrastructures. The disaster potential is, therefore, growing up along with development activities, and it is necessary to keep disaster prevention in mind for the sustainable development activities.

Figure 2.1.1 shows a schematic chart of backgrounds of disasters in Nepal which was simplified by the Study Team to focus the approaches taken in the CDPP and the IDPP. According to the figures, there are three major backgrounds of disasters in Nepal as shown below:

#### (1) Natural background

Nepal has peculiar characters in nature with respect to meteorology, topography, and geology, and it is true that the potential of natural hazards in Nepal is higher than in many other countries in the world due to such original natural characteristics. Rainfall in Nepal mostly concentrates during summer from June to September due to the monsoon climate. In the central development region of Nepal, more or less 80% of annual rainfall is observed during these four months.

In the case of forming dipslope of bed rock slope in mountains, stormy rainfall on the mountain sometimes creates instability between soil mass on the surface and the inner bed rock due to the decrease of friction force by submerged flow on the bed rock. Top soil erosion and slope failure may occur due to heavy rain which flows to the river on the steep slope. It will create more steep and unstable topography, and the natural hazard potential in terms of landslides, slope failures, and debris flow will increase.

Excess sedimentation is yielded in the upstream by such mountain erosion activities and is transported to the downstream by flush flood. The sedimentation spreads over the river and forming alluvium area at the

downstream. The river width is remarkably expanded and the river course is meandered due to re-erosion of alluvium area. The meandering river erodes the river banks and wash out the farmland on the banks.

Because of such natural phenomena, the hazard potential on mountain slopes and river sides will increase continuously if no countermeasures are taken.

## (2) National background

Since Nepal is a developing country, there are high demands for various kinds of infrastructure developments such as road, electricity, irrigation, and so on. For various development activities, the required size of investment is larger than what Nepal can afford.

According to the Statistical Year Book of Nepal, 1995, published by the Central Bureau of Statistics, the development expenditure is estimated at 21,482 million Nepalese rupees in 1993/94, which exceeds the annual revenue of 19,580 million Nepalese rupees and shares 62% of total annual budget of 34,479 million Nepalese rupees including revenues, foreign grants, foreign loans, and internal loans.

As development activities, particularly infrastructure development, aim at future economic development, the priority is put on development both in urban and rural areas. Under such conditions, it is difficult to emphasise disaster prevention measures. Reflecting such high demands for various development activities, the disaster prevention measures are so far paid less attention.

However, the infrastructures developed under such policies will be physically vulnerable and they will have higher disaster potential under the natural hazard conditions in Nepal. And it is needed to take into account disaster prevention measures within a range of economic feasibility during the development planning stage.

## (3) Rural background in hilly areas

The following table shows the areas and the population distributions by geographical regions in Nepal. According to the 1991 census, the population of Nepal was 18.5 million. During the last decade from 1981 to 1991, the net increase in population was about 3.5 million, and the annual average increase rate during this period was 2.1%.

Area and Population Trend in Geographical Regions of Nepal

Region	Area (km <sup>2</sup> )	Population ( thousand)			Annual Growth (%)		Population density in 1991 (persons/km <sup>2</sup> )
		1971	1981	1991	1971-81	1981-91	
Mountain region	51,817	1,139	1,303	1,443	1.36	1.03	28
Hill region	61,345	6,071	7,163	8,420	1.67	1.63	137
Terai region	34,019	4,346	6,557	8,628	4.20	2.78	254
<b>Nepal</b>	<b>147,181</b>	<b>11,556</b>	<b>15,023</b>	<b>18,491</b>	<b>2.66</b>	<b>2.10</b>	<b>126</b>
Makwanpur district	2,426	164	243	315	4.82	2.96	130
Sindhuli district	2,491	147	184	224	2.52	2.17	90

Sources: Statistic Year Book of Nepal, 1991 and 1995, Central Bureau of Statistics

In the hilly region, which covers 42% of the whole territory of Nepal including Kathmandu and Pokhara cities, as well as the study areas of Makwanpur and Sindhuli Districts, the annual population growth from 1981 to 1991 was 1.63%,

and the population density in 1991 was calculated at 137 persons per km<sup>2</sup>, which was slightly higher than the national average of 126 persons per km<sup>2</sup>.

In the case of Makwanpur and Sindhuli Districts, however, the population growth ratios are estimated at 2.9% and 2.2%, respectively, which are much higher than the average population growth in hilly regions.

The table below shows the trend of economically active population in Nepal. The majority of the people in Makwanpur and Sindhuli Districts depend on the agriculture sector for their income sources. According to the figures, about 80% of the people belong to the agriculture sector. In the case of Makwanpur and Sindhuli Districts, about 83% and 89 % of their economically active populations respectively were classified in the agriculture sector in 1991, which indicates that the agriculture sector is still playing a key role in economic activities in the study areas as well as in Nepal.

Economically Active Population Trend in Geographical Regions of Nepal

Region	Agriculture (thousand)			Non-agriculture (thousand)			Total (thousand)		
	1981	1991	Ann. growth (%)	1981	1991	Ann. growth (%)	1981	1991	Ann. growth (%)
Mountain region	680	693	0.19	13	62	37.69	693	755	0.89
Hill region	3,265	3,131	-0.41	247	577	13.36	3,513	3,708	0.56
Terai region	2,299	2,128	-0.74	346	749	11.65	2,645	2,877	0.88
Nepal	6,244	5,952	-0.47	606	1,388	12.90	6,851	7,340	0.71
Makwanpur district	104	112	0.77	11	23	10.91	115	135	1.74
Sindhuli district	77	83	0.78	5	11	12.00	82	94	1.46

Source : Statistical Year Book of Nepal, 1991 and 1995, Central Bureau of Statistics

However, the trend of population in the agriculture sector slightly decreased from 1981 to 1991 as shown in the above table. Annual decrease ratios of population in the agriculture sector are -0.47% in Nepal and -0.41% in the hill region. On the other hand, both districts in the study area differ from the national and regional trends. The population in the agriculture sector increases at a rate of about 0.8% per year in Makwanpur and Sindhuli Districts.

Trend of Agricultural Land in Geographical Areas of Nepal

Region	Total Area (km <sup>2</sup> )	Agricultural Land			Share of agricultural land 1991 (%)
		1981 (km <sup>2</sup> )	1991 (km <sup>2</sup> )	Ann.increase (%)	
Mountain region	51,817	1,226	2,065	6.84	3.99
Hill region	61,345	9,397	10,175	0.83	16.59
Terai region	34,019	14,014	13,750	-0.19	40.42
Nepal	147,181	24,637	25,990	0.55	17.66
Makwanpur district	2,426	415	315	-2.41	12.98
Sindhuli	2,491	152	297	9.54	11.92

Sources : Statistical Year Book of Nepal, 1991 and 1995, Central Bureau of Statistics

The above table shows the trend of agricultural area from 1981 to 1991. The agricultural area is gradually expanding at a rate of 0.55 % per year in Nepal. The same trend is observed in the hilly region as well. The net increase in the agricultural area is estimated at 77,800 ha for ten years.

The population increase in the hilly region gives a strong pressure on expansion agricultural area. New agricultural lands are found mainly along river beds or mountain slopes and invade forest areas. Forest is therefore decreasing and the soil on the slope is eroded mainly due to such human activities.

The above backgrounds of the national economy, the natural characteristics and the rural activities will increase physical vulnerability and escalate hazard potential. Infrastructures constructed with a less attention to disaster prevention will have higher potential of hazard. The cultivated lands expanded by the pressure of population increase are more vulnerable as they are mainly located in river sides or on slopes without soil conservation measures.

## 2.2 Approaches to Disaster Prevention in Nepal

### 2.2.1 Status of the disaster prevention programme in the Eighth Plan

The Eighth Five-Year Plan (1992 - 1997) of Nepal focuses on the following three principal objectives of development as:

- 1) Sustainable economic growth,
- 2) Poverty alleviation, and
- 3) Reduction of regional imbalances.

For achieving the above principal objectives, however, it will take a long time and it is not possible to achieve them completely within a single five-year plan. Accordingly, priorities are given to the following programmes to attain the principal objectives in the Eighth Plan:

- a) Agricultural intensification and diversification,
- b) Energy development,
- c) Development of rural infrastructures,
- d) Employment generation and human resource development,
- e) Control of population growth,
- f) Industrial development and tourism promotion,
- g) Export promotion and diversification,
- h) Macro economic stabilisation,
- i) Reforms in development administration, and
- j) Monitoring and evaluation.

Regarding the disaster prevention issues in the Eighth Plan, there is no specific programme planned. However, the following programmes are related to disaster prevention issues, and were planned to implement in the forest sector in the Eighth Plan:

#### (1) Soil conservation and watershed management programme

“ In order to control natural calamities such as soil erosions, floods, and landslides and bring about improvement in water deposits and hydrological balance, tree plantation will be undertaken along river banks and in watershed areas of large hydropower and irrigation projects. In addition, integrated soil and watershed management programmes will be implemented in co-ordination with agricultural and irrigation programmes in the concerned watershed areas. Technical assistance will be provided to this programme from the forest, the agriculture and the irrigation offices of the district in addition to the nearest soil conservation project site. Similarly, with a view of making extended technical services more effective, operational research work will be undertaken on a regional basis, and programmes will be conducted to raise the awareness of soil erosion and soil conservation among the general public.”

(2) River control project

“ River control works will be continued as a regular programme in order to check the damage to land and settlements and erosion of cultivable land resulting from erosion of river banks by floods in the river. River control works will be carried out at necessary places by encouraging local people’s participation. A master plan of one or two major rivers will be prepared in every region under the river control programme and the control work will be carried out in a systematic manner. In this, river control works of Rangeli and Sunsari will also be implemented.”

(3) Water-induced hazard control

“ Support will be provided to water-induced hazard control works by organising relevant training programmes and collecting the data relating to water-induced hazard control. Besides, construction of a hydraulic laboratory, installation of equipment and various training programme will be undertaken.”

Prior to implementation of the Eighth Plan, the following disaster prevention activities were carried out in the forest sector from 1990 to 1992:

- a) 29 gully control works,
- b) 24 landslide control works,
- c) 92 ha of terrace rehabilitation works, and
- d) 42 protection works of water sources.

### 2.2.2 National Action Plan in Disaster Management

There is a noteworthy activity regarding the disaster prevention issues in Nepal. Reflecting the International Decade of Natural Disaster Reduction (IDNDR), which was declared by the United Nations to be launched in the 1990s, the IDNDR national committee of Nepal has been formed under the chairmanship of the Ministry of Home Affairs.

Figure 2.2.1 shows the framework of the Draft National Action Plan on Disaster Management, which was prepared in July 1995. It is noted that the national action plan on disaster management will be incorporated in the Ninth Plan (1998 - 2003) as multi-sectoral activities.

There are four major components as listed below:

- a) Disaster preparedness,
- b) Disaster response,
- c) Disaster reconstruction and rehabilitation, and
- d) Disaster mitigation.

Disaster preparedness is mainly concerned with forming appropriate institutional arrangement for policy making and executing levels in region, district, and village. The hazard assessment and mapping for the selected areas are carried out for effective disaster preparedness activities.

Action plan for disaster response will be for a certain area where a disaster attacks. The action plan is prepared as a part of preparedness for actual response operations. The major components of disaster response are:

- Evacuation, search and rescue,
- Communication and transportation,
- Temporary settlement, and
- Health, nutrition, and sanitation.

Disaster reconstruction and rehabilitation programme aims at incorporating income generation into the rehabilitation works. Conducting feasibility studies for rehabilitation and reconstruction works identifies sustainable rehabilitation activities. The programme also emphasises the needs for carrying out regular capacity assessment and inventory preparation at various levels of organisations.

Disaster mitigation programme is to provide disaster mitigation measures for the selected areas, where major hazardous areas are identified by the government. It is also to carry out risk assessment and the EIA in further development planning. Such activities will result in the reduction of physical vulnerability of the previous and future development activities. Allocation of the national budget to disaster management and mitigation programme will be considered, and encouraging international assistance in technical and financial aspects to implement the programme is emphasised.

## **2.3 Basic Concept of JICA Disaster Prevention Study**

### **2.3.1 Basic Concept**

Concerning the current activities on disaster prevention in Nepal, it is essential to refer to the national action plan on disaster management, and the proposed disaster prevention plans in the Study should be incorporated into the national action plan as well as the Ninth Plan for 1998 to 2003.

The major issues to implement the national action plan is how to select the priority areas for implementation, particularly in disaster rehabilitation, reconstruction, and disaster mitigation aspects. There are so many places physically required to take actions immediately. But it is not possible to carry out disaster prevention measures for all hazardous places.

The Study Team would like to recommend that the places, where severe disasters have occurred and no permanent rehabilitation and reconstruction measures are provided, shall be prioritised for implementation of disaster prevention works through rehabilitation. Three years have passed since the 1993 disaster, but many damaged areas are still not rehabilitated and the people in the damaged areas are seriously suffering due to the lack of land and job. Rehabilitation works are essential to encourage people in the damaged areas for further development. This approach will help to reduce physical and social vulnerability of society through rehabilitation and disaster prevention activities.

In case disaster prevention measures are provided in the areas where the people have no experiences of disasters, there are less possibilities to encourage people's participation as well as economic development through the disaster prevention programme. The people in such areas don't recognise the hazard potential and they do not fear disasters.

Another issue which the Study Team will take into account is how to encourage the people to participate in and operate the disaster management system and to recover from the damage by future disasters by themselves. The UNDP commented that "A strong economy must be the best defence against disasters," in their disaster management training manuals. The Study Team fully agrees with the concept of disaster prevention, and encouraging community development must be one of the best disaster prevention measures by which the vulnerability of society is reduced.

In addition, the Study Team fully understands that nobody is interested in implementing the structural disaster prevention works without any economic advantage, but if there is a clear economic advantage in the disaster prevention activities, they will be realised. Based on the above circumstances, all the structural disaster prevention measures shall be assessed in the feasibility study. The disaster prevention works bring about various benefits, tangible and intangible ones. In the Study, mainly direct benefit by disaster prevention activities will be taken into account.

For example, the land damaged by a disaster such as debris flow and bank erosion can no more be utilised for farming purpose. The disaster prevention with rehabilitation measures however, can make it productive again. That is the direct benefit by disaster prevention activities. In other cases, if most people are fully discouraged by the disaster and hope to migrate to other areas, only disaster prevention measures can encourage them to stay there and continue farming activities, which must be a benefit of the disaster prevention measures.

Taking into account the above current activities and backgrounds regarding disasters, the basic concepts are proposed in the Study as shown in Figure 2.3.1 and described below:

(1) "Disaster prevention through disasters"

The Study Team believes that the most effective and practical measures for disaster prevention are to concentrate efforts on the areas where people are affected severely by disasters rather than to spread efforts to the whole country. Because, those who have no experience of disasters give less interest in disaster mitigation activities. There will be limited effectiveness as well as limited participation in such places for implementing disaster mitigation programme. By dealing with the problems one by one, the whole country will become less hazardous in the long run. Considering the above aspects, the "disaster prevention through disasters" approach will be one of the basic concepts in the Study.

Under this concept the areas severely affected by the 1993 disaster were selected as the study areas for disaster prevention activities in the Study.

(2) "Disaster prevention for development"

The Study Team has understood the current high requirement of economic development in Nepal. And the improvement of basic infrastructures is essential for development. Many of previous efforts for development were, however, not fully successful due to disasters. Additional investment was forced to be made to recover the original function of infrastructures, which are not expected to provide any additional benefits. Considering such situations, the Study Team will make efforts to create income generation opportunities through disaster prevention activities.



With this concept, the CDPP and IDPP will be formulated by adopting low cost technologies and multipurpose usage of disaster prevention structures for development. Feasibility study will be also carried out for the selected CDPP and IDPP.

(3) “Community development under people’s initiative”

The Study Team has found that the people with experience of a disaster can understand the importance of disaster prevention and management activities. At the same time they are very discouraged to keep on living because they have lost their families, properties, land and jobs by a disaster.

The importance of disaster preventive activities is to encourage people to look at the future and start actions for tomorrow. Approaching the people in the damaged areas and encouraging people to participate in disaster prevention activities through village rehabilitation and development shall be realised in the Study.

It is very important that “people’s participation” is not for saving investment by using free labour force from people’s groups, but for strengthening the people for sustainable development. The disaster prevention or community development plan which is planned by an outsider and forces people to participate in often results in no effects on strengthening the people for reduction of vulnerability and for sustainable development. The support for the people in planning, co-ordinating, and implementing the CDPP is the ultimate objective of the Study. This is called “people’s initiative” in the CDPP.

To achieve community development under people’s initiative, an intensive approach to the village with technical information for plan formulation will be needed, and forming and strengthening user committees will trigger community development activities and reduction of vulnerability, then finally achieve a successful disaster prevention project.

Under the above concept, the Study Team approached the people many times to discuss development needs, issues, possibility of people’s participation, and so on during the field investigation period, and tried to use this information as effectively as possible to formulate the CDPP.

### 2.3.2 Overall Plan and Priority Plan

To achieve all the objectives of the Study, it will take a long time and many activities should be taken gradually with the consideration of the technical and financial capability as well as the urgency of respective activities.

The plan formulation is, therefore, made in two steps; Overall Plan and Priority Plan as described below:

(1) Overall plan formulation

The Overall Plan shall be defined as a long term plan targeting the reduction of vulnerability in physical, economic, and sociological aspects. It is noted that the Overall Plan in the Study is not a basic plan to satisfy the objectives completely, but a long-term plan with continuous actions for disaster prevention and community development.

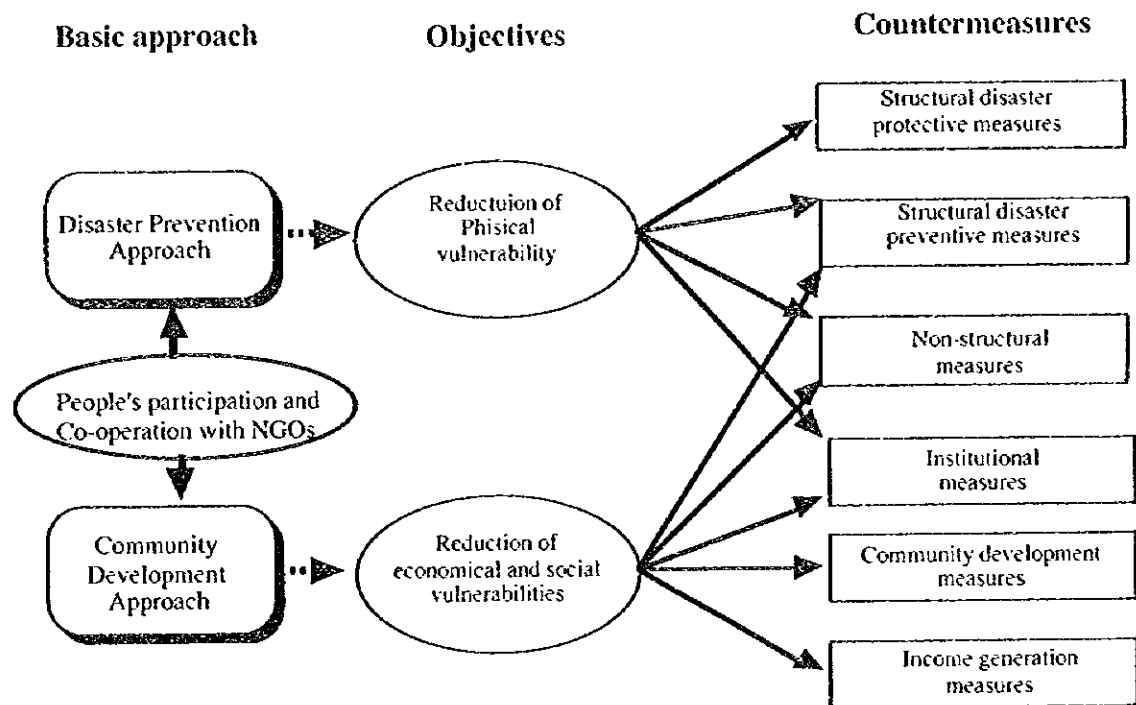
(2) Priority plan formulation

The Priority Plan shall be formulated as an urgent plan for achieving rehabilitation and immediate disaster prevention for development. However, it is required to consider the priority needs of the villagers in the CDDP for smooth implementation of disaster prevention activities. There is actually little difference in priority between disaster prevention viewpoints and urgent needs of the people. Practical and effective measures for continuous activities should be considered for the priority plan formulation.

In view of "disaster prevention for development," feasibility studies will be conducted in the Priority Plan.

2.4 Basic Approaches to the Plan Formulation

Along with the above basic concepts of the Study, two different approaches are taken to formulate the CDDP in the Study. They are disaster prevention approach and community development approach as shown in the following figure:



Basic Approach for the CDDP

The disaster prevention approach is mainly concerned with the potential of natural hazard in the community. The measures are assessed based on the results of the hazard analysis from the viewpoints of topography, geology, meteorology, land use, and so on. Based on the estimated natural hazard potential, the countermeasures to prevent, mitigate, and evacuate from disasters will be proposed.

The community development approach is mainly concerned with the vulnerability of the community which is damaged by natural hazard. The measures are assessed based on the vulnerability assessment of the people in the view of economic and social conditions. The

countermeasures will be proposed to empower the people to recover from and manage disasters by themselves.

Details of both approaches are explained in the following subsections:

## **2.5 Disaster Prevention Approach**

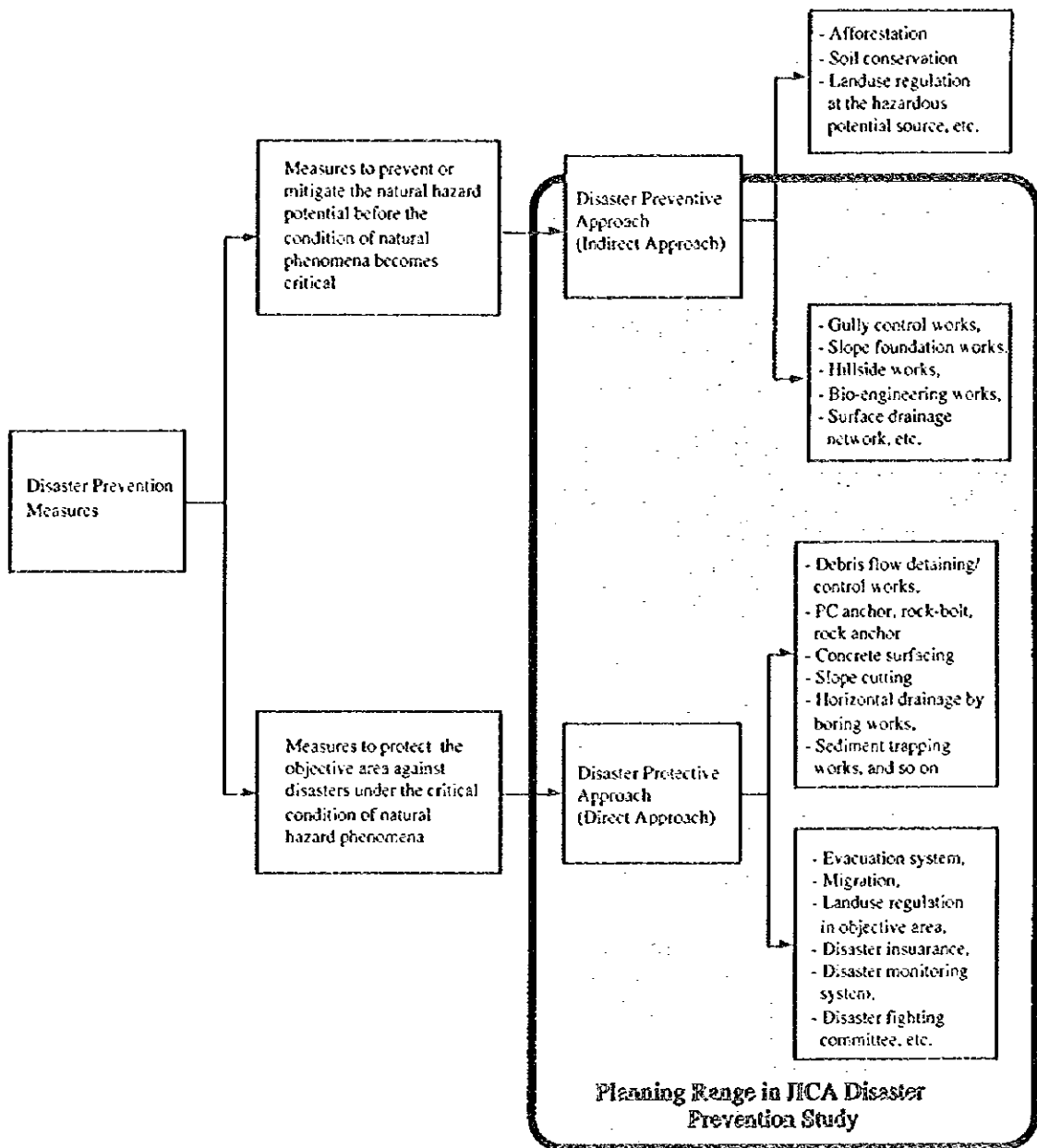
### **2.5.1 Formulation of Disaster Prevention Plan**

In mountainous areas, the natural slopes sometimes become unstable due to topographical and geological activities, and natural hazard phenomena such as failure, landslide, debris flow occur. In such areas debris activation is generally called "mass movement". This phenomenon itself is no more than one of natural phenomena in which unstable slopes are to be stabilized. However, once this phenomenon happens in human society, and threatens human life and/or properties, it would be called "disaster".

To prevent such disasters, there are basically two kinds of approach as follows:

- (1) To prevent or mitigate the natural hazard potential before the condition of natural phenomena becomes critical,
- (2) To protect the objective human society against disasters under the critical condition of natural hazard phenomena.

The former approach is called "Preventive measure" or "Indirect measure" which will be taken before the condition of the natural phenomena becomes critical. The latter is called "Protective measure" or "Direct measure" which will be taken against the critical condition of natural hazard phenomena in human society. Sabo planning is generally considered the best combination of both approaches to prevent disasters in the long term. In this Study also, both measures are taken for the CDDP and IDPP formulation as shown below:



### Classification of Disaster Prevention Measures

Generally, disaster prevention projects are formulated only for the critical areas subjected to the high potential of disasters, and most of the project sites urgently require some countermeasures for protection against disasters. Under such circumstances, in disaster prevention works generally the structural measures of "Protective Approach" are given priority even they are costly, considering the necessity to satisfy the basic human needs.

On the other hand, taking into consideration the huge potential of hazard and the financial limitation, it is not practical to depend only on the structural measures of protective approach, which need require many massive structures to meet the force of disaster energy and, therefore, huge costs.

Accordingly, the plan formulation in the Study will put mainly force in the non-structural measures of protective approach with minimum input of structural measures of protective

approach.

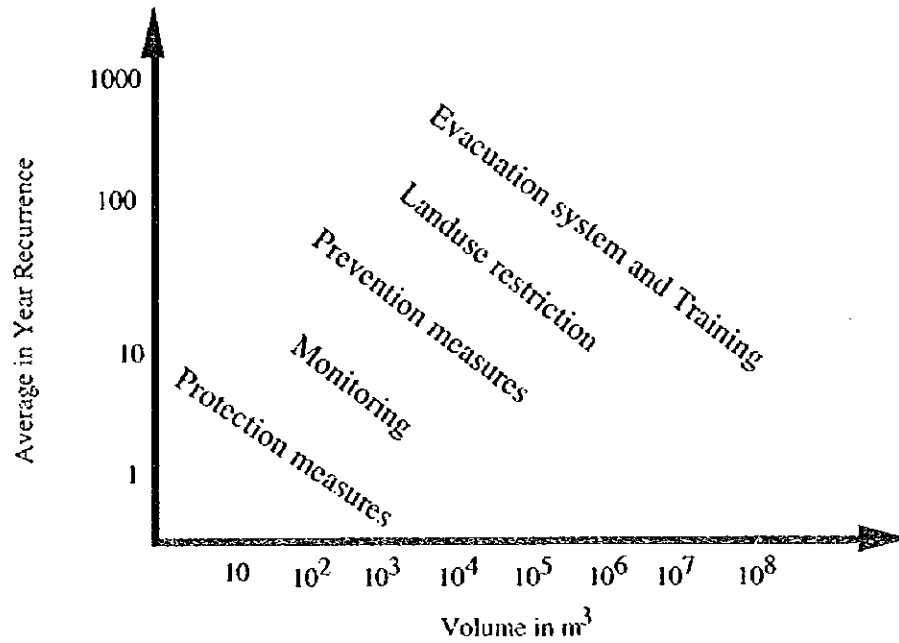
In addition, there are many places which have been so far not seriously damaged but will become hazardous in future. In such areas, the structural measures of preventive approach will be applied aggressively to prevent further disasters. If the problem is left without any solution, it must be much more difficult to deal with it later. The Study Team believes that earlier actions must be much economical.

Based on the results of detailed field investigation, the Study Team felt that the non-structural preventive measures such as afforestation and soil conservation measures can be applied only in limited places in which the slope stability is still guaranteed. Once the slopes or gullies became unstable, foundation works as structural preventive measures would be required prior to non-structural preventive measures. On the other hand, the areas in which non-structural preventive measures are applicable are usually attractive as the productive areas for sloped agriculture activities, or sources of firewood or pasture. Then, the candidate areas for non-structural preventive measures almost overlap with the potential areas for community development. With regard to the land availability and development potential of the community, the area for non-structural preventive measures will be treated in the community development aspects with due attention to the environmental impact and not concerned with the disaster prevention planning.

Accordingly, the disaster prevention plan in the Study is formulated basically according to the following concepts:

- (1) To propose minimum structural protective measures to be undertaken by the Government,
- (2) To apply non-structural protective measures to be undertaken with the people's participation to cover the effects beyond the structural protective measures,
- (3) To propose structural preventive measures with appropriate technologies to be applied with the people's participation.

The concepts of the three measures of disaster prevention approach are shown in the following schematic figure:



Schematic Concept of Disaster Prevention Measures

### 2.5.2 Planning Range and Scale

The disaster in the community is not caused by the phenomenon which occurs in the same community area. The causes are the landslide in the upper area and its sediment which flows down along the reaches. Accordingly, the disaster prevention plan should consistently cover the whole area. In this Study, however, only the basic arrangement of structures is described in the disaster prevention plan.

The Study Team examines the disaster prevention plan assuming the similar causes of the 1993 disaster, mitigating its special and limited area's effects, and adjusting to prepare the plan for urgent remedial measures for the 1993 disaster.

## 2.6 Community Development Approach

### 2.6.1 Basic Concept of Community Development and People's Participation

Along with engineering approach, community development approach is the major principle adopted in the Study. In the Study, the main issue is to work out disaster prevention plans for the people who have been severely affected by the July 1993 disaster. Table 2.6.1 shows the number of lost lives due to disasters in the last decade. Although it seems that community development has nothing to do with disaster prevention, it is recognised in the Study that community development is very important for disaster prevention in that it improves the living standard of people and helps protect people from disasters directly and indirectly.

A direct effect of community development on disaster prevention is, for example, that a community works together to carry out afforestation so that landslides and slope failures will be mitigated. An example as an indirect effect is that a community development helps generate income so that the people can afford to resettle from disaster-prone areas to safer areas, then they will not face disasters any more.

Community development approach is classified as a non-structural measure; it contains no physical structures but consists of software for disaster prevention. On the other hand, a structural measure is defined as an approach taken by engineers to plan and design structures which prevent disasters physically.

The distinction between rural development and community development is clear in definition, but their objectives are so similar that they are sometimes used interchangeably. If a clear distinction is needed, it would be given as follows: In rural development, the focus is on development of a rural area, usually a rural village or a rural town which is underdeveloped compared to the national average and is the origin of the regional income disparity, while in community development, the focus is on development of a people's community, empowering people by forming people's groups. A rural area usually comprises a village, while a community comprises a unit of people's group with similarities in ethnic backgrounds, experiences, and customs, and close geographical linkages. A community is usually smaller than a village, but this is not always true, it depends on situations. Theoretically speaking in sociology, there exist a broad range of community sizes. Although both development approaches have different literal names and different development focuses, they often have the same or very similar objectives and methods of development. Hence the Study Team does not restrict itself to community development, rather it considers both community development and rural development in order to prepare an effective CDPP.

In most cases in developing countries, a rural area and a community often coincide, so that it does not make sense to try to distinguish rural development from community development clearly. It can be said that community development belongs to rural development because rural development allows us to use more diversified methods than community development does in order to achieve its goal. It can also be said that both rural development and community development belong to social development because social development deals with all those which are related to social aspects. Anyway, the Study Team does not distinguish rural development from community development seriously.

In the Study, people's participation is strongly encouraged to carry out community development. It is fully understood that people's participation is indispensable for community development. The definition of people's participation in the Study, however, is slightly different from what is usually perceived by many development planners and practitioners in the world. Put differently, people's participation in the Study is much weaker than what it usually implies. In an ordinary people's participatory project, people take the initiative from the beginning of the project and are being involved till the end. That is, people, in a positive attitude, do everything such as planning, designing, constructing, operating, and maintaining. In other words, people's participation is realised by the bottom-up approach.

On the contrary, people's participation in the Study is interpreted as a mix of the bottom-up approach and the top-down approach. This mixed approach is due to the time limitation and the necessity of integration with physical disaster prevention plans. Usually it takes a long period of time to implement a participatory project. To find out what people really want and to make people participate in a project, it can be said from the

experience for the last two decades by the United Nations, the World Bank, etc., that it usually takes five to ten years. But the Study should be completed within a year plus during which there is less than a half-year field research, thus people's participation is hardly realised in a usual way. Moreover, the integration of community development plans with technical/physical disaster prevention plans is also an important factor in the Study. Disaster prevention plans designed by engineers are highly technical and are not easy for people to understand and make their own plans in a co-operative way. In this sense, the integration with technical disaster prevention plans leads us inevitably to take the top-down approach to some extent.

What should be noticed in taking a mixed approach is that the experience in people's participation in the past should not be ignored - many international aid agencies have failed to obtain people's participation in their projects in which a mixed approach was taken. They have concluded that a complete bottom-up approach is a must to obtain people's participation and attain a sustainable development. The Study Team should take into consideration this fact seriously and try to make the CDPP very carefully so as not to make the same mistake.

In the discussion so far, community development approach is restricted to people's participation and the integration with technical disaster prevention plans, but this is not the end of the whole approach. An aspect of regional development is also very important in a sense that it helps to generate jobs and income, which will contribute to community development by upgrading the standard of living and reducing women's burden. The ultimate goal of any public project is to make people better off. Disaster prevention projects are for making people's living better, not for preventing disasters themselves. In the Study, regional development is considered as one of the important components in community development. Successful regional development programs will improve people's living standard and contribute indirectly to disaster prevention in many ways. With increased income, women will not have to work hard to collect firewood because they can afford to use kerosene, which will deter deforestation, thus prevent disasters and relieve women from painstaking works as well.

By regional development it is meant that economics is taken into account for development of a region. In community development or rural development, sociology and anthropology are mainly used among disciplines in social sciences. On the other hand, in regional development, economics is the major discipline used. Therefore, for the CDPP, an interdisciplinary approach - sociology, anthropology, and economics - is to be taken.

Sustainability is an important aspect to be considered in development projects, and it is recognised in the world that community development with people's participation is very effective to achieve this sustainable development. It has been frequently seen in the past development projects that without people's participation many projects failed to achieve their goals, or even though they looked successful in the short term, they were recognised as failed projects as the time went by due to circumstantial changes. It is concluded that people's participation is the key to attain sustainable development, and thus community development approach with people's participation should be explicitly considered in the Study.

The reduction of vulnerability of community to disasters is also important. Through community development, it is expected that vulnerability will be reduced and people will get stronger against disasters. One of important aspects in disaster prevention is to reduce vulnerability of people/community to disasters. If people are no longer vulnerable to disasters, they will be able to recover from disasters by themselves, or they can recover and even develop their living conditions from the aftermath of disasters. Although the



reduction of vulnerability of community to disasters does not directly prevent disasters, it should be regarded as one of important aspects in disaster prevention.

Since Nepal has received so many foreign aids, it is said that the people in Nepal have to some extent a dependency syndrome. When the future of Nepal is pondered seriously, such dependency in people's minds should be wiped out and they have to help themselves for their future. To do so, community development with people's participation would be very effective to make Nepali people realise the importance of self-help development. In this sense, too, community development approach should be seriously carried out in the Study.

## 2.6.2 People's Participation and Co-operation with NGOs

In the course of the Study, the following process are taken with regard to people's participation in plan formulation:

No.	Timing	Investigation Method	Investigation Area	Target Group	Research Items
1	Feb.1996	Questionnaire Survey	9 villages in the Study Area	30 HH x 9 villages	living condition, education level, income level, job opportunities, damage condition by 1993 disaster, development needs, etc.
2	Mar. 1996	Focus group discussion	Phedigaon, Namtar, Chisapani, Sahan	Village chairman, teachers, public health nurse, farmers, women's representative	Background of the village, problems, development needs, etc.
3	May 1996	Rapid rural appraisal	Phedigaon, Namtar, Chisapani	Different groups (village representative, men's group, women's group, farmers' group, etc.)	Problems and development needs in each group
4	Jun.1996	Discussion about draft plan	Phedigaon, Namtar, Chisapani	People's representative group	Explanation of draft plan, comments and discussion
5	Sep.1996	Discussion about people's role/responsibility	Phedigaon, Namtar, Chisapani	People's representative group	Discussion about people's roles and responsibilities in implementation stage.
6	Oct. 1996	Hearing survey for evacuation activities	Phedigaon, Namtar, Chisapani	50 HH x 3 villages	Evacuating destination, timing, route, safer zones in the village, etc.
7	Jan. 1997	Seminar for transfer knowledge	Phedigaon, Namtar	About 500 people in each village	Advise for project implementation

Questionnaire survey was firstly conducted at the beginning stage of the Study. Objectives of the survey are mainly to select priority areas among 9 communities in the Study area. The criteria for the selection are living condition, severity of disaster damage, further disaster potential and so on. The results of the survey were also useful to assess the education level and trend, income level and people's needs.

Focus group discussion and rapid rural appraisal were conducted in the priority areas, Phedigaon, Namtar and Chisapani villages in Makwanpur District. The discussions between the Study Team and various people's groups are carried out to research problems and needs in different groups such as representative group, men's group, women's group, farmers' group and so on. Based on the analysis in different group, the common issues are found out and reflected to the CDPP formulation. Particularly, the rapid rural appraisal were intensively done by the expert in the Study Team and local sociologist from NGO. As the results, various community development measures are proposed in due consideration to the needs in different people's group.

For example, rural road improvement programme in Namtar are attractive in many people's groups. For farmers' group, it is quite useful to transport agricultural products to vegetable market in Hetauda. For women's group, their children who migrated to cities are easier return village and increasing opportunities to meet. For health post workers, the severe sickness and injuries can transport to the hospital in time.

Draft community development plans were formulated based on the results of discussion with people's group, and were revealed to them in June 1996. There were no big comments from people's groups so that their problems and needs are basically reflected in the draft plan. However, the Study Team found that the people's groups highly depend on the implementation arrangement to the government and the Study Team, and there was less sense of people's initiative for project implementation.

The Study Team seriously assessed the high dependency syndrome of the people's group, and suggest them to think their roles and responsibilities for the project implementation. The discussion about the people's roles and responsibilities are held in September 1996. At that time, the people's group proposed the following activities are under their roles and responsibilities:

- 1) supply of unskilled labour force,
- 2) collection of construction material such as stone, sand from nearby the village,
- 3) Land provision for stock yard, administration camp, demonstration farm.

It was revealed that high discrepancies exist between the Study Team and the local people in terms of people's participation. "The community development measures shall be implemented under the people's initiative, and support from others if necessary" is the basic policy of the Study Team.

Considering to the high discrepancy, seminar for transfer of knowledge was conducted in January 1997 at the final stage of the Study. The message from the Study Team, "Stand on your legs first, and then only seek donor's help" was put through street drama which was performed by the professional actor/actress group at respective villages. The scenario of street drama was prepared by the Study Team to remind the disaster in 1993, and the problems after the disasters, and the solutions. In the drama, it is presented that "the donors and technical support team come only tentatively, and they will not stay

permanently. The restoration and development of the community will take long time, and the initiative of the local people is essential to realise the long term activities.” The seminar was successful attending more or less 500 persons in each community, though the Study Team wonder whether local people really understood the message or not.

As presented above, the people's participation aspect for plan formulation is particularly put force in the course of the Study. In this regards, advises and suggestions from NGOs were quite effective so that they have abundant successful and unsuccessful experiences for participatory development activities. For co-ordination with NGOs, the Study Team held the NGO seminar for three times during the Study, February and May 1996, and January 1997.

### 2.6.3 CDPP Plan Formulation

Though there are a lot of difficulties, such as time limitation, to be successful in plan formulation, the CDPP formulation is carried out according to the procedures shown in Figure 2.6.1. The difficulties are the time limitation for grasping the real needs of the local people. As shown in Table 2.6.2, there are remarkable transitions of development priorities from February to May 1996. The priorities at four different occasions are summarised in this table. The villagers' development priorities change as the degree of understanding in community development got deepened through a series of discussions with the Study Team. The CDPP plan formulation therefore requires repeated discussions as much as possible for working out long term measures.

The countermeasures to reduce physical, economic, and social vulnerabilities of the community are listed up, which are the components of the CDPP. For the plan formulation, it is herewith to propose the programmes for smooth implementation as shown below. It is noted that the programmes in community development approach are not limited to the following, but are formulated as determined by the users' committee. Figure 2.6.2 shows the major components and formulation of programmes of the CDPP.

#### (1) Users' committee formation programme

- a) To form users' groups in the whole community. Each group will be composed of more or less than 10 neighbouring households.
- b) To form users' committee consisting of representatives of users' groups. The users' committee shall be a supreme organisation of the community, and shall be registered to the Chief District Officer (CDO) of the HMG/N as a local NGO.
- c) To select community organisers by the users' committee to co-ordinate with the users' committee and to implement the CDPP.

#### (2) Disaster prevention programme

- a) Gully control and slope stabilisation works mainly to reduce the sediment yield and transport to downstream areas. Stabilisation of the slopes by the above works will be encouraged by afforestation on the steep unstable slopes.
- b) River control and land development works are proposed from the economic viewpoint for the buried or eroded farmland. Land reclamation

activities for landless farmers will be realised by the works. Agricultural production can be increased by extending farmland.

- c) Multipurpose developments through disaster prevention works such as micro hydropower, water supply, fish pond, and causeway with disaster prevention structures as required in the community development.

(3) Disaster mitigation programme

- a) Applying appropriate technologies such as dry stone masonry and bio-engineering measures as supporting measures for disaster prevention structures. People's participation shall be emphasised for better maintenance as well as fund raising for the future community development.

(4) Disaster evacuation operation programme

- a) Formation of a disaster management subcommittee under the users' committee for dissemination of hazard map and evacuation operation measures, and disaster response operation and disaster recovery operation.
- b) Hazard mapping for assessing better land use and researching the optimum evacuation system to save human lives against further disasters.

(5) Community infrastructure programme

- a) Access road development for improving marketing of agricultural products and strengthening communication with other areas.
- b) Irrigation development for stable and intensive agricultural production.
- c) Water supply network expansion for social welfare and reduction of women's load.
- d) Other required rural infrastructure development.

(6) Agriculture development programme

- a) Optimisation of cropping pattern with effective marketing,
- b) Intensification and diversification for increasing income level and making effective use of farmland.
- c) Forming and strengthening the agriculture committee under the users' committee for co-operative activities for agricultural development.

(7) Forest management programme

- a) Community forest expansion for sustainable usage of the existing forest for fodder and firewood sources.
- b) Agro-forestry by tree crops like fruits for better use of unused slope land for income generation.

- c) Mulberry tree plantation on unstable lands to improve their stability and generate further income sources for sericulture development particularly for women in development.

#### 2.6.4 Basic Strategy for Implementation

To implement the CDPP successfully, the basic strategies for implementation will be as follows:

##### Stage 1: To form users' committee for transfer of CDPP

The first step is defined as the preparation stage for implementing the people's leadership in the CDPP. To form the users' committee and to transfer the CDPP to the community are the main objectives of the first stage. To achieve these objectives, supports from local NGOs are essentially required.

##### Stage 2: To achieve "Equity" in the Community through rehabilitation and disaster prevention activities

The second stage shall be started only after the successful creation of a united users' committee as the supreme institution of the village. The Government should recognise officially the status of the users' committee, as the final decision maker for implementing the CDPP.

The main objective of the second stage is to achieve "Equity" in the community. The poorest people should be encouraged for development, and the users' committee should emphasise income generation for the poorest people. In this stage, technical and financial support will be needed to implement the CDPP. The users' committee will participate in part of construction works, and the supporting groups, such as the Government, foreign donors, and NGOs shall try to train the people and transfer knowledge for operation and maintenance of the structures.

Fund raising for the future community development activities shall be considered through the participatory disaster prevention activities. The users' committee should have strategies for strengthening the financial aspects.

To strengthen the users' committee means that all the villagers should respect the committee's decision, and the committee should look at the poorest and help them reach the standard level. Through rehabilitation activities such as land reclamation, the committee should make best efforts to distribute the reclaimed land to landless people and to implement income generation measures.

##### Stage 3: To improve rural infrastructures for "Growth"

The third stage shall be started only after improvement of "Equity", to distribute equal benefit to all the members of the community by utilising rural infrastructures. At that time, the users' committee will be much strengthened and all the villagers will highly respect the users' committee.

Rural infrastructures, such as irrigation development, road network expansion, micro hydropower development, telecommunication system, and so on shall be constructed and/or rehabilitated under the people's leadership. The users'

committee should be capable enough as the implementation board, and can submit proposals to concerned agencies for technical or financial assistance.

Stage 4: To carry out intensification and diversification of agricultural products

The fourth stage shall be started after improvement of rural infrastructures, utilising the infrastructures as much as possible for development of the community. The agriculture development will be a major component in this stage for intensification and diversification.

Since all the farmers will have land for agriculture, the activities in agricultural development will be successfully achieved under the leadership of the users' committee. The benefits will be well distributed to the whole community, and the income level of the villagers will be much improved.

Stage 5: To continue sustainable rural development with environmental conservation

The fifth stage, which is defined as the final stage of master plan of the CDPP, aims at sustainable development. Since democracy in the community will well achieved in the previous stages, the development activities such as industrialisation, expanding economic activities, and civilisation without many inputs from outside have been can be realised. However, the users' committee should take care of environmental issues for sustainable development. The development activities with environmental concern must be essential for sustainable development. An Inter-users' committee shall be formed at this stage to involve regional, national and global visions for sustainable development.

Table 2.6.1 Loss of Lives by Disasters (1984 - 1993)

Types	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Earthquakes					721					
Floods & Landslides	363	420	315	391	328	680	307	93	71	1336
Fires	57	52	96	62	23	109	46	90	97	43
Epidemics	521	915	1101	426	427	879	503	725	1128	100
Storm/Thunderbolts				2		28	57	63	20	45
Avalanches					14	20				
Stampede					71					
<b>Total</b>	<b>941</b>	<b>1387</b>	<b>1512</b>	<b>881</b>	<b>1584</b>	<b>1716</b>	<b>913</b>	<b>971</b>	<b>1316</b>	<b>1524</b>

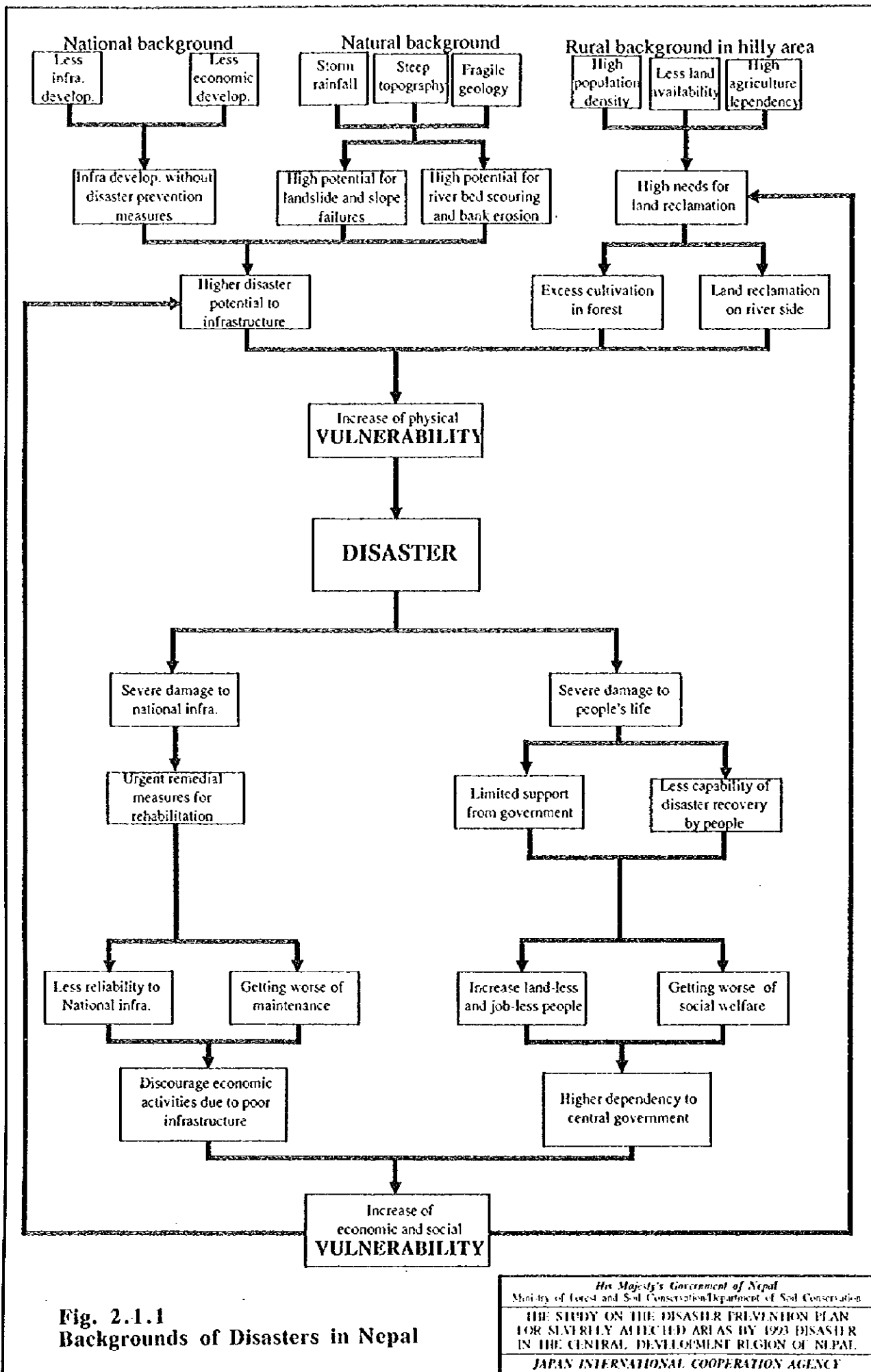
Source: "Disaster Management in Nepal, A Profile", Ministry of Home, Disaster Relief Section,  
July 1994

Table 2.6.2 Transition of Development Priorities

Survey Type	Rank	Phedigaon/ Phatbazar	Kebreni	Bimaltar	Namtat/Tilar	Chisapani	Deukhel	Beluwa	Betini	Sahan
Questionnaire (I)	1 2 3 4 5	Water Stone Quarry Disaster Irrigation Forest	Water Irrigation Road School Electricity	Road Water Irrigation Electricity Hospital	Water Road Electricity Irrigation Forest	Water Road School Hospital Electricity	Irrigation Road Electricity Hospital Water	Settlement Water Electricity Forest School	Disaster Hospital Road Water Irrigation	Disaster Water Road Hospital Electricity
Questionnaire (II)	1 2 3 4 5	Irrigation Disaster Water Stone Quarry Forest	Road School Irrigation Electricity Water	Road Irrigation School Electricity Disaster	Road Irrigation Bridge Electricity Training	Disaster Road Forest Electricity	Road Irrigation Electricity Disaster School	Settlement Employment School Hospital Water	Disaster Irrigation Road Electricity Water	Irrigation Road Marketing Electricity School
RRA - Part (I)	1 2 3 4 5 6	Irrigation Disaster Agri Inputs Marketing			Road Irrigation Electricity Disaster Employment School/Hospital	Road Forest Electricity Energy				
RRA - Part (II)	1 2 3 4 5 6	Forest Stone Quarry Disaster Irrigation Evacuation			Road Irrigation Electricity Forest	Disaster Employment Road Electricity Water Hospital				

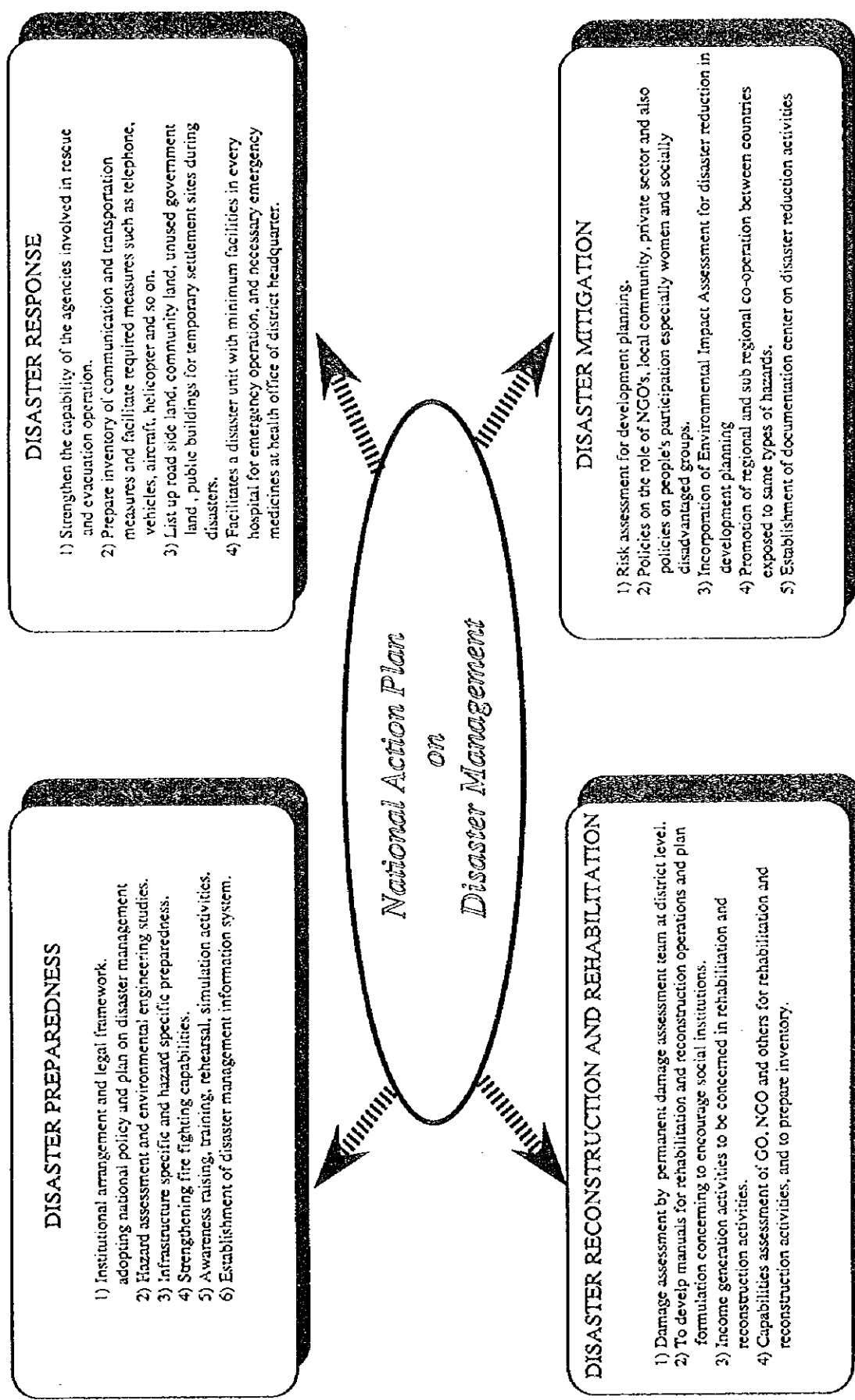
Note: 1) "Water" represents "Drinking Water Supply," "Stone Quarry" represents "Stopping Stone Quarry Activities," "Disaster" represents "Disaster Prevention," and "Evacuation" represents "Creating Evacuation System."  
 2) The ranks in Questionnaire (I) were determined by accumulating weighted scores, i.e., the 1st priority got 5 points, the 2nd 4 points, and so on.  
 3) The RRAs - Part (I) & (II) were carried out in the CDPP priority areas only.





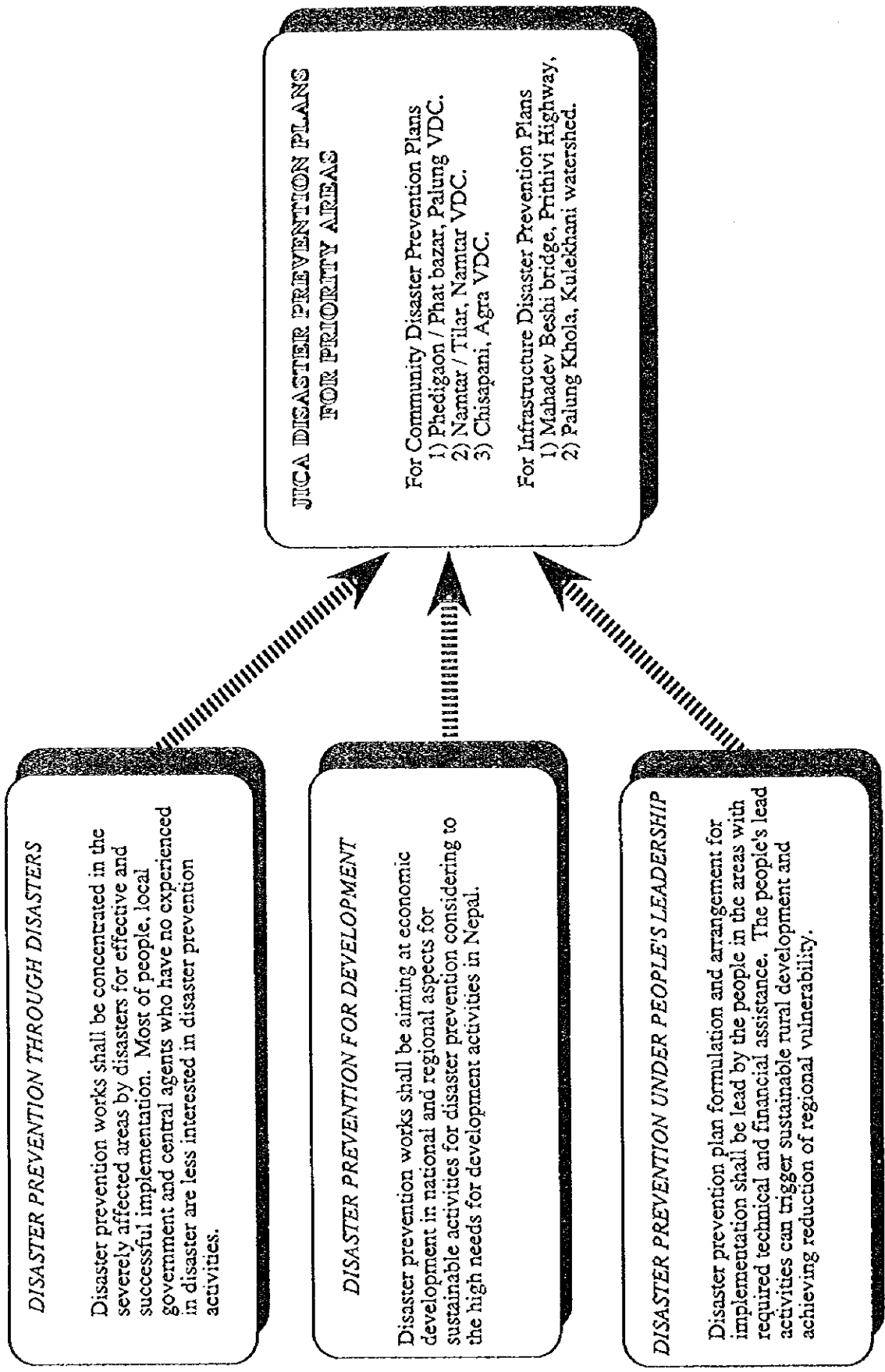
**Fig. 2.1.1**  
**Backgrounds of Disasters in Nepal**

*His Majesty's Government of Nepal*  
 Ministry of Forest and Soil Conservation/Department of Soil Conservation  
 THE STUDY ON THE DISASTER PREVENTION PLAN  
 FOR SEVERELY AFFECTED AREAS BY 1993 DISASTER  
 IN THE CENTRAL DEVELOPMENT REGION OF NEPAL  
 JAPAN INTERNATIONAL COOPERATION AGENCY



**Fig. 2.2.1**  
**National Action Plan on Disaster Mitigation in Nepal (DRAFT)**

*His Majesty's Government of Nepal*  
Ministry of Forest and Soil Conservation / Department of Soil Conservation  
**THE STUDY ON THE DISASTER PREVENTION PLAN FOR SEVERELY AFFECTED AREAS BY 1973 DISASTER IN THE CENTRAL DEVELOPMENT REGION OF NEPAL**  
JAPAN INTERNATIONAL COOPERATION AGENCY



**Fig.2.3.1**  
**Basic Approach for JICA Disaster Prevention Study**

*His Majesty's Government of Nepal*  
 Ministry of Forest and Soil Conservation / Department of Soil Conservation  
 THE STUDY ON THE DISASTER PREVENTION PLAN FOR SEVERELY AFFECTED AREAS BY 1993 DISASTER IN THE CENTRAL DEVELOPMENT REGION OF NEPAL  
 JAPAN INTERNATIONAL COOPERATION AGENCY

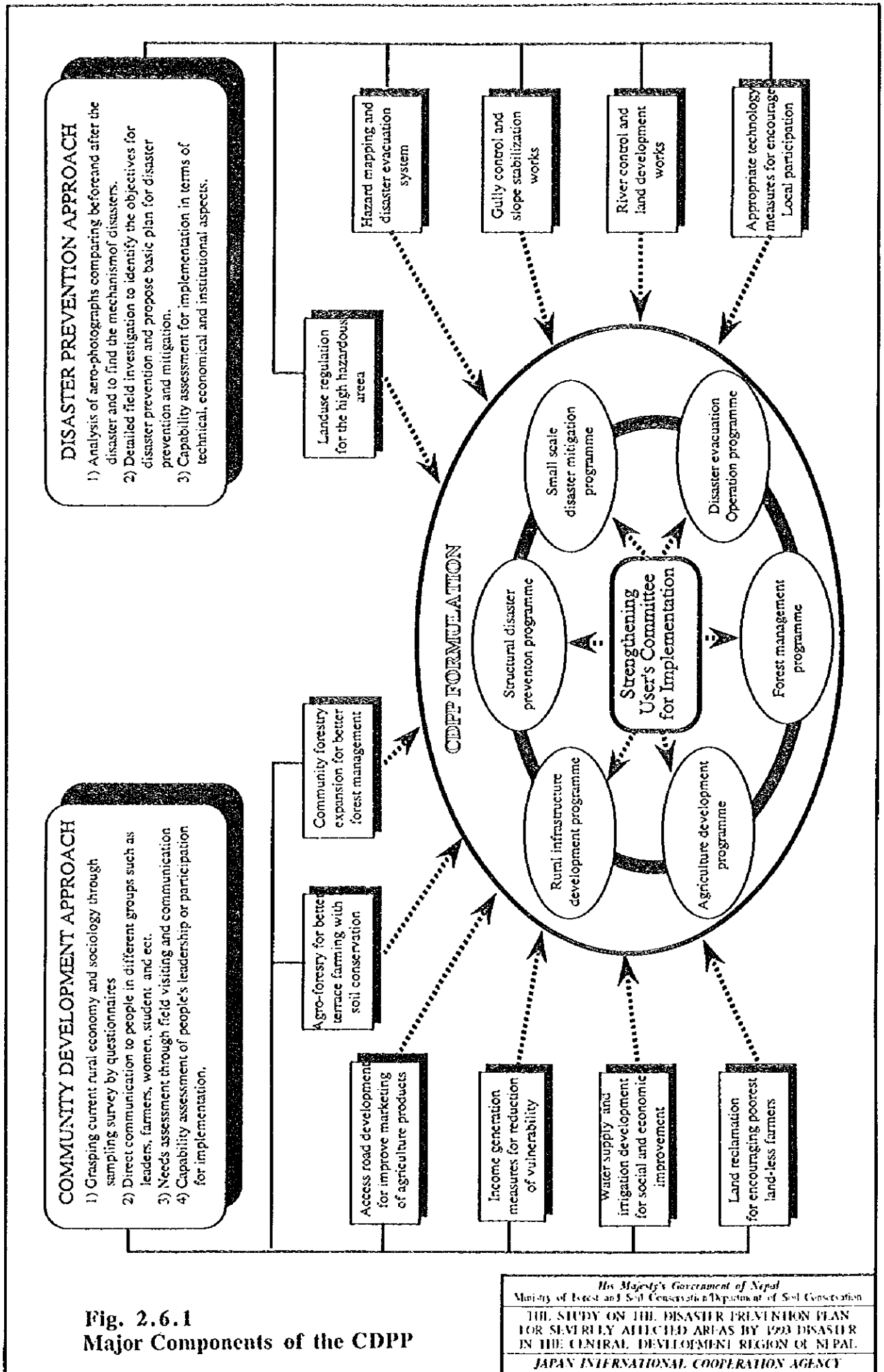


Fig. 2.6.1  
Major Components of the CDDP

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IN THE CENTRAL DEVELOPMENT REGION OF NEPAL  
JAPAN INTERNATIONAL COOPERATION AGENCY

**CHAPTER 3**

**COMMUNITY DISASTER PREVENTION PLAN  
FOR PHEDIGAON/PHATBAZAR**

### 3. COMMUNITY DISASTER PREVENTION PLAN FOR PHEDIGAON/PHATBAZAR

#### 3.1 Background of Community

##### 3.1.1 Topography and Geology

Phedigaon/Phatbazar area is located in the Phedigaon Khola basin. The main tributaries in the Study Area are Dhungakate, Ghatte and Bhottekhoria Khola as shown in Figure 3.1.1. The river characteristics in the Study Area are shown below:

River Characteristics in the Study Area

<i>Basin name</i>	<i>Catchment area (km<sup>2</sup>)</i>	<i>Maximum elevation (m)</i>	<i>Minimum elevation (m)</i>	<i>Relief energy (m)</i>
Dhungakate	1.20	2,510	1,794	716
Ghatte	0.97	2,500	1,802	698
Bhotekoria	1.40	2,300	1,802	498
Residual basin	2.33	-	-	-
Total study area	5.94	2,510	1,770	740

An alluvial cone having a length of 350 m and a width of 100 m is formed from the outfall of the Dhungakate Khola and Ghatte Khola as the in confluence with the main tributaries as shown in Photo 1 in the front page (e.g., Dhungakate and Bhottekhoria). In the 1993 disaster, debris flow inundated almost the alluvial cone and caused large damage. Many landslides and gullies are distributed in the hill slopes and the banks of these tributaries. It looks very devastating.

The profile of the Phedigaon torrents is shown in Figure 3.1.2. The riverbed gradient in the cone portion of Dhungakate and Ghatte Khola is from 1/13 to 1/15 on average. The relative height difference between the tributaries at the outfall is about 4 m. The riverbed gradient of the Bhottekhoria Khola is about 1/21, more gentle than that of the Dhungakate and Ghatte Khola. Furthermore, around the confluence of the Dhungakate Khola and Bhottekhoria Khola, the riverbed gradient varies remarkably, and the average riverbed gradient in Palung downstream of this size is 1/42, which is about a half of that of the Bhottekhoria Khola. The profile of the Phedigaon torrents varies remarkably, and it would be changed easily in future by medium or small floods.

The soil of the Study Area is mainly composed of schist, phyllites and metamorphic sandstone of Kulekhani Formation, which is one of the formation of Bhimpheedi Group, and quartets and phyllites of Markhu Formation distribute in the northern part of the area. The bedding plane generally dips towards north at an angle of 30° to 40°. In this area, which is affected by the geological structure, cuesta terrain with gentle slopes towards north (dip slope) and steep slopes towards south (opposite dip slope) are found obviously.

##### 3.1.2 Landuse Condition

The landuse condition of the Study Area has been examined by aerial photograph and field investigation. Figure 3.1.3 shows the landuse map. The landuse condition is as described below:

- 1) Forest  
Forest is distributed in the headwater part of the Dhungakate and Ghatte Khola, on the southward slopes of the Ghatte and Bhottekhorla Khola, in the upper reaches of the Deorali and Soltu Khola; (the tributaries on the left side of the Palung Khola), and in a part of the northward slopes parallel with the Phedigaon torrents. The dominant tree is mainly large pine.
- 2) Bush  
Bush is distributed in a part of the Dhungakate Khola basin.
- 3) Grass, Bare land  
Grass and bare land are mainly distributed in the boundary areas between forest and cultivated land. The scale of distribution of grass and bare land is similar to the forest zone.
- 4) Land for cultivation  
The Study Area is occupied to a large extent by cultivated land and especially, almost all gentle slopes are used for cultivation.
- 5) Land for housing  
Most houses are settled on the stable and gentle slopes of the ridges which are also used for cultivation. The houses are distributed in a small group (e.g., four to five houses in a group). The Phatbazar and Palung villages are settled along the banks of the Palung Khola river.
- 6) Area for stone mining  
Stone mining is carried out on the upper hillsides of the Dhungakate Khola basin, and unused stones are left on the slopes.

### 3.1.3 Socio-economy

Phedigaon and Phatbazar are adjacent to each other and located in Palung VDC in Makwanpur District. They have a geographical advantage: it takes only about three hours by car to go to Kathmandu, and there exists an access road from Tribhuvan Highway which runs along and across the Palung Khola, though it is motorable only in the dry season. Another advantage is that they are situated around 1,700 to 2,000 m above the sea level, i.e., about 400 to 700 m higher than Kathmandu.

Owing to these advantages, Phedigaon and Phatbazar can be a good supplier of agricultural products, especially vegetables, to consumers in Kathmandu, and they have been so since the FAO implemented an agricultural extension program over there about a decade ago.

According to the field survey conducted in early February 1996, the populations of Phedigaon and Phatbazar are about 2,600 and 280, respectively, while the total population of Palung VDC is about 5,200 according to the Central Bureau of Statistics in 1994. The population of Phedigaon looks too big to believe. As is often the case in Nepal, however, a boundary of a community or a village is not clear whereas an administrative boundary of ward, VDC, or DDC is made quite clear. Since the focus of the Study is on the community of those people who have been severely affected by the 1993 disaster, the Study Team has basically contacted those people and the communities they belong to. The community of Phedigaon and Phatbazar includes Wards No. 9 and No. 8, and probably Wards No. 7 and No. 6 should also be included in the community to

be focused in case that the projects planned by the Study Team have some direct influence on these two wards.

In Phedigaon, the major ethnic group is Tamang, roughly 75 % of the total population, then Chhetri about 16 %. The rest is nominal: Magar 4 %; Gurung 2 %; Kami 2 %; and just a few groups such as Newar, Brahmin, Bhujel, and Rauniyar. In Phatbazar, on the other hand, Chhetri is the major ethnic group with more than 80 % of the total village population, and the others are Tamang, Newar, Magar and Damai with about 3 % to 6 % each. Please refer to Tables 3.1.1 and 3.1.2 for details.

## 3.2 Description of the Disaster

### 3.2.1 Disaster Damage to the Community

Due to the disaster of July 1993, 58 people's lives were lost in Phedigaon, a lot of houses and farmland were washed away and most of them still remain under the debris by now. The area covered by the debris is roughly estimated at more than 30 ha. (The memorial hall in the primary school shows 55 names of death people in the name plates on the wall, though.) Those people who lost their families, houses, and farmland are still having difficulties to survive: Some victims are living with their relatives if any, providing manual labour works for nominal wages, just a few had a chance to migrate to Hetauda where the HMG/N and an INGO have offered houses for free though the life in these free houses in Hetauda is awful on account of no job, no farmland, no water, and no electricity.

Figure 3.2.1 and Table 3.2.1 show who were killed and damaged at what place by the 1993 disaster. As shown in Figure 3.2.1, the houses washed away or damaged were located mostly in the alluvial cone. The numbers and the letters indicated in Figure 3.2.1 correspond to those in Table 3.2.1. By looking at those numbers, it is possible to identify who were killed at which house.

The conditions of the damaged areas by the 1993 disaster are shown in Fig 3.2.2, disaster map, which has been prepared based on the aerial photograph interpretation and the field investigation.

### 3.2.2 Mechanism of the 1993 Disaster

Based on the results of field investigation, aero-photo investigation and disaster mapping, the mechanism of disaster is assessed. The main causes of damage are as follows:

- a. Destruction of houses due to the debris flow in the alluvium cone area.
- b. Washout of house due to gully erosion upstream of the Dhungakate Khola.

#### 1) Disaster due to debris flow

Initiation of the debris flow results from the yield of sediments due to landslide and gully erosion in the Dhungakate and Ghatte Khola basins, and the sediments are brought by these Khola. The alluvial cone formed by the debris flow deposits is essentially high hazard-prone area. Actually, the large-scale debris flow occurred in 1915 also caused extreme damage.



Based on the initiation mechanism, the landslides in the upper part of these Khola are divided into two types as plane slide and slump slide. The plane slides occurred on the northward dip slope whose dip direction is equivalent to the bedding plane. The thickness of the weathered bed rock was observed to be 3 to 4 m, thus the thickness of the landslide can be estimated to be 2 to 3 m. Most of landslides are equivalent to this type which are characterised by large-scale ones. The bedding plane dips about 30° to 40° which also helps to slide down. The plane slide is mainly caused by pore water pressures increased by the infiltrated excessive rainwater inside the weathered bed rock, then sliding surface formed over the hard rock.

On the other hand, slump slides were observed in the unconsolidated colluvium and on the slopes of weathered mass. It is estimated that the landslides of this type are mainly caused by toe erosion of the slope, due to which slope became unstable and slid down.

## 2) Disaster due to gully erosion

Narrow and long gullies are observed on the gentle slope upstream of the Dhungakate Khola, which are composed of colluvial deposits by old landslides. The gullies are formed by gathering rainwater on the hillsides and infiltrated water in the unconsolidated bed. The damaged houses were located along a previous small tributary, thus it is estimated that the bank of the tributary was washed out due to erosion, and as a result, the houses were washed out at the same time.

## 3.3 Needs of Disaster Prevention and Community Development

### 3.3.1 Current Major Issues in the Community

Through the survey and frequent visits, the Study Team has been noticing many problems in the communities from major ones to minor ones. Among those problems, several major problems that should be paid attention to in the Study are described below. Please note that the order of presentation of each problem does not necessarily represent the degree of importance.

#### (1) No recovery from the 1993 disaster

The first problem that can be noticed when visiting Phedigaon and Phatbazar for the first time is the debris deposited during the 1993 disaster still remains all over the villages as it was three years ago. Since no major structural measure for disaster prevention has been taken, the people think that another debris flow or flood seems likely to happen any time, thus they are quite reluctant to reclaim the land. This implies that there still exist lot of landless people suffering from losing their properties. There are few job opportunities for those landless people, so what they can do to make living is to work as peasants at farmlands owned by large landlords or as porters to carry some loads, or to go to Kathmandu or somewhere and find jobs. Unfortunately, all these alternatives will not give them a good living.

#### (2) Disaster-prone areas

Since no structural measure for disaster prevention has been taken, several houses are still located in disaster-prone areas. Many people are afraid that another disaster would occur,

but they do not know exactly how much dangerous it could be. At the same time, they have no choice but to stick to their houses and land in disaster-prone areas because they cannot afford to move to a safer place.

(3) Divided community

As described in this section, the community in Phedigaon has a potential of internal disunion. Dissatisfaction among those who did not receive any relief materials is so huge that it is likely for any community development project with people's participation to be disintegrated and end up with a failure.

(4) Rainfed agriculture

Many farmers rely on the rainfall, so that their productions fluctuate season by season and year by year. Rainfed agriculture makes farmer's life unstable and hinders further development. The 1993 disaster destroyed many irrigation canals most of which have not been rehabilitated, but the canals behind the centre of Phatbazar are now under rehabilitation and 100 ha of land will be irrigated soon. There is no possibility of irrigating the farmland in hilly areas where even drinking water is not sufficient enough.

(5) Deforestation

There once were dense forests in Phedigaon, but nowadays the forest areas have been retrieved to tips of hills. Most villagers are aware of the phenomenon of deforestation and its consequences, they think they need to do something against deforestation. They have formed an informal forest users' group and tried to save the forests, though it was not effective so far. The Tamangs living next to the forests do not give up their traditional habits and keep living on the forests.

(6) No motorable road during the monsoon season

During the dry season, there is a motorable road from Tribhuvan Highway through Palungbazar, Phatbazar, up to Phedigaon which goes along and across the Palung Khola. But vehicles cannot go during the monsoon season, for the road is just like a trail made by a single blow of bulldozer along the river bed and bank. Economic activities during the monsoon season are considerably hindered due to the lack of motorable road.

### 3.3.2 Hazard Assessment of the Community

Based on the condition of the 1993 disaster, hazardous areas were examined and a hazard map is prepared for local disaster prevention. The procedures mentioned in Section 1.4 in Annex-1 are taken for hazard mapping.

A hazard map for Phedigaon community is shown in Figure 3.3.1. The following disaster phenomena are considered in preparing the hazard map for Phedigaon.

	Type of Disaster	Description
I	Estimated hazard area of landslide and failure	Each zone for landslide and failure are classified into three hazard levels A, B and C. The high hazardous areas defined as level "A" are concentrated on the upstream part of the Dhungakate and Ghatte Khola, on the western slope of the community.
II	Estimated hazard area of gully erosion	Identified hazardous gullies are shown in the map. There is no hazard degree classification for gully erosion. The identified hazardous gullies are located in the Dhungakate and Ghatte Khola basins.
III	Debris prone area	The debris prone area is estimated based on the same damaged area by the 1993 disasters.
IV	Inundation area by flash flood	The flood inundation area is estimated based on the same inundated area by the 1993 disaster.
V	Existing landslide and failure and rock exposure	The zones in this category show that landslides and failures have occurred as a result of the 1993 disasters, and are currently defined as the hazardous areas. There is no classification of hazard levels.
VI	Safety zone	The zones in this category are relatively safer than other areas.
VII	Dangerous houses	The houses located in the high and medium hazard areas of category I or hazard areas of category B are identified as dangerous houses.

### 3.4 Overall Disaster Prevention and Community Development Plan

#### 3.4.1 Disaster Prevention Aspects

A lot of unstable slopes still exist here and there in Phedigaon/Phatbazar. Therefore, it can be said that the potential of recurrence of disaster of the same magnitude as that occurred in 1993 is high in the near future. To prevent or mitigate such a potential damage, an overall disaster prevention plan is established as shown in Figure 3.4.1.

Based on the disaster pattern and the damage, the community can be divided into three areas, upper area, alluvium fan area, and lower area along the river course. The anticipated pattern of disaster in the respective area and the magnitude of damage occurred in 1993 are shown below.

### Pattern of Anticipated Disaster and Damage

Area	Disaster Pattern	Damage in 1993
Upper area	<ul style="list-style-type: none"> <li>• Loss of forests and cultivated lands caused by landslide</li> <li>• Washing out of cultivated lands and houses caused by gully erosion</li> </ul>	<ul style="list-style-type: none"> <li>• Several losses of lives</li> <li>• There are a lot of unstable slopes in this area at present</li> </ul>
Alluvial fan area (middle area)	<ul style="list-style-type: none"> <li>• Washing out of cultivated lands and houses caused by debris flow</li> </ul>	<ul style="list-style-type: none"> <li>• A great loss of lives</li> <li>• Houses were completely destroyed</li> </ul>
Lower area along river course	<ul style="list-style-type: none"> <li>• Damage of cultivated lands caused by flooding</li> </ul>	<ul style="list-style-type: none"> <li>• Covered with sand and debris about 50 cm deep</li> <li>• Cultivated lands were reclaimed at present</li> </ul>

Major damaged areas in the community are concentrated in the alluvial fan formed just downstream of the Ghatte Khola and Dhungakate Khola basins as compared in Photo-1 at the beginning of the report. Before the said disaster took place, the area on the alluvial fan had been utilised for residential areas and farmland. However, ground surfaces of the alluvial fan have been covered by debris flow deposits at present. The cause of the disaster was debris flow which was flushed out from the upper reaches of the alluvial fan as shown in Photo 3.4.1. Therefore, first priority of the overall disaster prevention plans should be put on the countermeasures against the debris flow.

On the other hand, villagers living in this area desire strongly to reclaim the farmlands at first and they have been working for rehabilitation of the river course by themselves. If the area on the alluvial fan could be left as a wasteland, it could be used as a huge sand retarding basin against the mud and debris flows as shown in Figure 3.4.2. Taking into account the villagers' wishes, however, such countermeasures as provision of a huge sand retarding basin are impossible. As for the countermeasures, therefore, it is planned to prevent flushing out of mud and debris flows in the upper area, to construct coffering/training dikes and channel works against mud flow in the alluvial fan area, and to provide channel works in the lower area as shown in Figure 3.4.3.

The components of the overall disaster prevention plan is described in Table 3.4.1.

#### 3.4.2 Community Development Aspects

The overall community development plan is formulated taking into account the villagers' needs and the development potential from the rural economic viewpoints. Figure 3.4.4 shows the general layout of the overall community development plan of Phedigaon / Phatbazar.

When the Study Team visited Phedigaon and Phatbazar on May 19 to 23, 1996, the priorities of development of these communities were discussed and the tentatively decided priorities are described in this section. This survey is called rapid rural appraisal - part (II). Before May 19, the Study Team had already held various group discussions and key informant interviews many times. Prior to these discussions, the household baseline survey by Questionnaire (I) and the focus group discussion with key informants by Questionnaire (II) had been conducted in January and February 1996. Also the rapid rural appraisal - part (I) was done in March 1996.

From May 19 to 23, the Study Team, held several group discussions such as female group discussion and male group discussion in each of which the development priorities were determined (see Photos 3.4.2 to 3.4.5). Then the Study Team held a final group discussion with heterogeneous participants comprising key persons, farmers, landless, untouchables, female, etc. In this final group discussion, the priorities derived in the previous discussions were presented along with the views of the Study Team. At the end of the final group discussion, the priorities were determined with a consensus among all participants.

The discussions were held separately in Phedigaon and Phatbazar. Surprisingly, however, both villagers in Phedigaon and Phatbazar ended up with the same priorities in development as shown below.

#### Development Priorities in Phedigaon and Phatbazar

- No. 1: Protection against Deforestation
- No. 2: Termination of Stone Quarry
- No. 3: Construction of River Control Works
- No. 4: Rehabilitation of Irrigation Canals

Not only the Phedigaon people but also the Phatbazar people recognise that the deforestation of the forest between the Ghatte Khola and Dhungakate Khola and the stone quarry along the Dhungakate Khola are the major causes of the debris flow occurred in July 1993. Because of this perception, they have ranked "protection against further deforestation" and "termination of stone quarry activity" as the highest priorities. Moreover, they think that these two are their own internal matters and can be dealt with by themselves, without any assistance from outsiders.

The concerned forest is mainly used by the Tamangs living nearby who do not follow the rules the Phedigaon village has enforced. Phedigaon has a forest users' committee, but it is not legally acknowledged by the HMG/N. The committee despatches a group of five to ten guards everyday to oversee the forest, but it does not work well. The Phedigaon people understand the mode of living of Tamangs, i.e., Tamangs live on forests, so that the villagers cannot force the Tamangs to follow the rules, which makes the villagers face a dilemma and get frustrated.

Similarly, although the villagers do not want a stone quarry company to do business along the Dhungakate Khola, they cannot forcibly stop it because the Tamangs are the major labourers at the quarry sites and they cannot find other income sources without it. They have requested Palung VDC and Makwanpur DDC by formal letters to stop quarrying, and also the permission of quarrying by that private company has expired in last November. Quarrying activities, however, still go on right now.

With regard to river control, the villagers totally count on the engineers of the Study Team, they are pleased to agree to whatever plans the engineers will come up with. What they need from river control works are to secure their lives by training the rivers and to get opportunities to reclaim their land that is covered by debris now. The status quo is that the villagers are reluctant to reclaim their land due to a high possibility of another debris flow - they believe so - and that they leave the buried land as it is.

The community development team of the Study Team made a brief explanation on what kind of scheme the engineers had in minds about river control. The villagers were so delighted when they heard about the idea of a dike road along the river course that would be constructed as a by-product out of river bed excavation works. Since they do not have

a motorable road during the monsoon season, the villagers would like to have such a dike road. The idea of a dike road, however, was not originally derived from the villagers, but they were informed by the Study Team, then they have started loving it.

What is meant by the irrigation proposed by the villagers is a little problematic. They basically want to have irrigation systems to their farmland located in the upland of hilly areas, as well as those in the flatland along the rivers where irrigation systems existed before the 1993 disaster. In the upland, even a water source for irrigation does not exist in most cases, even if it does, an irrigation system would not be realistic in terms of cost effectiveness. The Study Team informed the villagers that it would try to identify any possibility for irrigation as well as drinking water around the two villages, and to do so, the Study Team asked them for cooperation.

Tables 2.6.2 shows the transition of development priorities from February to May 1996. The priorities at four different occasions are summarised in this table. The villagers' development priorities change as the degree of understanding in community development got deepened through a series of discussions with the Study Team. At the beginning, the villagers were nearsighted and concerned only with self interests, so their first priority was drinking water supply. As the discussions went on, they started thinking of the development of the community as a whole and they expressed more constructive perspectives for community development.

Because of geological difference, the priorities of Phedigaon and Phatbazar are slightly different in the early stage in February. Phatbazar is located downstream of Phedigaon and have much flatter land. The people in Phatbazar are much concerned about irrigation rehabilitation and flood control whereas the people in Phedigaon are worried about debris flow and landslide. In the end, that was in May, all the people in both villages have understood what are necessary for development of their communities and ended up with the same priorities.

### 3.5 Priority Plan

Figure 3.5.1 shows the selected priority plan of the CDPP for Phedigaon / Phatbazar. For the respective selected sub-project, the proposed mode of implementation, government work, people's participation works and people's initiative works are indicated. The detailed description of the selected priority schemes are as follows:

#### 3.5.1 Structural Disaster Prevention Measures

##### (1) Criteria for Selection of Priority Schemes

The priority of countermeasures against disaster to be taken in each area is selected comprehensively after evaluating the magnitude of damage, the urgency and the economic effects of the respective scheme.

##### (a) Magnitude of damage

Degree of the land devastation is remarkable in the both the Dhungakate Khola and Ghatte Khola basins in the upper area as shown in the disaster map in Annex - 1. In the alluvial fan area, the river courses are suffering from heavy damage due to the mud and debris flows. To the contrary, in the lower alluvial plane area, there is no missing of houses and farmlands, and roads damaged have already been

restored. Therefore, it can be evaluated that the degree of damage in the lower area is relatively small compared with those in the upper area and alluvial fan area.

(b) Urgency of Countermeasures

Taking into consideration a risk of disasters in future, urgency of the countermeasures is indicated on a hazard map as shown in Annex - 1, that is, the priority of urgency is given to the area having the highest hazard rank. The highest hazard rank areas are widely distributed in both the Dhungakate Khola and Ghatte Khola basins as shown in the hazard map in Annex - 1. Furthermore, the mountainous areas in these basins will become a source of mud and debris flows which are flushed down to the downstream alluvial fan area in the future. Therefore, it can be evaluated that the top priority of the urgency is given to these upper basins.

(c) Economic Effects

The economic effect is evaluated whether the land is available for an intended purpose adequately or not, by the implementation of the restoration works. In the alluvial fan area which suffered from a heavy damage, it is not expected to establish a plan of land use without restoration works for the debris flow in the upper area, since there is a risk of recurrence of the debris flow again. From this viewpoint, it can be said that the economic effect of the said restoration works is quite high in the Dhungakate Khola and Ghatte Khola basins which can create new benefit for agricultural production in the alluvial fan area. On the other hand, the economic effect of the river improvement works in the lower area is rather low, though the farmlands along the river course will be secured it is in tentative base, and the existing access road to the Phedigaon village will also be rearranged suitably. Because these restoration works have already been carried out by the villagers themselves, and all the farmlands have been already restored.

(d) Overall Evaluation

Overall ranking (a to c) and priority (A to B) according to the magnitude of damage, urgency of countermeasures and economic effects in the respective districts are evaluated as shown below:

Overall Evaluation in Respective Districts

District		Magnitude of damages	Urgency of countermeasures	Economical effects	Priority
Upper area	Dhungakate Khola	a	a	a	A
	Ghatte Khola	a	a	a	A
	Bhottekoria Khola	b	c	b	B
Alluvial fan area		a	a	a	A
Lower area		c	a	c	B

Notes: a: Relatively high  
b: Medium  
c: Relative low

A: First priority district  
B: Second priority district

From the above table, the first priority has to be given to the Dhungakate Khola and Ghatte Khola basins in the upper area, and the alluvial fan area.

(2) Priority Structures and Order of Performance

The disaster prevention structures to be planned in the respective priority area are as listed below:

Priority Structures and Order of Performance

District	Structures	Total Number of Structures	Number with First Priority	Order of Performance
Dhungakate Khola	Concrete check dams	2	2	1
	A series of groundsills	5	5	2
	Hillside works	3	-	-
Ghatte Khola	A series of groundsills	3	3	2
	Hillside works	2	-	-
Alluvial Fan Area	Coffering dikes	2	2	3
	Training dikes	6	6	5
	Channel works	2	2	4
	Revetment	1	-	-

Priority structures have to be selected in accordance with the order of performance taking into account the results of economic evaluation. Therefore, it is considered desirable to construct all structures planned, if there is no economic problems. Feasibility studies will be made on the first priority schemes with biggest effect against the disaster.

There are two concrete checkdams in the priority plan, checkdams Dh-1 and Dh-2. Among them the preliminary design of checkdam Dh-1 is shown in Figure 3.5.2. For the alluvium fan area, the channel works of the Dhungakate and Ghatte Khola are selected as priority plan, which is highly expected from the community development viewpoint also. The coffering dike, training dikes, revetment works are included in the channel work. Figures 3.5.3 and 3.5.4 show the preliminary design of the Dhungakate Khola, and Figures 3.5.5 and 3.5.6 show that of the Ghatte Khola.

3.5.2 Non-structural Disaster Prevention Measures

(1) Phedigaon Community Disaster Evacuation System

Many deep gullies exist in Phedigaon area, which indicates that severe gully erosion was repeated by the flood and debris flow. In the case of Phedigaon, it is quite dangerous to cross such gullies during the rainstorm. Moreover it would not be physically possible to cross such deep gullies. Considering the above, Phedigaon area is divided into 11 units by the gully network to avoid crossing gullies for selecting the evacuation route.

Figure 3.5.7 shows the proposed evacuation system plan together with Chisapani community. The 11 units for Phedigaon Community are from Unit E to Unit O. The details are explained in Annex-5. The summary of the respective evacuation unit is as follows:



Summary of Community Disaster Evacuation System for Phedigaon/Phatbazar

Unit No.	Name of Community	H.H No.			Monitoring measures	Evacuation Place	Priority
		in safety area	out of safety area	Total			
E	Bandelidanda	120	30	150	Flood	Residence	High
F	Soltgaon	25	15	40	Landslide	Residence	High
G	Cautara	30	10	40	Flood	Residence	Medium
H	Ponmalidanda	15	45	60	None	Residence	Low
I	Deorali	9	3	12	None	Residence	Low
J	Dhulo Nange Chuli	2	4	6	Failure / Landslide	Residence	Medium
K	Ghatte Khola	7	3	10	Failure / Landslide	Residence	High
L	Dhungakate / Ghatte Khola	28	7	35	Failure / Landslide / Flood	Residence	High
M	Upper Dhungakate Khola	1	1	2	Failure	Residence	Low
N	Loshe Pakha	1	14	15	Landslide	Multipurpose Shelter	High
O	Garigaon	30	120	150	Flood	Residence	High

### 3.5.3 Community Organisation Set-up

Along with the projects proposed elsewhere as community infrastructure, agricultural development, and community forest, other possible community development projects are proposed here. Agriculture, forest, and infrastructure can comprise many aspects of community development components. In this section, the things that are not categorised to be among the above three are discussed. Other components that are often carried out in other typical community development projects are health care/sanitation, education, vocational training, group organisation, and so on. Among those various components, the following ones are considered to be important and discussed here.

#### (1) Formation of Users' Groups

Whatever kind of community development project is to be implemented, the formation of users' groups should hold a key for success. Without an efficient, firm, and dynamic users' group, any community development project with people's participation would fail.

Especially in Phedigaon where strong conflicts exist among the people, the formation of a users' group should come first prior to any development project. The internal conflicts will be eased and melted down through activities of forming users' groups, and unity of the Phedigaon community will be attained.

The procedure and contents of forming users' groups are as follows:

(a) Formation of users' groups

Each users' group may consist of 10 to 15 households. The number can vary depending upon a situation, no definite size is given. Usually people tend to form a group with relatives, friends, and neighbours, but there is no decisive rule to decide who belongs to what group. It is better to let people form user's groups themselves with a little help and guidance from outsiders. One field technician is assigned to form a users' group at each site. One project coordinator controls these field technicians at the headquarters.

(b) Formation of users' committee

One users' committee is formed by election or through discussion by all users' groups at each site. This committee should be at the highest hierarchy of the social power strata of the community. The purpose of the committee is to coordinate, supervise, and monitor inter-group activities. The number of members can also vary, but 10 to 15 persons may be appropriate.

Users' groups and users' committee are the fundamental units for any community development projects. Based on these units, other groups and/or committees are formed in accordance with requirements of each community development project. Figure 3.5.8 shows a concept of a possible structure of community organisation. Under the users' committee, there will be another committee formed for each project. As an example, the procedure of forming a farmers' cooperative and contents of its activities are described in the following.

(c) Technical assistance

A field technician gives each group technical assistance on many aspects of agricultural activities such as collection of seeds, planting, harvesting schedule, use of pesticides, etc.

(d) Formation of marketing committees

The users' committee forms a marketing committee by selecting capable persons from among all users' groups. The marketing committee handles all aspects in the sales of agricultural products of its members. All members of the community sell their products to the marketing committee and the marketing committee takes responsibility to sell them to outsiders. With a good information network and increased bargaining power as a big organisation, the marketing committee makes the best decisions on when, to whom, by how much prices their products are to be sold.

(e) Formation of production committees

The users' committee also forms a production committee, in which technical matters in production are taken care of. A field technician gives each users' group some technical assistance, but there should be a forum to openly discuss the best move in production in the community as a whole. Sooner or later the project will be over and field technicians will not be available at the site. The production committee will inherit all techniques from field technicians, accumulate them in their knowledge stock, and apply them to future problems they will face.

(f) Formation of farmers' cooperatives

If the marketing committee and production committee function well and farmers can increase their income, people can move further to form a more sophisticated organisation, called farmers' cooperative. A farmers' cooperative has multiple functions such as the ones explained above as well as savings and loan, procurement of various stuffs like chemical fertilisers, and so on.

The above description on the procedure of forming users' group' gives a rough idea on what it is all about. The Study Team has found that a similar project has been carried out successfully in Nepal, so it seems to be applicable to the study areas. With the formation of these users' groups and committees, people will become vocal, cooperative, and positive. Shyness and ignorance that spread all over the rural areas in Nepal will gradually disappear, the people will be able to get out of poverty by themselves.

There are several negative things that should be paid attention to and be solved in the course of implementing this project. Four major things are to be shown below. First of all, the traders who have dealt with all agricultural commodity transactions so far at a site will be kicked out of the business, so they will try to intervene in the implementation of the project. Their existence will undermine the success of the project. Vigorous efforts to encourage and motivate people with continuous talks should be necessary.

Secondly, influential persons intend to intervene in the process of decision making in order to maintain their power in their society. Since forming users' groups and committees will destroy to some extent a traditional power structure in the society, those who have had power do not want to lose it and resist it.

Since the restoration of democracy in 1990, the multi-party system has started. Since then, rural people have been divided into political parties they belong to. The third negative thing is that this political division among people will destroy the harmony of the community and undermine the success of the project. Field technicians should keep telling people that cooperation is required to attain the overall goal - improvement of people's welfare.

Finally, many people are suspicious of the effectiveness of the project at the beginning of the project implementation. Although they are not convinced, they disguise to be cooperative and form users' groups so that they are eligible to receive any benefits that may be given by a project implementing organisation. Field technicians and other staff are likely to be cheated by people and they misunderstand the real situation. Careful observation and continuous efforts are required.

(2) Disaster Management Training

It is understood that physical structures like check dams will not stop all disasters - it is possible to do so if there is unlimited money available to invest, but such a case virtually is impossible in the world. Rather than facing disasters physically, an economical way is becoming popular in the world to cope with disasters, i.e., disaster management. There are many aspects in disaster management to cope with disasters, and here training of disaster management is proposed.

When people are trained about disaster management, the impact of disasters can be minimised though it cannot be completely prevented. The procedure and contents of disaster management training are described below.

(a) Training of local trainers

First of all, some local people are selected as local trainers. They must be highly motivated and well educated, and have a potential to direct their community in disaster management in the later stage. There should be at least four trainers at each site (hopefully two males and two females). The training lasts for half a month.

They are the ones who teach local people about disaster management. They should be paid a bit more than the average salary of teachers because they have to give up their income opportunities. The training can be held either in Kathmandu or at site.

Trainers will learn, among other things, the following topics:

- \* Types and causes of disasters
- \* Communication skills
- \* Community-based disaster management
- \* Inventory management
- \* Risk assessment
- \* First aid
- \* Task analysis
- \* Teaching methodology
- \* etc.

(b) Training of local people

Under the supervision of a project coordinator, the local trainers provide disaster management training for local people. Although local people may be busy to share the time for training, at least 10 % of total household heads should attend the training. It will take 6 days to complete one training course and it should continue every year to refresh and sharpen people's awareness of disasters.

The training programme can be provided at schools as well. It can be integrated into the school curriculum so that students will be aware of disaster management.

(c) Evacuation system

The local trainers are the right persons who play a significant role of implementing the early warning and evacuation system. With these well trained local staff, the early warning and evacuation system will be smoothly implemented and give fruitful outputs.

(3) Training of Community Organisers

There are many services available in Nepal provided by the HMG/N, foreign official aid agencies, INGOs, etc., but the rural people simply do not know about them. For example, each district has many representatives and their offices from almost all departments and ministries of the HMG/N and they are providing their special services for rural people in that district.

Rural people do not know with whom their problems are to be consulted. They do not know what kinds of services are available from whom. Even ward members, VDC members, and DDC members do not know well how to obtain what kind of service from what organisation. Rural people cannot make use of those services and resources.

In this project, a few local people at each site are selected to become community organisers and they receive the training in which they can learn how to solve the above mentioned problems. Those trained people will be able to play a role of middlemen who mediate between their local community and outsiders. A diagram of this scheme is shown in Figure 3.5.9.

The procedure of training community organisers is as follows:

- (a) The users' committee, the highest rank of social structure in the community, appoints its community organisers, two to three persons, selected from among the community. Preferably, those appointed persons are capable, motivated and dedicated to development of the community. (Hopefully they have passed the SLC (School Leave Certificate).)
- (b) A project coordinator makes contract with the users' committee for the training of the community organisers. They may be paid a bit higher than the national average salary of teachers. The salaries are paid to the community organisers by the project coordinator through the users' committee.
- (c) First one month is spent for an intensive training in Kathmandu. During this period, project coordinator gives them lectures, takes them to offices of important institutions, has them make a field trip to a site where successful community development projects are seen. The community organisers will learn the following:
  - \* Concept of community development
  - \* Institutions that provide services and resources
  - \* Successful example of community development
  - \* Roles of community organisers
  - \* Identification of problems in the community
  - \* etc.
- (d) After the one-month training in Kathmandu, the project coordinator visits the community every month where the community organisers reside and stays there for about a week or less. He sometimes takes them to the DDC office to show them what services and resources are available there. He discusses with them about what are the problems in their community, what they can do to solve those problems, and what kinds of services and resources are available around them.
- (e) The project coordinator keeps on visiting the community every month for a year and does the things described right above. After one year, the community organisers will be good enough to deal with their community's problems by themselves.

In Phedigaon and Phatbazar, community organisers are definitely necessary to help develop their communities. They do not know well about what kinds of services and resources are available. They may know some of those services, but they do not know how to approach and get them in their hands.

This project will not cost very much and can be duplicated easily everywhere. This project will really contribute to the empowerment of people and the formation of self-help development minds.

#### (4) Construction Works with People's Participation

There are many construction works planned in the Study. Those works are mainly for structural measures, but there are some for non-structural measures as well for community development. Many parts of the construction works can be done by the people themselves: The people can provide their labour force, local materials, and indigenous technologies for the works.

Details of this project will be determined when specific construction plans are analysed and discussed in the later stage of the Study. That is, because no such construction plans are discussed in this interim report, no specific plan of this project is given at this time. Thus only general discussions on construction works with people's participation, not a project-specific discussion, are given in this section.

Gabions, small earthworks, and bio-engineering works can and should be done by the people. There may be some other works that can and should be done by the people. For example, if a water supply project is implemented, installation of pipelines, construction of tapstands and intakes can be done by the people with a technical assistance from outsiders.

There are two major reasons why people's participation is necessary in construction works. The first reason is that the people can acquire technical skills and technology transfer can be realised through the construction works. Once they learn how to do it, they can do repairing works by themselves, also they can apply their skills to other works as they wish to do so. Technology transfer help empower the people.

The second reason is that the people love the structure and take good care of it if they participate in its construction works. They feel as if the structure is their child if they built it themselves. That feeling is important in that it helps develop satisfaction, confidence, and unify the people's minds.

A construction sub-committee is firstly formed by the users' committee. The construction sub-committee deals with everything related to construction works with people's participation and is a counterpart to a project coordinator (refer to Figure 3.5.8). If necessary, the construction sub-committee will form users' groups in which all beneficiaries are involved. Each users' group may have 10 to 15 members of household heads and it is given a full responsibility for a certain part of works by the construction sub committee. In this way, everybody involved knows who takes what responsibility, each users' group ties to complete its assigned works.

In Phedigaon and Phatbazar, there will be many opportunities for the people to participate in construction works. This project will be integrated into many other projects in which construction works are included. With this project, there will be no such a case in Phedigaon and Phatbazar in which the people ignore the structure given and constructed by an outsider and leave it as it is even it is broken.

### 3.5.4 Agricultural Development

#### (1) Cash Crops Production

After the completion of Tribhuvan Highway, which was the first high way in Nepal, there have been major changes in agricultural practices in the Palung area.

By increasing vegetable demand in Kathmandu, Hetauda, Birganj, Pokhara and other parts of the country the farmers in this area have been encouraged to grow more and more vegetables. Farmers in this area have been practising various cash crops according to the market demands and are taking advantages of high elevation by producing off-season vegetables. The exact data of vegetable export from the Palung area are not available but according to the rough information given by Palung and Daman VDC states, during 1995 season the main vegetables exported were: Potato (1,200 truck loads, 8,000 tons), cauliflower (1,450 truck loads, 6,250 tons), cabbage (2,300 truck loads, 13,100 tons), radish (1,550 truck loads, 8,500 tons), etc. The area being utilised for cereal crop production is gradually being replaced by cash crop production. For the last few years the Palung area has been growing as a centre of vegetable production especially during the off season. The FAO through fresh vegetable and vegetable seed production projects, has supported these activities in Phedigaon, Shikharkot, Ghartikhola, Anghree, Okhargaon etc. Vegetable brokers from Kathmandu and other areas visit this area occasionally and recommend the farmers to produce vegetables which are in high demand. It seems that farmers have selected the best species and the best cropping patterns.

Migration in this area is not in higher degree as in other parts of the country as described in Chapter 1 of Annex-7. The reason of lesser migration is vegetable production, which has attracted many small and large farmers. According to the farmers in this area, villagers who migrated from this area before and after the disaster are trying to come back again to engage in the vegetable cultivation.

(a) Cauliflower

As described before, among different crops, the net income received by farmers was highest for cauliflower despite its low yield. The estimated yield of cauliflower per ropani was 800 kg while, according to VDC, potential yield is 1,500 kg (HMG/FAO Fresh Vegetable and Vegetable Seed Production Project. GCP/NEP/043/SWI, Nepal, Cost of Production, Market Margins and Transportation of Vegetables in Palung/Daman Area, 1992 P IV). Adequate and timely supply of chemical fertilisers, technical support and irrigation may increase the yield more than 70% from the present status. Early varieties should be introduced so that farmers can sell them at high prices. Cauliflower production is in increasing trend among different vegetable crops and there is a great potentiality to increase the area as well as productivity. A net profit of cauliflower produced in Phedigaon is estimated at NRs. 11,156 per ropani as shown in Table 3.5.1.

(b) Potato

Although the production of potato is in decreasing trend in Palung VDC, still it is one of the main cash crops in Phedigaon/Phatbazar. Farmers sell potato at a price of about NRs. 6 per kg in the harvesting season and buy seeds at about NRs. 10 per kg. Since there is no any proper cold storage facility in the area, farmers are not able to preserve seeds for the next season. So they keep them in cold storage in Kathmandu, Hetauda, or elsewhere. It is estimated that about 1,200-ton capacity of cold storage is needed. According to the farmers, regular supply of chemical fertilisers, other inputs and technical support may generate more production and income. A net profit of potato production in Phedigaon is estimated at NRs. 1,127 per ropani as shown in Table 3.5.1.

(c) Carrot

The cultivation of carrot is getting popular among the farmers in Palung. But only few farmers in Phedigaon/Phatbazar are cultivating it. The wholesale price of carrot in Kalimati Wholesale Market is highest in October/November (NRs. 32.37/kg) and is lowest in April/May (NRs. 13.49/kg) as shown in Table 3.5.2. The farmers in Phedigaon/Phatbazar indicate they will produce carrot all year round if irrigation is available.

(d) Capsicum (Bhende Khursani)

A few farmers have started capsicum cultivation and are getting good prices. The highest price in the Kalimati Wholesale Market is in the month of March/April with NRs. 52.5/kg and lowest in the month of Apr/May with NRs. 10.67/kg (refer to Table 3.5.2).

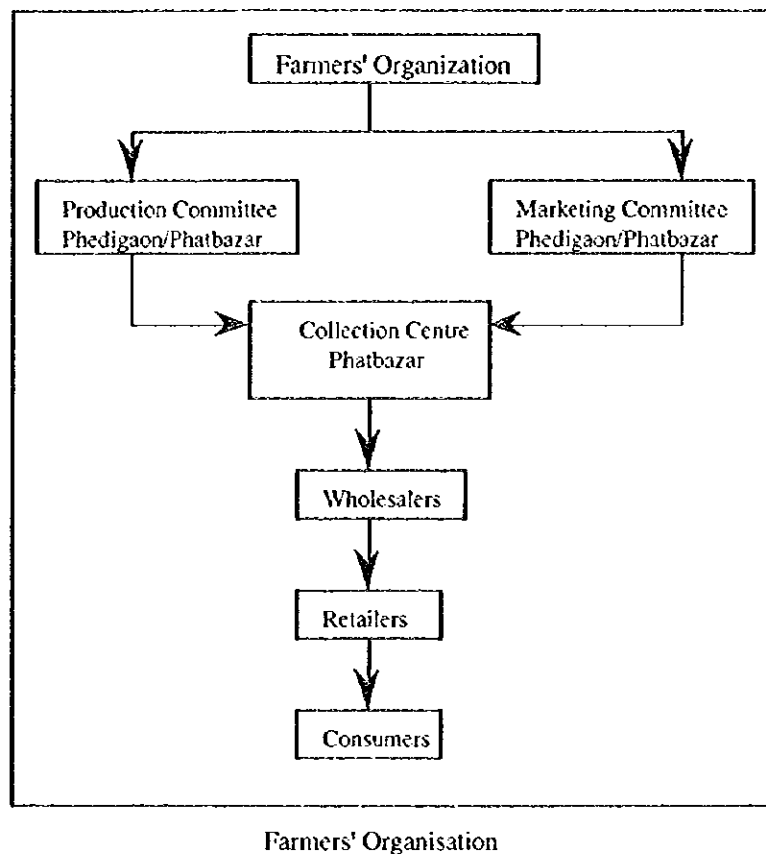
(2) Formation of Farmers' Organisation

Presently, individual farmers and individual traders in the whole Study Area are making deals for small volumes and it is very difficult to introduce important changes in production and marketing systems. Working in group will enhance their confidence in production and marketing. Two committees, a production committee and a marketing committee, are proposed. In Ward No. 9 where Phedigaon is located, there are 262 households and among those households 22 households are landless. Farmers should form committees comprising about 50% households in each committee. The production committee will collect the members' needs of fertilisers, seeds, pesticides etc. and inform them to the marketing committee to carry their needs to the related organisations. Related organisations will manage inputs beforehand. Likewise the marketing committee will collect and feed back the market information to the farmers and recommend profitable crops for the next season. The marketing committee will also prepare a cropping calendar.

A building in Phatbazar should be rented and used as a collection centre. Harvesting dates and per household commodities and quantities should be identified beforehand and be collected at the collection centre. Marketing groups arrange a truck and manage to transport the products to the market.

In the second step those committees will develop into cooperative societies. Those cooperatives will market the vegetables and procure various inputs like chemical fertilisers, seeds and pesticides to the farmers. Cooperatives will develop a cropping calendar for different farmers' groups, detailing the crop varieties to be grown, dates for plantation, etc.





### 3.5.5 Forestry Administration

#### (1) Community Forestry Programme for Phedigaon and Chisapani

The Phedigaon area is situated in the upper reaches of the Kulekhani basin. The forest remaining in this area is natural forest, occupying headwaters of the Dhungakatte Khola, Ghatte Khola, and Bottekhoria Khola of Palung River in the Kulekhani basin. At the altitude of around 2000 m *Alnus nepalensis* and *Pinus* spp. are generally dominant, and in at a higher altitude of around 2700 m. *Onerous* spp., *Castanopsis* spp. and *Micheria* are dominant. The forest is seriously deteriorated because of tree-felling, pasturing, getting firewood and humus layer. Deteriorated forest exerts a bad effect on land conservation. Occasional disastrous events are clearly deeply entangled in the deterioration of forest and devastation of forest land, although geomorphology and geology in the area are originally worst in nature.

#### (a) Essentials of Community Forests in Phedigaon and Chisapani

The functions of the forest, in general, can broadly be divided into four categories:

- 1) to produce such forestry products as timber/lumber, legs, and firewood,
- 2) to maintain the origin of water resources,
- 3) to protect the hills from erosive agents which generate various disastrous events, and
- 4) to conserve a better natural environment.

Although all the functions are usually to be evaluated in a form of integration, the actual manner of forest management necessarily varies to a large extent depending upon the circumstances under which the functions among them should be focused on.

For instance, the management manner to keep a wood-production forest differs utterly from the way of management to restore and protect forest from further deterioration. The point of forest management is, thus, to identify first the most important function among those integrated functions, taking natural and socio-economic circumstances into consideration. Namely, without firm confirmation of the first aim of forest management, it is impossible to materialise the way fostering the forest as well as making proper use of forest products.

In case of Phedigaon, many local people, 40 % of sampled households, pointed out that deforestation is the major cause of the 1993 disaster. The government officials also believe the tree plantation on the bald slope is the best solution as the disaster prevention measure. However, the Study Team is not fully agreed to the suggestions of the government officials so that direct tree plantation on the devastated slope is not possible due to less stability of existing slope. Moreover, the remaining forests on the slope are rapidly deteriorating by natural slope failures and tree cutting for firewood.

It is therefore recommended that the objectives of forest management in Phedigaon is to maintain the existing forest area at first, and to expand forests for disaster prevention aspect as well as proper utilisation of forest resources in the future. Otherwise, the forest is going on deteriorating and resulting higher disaster potential and scarcity of forest resources in the community.

(b) Proposed Sites for Establishment of Community Forest

The following sites are proposed for the establishment of Community Forest in line with the request from the inhabitants as well as based upon their agreement. An approximate size of each area is also shown

Site No.	Name	Area
1.	Thulo Pokhari Forest	25 ha
2.	Thulo Chour Forest	35 ha
3.	Tham Danda Forest	60 ha
4.	Chuche Dhunga Forest	-- ha
5.	Loche Paka Forest	15 ha
6.	Chuli Bhan Forest	60 ha
	Total	195 ha

The locations of the sites are shown in Figure 3.5.10. Of the above-mentioned six sites, the first three sites: 1) Thulo Pokhari Forest, 2) Thulo Chour Forest, and 3) Tham Danda Forest, are covered with forest trees of which crowns are rather well developed. Dominant species are *Quercus* spp., *Castanopsis* spp. and *Micheria* spp.. The last three sites: 4) Chuche Dhunga Forest, 5) Loche Paka Forest, and 6) Chuli Bhan Forest, are not well covered with good forest

trees; namely, the stand density is poor since these forests are located near the villages. Dominant species are *Pinus* spp. and *Alnus* spp. Particularly, Chuli Bhan Forest located in the Chisapani area is badly influenced by human activities, having a low grade of stand density, being unexpected to function well.

The total area of 4) Chuche Dhunga Forest is not given in the above table. This is because severe landslides are observed and it is not possible to start any community forest programme at this moment. After a programme in 3) Tham Danda Forest has been implemented and getting on the right track, some kind of community forestry programme will be necessary.

### (c) Approaches to Community Forestry Establishment

Community forestry can be defined to be an integrated management of forest by local people for themselves, apart from centralised administration of the Government. In this sense, due establishment of users' groups should come first, together with their better understanding and consistent agreement. Before the establishment of users' groups there should be some prerequisites involved in the contents of activities.

The items to be examined deliberately and the approach to the establishment of users' groups can be described in the flow shown in Figure 3.5.11.

For the implementation of community forestry, there must be a lot of problems on applying the principle of management. However, it may be too early to touch on practical matters because some elementary conditions are still left to be harmoniously solved. Among a number of basic conditions, the following will include greatly intractable problems:

- i) to restrict or prohibit gathering of firewood, fodder, humas in a designated extent of forest land,
- ii) to provide some fences so as to protect forest land from free pasturing of cattle and goats, and
- iii) to strictly prohibit the felling of standing trees in most forest lands.

Such regulation is assumed to bring about serious situations to the inhabitants who have been relying on customary utilisation of forests and sustaining the livelihood of subsistence agriculture on the hilly land. Nevertheless, judging from all the aspects of forest land, it is a high time for people to embark on a better management of forest of which key point should first be put on such conservative way of management as making the best of erosion control function of the forest. Not only the approach but also the implementation of community forestry programme will not be an easy task to deal with. All kinds of devices are to be called for in the implementation practice.

Available species of trees, fodder trees and grasses are tabulated in Tables 3.5.3, 3.5.4 and 3.5.6.

(d) Notes for Implementation

It is easy to suppose that throughout the preparation steps toward the implementation quite a few problems will have to be dealt with. But it is too early to move on those complicated matters since no detailed surveys have been carried out. However, there are some issues on which the Study Team cannot but touch in advance.

The three out of six proposed sites for the implementation of community forestry; that is, 2) Thulo Chour Forest, 4) Chucho Dhunga Forest, and 6) Chuli Bhan Forest, should be treated by engineering ways to mitigate erosions and landslides along with community forestry implementation.

- i) In the area of Thulo Chour Forest, a fierce erosion prevails on the lower hill slopes because of excessive cultivation and pasturing. It is feared that the erosion agent will expand to the upper slopes where the community forestry is envisaged. Properly designed countermeasures by way of engineering technique will be prerequisite.
- ii) In the area of Chucho Dhunga Forest, landslides have occasionally occurred and symptoms of landslides are still seen now. Although the inhabitants consider the tendency of landslide as currently not prominent, the establishment of community forestry should call for further examination at any rate. Careful attention should be paid to the drainage of rain water.
- iii) Chuli Bhan Forest in Chisapani is situated on actively moving landslides with a big mass. The establishment of community forest should be examined. Erosion and landslide control works are a prerequisite for the implementation of community forest. In short, it may be impossible to materialise the community forests without introducing erosion/landslide control technologies to the work items of community forest management.

(2) Agroforestry Programme

(a) Promotion of Fodder Trees Plantation

Farmers are reluctant to plant trees on their crop land because they suspect that trees will have a negative impact on vegetable production. But after the 1993 disaster, the awareness of planting trees in and around the farmland has been developed. Considering the profitability of vegetable cultivation in the area, fodder trees can be promoted in marginal lands such as abandoned terraces, degraded or eroded and often single cropped areas. Usually the marginal lands are far from their residential areas and the control over grazing animals often leads to a serious problem.

Before promoting the fodder tree plantation, marginal land or eroded land should be identified, and locally available and suitable plant species should be identified. For the plantation on agricultural land, less branchy and crown density tree species should be chosen.

Growing fodder trees on the private land in Phedigaon/Phatbazar can save time for collecting fodder and fuelwood and will help to maintain the natural vegetation. It will reduce human pressure on natural forest, too.

Declining forest resources around the Study Area is leading the farmers to become more dependent on private resources for meeting their basic requirement of fodder, fuelwood, etc. In the near future, the access to the natural forests, i.e., Thulichour, Thulopokhari, Mahabir, Thamdanda and Losepakaha, will be restricted because of the community forestry programme proposed by the Study Team. What is meant by restriction is that an individual household cannot use the forest at its own disposal. Users must follow the regulations set by the forest users' group.

Tree-based fodder has become scarce as mentioned above causing loss of milk production. It is estimated that 1 kg of fresh leaf fodder (4 kg of dry leaf fodder equivalent) would increase milk production by one litre (World Bank 1980, cited in Marko Katila, Accounting for Market and Non Market Production of Timber, and Fodder in the National Income Accounting Framework, a Case Study, Banko Janakari, MFSC, March 1995).

According to the focus group discussion in Phedigaon, farmers did not know the best species of fodder tree which are superior to the existing species and they did not get the seedlings for plantation. Forest nurseries are far from the Study Area and the transportation of seedlings is very difficult. Suitable fodder tree species will be distributed from the Forest Nursery Development and Plant Distribution Programme which has been proposed. The following fodder tree species are recommended for the Phedigaon/Phatbazar area.

Kimbu (Silkworm mulberry)  
Khanyu (*Ficus semicordata*)  
Kabro (*Ficus locor*)  
Koiralo (*Bauhinia variegata*)  
Dudhilo (*Ficus nemoralis*)

(b) Promotion of Improved Grass Plantation

Introduction of improved grass species on private land will reduce the pressure on the existing forest. The demand for fodder in the area has recently been overwhelming. Most prominent grass species are Napier (*Pennisetum purpureum*) and Amriso (*Thysanolaena maxima*) which have strong soil binding qualities and are recognised as good fodder. These grasses can be planted on the edges of terraces and on steep slope areas. Amriso can be sold in the market as broom grass and has a relatively high financial value. Seeds of improved grass species will be distributed from the Forest Nursery Development and Plant Distribution Programme which has been proposed.

(c) Promotion of Horticulture

Although many farmers are more interested in vegetable production than fruits, some farmers have shown some interest in fruit production. According to the field survey some farmers were eager to plant pear and lemon trees on their private land but they did not get the desired seedlings. In Daman, a well developed horticulture farm has been under operation for a long period, but its production is not sufficient to fulfil the demand of the farmers. Because of

difficulty in transportation and due to lack of extension programmes, the activity has not picked up. A major constraint to horticulture promotion on farmland in the Study Area is the inability of farmers to forego the vegetable cultivation while fruit plantation is being established.

According to a rough estimate, cash income expected from one ropani of land five years after planting pear and lemon is Rs 12,600 and Rs 7,500, respectively (refer to Table 3.5.6). In the comparison with cauliflower and potato which are the main cash crops at present, the production of pear and lemon will be more profitable. The analysis of potato and cauliflower shows that the net profit realised from those two vegetables from one ropani of land is Rs 1,127 and Rs 11,156 respectively (refer to Annex-7: Agriculture). Whatever the reason, the ultimate test of agroforestry's usefulness will be its acceptance by the farmers because they are the managers of land. Progressive farmers often choose their best land for profitable crops production. Since there are no farmers selling fruit in big quantity and they do not know the best species, they want a demonstration farm in order to introduce successful species. Quasi fruit like Kaphal (*Myrica esculenta*) and Lapsi (*Spondias axillaris*) can be planted in community forest as users' groups become more confident in their role as forest managers.

(d) Promotion of Medicinal Herbs

Herbal remedies, herbal cosmetic and Ayurvedic drugs are getting popular not only in the developing countries but also in the developed countries. The increasing demand and the development of drug industry in the country have brought medicinal herbs into focus. The medicinal herbs proposed below for cultivation are found wildy around the Phedigaon and Chisapani area. Planting those herbs systematically on marginal land, community forest, ridges of terraces will generate more income.

There are two herbal farms operated by the Department of Medicinal Plants, Ministry of Forest and Soil Conservation near Phedigaon, one in Daman and other in Tistung. The Tistung herbal farm, located at an altitude of 1,800 m, was established in 1962 and has experimented various herb species. Many herb species wildy found around Phedigaon and Chisapani have been experimented in the herbal farm and have been successful.

Medicinal herbs have a very good export market. They are in good demand in India and other countries. Table 3.5.7 shows that in 1994/95 the total amount of export was Rs 31.6 million and the share of India was about 80 %. In recent years the amount of medicinal herbs has increased remarkably.

The following species which are found wildy in the Phedigaon and Chisapani areas are proposed to be cultivated systematically. As Table 3.5.8 shows, some herbs such as Sugandhawal (*Valeriana wallichii*) are economically important, generating more than Rs 4,500 per ropani of land annually.

1) Chiraito (*Swertia chirayita*)

This species is found in the temperate zone of Nepal. This herb attains a height of up to 1.5 m. Chirayata is the trade name of the drug obtained from this plant. The entire plant is collected in the following stage and dried. It is used at the time of fever, diarrhoea, etc.

2) Jatamansi (Nardostachys Jatamansi)

This herb has a height of up to 60 cm. Jatamansi is the trade name of the drug obtained from this plant. It is used for the treatment of certain types of fits, palpitation of heart and convulsions. It also promotes urination, digestion and menstruation.

3) Sugandhawal (Valeriana wallichii)

Its roots are used for the treatment of hysterical, epilepsy, neurosis etc. Plants are used for the treatment of nervous unrest and similar emotional states.

As described before this is the most profitable herb and per ropani net income is estimated to be about Rs 4,550.

4) Paakhanved (Bergenia ciliata)

Its roots are used for the treatment of fever, diarrhoea, pulmonary affections, antiscorbutic, etc.

5) Indrayani (Indreni, Bitter Apple)

Roots of this plant are used for purgative, ascites, jaundice, urinary diseases and rheumatism. Fruit and roots are for antidote to snake poison.

### 3.5.6 Community Infrastructures

#### (1) Installation of Telephone System

Telecommunication is a vital component for development. Information brought through telephone will contribute to many aspects of economic and social activities, the magnitude of the contribution must be enormously big that it cannot be evaluated in a tangible way. For example, marketing of agricultural local goods can be done by telephone. People need not sell their products to local traders who give them an unreasonably low bid and exploit them. Another example is that in case of emergency, like the 1993 disaster, a telephone system makes it possible for them to contact outsiders and ask for help.

There are two telecommunication systems available for the people living in remote areas in Nepal. These two systems are provided nationwide by the Nepal Telecommunication Corporation (NTC). The NTC has been established by the HMG/N with the objective of providing essential, nationwide, low cost, reliable, and readily available telecommunication system to the general public, the government administrations, and the country as a whole, thereby supporting the unity, the integrity and the economy of the nation. The NTC is the 100 % government-owned corporation.

One of the two systems is called the MARTS (Multiple Access of Radio Telephone System), and the other is the VHF (Very High Frequency). One MARTS has a capacity of 40 telephone lines and is relatively expensive to install. Therefore, the MARTS should not be applicable to the study areas and it is ignored in the Study. On the other hand, One VHF has just one telephone line and is quite cheap, so that even poor rural people can afford to have one. Both systems do not require a telephone cable, but information is

transmitted through an electric wave in the air, so they can be installed even in an isolated community in a remote hilly area.

To install the VHF, it costs only Rs. 45,000 in total, in which the insurance premium on the equipment is included. The running cost is also inexpensive. One operator is necessary to run the VHF and his salary of Rs. 1,500 per month should be paid by the community. The VHF can be run by solar power and the solar panel cost is included in the above Rs. 45,000. Thus no energy cost accrues to the community. The system has very rare mechanical problems, so the maintenance cost is also nominal.

The procedure to install the VHF is described below:

- (1) Once the community has decided to install the VHF, the community asks the VDC to write a formal request letter to the DDC.
- (2) Then the DDC writes another request letter to a local office of the NTC.
- (3) Upon the formal request from the DDC, the local NTC writes another request letter attached with the letter from the DDC and sends them to the headquarters of the NTC in Kathmandu.
- (4) The headquarters of the NTC informs the local NTC of its approval of this request.
- (5) The local NTC goes to the field and evaluates technical feasibility. The result of the evaluation is informed to the headquarters of the NTC.
- (6) If feasible, the headquarters of the NTC orders the local NTC to install the VHF in the community.
- (7) The installation is done by the local NTC.

In the above process, each organisation makes its evaluation and decision about the installation of the VHF in the community. The request can be rejected at any stage.

According to the interview with a staff of the local NTC in Hetauda, the financial conditions of all VHF installed in Nepal are, in general, very healthy. The Study Team visited the telephone office in Palungbazar where the MARTS is installed. An operator said that even though only one telephone was used their annual net profits were approximately Rs. 40,000 to Rs. 50,000, and that they were quite comfortable with the MARTS financially.

In Phedigaon and Phatbazar, there is no possibility to have the VHF, because the MARTS has been already installed in Palungbazar, which is located just next to Phatbazar. Thus the installation of telephone system does not have to be considered here.



Table 3.1.1 Demographic Information  
in Phedigaon

No.	Type of Information			
1	Household and Population	Household (Nos.) 294	Population (person) 2,603	Average Family (person) 8.85
2	Population and Household by Caste Group	Household (Nos.)	Population (Nos.)	Share (%)
	1 Tamang	189	1,945	75%
	2 Chettri	60	410	16%
	3 Magar	19	100	4%
	4 Kami	9	51	2%
	5 Gurung	9	41	2%
	6 Others	8	50	2%
3	Damages by 1993 Disaster			
	1 Human damage	Dead persons 58	Injured persons 250	
	2 House damage	Fully 32	Partially 19	

Source: The various field survey by the Study Team, 1996

**Table 3.1.2 Demographic Information  
in Phatbazar**

No.	Type of Information			
1	Household and Population	Household (Nos.) 55	Population (person) 280	Average Family (person) 5.09
2	Population and Household by Caste Group	Household (Nos.)	Population (Nos.)	Share (%)
	1 Chhetri	46	230	82%
	2 Tamang	3	15	5%
	3 Magar	3	15	5%
	4 Damai	2	10	4%
	5 Newar	1	15	5%
3	Damages by 1993 Disaster			
	1 Human damage	Dead persons 0	Injured persons 0	
	2 House damage	Fully 2	Partially 53	

Source: The various field survey by the Study Team, 1996

Table 3.2.1 Casualties and Their Caste by the 1993 Disaster

S. N.	Name	No. for Caste	Fig. 3.2.1	Name	I.tr. for Caste	Fig. 3.2.1
<b>Dead People</b>				<b>Damaged Household</b>		
1	Bhim Bahadur Biswakarma	Kami	1	NA	Tamang	a
2	Kamala Biswakarma				Kami	b
3	Ramlal Biswakarma				Kami	c
4	Bharat Biswakarma				Tamang	d
5	Mangali Biswakarma				Tamang	e
6	Gopal Biswakarma	Kami	2		Tamang	f
7	Methi Biswakarma				Tamang	g
8	Kajibhai Biswakarma				Tamang	h
9	Thulo Bainsi Biswakarma				Tamang	i
10	Sani Biswakarma				Chhetri	j
11	Bishnu B. Basnyat	Chhetri	3		Chhetri	k
12	Maiya Basnyat				Chhetri	l
13	Jivan Basnyat					
14	Nabin Basnyat					
15	Saran Basnyat					
16	Sanukanchi Tamang	Tamang	4			
17	Nanimaiya Tamang					
18	Belu Tamang					
19	Krishnamaya Tamang					
20	Sukalal Tamang					
21	Sukra B. Tamang	Tamang	5			
22	Yama Maiya Tamang					
23	Dalli Tamang					
24	Seti Tamang					
25	Sanukancha Tamang					
26	Sanukanchi Tamang					
27	Jhanka Nath Khanal	Brahmin	6			
28	Bhim Kumari Khanal					
29	Indira Kumari Khanal					
30	Laxmi Khanal					
31	Pramod Khanal					
32	Praladh Khanal					
33	Sarada Khanal					
34	Kapindra Khanal					
35	Ashish Khanal					
36	Abish Khanal					
37	Ganesh Bahadur B. K.	Kami	7			
38	Kanchi B. K.					
39	Ram Bahadur B. K.					
40	Sanubhai B. K.					
41	Ram Maya B. K.					
42	Sanunani B.K.					
43	Tulasi B. K.					
44	Batuli Tamang	Tamang	8			
45	Lila Tamang					
46	Ashok Tamang					
47	Kancha Tamang					
48	Pudke Moktan					
49	Thuli Moktan					
50	Dhana B. Tamang	Tamang	9			
51	Sanikanchi Tamang					
52	Maiya Tamang	Tamang	10			
53	Thulobabu Magar	Magar	-			
54	Bhim B. Tamang	Tamang	11			
55	Pode Tamang					

**Table 3.4.1(1) Main Features of Proposed Structures on Dhungakate Khola**

ID No.	Type	Material	Quantity	Purpose
Dh-1	check dam	concrete	1	*Control of sediment yield *Propping toes of landslides at right bank upstream
Dh-2	check dam	concrete	1	*Propping toes of landslides at right bank upstream
Dh-3	a series of small check dams	gabion	9	*Prevention of river bank erosion
Dh-4	a series of small check dams	gabion	14	*Prevention of river bank erosion and gully erosion
Dh-5	a series of small check dams	gabion	7	*Prevention of gully erosion
Dh-6	a series of small check dams	gabion	14	*Prevention of gully erosion
Dh-7	a series of small check dams	gabion	13	*Prevention of gully erosion
Dh-8	hillside works	vegetative dry masonry	5 steps	*Prevention of river bank collapse
Dh-9	hillside works	vegetative dry masonry	4 steps	*Prevention of river bank collapse
Dh-10	hillside works	vegetative dry masonry	3 steps	*Prevention of river bank collapse

Note: Refer to Figure 2.1.1 to find a plan of locations of structures.

**Table 3.4.1(2) Main Features of Proposed Structures on Ghatte Khola**

ID No.	Type	Material	Quantity	Purpose
Gh-1	a series of small check dams	concrete	21	*Prevention of gully erosion
Gh-2	a series of small check dams	gabion	12	*Prevention of gully erosion
Gh-3	a series of small check dams	gabion	13	*Prevention of gully erosion
Gh-4	hillside works	vegetative dry masonry	2 steps	*Prevention of river bank erosion
Gh-5	hillside works	vegetative dry masonry	3 steps	*Prevention of river bank erosion

Note: Refer to Figure 2.1.1 to find a plan of locations of structures.

**Table 3.4.1(3) Main Features of Proposed Structures on Bhottekhoria Khola**

ID No.	Type	Material	Quantity	Purpose
Bh-1	check dam	concrete	1	*Prevention of sediment yield
Bh-2	check dam	gabion	1	*Prevention of collapse in right river bank upstream and secondary erosion transport of sediment
Bh-3	check dam	gabion	1	*Prevention of sediment yield
Bh-4	a series of small check dams	gabion	10	*Checking of stream-bed under-cutting
Bh-5	a series of small check dams	gabion	9 3	*Prevention of bank collapse
Bh-6	a series of small check dams	gabion	4	*Preventing the outflow of collapsed sediments

Note: Refer to Figure 2.1.1 to find a plan of locations of structures.

**Table 3.4.1(4) Main Features of Proposed Structures on Alluvial Fan**

ID No.	Type	Material	Quantity	Purpose
Ph-1	coffering dike	masonry	1	*To give due direction of sediment outflows
Ph-2	coffering dike	masonry	1	*To give due direction of sediment outflows
Ph-3	training dike	vegetated gabion	6	*To train sediment-water flows
Ph-4	channel works	vegetated riprap with drop-check gabion	1	*To give a stable channel laterally and longitudinally
Ph-5	channel works	vegetated riprap with drop-check gabion	1	*To give a stable channel laterally and longitudinally
Ph-6	revetment	vegetated gabion	1	*To protect the channel from landslides

Note: Refer to Figure 2.1.1 to find a plan of locations of structures.

**Table 3.4.1(5) Main Features of Proposed Structures between Phedigaon and Palungbazar**

ID No.	Type	Material	Quantity	Purpose
Pa-1	channel works	vegetated riprap	1	Flood control between Phedigaon and Phatbazar

Note: Refer to Figure 2.1.1 to find a plan of locations of structures.

Table 3.5.1. Cost of Production and Net Profit from Potato and Cauliflower

	Potato	Cauliflower
Yield Kg/Ropani	1,000	800
Value (Rs)	6,000	14,400
Cost Per Ropani (Variable and Fixed cost Rs)	4,623	3,044
Marketing Cost (Rs)	250	200
Total Cost (Rs)	4,873	3,244
Net Profit	1,127	11,156

Source : Hearing Survey by the Study Team, 1996

Table 3.5.2 Monthly (Average) Wholesale Price of Some Fruits and Vegetable of Kalimati Market of Kathmandu, Year: 2051 (1994/95)

S.N	Commodities	Baishak Apr/May	Jestha May/June	Ashad June/July	Shrawan July/Aug	Bhadra Aug/Sep	Aswin Sep/Oct	Kartia Oct/Nov	Marga Nov/Dec	Poush Dec/Jan	Magh Jan/Feb	Falgun Feb/Mar	Chaitra Mar/Apr	Average
1	Amar	27.50		7.74	28.05	30.45								23.44
2	Bhindekursani	10.67	13.73	14.79	16.09	15.79	19.28	30.09	42.40	41.98	33.01	36.61	52.50	27.24
3	Bhindi	9.33	6.69	7.57	7.92	7.45	12.47	18.53		23.00	20.84	22.08	18.86	14.07
4	Bodi	10.81	9.80	14.44	13.74	13.53	15.20	15.72	15.56	12.03	11.56	11.00	18.31	13.47
5	Cabbage	4.53	3.71	5.15	6.80	6.81	13.53	14.34	14.22	8.82	5.71	4.90	5.58	7.84
6	Cauliflower	16.10	10.81	16.75	18.13	26.65	18.41	16.87	14.67	10.80	9.69	11.18	11.26	15.11
7	Chilobindo	7.79	10.46	9.27	7.70	6.14	6.46							8.01
8	Cucumber	8.99	16.65	13.30	12.80	10.46	10.70	9.81	16.64	14.81	39.33	34.58	15.61	16.14
9	Dhaniya	26.53	29.10	34.20	32.50	10.46	38.13	36.91	33.75	32.31	31.38	31.60	33.33	32.70
10	D. Bhanta	6.46	4.99	4.60	5.86	4.63	6.27	8.27	7.14	5.82	4.71	6.13	6.96	5.98
11	Dry Fish	52.08	50.83	49.35	65.30	55.00	57.50	58.75	62.50	55.36	54.73	52.50	24.19	55.92
12	Dry Garlic	21.86	20.19	23.91	27.73	33.61	33.88	30.13	40.23	43.68	54.07	43.17	58.28	33.11
13	Dry Khursani	44.25	52.70	49.53	55.13	25.25	51.50	69.50	64.17	62.17	54.07	49.38	58.28	52.99
14	Dry Onion	4.78	5.38	6.85	7.43	10.24	10.63	12.91	10.27	8.54	6.68	5.38	5.96	7.92
15	Gajar	13.49	13.50	14.86	18.49	32.34	30.95	32.37	30.39	25.79	26.51	20.66	18.01	23.11
16	Ghiraula	9.13	8.38	7.49	7.54	6.46	6.17	6.44		21.00	19.81	13.25	12.11	9.85
17	Ginger	29.16	28.43	27.22	26.16	17.01	17.18	17.96	15.65	16.15	11.77	11.05	17.18	22.16
18	Green Garlic	8.21	8.62	8.90	10.25			15.20	10.23	9.82	10.37	10.43	16.25	10.19
19	Green Mango	8.19	8.46	7.36									11.04	9.70
20	Green Onion	8.84	8.97	8.87	10.50			9.50	9.57	9.19	12.94	8.89	9.54	12.73
21	G. Simi	11.31	10.00	12.94	12.89	14.24	18.11	15.88	14.57	11.53	17.24	20.39	17.95	15.12
22	G. Khursani	10.04	11.29	9.74	10.24	15.68	17.14	16.76	21.18	13.84	4.70	5.68	6.21	6.46
23	Lauka	6.34	5.58	6.01	7.69	7.07	6.43	7.57	6.50	7.76	33.26	37.89	49.63	32.63
24	Lemon	37.40	38.67	31.19	28.55	28.99	27.95	26.59	26.22	25.23				32.63
25	Lichi	24.75	21.00	19.43		9.50								18.67
26	Matarkosa	13.42	26.20	14.99	10.40			19.46	16.78	10.83	8.96	10.53	16.78	15.52
27	Methi Ko Sag	9.39	9.45	9.25										9.36
28	Naspatti	7.50		9.13	7.89	6.48	7.69	7.45						7.69
29	Papaya	17.73	18.78	17.40	17.45	18.53	16.33	17.50	16.88	16.50	17.36	17.86	17.85	17.51
30	Pidalu	7.50		9.99	9.99	8.19		7.51	8.23	9.45	8.10	10.09	12.00	9.00
31	Pointed Gaurd	14.07	11.55	8.22	10.32	10.77	13.99	12.70	13.19	10.98		38.07		14.39
32	Red Bhanta	7.27	4.66	5.37	5.23	5.00	6.50	11.24	10.19	6.53	5.50	5.08	5.08	5.67
33	Red Potato	5.45	6.48	7.54	9.29	9.81	10.31	5.53	4.86	4.33	5.44	8.49	5.77	7.71
34	Red Radish	5.86	5.37	5.03	4.10	4.78	5.67	5.33	7.43	5.83	6.25	6.65	6.92	6.98
35	Salgun	7.01	6.81	6.71	7.17	6.95	8.29	7.78						
36	Tama	22.05	25.50	23.60	20.30	17.90	16.90	16.73	16.10	22.07	20.71	17.50	18.44	20.06
37	Tite Karela	10.05	8.23	8.83	10.52	10.22	13.58	15.59	17.44	13.83	9.11	21.14	10.182	14.63
38	Tomato	7.88	7.82	13.00	22.11	18.20	25.07	24.36						14.85
39	Tree Kathar	7.38	8.47	6.13	8.94	9.50								10.50
40	White Bhanta	5.91	4.38	6.11	5.67	4.89	6.14	5.76	5.06	5.15	3.98	5.43	6.27	5.42
41	White Potato	4.52	5.12	5.84	7.32	7.58	6.54	10.45	9.06	5.25	5.19	4.82	5.30	6.41
42	White Radish		6.50		3.97	4.77	5.15	4.50	3.67	4.19	4.70	3.88	4.41	4.55

Source : Agricultural Marketing Information Bulletin Special Issue, Department of Agriculture Development, Agricultural Marketing Development Division, 1995



Table 3.5.3 Available Plants

English/Local name (Botanical name)	Remarks	Use
Nepali Alder / Utis ( <i>Alnus nepalensis</i> )	deciduous, tall; shallow root-system, rapid growth soil-improving tree, fittable devastated land	firewood timber
Blue pine / Gobre salla ( <i>Pinus wallichiana</i> )	evergreen coniferous, tall; deep root-system, dry- proof, fittable devastated land	timber
Plum / Painyun ( <i>Prunus cerasoides</i> )	deciduous, tall tree, distributed in India, Himalayas; useful as product	timber
Chilaune ( <i>Schima wallichii</i> )	deciduous, tall, distributed in South East Asia rather slow growth, useful forest tree	timber
Wooly Oak / Bajha ( <i>Quercus pubescens</i> )	ever-green, tall tree; growing on 2000m EL around suitable for rather humid land	timber
Champac Micheria / Champ ( <i>Micheria champaca</i> )	ever-green, tall tree; leaves available for sericulture rather slow growth, useful forest tree for furniture production	timber sericulture
Silky Oak / Kangiyo ( <i>Grevillea robusta</i> )	ever-green, tall tree; rather rapid growth,	timber
Katus / Chestnut ( <i>Castanopsis hystrix</i> )	ever-green, tall tree; growing in South East Asia, Himalayas, edible fruit, useful as wood-material	edible timber
Musure Katus ( <i>Castanopsis tribuloides</i> )	ever-green, tall tree; widely distributed in Middle Highland of Nepal; suitable for thick layer of soil	edible timber
Rhododendron / Lali Gurans ( <i>Rhododendron arboreum</i> )	ever-green, tall tree; partly distributed Ceylon to South China, available for wood-craft, useful as firewood	firewood timber
Gale / Kaphal ( <i>Myrica esculenta</i> )	ever-green, small to tall, distributed Low Himalayas to South China; edible fruit, a kind of soil-improving tree	edible
Camphor / Kapur ( <i>Cinnamomun camphora</i> )	ever-green, tall tree, strong, durable tree, showing rather rapid growth; available as softwood, containing camphor	timber edible
Cinnamon / Tej Patta ( <i>Cinnamomun tamala</i> )	ever-green, small to tall; distributed Low Himalayas to South China, leaves for spice, bark for cinnamon- substitute	spice
Lapsi ( <i>Choerospondias axillaris</i> )	deciduous, tall tree, available for furniture-making; the fruits for medicine, also edible	timber edible medicine
Himalayan ash / Lankuri ( <i>Fraxinus floribunda</i> )	deciduous, tall tree; growing on human land; hard- wood for furniture production	timber

Source: Field Survey by the Study Team, 1996

**Table 3.5.4 Fodder Trees**

English/Local name (Botanical name)	Remarks	Use
Silkworm mulberry / Kimbu ( <i>Morus alba</i> )	deciduous, small to middle/tall tree, leaves for sericulture and twigs for medical use	fodder sericulture
Rai Khanyu ( <i>Ficus semicordata</i> )	deciduous, middle to tall tree, having well-developed root-system, suitable for erosion control; capable for growing on dry cut-slope	fodder
Kabro ( <i>Ficus lacor</i> )	unknown	fodder
Dudhilo ( <i>Ficus nemoralis</i> )	unknown	fodder
Nimaro ( <i>Ficus roxburghii</i> )	unknown	fodder
Gogan ( <i>Saurauia nepalensis</i> )	deciduous, small tree, bearing edible fruits	edible fodder

Source: Field Survey by the Study Team, 1996

**Table 3.5.5 Grasses**

English/Local Name (Botanical name)	Remarks	Use
Napier ( <i>Pennisetium purpureum</i> )	perennial grass, available for fodder, growing up rapidly; available to erosion-control purpose; culm can be used for thatching material.	fodder erosion-control, thatch
Amriso / Broom grass ( <i>Thysanolaena maxima</i> )	perennial grass, bamboo-like grass species, expectable for the purpose of erosion-control; the ears for broom	fodder, erosion-control, broom
Vetivar ( <i>Vetiveria zizanioides</i> )	perennial grass, available to erosion-control purpose; perfume oil can be extracted from the root.	fodder, erosion-control,
Musekharuki ( <i>Pogonatherum paniceum</i> )	perennial grass, easy propagation using the splits of roots, available for the purpose of steep-slope covering	fodder, erosion-control
Ketuki ( <i>Agave spp.</i> )	fittable to control surface erosion of soil, strongly growing even on dry spot; fibre from the leaves	erosion-control, fibre

Source: Field Survey by the Study Team, 1996