Participatory Land Use Planning in Natural Hazard's Fragile Context: A Case Study of Kalam, Pakistan

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Abstract

Land use planning is an integrated and multi-disciplinary approach towards using available land in a more appropriate way. This approach is contributing towards the sustainability of available resources, mitigating environmental degradation, better physical infrastructure, and mitigating natural disasters. The unplanned built up and inappropriate practices by human beings have led to the depletion of natural resources and an increase in vulnerability of the communities to natural disasters. Some factors which include lack of planning, rapid increase in population, and poor physical infrastructure further aggravate the situation. In such situations, there is a dire need to conduct surveys and equip the local communities with a knowledge and awareness of land use planning. This research is part of the project titled "Building Resilience through Community Disaster Risk Reduction" funded by Diakonie Katastrophenhilfe (DKH). This research presents the findings of the participatory land use planning exercise conducted in five villages of Kalam in Pakistan.

Keywords: Land use planning, Natural Hazards, Sustainability

Introduction

Land use planning is an integrated and multi-disciplinary approach towards using available land in a more appropriate way. This approach is contributing towards the sustainability of available resources, mitigating environmental degradation, better physical infrastructure, and mitigating

natural disasters. However, all of these are contributing towards livelihoods improvement and sustainability.

LASOONA Society for Human and Natural Development under the project titled "Building Resilience through Community Disaster Risk Reduction" funded by Diakonie Katastrophenhilfe (DKH) conducted land use planning in five villages of Kalam Union Council. Thus, this village is situated at the extreme north of Swat district. Villages selected for this purpose were **Kalam proper, Gorkin, Ashuran, Gaheel, and Jalband**. Generally, the major land use area includes alpine postures, snowy and rocky mountain peaks, forest, grazing lands, agriculture lands, and settlements. Forest is the most important land use in the area. Alpine and Sub Alpine forest is the most dominant and important land use pattern of the area. In addition, there are valuable forest trees on hill slopes and foothills which provide ample opportunities of livelihoods including NTFPs. The surrounding mountains along the villages also consist of high peaks exceeding an altitude beyond the tree line. These peaks are perennially covered with snow, while some peaks are too steep that they lay as barren. Furthermore, this enhances the aesthetic value of the area.

The major natural disasters of the area are flood, land sliding, and glacial avalanche. According to the field work conducted in the target villages, the anthropogenic causes and mitigation measures are almost the same in different parts of the Union Council

Methodology

Stakeholder's Analysis

The following are the key stakeholders of land uses in the target union councils. They are:

i- Local Population

The local people are the primary stakeholders. However, with the passage of time, the population is increasing sharply. Thus, this result in a change in the land use pattern.

ii- Government Departments

The stakeholder government departments include the federal/provincial/district government, departments of forest, agriculture, livestock, soil conservation, mining, communications and works etc. Subsequently, government departments and local population are the two most important stakeholders. The government policies, regulations, plans, and implementation affect the land use pattern of the area.

iii- Nomads/Herders

During the summer season, the nomads migrate with a large number of sheep and goats to the area to graze in the forest and grazing lands. Thus, there is

no control over grazing. Due to uncontrolled grazing, the newly growing forest trees are affected and this leads to decrease in forest cover.

iv- Businessmen from Down Country

The target union councils are tourist hubs. Also, the business community from the down country is investing in the area of hotteling and other commercial activities including timber, NTFPs trade, and mining. Increase in commercial activities results in changes in the land use pattern. Thus, this leads to increase in settlements and infrastructure area.

v- Tourists

The tourist from all over Pakistan and abroad are visiting the target union councils for tourism trips. Before the militancy war, a large number of foreigners were also visiting Kalam and Utror UCs. Furthermore, there are large numbers of hotels, especially in Kalam union councils. In addition, the tourists stay in the local hotels. These hotels often use forest wood for heating purposes especially during winters.

vi- Seasonal Migrants

Some of the families from the down country migrate to the villages in the target union council to spend the summer season. These families pay the rent for the small houses. Due to increase in the trend, the local people are constructing small houses rather than their living places. It also increases the built up area and resulted in changes in the land use pattern.

vii- Nongovernmental Organizations

Different NGOs are working in the area on different themes. Some of the NGOs are raising awareness regarding mitigation of natural disasters, land use planning, agriculture, agro forestry, and forestation. These activities also positively contribute to raising the awareness regarding land use planning.

Field Work

During the field work, a total of five sessions were conducted in five different villages of Kalam union council. Thus, the following strategy was adopted during all these sessions:

i- Briefing with the staff members of LASOONA society regarding the village, and gathering key informants for the session.

ii- Documenting direct observation through a walk in the village.

iii- Preparing existing land use map of the village.

iv- Analyzing existing land uses through pie diagrams or focused group discussions.

v- Exploring trends in land uses for the past two decades and forecasting for future two decades.

vi- Analyzing existing status of natural resources, exploring trends in natural resources since the last two decades, and forecasting future two decades.

vii- Exploring natural disasters of the village with anthropogenic causes and proposed mitigation measures.
viii- Documenting information from the key informant through semi structured interviews.
ix- Preparing land use planning map for the village.
x- Concluding remarks

Tools Used in the Field

The following tools were used during the land use planning exercise. They are:

i- Land Use Mapping

During the exercise after the introduction of the event, the participants were told to construct a map showing the existing land uses of the village. The community members were facilitated by the field staff of Lasoona Society. In each village during the beginning, a land use map was prepared. The task was also conducted with the women activists. However, in some villages, it does not seem possible to draw a land use map. As a result, their inputs were recorded regarding existing land uses.

ii- Pie Charts

The existing land use was analyzed by the participants through pie charts. They were being provided with charts and markers. They have drawn a circle as the total area of the village. Then, they divided the circle into different parts according to the know-how of the covered area by forest, agriculture land, open spaces, and settlements.

iii- Focused Group Discussions

During the focused group discussion, each of the land use was analyzed on a chart. The existing land use was compared to the situation twenty years back. Then, the situation of the land use was forecasted for the coming two or three decades according to the present trends.

The natural resources were also analyzed in a focused group discussion. The existing status of the resource was explored. Then, the twenty years back time was compared and the forecasting was made regarding the status of the natural resources according to the current trends. The participants also put forward their suggestion regarding land uses after having a thorough discussion with each other.

The natural disasters being active in each village since the last few decades were explored. The impacts, anthropogenic causes, contributing to the disaster and mitigation measures were also proposed during the discussion.

iv- Disaster Mapping

After having discussion during FGD on natural disasters, the disaster prone areas were shown on the land use map. Different symbols were used for different disaster like red line along the river for flood prone sites, writing

capital G for glacial avalanche prone site, and writing LS for land sliding prone areas.

v- Natural Resource Mapping

The status of the natural resources was explored during the focused group discussion. The existing status of each natural resource was compared to the status of two decades back. Then, the existing trends of what will be the situation after two or three decades was kept.

vi- Semi Structured Interviews

From the key participants, the information related to land use planning was recorded through semi structured interviews. The tools were mostly used during women sessions. Also, the information related to existing land uses, natural resources, natural disasters, trends, forecasting, and land use planning was recorded.

vii- Direct Observations

During the field work, the consultant conducted a walk through the village and documented direct observations related to land uses, natural resources, and natural disasters.

viii- Land Use Planning

The last thing employed during each session is to have a land use plan for each locality. Prior to land use planning, the existing land use was analyzed. The status and trends of the natural resources were also analyzed. The natural disasters and mitigation measures were explored. Then, keeping in mind all the previous data, the participants were asked to prepare a land use plan for their village on a sheet.

Field Survey of the Target Villages

Kalam Proper

Elevation	:	1984 meter
Coordinates	:	35 28 46.9 North, 72 37 33.4 East

Kalam is the commercial and administrative center for the villages of UC Kalam and UC Utror. It is also a hub for providing accommodation, food, and transportation services to tourists. It is a commercial area in which the settlements are rapidly increasing with the passage of time. The valuable agriculture land is being converted into houses, hotels, shops, and apartments.

The land use planning exercise was conducted at Hujra with an active participation from the local committees.

Analyzing Existing Land Uses

The following are the major land uses of Kalam. It includes the changes that have occurred in the past 20 years and the forecasting for the future 20 years.

i. Forest

According to the elders of the village and local activists, the forest cover has decreased by 40 % in the past 20 years. This occurs as a result of encroachment on forest land by agriculture lands towards forest area cultivation. Thus, over grazing in the forest area lead to a decrease in the new growing forest trees, deforestation, natural disasters, population increase, and increase in commercial activities. Based on the existing analysis in the present circumstances, the forecasting for the future regarding forest area resulted in further decrease by 50 %.

Present Situation

Presently, a total of 30 to 40 % area is covered with thick forest cover, including hill slopes and on piedmont plane developed between the two rivers.

Trends in Forest Cover since the Past 20 Years

The forest cover is decreasing sharply with the passage of time. In the past 20 years, the forest cover decreased approximately by 40 %. The following are the reasons for reduction in forest cover. They are:

- Encroachment by agriculture land in the forest area.
- Over grazing in the forest lead to decrease in the growth of new trees.
- Deforestation.
- Natural disasters especially land sliding, glacial avalanche, and floods.
- Population increase leads to increased housing.
- Increase in commercial activities leads to increase in hotels and shops.

Forecasting for the Future 20 Years

In the present circumstances, if the same trend continues, it will lead to a decrease of forest area by 50% in the coming 20 years.

Suggestions for Mitigating a Sharp Decrease in Forest Cover

- Plantation of agro forestry trees in the open spaces within the village settlements and foothills for local use.
- Plantation of forest trees on hill slopes and protecting of newly growing forest trees.
- Awareness rising regarding the importance of forest cover.

ii. Agriculture Land

In Kalam village, the agriculture land is found on the gentle slopes between the river and mountains. On some foothills, the farms are being formed in terraced form. Mostly, there are patches of agriculture lands mixed with the houses. Kalam is a mono cropped area and the people are cultivating

only maize. Later on, many organizations worked on vegetable cultivation, and now the people are successfully cultivating vegetables on their farms.

Three decades earlier, the people were cultivating only maize for domestic use. Also, there were many barren lands lying useless. As the vegetable production started, and as the people sells it on high prices, it resulted to the making of new farming lands. As a result, even the people began encroaching towards the forest.

Existing Situation

The agricultural lands are forming almost 10-15% of the total area. Thus, the houses are mostly scattered in the fertile agriculture land.

Trends in Agriculture Land since the Last 20 years

The agriculture land increased due to the making of farming land in the open spaces and encroachment towards the forest. On the other hand, the agriculture land is decreasing due to increase in the settlement area. Still, there are many open spaces which lie vacant. Hence, these are communal lands mostly disputed or being used for grazing livestock.

Forecasting for the Future 20 years

If the present trend continues, there will be a sharp decrease in the agriculture lands. Presently, construction is mostly going on fertile agriculture fields. Thus, the present trends will lead to a decrease of 50 to 60 % of agriculture lands.

Suggestions

- Awareness regarding land use planning
- Dividing the communal lands

iii. Settlements

The settlements including houses, hotels and shops, constitutes almost 5 to 10 % of the total area. This is due to sharp increase in population and increase in tourism activities. Consequently, the people are mostly using stone and forest wood during house construction.

Trends in Settlements since the Last 20 Years

There is almost 100 % increase in the settlements since the last 20 years. The number of hotels and houses was almost half as compared to the present situation.

Forecasting Future Trends

In the coming 20 years, there will be more than 100 % increase in the settlement area. It will cover most of the agriculture lands. Also, the trend towards multi story buildings will increase.

Suggestions

- Constructing houses at safe places
- Decreasing the use of forest wood in construction
- Awareness raising

- Taking care of fertile agriculture lands during construction

iv. Open Spaces/Grazing Lands

There are open spaces composed of grasses in the foot hills or along the river, or which is composed of barren soil with shrubs or hard barren rocks. In addition, there are also alpine pastures above tree line.

Trends since the Last 20 Years

The open spaces are decreasing with the passage of time. Thus, these were converted to agricultural lands and houses. Also, some of the open spaces close to the forests provides very good space for tourist to have picnics.

Forecasting the Future

The present open spaces will be reduced. Nevertheless, decrease in forest cover can lead to more open spaces on the mountain slopes.

Suggestions

- Zoning for the open spaces.

3.1.2 Natural Disasters

i. Flood

During the 2010 flood, Kalam was worstly affected. The houses, hotels, shops, and agricultural land along the river and streams were washed away by flood water. After the year 2010, the river bank erosion occurs during the flood season each year.

In addition, the prime reason behind the disaster is the decrease in the forest cover. Suggestions for mitigating the hazards are to stop construction at flood prone sites, to construct protection wall at some points, and to increase forest cover.

ii. Glacial Avalanche

The area experienced glacial avalanches during the years 2005 and 2006 in two different locations. The disaster washed away some empty houses, agriculture lands, and forest trees. Thus, the major cause of the disaster is decrease in the forest cover.

Furthermore, the people should be informed so as not to construct houses that would face the risk of glacial avalanche.

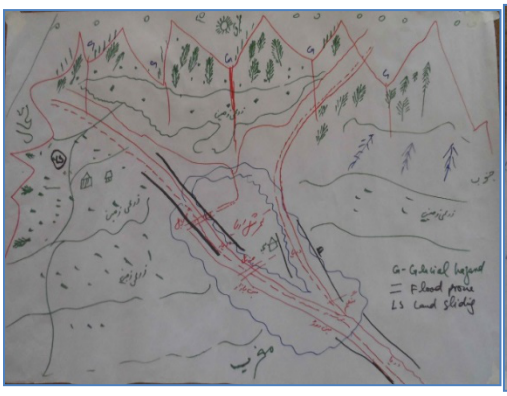
iii. Rock and Land Sliding

During the year 2005, land sliding occurred towards a hill side near Gaheel village. Apart from that, rock sliding is common especially after the melting of snow from the hill slopes. The reasons behind the disaster are decrease in forest cover and erosion due to running water. The mitigation measures involve checking dams for fragile slopes and plantation.

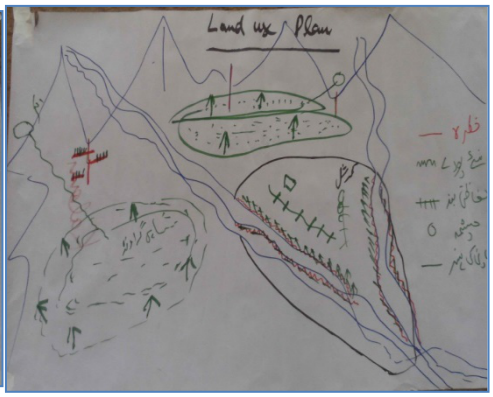
3.1.3 Suggestion for Land Use Planning

In the land use planning, the target communities suggested the following measures:

- Stop constructing houses along the river banks, streams, and sites prone to land sliding and glacial avalanches.
- Plantation of forest trees on the open spaces on hill slopes.
- Construction of an irrigation channel from a spring for irrigating the waste land.
- Construction of check dams on fragile slopes and protection wall construction at the flood prone sites along the river and streams.



Existing land use of Kalam by local people
Showing sites prone to natural disasters



Land use plan by local people showing sites of plantation, irrigation channel, protection walls, and check dams

Gorkin

Elevation : 2155 meter
Coordinates : 35 30 54.6 North, 72 37 05.9 East

Gorkin village is situated on Matiltan road at a distance of 2 to 3 km from proper Kalam. It is a small village with houses mostly scattered in the agricultural lands. Subsequently, the village is also prone to land sliding and glacial avalanche.

Analyzing Existing Land Uses

The major land uses in the village are forest, agriculture land, open spaces including barren rocky mountain slopes, and settlements.

i. Forest

Forest is the most important land use of the village. There are two types of forests situated towards the hill slopes. The first is forest trees found a bit far from the village settlements, while the second is another broad leave forest situated close to the village settlements. Thus, the wood of these trees are used only for burning and is locally known as Serai.

Present Situation

The forest cover is almost 40 % including both the coniferous and broad leave trees. The people uses broad leave trees such as fuel wood and the forest trees for constructing their houses.

Trends since the Last 20 Years

According to the local people, the forest cover decreased by 40 to 50% in the last 20 years. The major reason behind this is the use of forest trees by local people, population increase, and natural hazards.

Forecasting Future

If the same trends were going on, the forest cover will be further decreased by 50% in the coming 20 years.

Suggestions

- Alternate sources of fuel, like natural gas, etc.
- Introducing fuel efficient stoves.
- Plantation of forest trees.

ii. Agriculture Land

The agriculture land is situated between the mountain slopes and river. Also, there are houses in the scattered form in these agriculture lands. The farmers cultivate vegetables for earning their livelihoods. According to the farmers, the production of different vegetables, especially potato, is decreasing with the passage of time.

Present situation

In the present circumstances, the houses of the village are scattered in the farming land. Thus, the reason behind this is land ownership. The people have the opinion that agriculture land is the major source of their livelihoods. On the other hand, they are not having another option in constructing their house.

Trends since the Last 20 Years

Since the last 20 years, the agriculture land is almost decreased by 10 %. However, the people also prepared agriculture land in the open spaces. Still, the overall area is being reduced by the change of agriculture land into settlements. During 1980s and early 90s, the farmers were only cultivating maize. After then, the trends towards vegetable cultivation increased which led to commercial farming.

Forecasting for the Future 20 Years

With reference to the present trends, the agriculture land will be reduced further by 30 to 40 % in the coming 20 years.

Suggestion

- There should be a thorough research on soil and agriculture practices. Also, the farmers should be trained to get more production from their agriculture lands. This will reduce the trend of housing within the fertile agriculture land.

iii. Open Spaces/Grazing Area

There are open spaces in the surroundings of the village towards the mountain slopes and river.

Since the last 20 years, the open spaces were increased by 15 to 20 % in the area. The reason behind this increase is the conversion of forest area to open spaces.

If the same trend continues, then there will be an increase in the open spaces by 30 to 40 % towards the mountain slopes.

iv. Houses

At present, there are a total of almost 150 houses in the village. Thus, they are mostly in scattered form. In the last 20 years, these houses increased from 70 to 150 houses. In this present trend, there will be almost 250 to 300 houses after 20 or 30 years.

Natural Disasters

i. Floods

During the year 2010, the flood washed 2 houses and agriculture lands. After that, the river bank erosion occurred during the summer season when the water flow in the river is high.

In overcoming the issue of flood, there should be a plantation at the river side. Check dams should be constructed on the prone sites of mountains. In addition, houses should not be constructed on flood prone sites.

ii. Glacial Avalanche

Glacial avalanche occurred during the year 2007 and 2008. The reason behind its occurrence is due to reduction in the forest cover.

In overcoming the hazard, the forest cover should be increased especially on the fragile slopes.

iii. Land Sliding

The land sliding is occurring on small scale especially after the winter as the ice melts from the nearby hill slopes.

With the passage of time, the intensity of land sliding is also increasing due to decrease in forest cover and the weathering of rocks.

In overcoming the hazards, the forest cover should be restored on the fragile hill slopes. In addition, some species having quality of slope stability should be introduced.

Suggestions for Land Use Planning

- Plantation of erosion resistant trees along the river and streams.
- Awareness raising regarding house construction by keeping in mind safety and the preserving of fertile agriculture land.
- Constructing check dams along the channel of seasonal streams.

- Plantation of agro forestry trees to reduce the cutting of forest trees for fuel wood.

Existing land use of Gorkin by local people Showing sites prone to natural disasters

Land use plan by local people showing sites of plantation, irrigation channel, protection walls, and check dams

Ashuran

Elevation : 2085 meter
Coordinates : 35 30 21.8 North, 72 34 53.6 East

Ashuran village is situated on Kalam Utror road on a very beautiful plain formed between the two main branches of river Swat. The settlements of the village are scattered in the fertile agriculture fields along Kalam Utror road bounded by the forest trees on one side. It is sloping towards the river on the other side.

Analyzing Existing Land Uses

The following are the major land uses of the villages, including settlements, forest, open spaces, and agriculture lands.

i. Settlements

At present, there are a total of 350 houses. These are mostly semi pacca houses made with stone, forest wood, and CGI sheets on top of the houses.

Twenty years back, there were a total of 120 to 130 houses, which were made from stones and forest wood.

According to the present trends, there will be a total of 800 to 1000 houses in the next 20 to 25 years. According to the past trends, increase in the area of settlements will occur within the fertile agriculture lands.

ii. Forest

Forest is the most important land use of the village. The present forest cover is almost 40 % of the total area of the village according to the local people.

The forest areas is depleting with the passage of time. The reason behind this is the use of forest wood by local people and as a result of natural disasters. Encroachment of agriculture land into forest area also results in a decrease in the forest cover.

The forest cover can be increased by planting more forest trees and taking care of the new plants. If the present trend continues, there will be a decrease in the forest area in the coming twenty years by 40 % to 50 %.

iii. Agriculture Land

In the village, the average land holding is 4 to 10 kanals per households. This is with minimum of 0.5 kanals per household and maximum of 100 kanals per household.

Since the last 20 years, the agriculture land has increased in the area. However, the people have constructed their houses in the fertile agriculture land. More than that, the people prepared farming lands and grazing lands in the open spaces and in the forest area after cutting the trees. In the present circumstances, the agriculture land is decreasing with the passage of time due to rapid increase in population. However, this has led to the construction of more houses in the farming lands.

If the present trend continues, then the agriculture land will be reduced by 30 to 40 % in the coming 20 years.

iv. Open Spaces/Grazing Area

There are open spaces and grazing areas in the surroundings of the village settlements. With the passage of time, the forest area is been converted into grazing area. After then, the people prepares agriculture land within that area.

Natural Disasters of Ashuran Village

The following are the most common disasters of the village. They include:

i. Glacial Avalanche

In recent years, the village observed glacial avalanche during the years 2007, 1998, and 1993. During the winter season due to heavy snowfall, sometimes the glacier start fast movement along the mountain slope. With the passage of time, the frequency of the disaster is decreasing in the village due to decrease in the snowfall.

Therefore, the disaster can be mitigated by:

- Selecting proper site for housing.
- Constructing check dams along the fragile mountain slopes.
- Increasing the forest cover.

ii. Floods

The village experienced floods during the years 2010, 2006, and 2005. Apart from that, after 2010 flood, the river is cutting the sides during the

maximum flow season during the summer. During 2010 flood, a total of 35 houses and 03 mosques were swept away with the flood water.

Therefore, the flood disaster can be mitigated by the following measures. They include:

- Protection walls on the potential sites
- Thick tree cover along rivers and streams
- Check dams along the channel of streams
- Selecting appropriate space for house and mosque construction

iii. Land sliding

The land sliding is the most frequent natural disaster of the village. Almost every year, the rocks and debris are falling from the mountain slopes. Majorly, they brought damages to the forest trees, livestock, and agriculture lands.

With the passage of time, the frequency and intensity of the disaster is increasing. Therefore, the major reason behind this is the decrease in forest cover.

Consequently, the disaster can be mitigated by the following measures. They include:

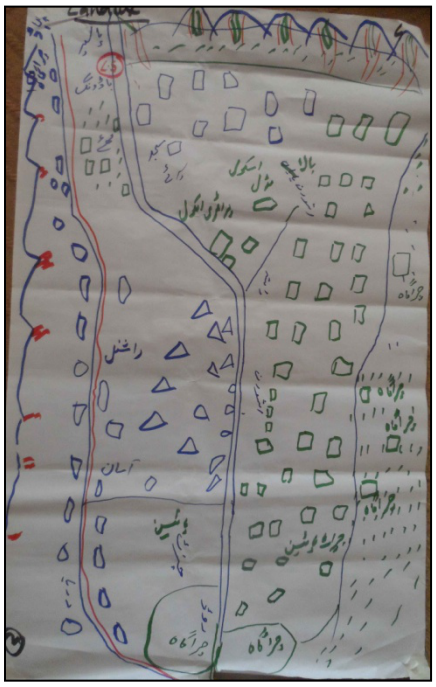
- Plantation on the open spaces
- Protecting forest on the steep slopes

Suggestions for Land Use Planning

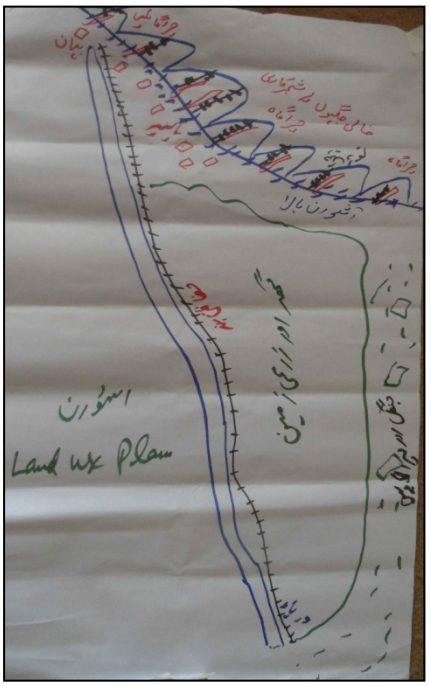
The elders and activists of the village are proposing the following measures for land use planning.

- During construction activities, floods, glacial avalanche, and land sliding should be taken care of.
- Protection wall along the river.
- Plantation on the open spaces and hill slopes.
- Constructing check dams along the channel of streams.

Existing land use of Ashuran by local people. Showing sites prone to natural disasters



Land use plan by local people. Showing sites of plantation, irrigation channel, and protection walls and check dams



Gaheel

Elevation : 2107 meter

Coordinates : 35 27 28.9 North, 72 35 16.9 East

Gaheel village is situated towards the south of proper Kalam along a stream coming from a lake named *Godar Jheel*. The village is a tourist area and it has a nice hotel. However, the hotel and the access road were swept away during the 2010 flood. Furthermore, there were also some fully concreted houses constructed by the people of down country including Punjab province.

Analyzing Existing Land Uses

The following are the major land uses of the village. They are:

i. Settlements

At present, there are a total of 180 houses situated in a scattered form. The houses are mostly semi pacca made with stone, forest wood, and CGI sheets on top. On the other hand, some fully concreted houses were also constructed by the residents of other parts of the country.

Twenty years back, there were a total of 50 houses in the village. Later, it increased to 180 after 20 years' time.

If the same trend continues, there will be almost 500 houses in the village after twenty years.

ii. Agriculture Land

The total agriculture land in the village is approximately 2500 to 3000 kanals. The people are mostly cultivating vegetables for earning their livelihoods.

However, the agriculture land is decreasing with the passage of time due to construction activities. Thus, if the aggregate area is compared with the agriculture land two (2) decades earlier, then it is increased. This occurs as a result of commercial farming. Consequently, the people are now preparing more agriculture lands in the open spaces.

If the same trends were going on, there will be a decrease of 30 to 40 % of the agriculture land in the next 20 years' time.

iii. Forest

There is thick forest cover in the surrounding hill slopes of the village, with some barren rocky mountain slopes. Thus, the forest is covering almost 40% of the total area of the village.

In the last 20 years, the forest area is reduced by almost 40 to 50% due to local use, natural disasters, and some illegal cutting and trade. The reason behind the forest depletion is overgrazing and forest cutting.

Keeping in view the present trends, there will be a decrease of 50 to 60 % in the forest cover in the coming 20 years' time.

Suggestions

- Strong coordination between the local people and the forest department.
- Controlled grazing.
- Reforestation.

iv. Grazing Land/Open spaces

There is approximately a total of 3000 kanal of grazing land and vast rocky open spaces on the mountain slopes.

With the passage of time, the grazing areas close to the village reduces due to the preparation of farming land. Also, the barren rocky open space increases due to decrease in the forest cover.

If the same trends continue with the passage of time in the coming 20 years' time, the open spaces on mountain slopes which cannot be used for construction or farming will be increased by almost 40 %.

Natural Disasters of Gaheel Village

The following are the common natural disasters of Gaheel village. They include:

i. Flood

The flood occurred during the years 2010 and 2005. During the 2010 flood, a total of 20 houses and almost 3% of agriculture land were washed away. The reason behind the disaster was the extremely high flow of water in the stream, lack of thick forest trees close to the stream, and houses on the flood prone points.

The flood disaster can be mitigated by the following steps:

- Protection wall at few points.
- Thick layer of erosion resistant trees close to the stream.
- Constructing houses on safe points.

ii. Land sliding

Apart from small scale rock and debris sliding during the year 2005, a total of 17 persons died due to land sliding. The frequency of the disaster is increasing with the passage of time. However, the reasons behind that is decrease in the forest cover. Therefore, the disaster can be mitigated by the following steps:

- Constructing houses on safe points
- Increasing forest cover on fragile slopes

iii. Glacial Avalanche

Glacial avalanche is occurring almost every year. The intensity of its occurrence depends on the quantity of snowfall. The avalanche is occurring in the gorges along the mountain slope. Thus, it leads to the washing away of forest trees and plants.

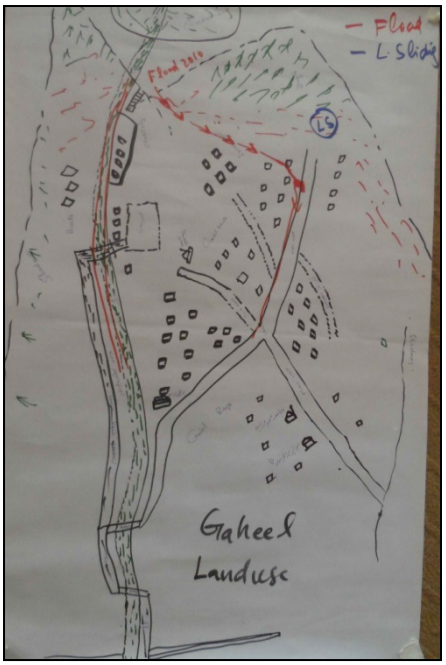
However, the disaster can be mitigated by:

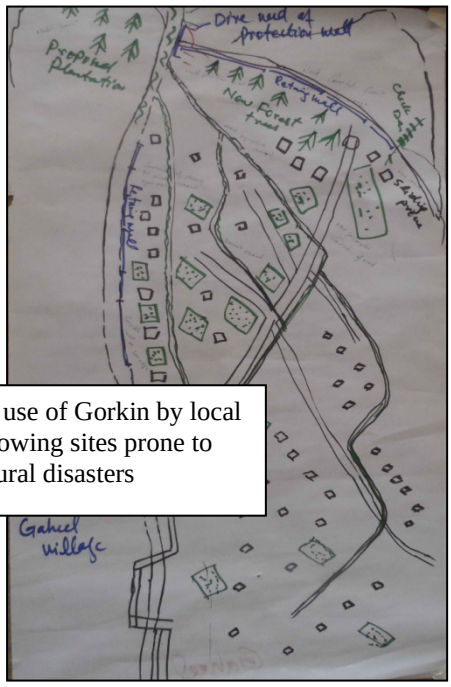
- Plantation which can be resistant to extreme cold and glacial flow.

Suggestions for Land Use Planning

The following measures were proposed by the inhabitants of the village for land use planning. They include:

- Towards the extreme north of the village, there is point which is an easy diversion for flood water towards the village. Also, there is a need for protection wall at that point.
- Plantation of forest trees towards the west and south side and along the stream.
- During construction activities, the natural disasters and preserving agriculture lands should be kept in mind.





Existing land use of Gorkin by local people. Showing sites prone to natural disasters

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Jal Band

Elevation : 2094 meter

Coordinates : 35 28 00.3 North, 72 34 54.0 East

Jal Band village is situated near proper Kalam. The commercial activities include hotels which are almost reaching the village boundaries. Furthermore, there are a total of 500 houses in the village mostly in scattered form. The following are the major land uses of the village.

Analyzing Existing Land Uses

The following are the major land uses of Jal Band village. They are:

i. Settlements

There are total of 500 houses mostly in semi pacca form. The houses are mostly found in semi scattered form. Also, the clusters of houses are with 5 to 10 houses together.

According to the participants 20 years back, there were a total of 200 to 250 houses in the village which have been almost doubled.

Forecasting the coming twenty years, the participants were of the opinion that after 20 years, there will be approximately 1000 to 1200 houses in the village.

The following are the suggestion for the land use related to settlements:

- Constructing house on safe places.

- Preserving fertile agriculture lands during house construction.

ii. Agriculture Land

At present, the total agriculture land of the village is 500 Acres. However, 20 years back, the people were carrying out agriculture practice only for their household needs. Then, as commercial farming started with the introduction of high value off season vegetables, the people prepared more agriculture lands. With the passage of time due to population increase, agriculture lands were being occupied by settlements and were also eroded by flood water. The agriculture land of the village is reduced almost by 50 % as compared to the past 20 years.

iii. Forest

The forest cover of the village is sharply decreasing with the passage of time. As compared to the 20 years back time, the forest cover remained only 1/4th. On the other hand, the remaining 3/4th part do not exist anymore. However, the following are the reasons behind forest depletion. They include:

- For local use, a household need almost 4 to 5 trees for their yearly consumption.
- The local people need forest wood during construction activities.
- Natural disasters, especially floods and glacial avalanche.

However, the following are the suggestions for improvements of forest cover:

- Providing alternate source of fuel.
- Cooperation between forest department and target communities.
- Plantation of agro forestry trees close to the village settlements.
- If any solid measures were not implemented, then the forest area of the village will be near to be completely finished after 20 years.

iv. Grazing Land/Open Space

There is a total of almost 550 acres of open spaces including 250 acres owned by a person. On the other hand, the remaining are the communal lands. However, the communal lands were increased due to deforestation.

The people are also using these lands in preparing farmlands and in constructing their houses.

Natural Disasters at Village Jal Band

The following are the most common natural disasters of village Jal Band.

i. Flood

Earlier, the flood which occurred during 2010 affected houses, forest trees and agriculture lands. The reasons behind the damages include the construction of houses near the stream, and very less trees along the stream.

Thus, the following are the suggestions for mitigating flood hazards:

1 Constructing protection walls

2 Check dams along the channel of the stream.

ii. Glacial Avalanche

Glacial avalanche is occurring almost every year. Also, it brings damages to houses, agriculture lands, and forest trees. The magnitude of the damages from the disaster is increasing with the passage of time due to decrease in forest cover. The disaster can be mitigated by thick forest cover on the mountain slopes.

iii. Land Sliding

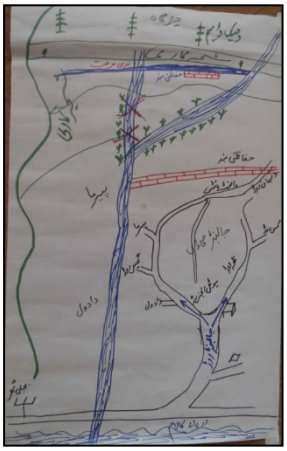
Land sliding is also affecting the lives and livelihoods of local people. Thus, this is with the passage of time as the frequency of the hazard is increasing. Few years back, some people died due to land sliding.

3.5.3 Suggestions for Land Use Planning

The following are the suggestions of local people regarding land use planning:

- There are two potential points for the construction of protection walls.
- A layer of forest trees at least 20 to 20 feet wide with thick plantation of erosion resistant trees.
- Houses should not be built along the streams and on the sites prone to land sliding and glacial avalanche.

Existing land use disasters



Land use plan

Land Use Plan for UC Kalam

According to the ongoing trends, population increase, technical studies, and inputs from the target communities were the proposed zones for land use planning in union council Kalam.

Critical Zone

This is a flood prone zone along the river with a risk of lateral erosion during the flood season. Therefore, this is shown on the map in red color. The zone is not proposed for any settlements or commercial activities. It can be utilized for flood protection measures including plantation, bio engineering structures, and construction of protection wall.

Forest-new Plantation Zone

In union council Kalam, the foothills and the vast grasslands below the tree line are potential sites for plantation of forest trees. According to the field work conducted in all the villages, the forest cover is sharply depleting. Thus, this results in natural disasters and environmental problems. The proposed sites on map are ideal for plantation of forest trees with protection measures after plantation like restriction of free grazing.

Recreational Zone

Kalam is a famous tourist area. It is also a hub providing services to the tourists for all the surrounding areas of Swat. However, the river side and forest side, everywhere in Kalam, is a recreational area. It is used for improving the services of three different zones which are allocated for recreational activities including picnic, sightseeing, and arranging events like Mela etc. One of the zones is situated in proper Kalam vast grassland; another is situated at the south of Kalam at village Gaheel; and the third is situated at Ushu village.

Agriculture Cum Residential Zone

In this present circumstance, due to the availability of very less plain or gentle slopes, land ownership and disaster proneness of the residential area cannot be separated from the agriculture lands. The people are constructing houses in the agriculture lands owned by them and are doing farming in the nearby land. The site is situated between the steep mountain slopes. Also, the river shown on the map is allocated for agricultural and residential activities.

Commercial Zone

At present, the shops and hotels are mostly situated along the main road. In the proposed land use plan, two different zones at proper Kalam and Ushu were allocated for commercial activities. At proper Kalam, the area adjacent to the present commercial area is mostly composed of open spaces or houses that are allocated to commercial area. Another zone for

commercial activities is allocated at village Ushu. Therefore, the site is situated close to the main road.

Existing Forest Area Zone

The forest in the area is so much important to be protected. The zone already covered by the forest area is allocated to the forest. Thus, it needs to be further protected from deforestation. The forest area is also providing sources of earning livelihoods like non timber forest products including morels, medicinal plants, local honey, tourism, and valuable fallen trees. No any other land use shall encroach to the existing forest area.

Glacier and Snow Zone

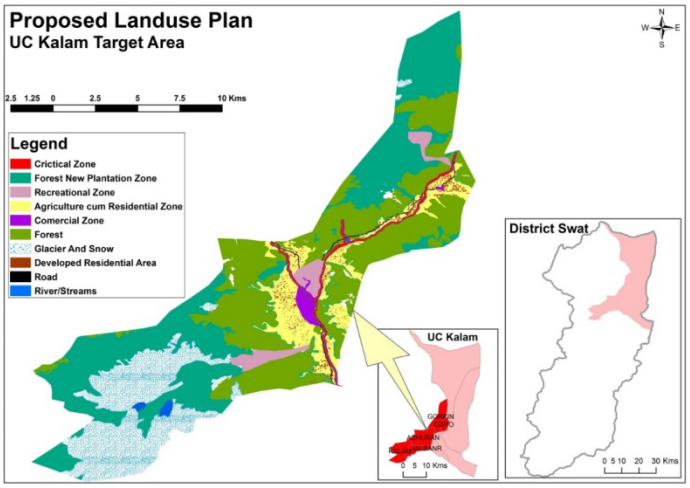
The region above the tree line on mountains is covered by vast pastures, snow and glaciers, providing a very nice view from the down valley regions. However, this zone cannot be used for any other purpose except grazing in the pastures during the summer season and providing hiking services to the tourists.

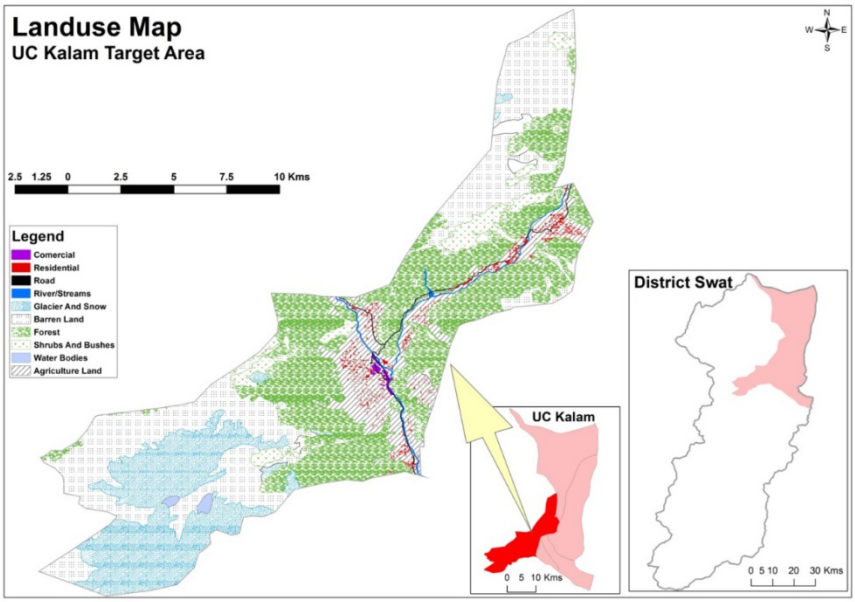
Developed Residential Zone

The zone which is already being occupied by the residential area is shown on the map. The houses are mostly in scattered form in the agriculture lands.

Road and River Zone

The road and river is shown on the map. The proposed zoning is made according to the accessibility of the road side. According to the local people after the 2010 flood, the lateral erosion of river is active. However, this can result to an increase in the river area. For this purpose, there is a need for erosion control measures along the river.





Recommendations

i- Controlled Grazing

Apart from deforestation, the major cause of forest depletion is free grazing. Every year, the nomads keeping goats and sheep are migrating to the area in big number. Thus, they freely graze their herds. Free grazing affects newly growing forest trees. In such situation, there is a dire need for controlled grazing on a rotational basis.

ii- Alternate Sources of Fuel and Construction Wood

In the present circumstances, each of the household need four to five forest trees for their annual fuel consumption. This is especially for those families who remain in the area during winter season. In the present circumstances, they are not having an alternate source of wood fuel. Hence, they were used for heating purposes. It serves as some alternate sources of wood fuel like plantation of fast growing trees on marginal lands, use of coal for heating etc.

iii- Soil Erosion Measures

In the target Union Councils, soil erosion is becoming so much frequent. Therefore, the valuable soil is being eroded with the passage of time with surface runoff and along the streams and river. Increase in the rate of soil erosion results in an increase in the waste lands with barren hard rocks. In addition, areas lying below are becoming more prone to rock sliding. In mitigating soil erosion, there is a need for soil erosion measures including plantation, bio engineering structures, and constructing of check dams.

iv- Standards Regarding Housing

The people in the target union councils were using excessive forest wood during the construction activities. Apart from the common use in housetops, frames, and doors, they are also used for the construction of walls. In constructing houses, a standard and excessive use of forest wood should be prohibited.

v- Improving Land Tenure System

In the present circumstances, there are some big pieces of lands. These lands were disputed and the local people are more proactive to cut trees from these lands. Improving the land tenure system for such lands will lead to clear ownership. Also, some productive use can be initiated by the owners.

vi- Top Working and Value Chain Promotion on Agriculture

According to the opinion of local farmers, the agriculture productivity is sharply decreasing with the passage of time, especially for some vegetables like potato. Due to decrease in agriculture productivity, the local people are not taking care of the agriculture lands. If the productivity will be increasing, they will value the land and will try to preserve agriculture lands for earning their livelihoods.

Conclusion

Land use planning is almost having similar challenges in all the ten villages of the target union councils. Forest cover being the most important land use is almost decreased by 40 to 50% in the target villages. With the passage of time, the agriculture lands are encroaching towards forest area. Also, the fertile agriculture fields are being converted into settlements. Constructing houses in a scattered form also increase the area covered by streets and drains. Due to small land holdings, it is hardly possible to allocate space for housing that is safe from the disasters and protection of the valuable agriculture land. The open spaces close to the village settlements which were being used as communal grazing lands are being converted into agriculture lands. Also, the barren rocky open spaces are increasing on mountain slopes.

Consequently, the major natural disasters of the area are rock/land sliding, glacial avalanche, and floods. This is with the passage of time. Also, the frequency and intensity of the natural disasters is increasing. The prime reason behind this is the decrease in forest cover. If the same trend continues, there will be an increase especially in land sliding and floods. The forest cover is depleting with the passage of time due to deforestation, overgrazing, and encroachment of other land uses. The natural disasters can be mitigated by an increase in forest cover and some other initiatives like bio engineering structures, plantation along streams and construction of protection walls.

Some initiatives from the local people and government can lead into positive contribution towards forest cover like controlled grazing, plantation of forest trees, use of other than valuable forest trees for household use including some indigenous trees and agro forestry trees. In some villages, the communal land is laying waste. Mostly, the soil cover is sharply eroded by water. The division of such land among the people can have some productive use of the land like plantation etc.

In conclusion, the population is sharply increasing with the passage of time which leads towards changes in the land uses. Also, natural disasters are becoming more frequent. In this situation, there is a dire need of land use planning, raising awareness regarding that, and the implementation of some measures related to land use planning by the target communities and government departments.

Pictures taken during the field work

Useless rocky slopes

Soily open spaces, potential for forestation

Deforestation leading to slope instability

Sessions with the community in progress

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