IMPACT OF DEFORESTATION AND TIMBER USE IN RURAL HOUSE RECONSTRUCTION IN EARTHQUAKE AFFECTED AREAS OF KPK AND AJK

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IN THE NAME OF ALLAHA, THE MOST MERCIFUL AND BENEFICIENT.

Dedicated to,

Evergreen part of my memories:

My Mother (Late) who was one of the best women on the earth

&

My Father who always encourages me and prays for my success.

(Acceptance by the Viva Voce Committee)

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List of Acronyms

AJK	Azad Jammu and Kashmir
ADB	Asian Development Bank
ADP	Association for Development of Pakistan
AusAID	Commonwealth of Australia Agency for International Development
CF	Community Forestry
CFMG	Community Forest Management Group
DRU	District Reconstruction Unit
DMS	Disaster Management Cell
ERRA	Earthquake Rehabilitation and Reconstruction Authority
ERRI	Emergency Response & Research Institute
EU	The European Union
EKC	Environmental Kuznets Curve
FAO	Food and Agriculture Organization
FSC	Forest Stewardship Council
GHG	Greenhouse Gases
GDP	Gross Domestic Product
GSP	Geographic Survey of Pakistan
IOM	Industrial Organization for Mitigation

ICARF	International Centre for Research in Agro forestry
IUCN	The International Union for Conservation of Nature
KPK	Khyber Pakhtunkhwa
OCHA	UN Office for the Coordination of Humanitarian Affairs
PERRA	Provincial Earthquake Reconstruction and Rehabilitation Agency
RHRP	Rural Housing Reconstruction Programme
ReGrIn	Rebuilding Green Infrastructure
RCC	Reinforced Concrete Cement
REA	Rapid Environment Assessment
SERRA	State Earthquake Reconstruction and Rehabilitation Agency
TPV	Third Party validation
TA	Technical Assistance
UNDP	United Nations Development Programme
UNADC	The United Nations Disaster Assessment and Coordination
UNEP	United Nations Environment Programme
UN-Habbitat	United Nations Human settlements Programme
UNECE	United Nations Economic commission for Europe
WB	World Bank
WWF	World Wide Fund for Nature

ABSTRACT

Earthquake of 8th October 2005 caused massive destruction in rural areas of Khaber Pakhtunkhwa and Azad Jammu and Kashmir. More than 780, 000 buildings were destroyed, 3.5 million people lost their homes, and most of the affected population was in the rural areas of KPK and AJK. A number of negative environmental consequences appeared due to post reconstruction activities. Demand for timber for reconstruction activities increased which put pressure on local ecosystems resulted in rapid degradation of forests with consequent loss of their environmental services. Deforestation causes the overall change in global climate due to global warming, loss of biodiversity, soil erosion, increases the threat of land sliding, and affects the rural livelihoods. Research study about impact of deforestation and timber use in rural house reconstruction in Earthquake affected areas of KPK and AJK was carried out. This study is based on field surveys questionnaire was used as tool for collection of data. 60 villages of 32 union councils of seven districts of KPK and AJK were consulted for data collection to determine the timber utilization and deforestation during reconstruction of houses. This research highlights the environmental problem of forest degradation during reconstruction activities after big disaster. After statistical analysis of collected data, the conclusion drawn is that in both KPK and AJK excessive use of timber for reconstruction of houses resulted into degradation of natural forests, which ultimately causes water resources depletion, productivity of land lost, and global warming. Highest number of trees was removed in district Battagram in KPK. In Rashin and Leepa all, the houses are Dhajee

type with extensive use of wood. Overall in comparison of timber utilization in AJK and KPK it is found that in AJK more degradation of natural forests as compared to KPK. Based on all these facts it is suggested that strictly prohibit the cutting of trees and sustainable use of timber should be encouraged. Excessive use of wood in reconstruction of houses should be prohibited. Replantation, good governance and sustainable management of forests all are important steps that should be taken to control the forest degradation due to rural reconstruction activities. Moreover forest department should properly monitor and control the illegal activities and timber mafia.

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(Saveela Tahir)

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DECLARATION

I hereby declare that the work present in the following thesis is my own effort, except where otherwise acknowledged and that the thesis is my own composition. No part of the thesis is previously presented for any other degree.

Date: 21-03-13

Saveela Tahir

FORWARDING SHEET

The thesis entitled, Impact of Deforestation and Timber use in Rural House Reconstruction in Earthquake Affected Areas of KPK and AJK submitted by Saveela Tahir, Registration No 50- FBAS/MSES/FO8 in partial fulfillment of Master of Studies in Environmental Sciences has been completed under my guidance and supervision. I am satisfied with quality of research work and allow her to submit this thesis for further process as per IIUI rules and regulations.

Date:__________

Signature:____________

Name: Dr Rashid Saeed

Chapter 1

INTRODUCTION

A drastic earthquake of 8 October, 2005 damaged various parts of Pakistan among which Khyber Pakhtunkhwa (KPK) and Azad Jammu and Kashmir (AJK) were most effected areas. A heavy damage occurred to trees of these areas because of deforestation during the earthquake and the use of trees by the people of these areas to rebuild their houses after the earthquake. The purpose of this research work is to estimate the loss of trees in various areas of Khyber Pakhtunkhwa (KPK) and Azad Jammu and Kashmir (AJK) and also to study the loss pattern of trees. This study will help us to determine that in which area the loss was more due to deforestation phenomenon and in other areas due to timber use for reconstruction of rural houses after the earthquake. This information will certainly help to take proper measures to cover the losses and rehabilitate the natural environment in these areas.

On Saturday 8 October 2005 at 8:50 am local time earthquake Of 7.6 magnitude occurred in northern Pakistan. The initial earthquake was followed by more than 300 aftershocks. The epicenter was situated just 95 km northeast of the Pakistani capital Islamabad (UNDAC, 2005). This caused massive destruction in the area. According to the Pakistan Government's official statement of November 2005 the death toll stood 87,350, although it is anticipated that the death toll could reach over 100, 000. Approximately 1, 38,000 were injured and over 3.5 million left homeless. According to government figures, 19,000 children died in this earthquake. Most of the children died because of the collapse of school buildings. The earthquake distressed more than 500,000 families. Approximately 250,000 farm animals died because of collapse of stone barns and more than 500,000 large animals needed immediate shelter from the harsh winter (EERI, 2006).

More than 780,000 buildings were completely destroyed and many more were damaged to such an extent that could not be used for a long time. Out of these, about 17, 000 were school and hospital buildings which were very close to the epicenter. Lifelines were badly affected. The critical roads and highways were damaged and bridges failed. Thus these areas remained cut off from main cities even three months after the earthquake (EERI, 2006).

The Asian Development and the World Bank conducted a joint assessment. According to their report, 203,579 housing units were destroyed and 196,575 units were damaged. Eighty four percent of the total housing stock was damaged or destroyed in AJK while 36 percent in KPK. These figures are expected to grow because the damages occurred due to aftershocks are not included and the losses occurred in the remote area will be included as the facilities to reach these areas become better. Ninety percent of the destroyed or damaged housing are found in rural areas. (ADB/WB, 2005). The 8 October 2005 earthquake that hit the northern Pakistan, KPK and Azad Jammu & Kashmir (AJK), was the most devastating in the nation's history.

The size of damage reached to hundred percent in Balakot tehsil. The damage ratio was up to 80 to 95 percent in other tehsils. Even the places, which were far from the origin of earthquake like Abbottabad got, damage about 15 percent. In rural areas the houses (kacha houses) are made with mud; heavy stones and heavy timber. The earthquake totally smashed these houses (ERRA, 2007). Thus, almost every family in rural areas was badly affected as they lost shelter and every thing in their lives.

Figure 1.1 A view of destruction caused by the 8 October, 2005 Earthquake in Balakot.

The foremost requirement for each and every family was to get a shelter. For this purpose, they got building materials from whatever means they can. These post earthquake reconstructions put number of negative effects on environment. For example, increase in the demand for timber, bricks, and other materials. Reconstruction caused accelerated deforestation, which weakened the natural cleaning process of environment. Massive reconstruction also has other environmental impacts that result in increased pollution, degradation of watersheds, sanitation, and health problems and issue of debris removal (ERRA, 2007).

Though the loss of human lives in the earthquake is the biggest loss but the other environmental issues generated as the aftermath of the earthquake, may become a threat not only to the nearby population rather the population of the remote areas too. The management of the waste material is a big challenge. For example, the vegetation cover should be properly managed to decrease the risk of landslides of slopes already destabilized by seismic activity, deforestation and grazing. The timber and stones, which are easily available in these areas, are lavishly removed for completing the ill-planed housing schemes will result in lost of their role such as slope stabilization and soil protection. Debris consolidation may become another environmental problem after completion of such housing schemes. The inefficiency in removing waste along rivers, drains, and roads during the reconstruction of houses will worsen the situation and will appear as a major threat for the environmental conditions (ERRA, 2007).

4.2 million hector land covered by forests in Pakistan, this area is equivalent to 4.8 percent of the total land area (Government of Pakistan, 1992), which is very low as compared with 30 percent of world forest area (FAO, 2001). Most of the forest distribution is in northern part of the country. 40% of total forests are in KPK and 6.5 percent in Azad Kashmir) (Babar, 2004)

Daily lives of the rural population living close to forested areas of KPK depend upon forests. Timber, pastures firewood and medicinal/edible plants all are the benefits that local people enjoy from forests. Forests dependent Communities are the poorest segments of the society and these are adversely affected by degradation of the forests (Durr, 2002).

KPK and AJK rich in fauna and flora, particularly in endangered species. Deodar, blue pine, chir, ash, maple, poplar, spruce and oak are present in District Muzaffarabad in addition to these species chestnut, quercus, olea cafidata and acacia modesta are also present in Bagh District. Blue pine and chir provide the most major forest cover in AJK. While in KPK lower alpine is a major forest covers in affected areas. District Manshera is rich in biodiversity. Most of the forests are reserved and guzara forests (ERRA, 2007).

The earthquake of 8 October not only damaged houses but also disturbed forest ecosystem of KPK and AJK. It further affected the commercial and valuable forest areas of KPK and AJK, where trees were uprooted, and felled, trees habitat disturbed, and mountains cracked. The needs of affected population in terms of fuel wood and timber for reconstruction are resulting in further pressure on forests (ERRA, 2007).

Post earthquake reconstruction caused further forests degradation in both KPK and AJK due to high demand of timber for reconstruction and fuel consumption during winters. The valuable trees Cedrus deodara and Pinus willichiana were criminally used as fuel wood. The communities living close to forest areas changed the location of their houses and forestland intrusion increased (ERRA, 2007).

After the divesting earthquake of 8october, 2005 reconstruction of 13,000 projects and protection of environment during reconstruction activities was the instantaneous challenge. To address this challenge the Government of Pakistan established the Earthquake Reconstruction and rehabilitation authority (ERRA) on 24 October, 2005. ERRA was established as an autonomous organization at the federal level with the aim to reconstruct with the highest standards and protect the environment in earthquake-affected areas against all reconstruction activities and rehabilitation process.

For the construction of houses in rural areas of KPK and AJK, ERRA provided the designs, specifications, and financial assistance to owners of houses in the form of four installments. The main purpose of the Program was the reconstruction of rural houses that comply with ERRA standards.

The Rural Hosing Reconstruction Programme was launched by ERRA for reconstruction of houses in rural areas. This was based on the geographical, environmental, and physical conditions existing in earthquake-affected areas. Special seismic opposing house designs were permitted to reconstruct houses that would be much more resistant to crumple for another earthquake.

1.1 SIGNIFICANCE OF THE STUDY

The study is about impact of deforestation and timber use in earthquake affected areas of KPK and AJK. This research highlights the environmental problem of forest degradation during reconstruction activities after the big disaster. It also advised the mitigation measures and recommendations for future to avoid precious forest loss. After earthquake October 8, 2005, houses and infrastructure had been greatly damaged. For reconstruction of houses, there is a requirement of timber that could be obtained by cutting of trees. Trees are the carbon dioxide absorbers deforestation can cause global warming which is a major environmental issue these days. Because of cutting of trees overall change in global climate occurred. This study also highlights the problem of soil erosion and loss of biodiversity arises because of deforestation. So sustainable use of timber, good governance, replantation and environmental training all are important steps which should be taken to control deforestation. Otherwise, deforestation can lead to another big natural disaster.

1.2 OBJECTIVES OF THE STUDY

This research study about impact of deforestation and timber use in earthquake affected areas of KPK and AJK was carried out as a member of the team of third party validation, which had been conducted by the ERRA and sponsored by the World Bank.

The main objectives of the study were:

- To study the level of timber utilization in rural house reconstruction in earthquake affected areas of KPK and AJK.
- To study the level of deforestation due to house reconstruction in earthquake hit areas of KPK and AJK.
- To analyze the environmental, social, and economic aspects related to the use of timber in rural reconstruction.
- To study the level of sustainable use of timber for reconstruction of houses in earthquake hit areas of KPK and AJK.
- To analyze the role of forest department in environment friendly reconstruction of houses.

1.3 SCOPE OF THE STUDY

The study will be helpful to ERRA to improve their work, and will act as a reference for next projects in Pakistan. It will help improve forest policy of Pakistan especially after earthquake. This study will also provide a guideline to improve to rural housing reconstruction strategy. The study will create awareness among all stakeholders regarding importance of forests and drawbacks of deforestation.

Chapter 2

LITERATURE REVIEW

Reconstruction and Rehabilitation work could produce adverse environmental and social impacts. For example, the reconstruction of houses might lead to timber logging and deforestation. As landslides have destroyed the sites for some of the houses, new sites would have to be found. ERRA has put together a strong environmental and social safeguards team, and has developed its environmental and social strategies and actions plans. Supported by a safeguards expert funded by the Australian Agency for International Development (AusAID), ADB is conducting a training program under EEAP for the safeguards specialists on national and ADB environmental and social safeguards policies and procedures. Under the Program, the attached TA project will provide additional assistance in social safeguards, as well as in integrating ADB's environmental, resettlement, and indigenous people's policies and procedures with the Government's regulations and procedures. These will supplement assistance from the United Nations Development Program (UNDP), which has allowed PERRA, SERRA, and DRUs to engage a team 20 safeguards specialists (ADP, 2007). An expert on forest management was made available by Swiss authorities on October 31, 2005 and deployed to Pakistan ensure that cutting of trees for fuel and shelter does not exacerbate erosion/landslide risks, or degrade the environment more than necessary under the circumstances (UNDAC, 2005). Construction materials used for rural housing in northern areas of Pakistan consist primarily of stone, wood and mud plaster (Rafay, 1990).

From February to May 1997, three devastating earthquakes occurred in rural areas of north and east of Iran. Considering the three consequent earthquakes in bad weather conditions and remoteness of the affected areas, the overall performance of the rescue and relief operations was excellent. In all earthquakes, 95 per cent of people were rescued within first 24 hours and by 48 hours all the affected people were settled in 70,000 tents as temporary shelters. Because of severe winter in north of Iran, reconstruction started one month after the earthquakes and 21,000 new dwellings (out of 29,000 planned) were built before the cold season started. The new seismically designed units are one storey with area of 40 to 60m. The units were built by the owner with free interest loans, subsidized construction material and under government supervision. By July 1997, 1,500 units and by January 1998, 20,000 units were finished and people were moved in. The overall evaluation of the rescue operation to reconstruction process is satisfactory and the lessons learned during the Manjil earthquake were useful and played a key role in this success. This reconstruction method now so far proved to be successful in rural areas and can be used in future in order to save time, money and reduce social consequences. In Iran temporary shelter cost up to one-third of the cost of permanent shelter (Ghafory, 1999). The government and the World Bank did not want to finance large-scale transitional shelter after the Yogyakarta earthquake (Manfield, 2007). An objection to transitional shelter is that there are many cases of transitional shelters that have become permanent (Bhattacharjee *et al.*, 2005). The World Bank's evaluation notes that temporary shelter is rarely temporary, and should be built accordingly (World Bank, 2006).

However, it may take years to provide permanent shelter. It sometimes happens that a response starts with the intention of avoiding transitional shelter. This was the case in Indonesia and Sri Lanka after the tsunami, but this position was reversed after three months in Sri Lanka and seven months in Indonesia (Scheper *et al.*, 2006). In Yogyakarta pressure from the Transitional Shelter sub-cluster led to a change in policy within six months (OCHA, 2007). A further problem is that the provision of transitional shelter may be nearly as slow as that of permanent shelter. In Aceh, it was projected that it would be more than two years after the tsunami before everyone was in transitional shelter, never mind permanent shelter (Oxfam, 2005). Transitional houses were still being built 18 months after the earthquake in Pakistan. Transitional shelter, like permanent shelter, can be supported by grants, materials or pre-built units. In urban areas of Pakistan, pre-built units were the norm, whereas providing materials for transitional shelters (timber, plastic and roofing sheet) was the norm in rural areas. In Bam there was a mix of owner-built transitional shelters and government-supplied pre-built dwellings the question of whether to use transitional shelter is complex. The most sensible transitional shelter arrangements are those which can later be incorporated into permanent dwelling, as happened in rural areas in Pakistan (Cosgrave and Nam, 2007). Ideally, transitional approaches should preserve existing social relationships (World Bank, 2006).

Every earthquake generates large amounts of rubble. One relief measure that can be useful is paying people to clear rubble. This can quickly inject some cash into the economy. However, there are several issues to consider here. Rubble contains elements such as timber, metal and other scrap that can be used to provide emergency shelter; 40% of respondents in a survey in Aceh reported that they had used salvaged materials to build emergency shelters (IOM, 2005a). Scrap also has an economic value that may be quite significant in the post-disaster construction boom. The price of timber tripled in Aceh after the tsunami (Oxfam, 2005). Scrap is so attractive that people may engage in risky activities to collect it, whether diving in Aceh (Brusset *et al.*, 2006) or risking injury in Pakistan (EERI, 2006).

Fuel wood is an important component of household economies in Pakistan: it covers about 53% of total annual domestic energy needs (Government of Pakistan, 1997). It has also been estimated that 70–79% of Pakistani households use fuel wood as a main source of energy (Hafeez, 2000; Siddiqui, 2000). This reliance on fuel wood is expected to remain high in Pakistan in the near future, mainly because the country's economic development is not strong enough for a shift from traditional to modern fuels (Siddiqui and Amjad, 1993). The high demand for domestic fuel wood is believed to be the cause of Pakistan's rapid depletion of forests (Government of Pakistan 1992). The deforestation rate in the country is estimated to be the second highest in the world (IUCN, 2002). The World Conservation Union (IUCN) has estimated that with the current population growth, wood consumption in Pakistan would increase by 3% per year. Hence, IUCN (2002) believes, if the present rate of deforestation continues; Pakistan's forests may vanish within the next 10–15 years. In Asia, the forests in the Himalayan region are considered to be among the most depleted (Tucker, 1987). Deforestation in the Himalayan region is also often attributed to increasing human population (Eckholm, 1975, 1976) called this explanation "overly simplistic" and has named it the "Theory of Himalayan Environmental Degradation." He argues that environmental degradation has been overdramatized, and often mere correlations between environmental degradation and other factors have been represented as a causal relationship. In this way, the conservationist literature has diverted the discussion from the main issues and the real causes of deforestation. Despite the importance of fuel wood collection for the national economy, reliable data for Pakistan on fuel wood collection and its impact on natural forests are not available. This is especially true for the Western Himalayan region in the Northern Areas (NAs), where few—if any—empirical studies of fuel wood consumption have been conducted so far. The present study has been undertaken to respond to this lack of reliable data and to gain an understanding of how fuel wood collection by the local communities impacts on forests in the northern areas of Pakistan. While other factors such as livestock grazing and conversion of forest to agricultural land may in some cases also be reported to contribute to deforestation, firewood consumption by local people is often mentioned in the literature as the main cause of deforestation in this region. In addition, the local extraction of timber was also estimated in order to be able to present a more complete picture of the causes of deforestation in the area. Indeed, overuse and mismanagement have been reported to have seriously impacted on natural forests in Basho Valley (Velle, 1998).

Some influential studies have suggested that biofuels production, depending on how its feedstock is grown, could lead to deforestation, biodiversity loss and net increase in global greenhouse (GHG) emissions through land clearing activities in carbon-rich peat lands or forests. Considering the importance of Indonesia's forests in climate change mitigation and the fact that the country produces almost half of global oil palm output, a major feedstock for EU biodiesel production, this study asks whether the EU Biofuel Directive contributed to forests loss in Indonesia. The paper finds that provinces with the highest log production also had the largest oil palm output. Furthermore, using province level data from 1997 to 2007, it is shown that greater palm expansion occurred after 2003, while increases in the world price of palm kernel also contributed to expansion in area harvested of oil palm during the period. Indonesia, which accounts for almost half of the world's oil palm production, has come under focus due to the importance of its forests as one of few remaining large tropical carbon-sinks. These forests are being threatened due to the expansion of palm plantations to produce palm oil, of which about 35% is exported mainly to the EU as a major feedstock for biodiesel production (Stromberg *et al.*, 2010).

It is estimated that deforestation is responsible for nearly one-fifth of global greenhouse gas emissions - more than the entire transport sector, and would likely release an additional 87 to 130 gig tons of carbon by 2100, equivalent to a decade of burning fossil fuel at current rates (UNDP, 2004).

As Fitzherbert *et al.*, (2008) suggested, oil palm expansion could in principle contribute to deforestation in four often indistinguishable ways: (i) as the primary motive for clearance of intact forests; (ii) by replacing forests previously degraded by logging or fire; (iii) as part of a combined economic enterprise, such as with timber, plywood or paper pulp profits used to offset the costs of plantation establishment; or (iv) indirectly, through generating improved road access to previously inaccessible forest or displacing other crops into forests.

Deforestation, defined as the annual change in forest cover, is one of the most actively researched environmental problems, with several factors identified among its causes (Brown and Pearce, 1994). On the global scale, socio-economic indicators such as income and population have been identified as determinants of deforestation. The role of income, usually measured by the gross domestic product (GDP), is explained through the Environmental Kuznets Curve (EKC) hypothesis. For example, Bhattarai and Hammig (2001) present evidence of an EKC relationship between income and deforestation in Asia, Africa and South America arguing that with a rise in income, the economic structure might shift towards coal and petroleum-based fuels, reducing the incentives to convert forests. However, such reduction in the rate of forest depletion depends largely on strong institutional factors rather than commonly cited macroeconomic variables.

A number of factors have contributed to the deforestation process in Nepal. Of them, shifting cultivation, overgrazing, illegal logging, unscientific cultivation in the hills, construction of physical infrastructures and collection of fuel wood, fodder and small timber for household consumption are the major ones. Once the deforestation occurs soil organic matter, flora and fauna are lost, run-off is increased, soil is compacted and top soil is eroded. Deforestation reduces the number and varieties of various organisms, and damages ground vegetation. Destruction of vegetation and soil erosion lead to loss in the production potential of the land. It further leads to the loss in biodiversity, occurrence of landslides and floods and increase in land degradation (Karkee, 2004).

The study strongly supported the fact that the protection and management of forest by local people positively affected a majority of the livelihood parameters. In addition to the natural capital and physical capitals, the indicator related to human and social capitals also increased after the adoption of community forestry. Local foresters participated in training programmes on capacity building and various skill development schemes. The community forestry approach also helped resolving small issues and conflicts at local level and there was an increase in the social cohesion. The finding of this study revealed that control of deforestation contributes to the increase of all the aspects of livelihood capitals (Karkee, 2004).

During the 'construction boom' phase (for about 3 years following the Tsunami), the high demand for construction materials (sand, stone, timber and brick) has led to intensified logging and sand/rock mining activities throughout Aceh and Nias. Reconstruction works, mainly in the coastal areas, in Aceh have already used an estimated 850,000 cubic meters of illegal logs (nearly 50% of the total timber used). It is estimated that illegal logging is destroying around 20,769 hectors of rain forest each year in Aceh. Most of this is in the inland areas that had remained relatively intact during the conflict years. The deforestation sharply intensified after the earthquake and Tsunami. The price of rice doubled within a year after the Tsunami, leading to clearance of more land for growing rice. The clearance of peat area for human settlements and oil palm plantations is also an environmental problem Given the importance of tree crops for both economic and environmental development in Aceh and Nias, in 2006 ICRAF and partners initiated a project Rebuilding Green Infrastructure with Trees People Want (Trees, Resilience and

Livelihood Recovery in the Tsunami-affected Coastal Zone of Aceh and North Sumatra, Indonesia) with funding supports the EU Asia Pro Eco-II programme. The ReGrIn project is promoting economically valuable trees in the coastal landscape in tsunami and earthquake damaged areas of West Aceh and North Nias. These productive 'trees people want' contribute to an enhanced resilience of the local communities to natural disasters and helps expedite livelihood recovery and economic development (Joshi, 2008).

Khan and Pervaiz (2001) point out that forest management in Pakistan has led to the divergence of individual versus social objectives with regard to the use of forest resources. The most important factor in this development is commercial timber extraction in which influential extractors collude with forest department officials. Co-opting officials has become easier as stagnant salaries have led to increased corruption. Forest fines and penalties have also become meaningless, as they have not kept pace with rising timber and fuel wood prices. Attempts to right price/tax the use of environmental resources is politically challenging as stakes resist policy reform threatening their economic profits. They also indicate that the lack of clearly defined resource rights exacerbates the impact of perverse incentives.

Community focus group discussions indicate that the forest department is viewed as inefficient and corrupt. The discussions cited Collusion with the timber mafia and the selective application of fines and penalties for forest transgressions as manifestations of such corruption (Khan and Khan, 2009).

In response to the disastrous floods of 1998, the Chinese Government introduced a policy in 1999 to return much of the low quality farmland to forest. In 2001, the State Council approved the plan for the six key forestry projects in China, which includes: (1) National Forest Protection Project; (2) "Grain for Green"; (3) The Three-North (northeast, north and northwest China) Protective Forest Programme; (4) Beijing-Tianjin Sand Source Control; (5) Wildlife Conservation and Nature Reserve Construction; and (6) Fast Growth Plantation Programme (Han, 2009). China's forest area expanded rapidly from 2001 because of the effect of these policies. Forest planting reached a peak in 2003, which was more than 80% higher than 2001 levels. From 1990 to 2000, the average annual area planted in China was 1.99 million hectares, and during the period 2000 to 2005, it averaged 4.06 million hectares. During 2008, 4.77 million hectares of forests were planted. These rates far exceed any other country (FAO, 2009).

On 12 May 2008, a magnitude 8 earthquake hit southwest China, with the epicenter located in Wenchuan County, Sichuan Province. Official casualties included more than 69,000 dead, 18,000 missing and 370,000 injured. An estimated 5 million people were left homeless. The quake caused extensive damage to infrastructure, with many roads and railroads left impassable, and thousands of buildings damaged beyond repair. Extensive damage to forests resulted from landslides, rock falls, and flooding caused by the formation of quake lakes; some 330,000 hectares of forests were affected across 46 counties. An estimated 19.58 million cubic meters of standing timber was lost (although some can potentially be salvaged). Due to the heavy dependence of local people on forest resources prior to the earthquake (timber, fruit, bamboo, gingko, herbal and medicinal plants, ecotourism, etc.). Local residents are supportive of proposals to rehabilitate forest resources and forest-related infrastructure. Good opportunities exist to involve local people in revegetation efforts, replanting of "economic forests" and rebuilding of forest-related infrastructure (Patrick, 2008).

The nexus between integrated family health and forestry systems in the KPK shows that poverty is one of the main factors of deforestation. Studies suggest that one single illness in the household would push the family into the poverty trap, compelling the people to resort to deforestation as a source of livelihoods (Zia, 2002).

Burgeoning population pressure resulting in unsustainable removals, dependence of 90% of rural & 60% urban households on fuel wood as primary source of energy; suspension of forest management in natural forests, unscientific grazing beyond carrying capacity, lack of adequate and sustained financial inputs for natural regeneration and sustainable development of fragile ecosystems (mountain, riparian, desert, mangrove), floods, fires storms, pests and diseases, developmental pressure i.e. construction of roads, buildings, and water reservoirs disturbing riparian and mangrove ecosystems lead to widespread deforestation in Pakistan (Saeed, 2003).

KPK has been the best forest resource in the country and provides a lot of timber to other provinces too. On the other hand, the high mountains in which the major part of the resource is situated are catchments of the rivers Tarbela and Mangla Dams. Similarly, local communities depend on the resource for their timber and fuel wood needs, fodder for cattle, and a general source of livelihood. The importance of the resource for the wild life habitat, environmental conservation, and bio diversity cannot be over stated. On these accounts sustainable management of the forest resource in the province is extremely important and at the same time highly complicated (Mehmood, 2003)

"With one of the highest rates of deforestation in the world, Pakistan's forests are in urgent need of protection and conservation". The conservation of our natural resources, habitat management, and their proper use, constitutes the fundamental problem which underlies almost every other problem in the area. What we must realize is that to skin and exhaust the habitat instead of maintaining it efficiently. The wastage of soil by water erosion, deforestation, and by human activities, for instance, is among the most dangerous. The present annual consumption of lumber is three times greater than the annual growth, and if this consumption rate continues, practically all our lumber will be exhausted in the near future (Natura, 2004).

Single most effective way to protect the type of forest that indigenous people inhabit is to involve them in the conservation process. They have a lot vested in the preservation of the forest ecosystem. That is where to get their water, their medicines. Forest guards are often not from that area, in fact, they are from somewhere far away, and sometimes they don't even live in the local area. The best way to protect ancestral rainforests is to help the local peoples hold on to their culture, is to help them protect the forest. People who best know, use, and protect biodiversity are the indigenous people who live in these forests. Local forest house hundreds of thousands of species of plants, many of which hold promise for their compounds which can be used to ward off pests and fight human disease. No one understands the secrets of these plants better than indigenous peoples - medicine men and women – who have developed boundless knowledge of this library of flora for curing everything from foot rot to diabetes. However, like the forests themselves, the knowledge of these botanical wizards is fast disappearing due to deforestation and profound cultural transformation among younger generations. The combined loss of this knowledge and these forests irreplaceably impoverishes the world of cultural and biological diversity (Butler, 2006).

Apropos, the capacities necessary for effective disaster mitigation and reconstruction in general could be represented through comprising a society with organizations particularly deal with disaster issues, well-developed disaster plans and preparedness, coping mechanisms, adaptive strategies, memory of past disasters, good governance, ethical standards, local leadership, physical capital, resilient buildings and infrastructure that cope with and resist extreme hazard forces, etc. (Benson, 2007).

Further, the experience and participation of local and international community are extremely important in disaster mitigation and reconstruction in the built environment. Many studies have recognized the need to include local community's participation into disaster reconstruction (Pardasani, 2006; Owen and Dumashie, 2007; Jayaraj, 2006) since disaster reconstruction is about building back homes and infrastructure to become more resilient to the next disaster, and fit for purpose for the community (Owen and Dumashie, 2007).

Incidentally, building codes, land-use planning, environmental risk and human vulnerability monitoring and safety standards are important in improving the design and construction of buildings, agricultural structures, infrastructure and other facilities to reduce their susceptibilities (Nateghi, 2000). Bosher *et al.*, (2007a) state that risk and hazard training should be systematically integrated into the professional training and professional development of architects, planners, engineers, developers, etc. and it is important to encourage cross disciplinary training for construction professionals and emergency managers (Bosher, 2007a).

Capacity gaps in the field of disaster management in general are common to disaster mitigation and reconstruction within the built environment as well. Thus the most common capacity gaps in relation to disaster mitigation and reconstruction can be mentioned as lack of necessary policies and legislation for mitigation and reconstruction, poor implementation of policies and legislation, (Nateghi, 2000; Mileti, 1999) problems in disaster management planning structures and coordination of stakeholders (El-Masri and Tipple, 2002), lack of disaster management related awareness, lack of proper education and training, lack of skilled and trained human resources for mitigation and reconstruction, (Bosher, 2007b) deficiencies in state of the art technology for disaster mitigation and rapid and sustainable reconstruction, deficiencies in information management (Laverack, 2005), and lack of community involvement in reconstruction (Lawther, 2009).

According to Gunaratnam (DMC-SL, 2010), the safe building guidelines have not been practiced properly owing to various gaps within the system in Sri Lanka in spite of they have been in existence for decades. Further, it has been pointed out that landslides often take place in Sri Lanka in its mountainous regions and in urban areas in particular, due to wrong practices, unavailability of retaining structures, improper cutting, and filling operations etc. (Anonymous, 2005). Incidentally, the tsunami on 26th December 2004 drew the attention of the government and the society towards many capacity gaps in the disaster management system of Sri Lanka. According to (Jayawardena, 2006), the massive destruction caused by the tsunami reconfirmed the need for multispectral, inter-institutional, and multi-disciplinary approaches to manage disaster risks in Sri Lanka. The findings of a study on reconstruction capacity gaps in Sri Lanka following the 2004 Tsunami highlight several capacity gaps that have hindered reconstruction efforts in the built environment after the tsunami (Haigh *et al.*, 2009).

Buildings and the equipment within them account for much of an affected community's demand for energy and material resources. Sustainable design and construction practices can greatly reduce the flow of energy, water, materials, and wastes that make indoor environments comfortable, convenient, and attractive. Building energy efficiency contributes significantly to sustainability by decreasing the environmental impact of energy use. While achieving energy efficiency is an important feature of sustainable design, selecting construction materials with minimal detrimental environmental effects presents an equally important challenge. This issue has become more meaningful as we become more aware of how purchasing decisions affect both individual human health in the indoor environment of our buildings, and the outdoor, natural environment. Descriptors such as environmentally benign, pollution-free, earth-friendly, resource-efficient, holistic, green, and healthy are often used to signify methods and materials that contribute to long-term sustainability. The most desirable building materials would be those, which were locally available, made from renewable resources, easily handled with local skills, had some value as thermal mass or insulation, and used little energy to produce, transport, and install (Sarkar, 2006).

Reinforced concrete and steel are the most common materials in building structure. Reinforced concrete has good durability and stiffness with relative low cost. Good seismic ability can be achieved through adequate design and detailing. Steel is a ductile material with good strength and is ideal for seismic buildings. Disadvantages of steel include cost, higher skill levels, and fire and corrosion protection (Yu *et al.*, 2002).

Non-structural partition walls using local materials such as bamboo, timber and clay bricks are low cost, but were eliminated due to durability and environmental aspects as regulated in the China code. Three options including precast panels; masonry walls; and straw bales are considered here. Precast panels could be standardized for batch production in a factory with low cost and good quality; based on the lessons learnt from 512 Sichuan Earthquake, a well-confined masonry wall has much better seismic ability than unconfined or inadequately-confined masonry walls. Seismic resistance can be achieved through robust structural detailing with reinforcement properly connected to main structural members. Masonry can also be manufactured from industrial waste with low cost. Another option for partition walls is the Straw Bale, which is more environmentally friendly, lightweight, and low-cost and has good thermal and acoustic properties (Yu *et al.*, 2002).

In Pakistan, rebuilding was prohibited in high-risk zones after the earthquake. While such restrictions may seem sensible at first glance, their cost needs to be balanced against the risk. There is also the question of effectiveness, as others may occupy the unsafe land once the original occupants are relocated (Anonymous, 2005).

In rapid environmental assessment, report (REA) of Joint UNEP/OCHA Environment Unit (2006) advice was provided on the likelihood of another earthquake occurring somewhere southeast of the epicenter within the next century. The expert recommended a safer and sustainable housing style with a light roof for reconstruction. He noted an abundance of clay in the region that could be processed to create a lighter housing insulation. He emphasized that another reason for the collapse of buildings and infrastructure during earthquakes is the undercutting and over-steepening of slopes without reinforcement (Anonymous, 2006).

According to environmental assessment report (REA) of Joint UNEP/OCHA Environment Unit (2006) after earthquake of 8 October 2005, immediate needs for timber for reconstruction will soon lead to serious deforestation, increasing the risk of soil erosion and potential landslides if measures are not taken. As well, energy efficient stoves and other alternative energy resources should be distributed to people in the region to reduce the pressure on forest resources. An emphasis should be placed on the reuse of wood from demolished buildings. The local administration should conduct assessments of the intact beams before issuing permits to harvest new timber. A possible lift of the ban on cutting green trees only for the affected areas and the respective consequences should be analyzed carefully by the MOE in order to avoid large uncontrolled cutting (Anonymous, 2006).

In post-tsunami Indonesia, the procurement lead time was contingent on a broader recovery environment. For instance, evidence from the observations and interviews showed that during the tsunami reconstruction, the 'Green Aceh' timber administration rules issued by the Indonesian government in 2007 reduced the possibility for donors to procure timber locally in Indonesia. A number of NGOs resorted to donor countries or other producing countries for timber resources. The lead time of procuring timber off-shore was unpredictable, especially when negotiating and obtaining approvals from Indonesian authorities or encountering road bandits during transportation in northern Sumatra (Chang *et al.*, 2010).

Housing in Aceh can be classified into three main categories, namely:

- The "permanent" houses, which are built from brick, often with reinforced concrete frames.
- The "semi-permanent" houses, which are built from brick and timber.
- The "traditional" houses, which are timber structures.

The lightweight construction of "traditional" housing means these houses will probably meet life safety criteria, and their seismic resistance depends less on either design or workmanship. However, there was evidence of other problems including leaks due to poor workmanship or timber shrinkage, and termites (Lubkowski *et al.*, 2008).

The housing units in Muzaffarabad were comprised of 56.35% of wood (ERRA, 2007). This clearly depicts the availability of wood, which could be utilized in post earthquake scenario of reconstruction phase. Therefore, this was essential to investigate on scientific basis the availability of wood in the earthquake hit region to make inferences for the future strategies. Moreover, after the earthquake, the dangers of exploitation of already denuding forestry resources were manifold. In kacha buildings, Chir (Pinus roxburghii) constituted 60% and Kail (Pinus wallichaina) 40% of the total timber used. In case of pakka buildings, 55% kail (Pinux w allichiana), 23% deodar (Cedrus deodara) and 7% chir (Pinus roxburghii) made up the timber used. The people preference for the tree species for construction purposes shows that Kail (Pinus wallichiana) is highly preferred as 58% respondents were in favor of the species. The others were as follow; Deodar (Cedrus deodara) was 38% and Chir (Pinus roxburghii) was 12% respectively. (Qasim *et al.*, 2010).

Traditionally, wood construction has held a prominent position. Considering the facilities it offers for relatively easy construction, in which low-skilled labor can also participate, its positive characteristics of earthquake resistance make wood-based constructions highly popular. On the other hand, brick-based construction is the preferred option for families which strive for a ''modern'' house. The immediate upsurge of wood construction has led to a large influx of wood of questionable origin, most of this being wood from unlicensed and illegal logging in Indonesia. The donor community has reacted to this with great concern, and undertaken tedious importation drives of massive stocks of certified, environmentally cleared timber resources for construction. The importation of these resources from Canada and New Zealand had to face unprecedented bottlenecks by immigration authorities and roadside pirates in northern Sumatra. Ultimately, the donor community had to resort to the construction of landing pontoons and bring in the direct supervision of the Aceh and Nias Rehabilitation and

Reconstruction Agency thus eliminating criminal elements, which earlier had laid their hand on these imports (with some success). Related to this, there has been much debate about alternative, wood-free construction, using metallic or aluminum structures. Brick construction, as such, has stipulated other concerns regarding the environment, as the burning of bricks is done partly with wood, or by consuming costly petrol. However, the alternative of cement-based brick technologies does not seem to have been considered yet (Steinberg, 2007).

Recent comparisons show that the production of steel and concrete as building material requires up to two times more energy than wood-based products. Extraction costs for wood such as logging and transportation are less than costs associated with mining for iron and aluminum. Wood is also a natural insulator for temperature and sound. Fire retardant-treated wood-based insulation is proving to be more economical, and more environmentally friendly than fiberglass or polystyrene. From a life-cycle perspective, building with wood can be, depending on local and climatic conditions, more sustainable than building with other materials. Green building systems employ sustainably produced wood to construct new and renovate existing buildings. Wood framed housing is gaining market share in Europe, among others because of the many environmental and economic advantages of wood. In France, the Government is notably committed, through the legislation adopted as a result of a public consultation on environmental challenges (Grenelle de l'Environnement) to promoting the use of certified wood in public construction from 2010 onwards. The objective of this measure is to adapt construction norms so that they specify higher minimum levels of the use of wood in new buildings, and to support the creation of a related label. In its new Wood Resource Policy, Switzerland set a target of increasing the proportion of wood in all new buildings by 50% between 2005 and 2020(Anonymous, 2009).

On the morning of October 29, 2008, an earthquake measuring 6.4 on the Richter scale hit Ziarat, Pishin and Harnai Districts of Baluchistan Province. As result of the earthquake, 117,500 people were affected and 9,881 houses were damaged, as the scantily constructed buildings could not withstand the earthquake. Large areas of Baluchistan province are at high risk due to increased seismic activity in that region. According to Geographic Survey of Pakistan (GSP) areas from Quetta to Ziarat and Pishin fall in Zone 4 which is the highest hazard category in the Pakistan Seismic Code. The local skilled artisans are not aware of the use of reinforcement and anchorage specifications for vertical and horizontal reinforcement; adequate location of openings and wall heights are not known. Usually people are constructing the walls using timber or steel girders in the wall which are half mud and half masonry. The shift from traditional to the non-engineered light weight construction poses a threat on the durability of buildings and their thermal performance. Old construction had good thermal resistance whereas the new thin walls and light sheet construction with a light pitched roof will require continuous heating in winters, which will increase fuel needs. This factor will impact on consumption of local trees, the juniper tree that is on the verge of extinction (UN-HABITAT, 2010).

A community forest in Nepal as defined by forest act 1993 is a national forest handed over to a users group under specified rules and regulations for its development, conservation and utilization for collective benefits. Community forestry has been a priority programme of the forestry sector in Nepal for over last two decades in which local communities have use rights of the resources and are organized as grass-root level institutions for the proper management of these resources. It is based on the principle of devolution of power and authority to local communities which work in partnership with the Forest department on the basis of mutual trust and cooperation. It is understood as an umbrella term denoting a wide range of activities which link rural people with forests, trees and the products and benefits to be derived from. More specifically, it refers to a component of participatory forestry that focuses on local communities as key stakeholders for sustainability (FAO, 2002). Community Forestry (CF) is gaining popularity in Bhutan as one of the successful forms of Community-Based Natural Resource Management. This study assesses the rural wood (construction timber and firewood) supply in the five CFs of Yakpugang, Shambayung, Lamjithang, Woku-Damchi and Yargey and attempts to determine if the current quantities of rural wood supply from the Government Reserved Forest (GRF) can be phased out. By doing so, we shall address the skepticism of policy makers and senior government officials on Community Forest Management Group (CFMG) through advocating their capability to effectively manage their CF. The CFMGs are managing their forest in an admirable manner. But there are recognized difficulties in this, as three (Lamjithang, Woku-Damchi and Yargay) of five CFs studied are either too young or purely plantations which are not in position to supply construction timber to CFMGs. Nevertheless, the other two CFs (Yakpugang and Shambayung), with well stocked forests, can meet the construction timber demand of 95% of the CFMGs. Firewood supply from CF is in better shape than construction timber since the CFs in Shambayung, Lamjithang and Woku-Damchi could meet about 95% of the CFMG's requirement. Therefore, we find that while the Kidu system of rural wood supply from the GRF to the CFMGs can be phased out on case-by-case basis, it is still premature to phase it out for all CFs. The wood deficit should continue to be supplied from GRF (Phuntsho and Sangye, 2006).

If there is no widespread adoption of alternative construction methods in Darfur the los of trees during reconstruction will be considerable. Assuming a displaced population of 2 million, 29 and 5 people per household, the number of huts and compounds to be rebuilt on return would be 400,000 if everyone returns. If 30–40 trees are used per plot, then 12–16 million trees would be cut for reconstruction (Anonymous, 2007). According to the United Nations Food and Agricultural Organization (FAO), natural forest in developing countries decreased by 13.7 million ha a year between 1990 and 1995 (FAO, 1999). In addition to this deforestation, forest degradation–a decrease in the ecological quality of forests–is occurring on an equally large scale. While the causes of forest loss and degradation are numerous, logging for the timber industry is undoubtedly a significant factor in many areas (Dudley *et al.*, 1995).

The decrease in forest quantity and quality has also resulted in many trees species showing drastic declines, and a total of 8,753 tree species are listed as globally threatened (Oldfield *et al.,* 1998). Logging is a factor threatening at least 1,000 of them. The majority of threatened trees are from tropical forests, where species diversity is high and individual species may occur at low densities (unlike the relatively uniform northern forests, which are generally dominated by widespread species). Sustainable management of forests used for timber production is vitally important to the future of forest ecosystems as a whole, and for the individual species harvested. Promotion of sustainable forest management has received considerable attention over the years; one significant outcome has been the development of certification schemes such as the Forest Stewardship Council (FSC), which label wood products originating from forests certified as well managed. Using wood carefully, with minimum waste, is also a vital component of sustainable timber use. Reducing waste and increasing re-use and recycling of timber could help meet the increasing demand for wood without further impacting on the world's forests and tree species (Magin, 2001).

Reclaimed timber and timber items can be used in new buildings, renovations, or alterations, and current fashion means that demand for good quality items is high. An estimated 2,500 businesses exists reclaiming and selling building materials of all sorts, including timber items such as flooring, beams, doors, staircases, and ornamental woodwork such as carved wood, fire surrounds, paneling etc. The total turnover of the whole reclamation industry is £450 million a year; no figures for the timber reclamation business are available, although ornamental woodwork is alone worth £36 million a year (Salvo, 1998).

Chapter 3

MATERIAL AND METHODS

The research study on the impact of deforestation and timber use in rural house reconstruction was conducted in the earthquake-affected areas of Khyber Pakhtunkhawa and AJK. This study was based on field survey. Mainly, the data for this study was collected from field survey but some of the data was taken as reference from ERRA.

3.1 SAMPLE SELECTION

3.1.1 Geographic samples:

During field survey, 239 households in 60 villages of 32 union councils of 07 districts of KPK and AJK were visited and data was collected to get an elaborated statistics about relationship between environmental issues and impacts of reconstruction activities.

Table.3.1.1

Districts and union councils of AJK and KPK which were covered during the survey.

S.No	Districts	Union Council	No of households surveyed
1	Muzaffarabad	Lamnian	12
		Salmia	4
		Ressehian	5
		Nakot	1
		Banamola	3
		Chakkar	4
2	Bagh	Harigal	1
		Nae Shar Ali	8
		Jaglarri	4
		Bani Basri	7
		Bagh	4
		Salian	1
		Hillsurong	1
3	Rawalakot	Dhamni	7
		Bunjosa	2
		Daraik	5
		Ghala	2
4	Abbottabad	Berot kalan	8
		Bakot	32
5	Mansehra	Batal	25
		Chattar Plain	13
		Hillkot	1
6	Battagram	Ajmera	14
		Rajdhari	4
		Batagram	8
		Battamori	7
		Shamlai	17
		HottalbattKool	10
		Thakot	8
		Paimal shrif	2
		Batkol	6
7	Shangla	Maira	13
Total		32	239

3.1.2 Demographic sample:

For field survey, population of KPK and AJK that was severely affected in earthquake of October 8, 2005 selected. About 3.5 million people lost their homes, 85 percent of 3.5 million population affected by the earthquake was rural. 84 percent of the houses destroyed in the affected districts of AJK and 36percent were damaged in affected districts of KPK. There was 100 percent damage in Balakot district. Several other districts experienced 80 to 95 percent damage. Abbtabad experienced about 15 percent damage. Villages of two union councils Bakot and Barot were severely damaged. Based on all facts population of rural areas of AJK and KPK were selected for survey. Rural population of districts Muzaffrabad, Bagh, Rawalakot, Abbottabad, Mansehra, Battagram and Shangla were visited for data collection.

3.1.3 Field samples:

Community for survey was selected based upon the housing infrastructure. The housing infrastructures were severely damaged in the earthquake affected areas of AJK and Khyber Pakhtunkhwa. The common use of non-seismic conventional house construction designs and location of houses on hazardous sites resulted in great damage and destruction of houses in the nine earthquake affected districts of AJK and KPK. Houses without beams and with use of rough building material in the house reconstruction were the major contributing factors for the massive destruction. The total number of houses affected due to earthquake was estimated 611, 05.

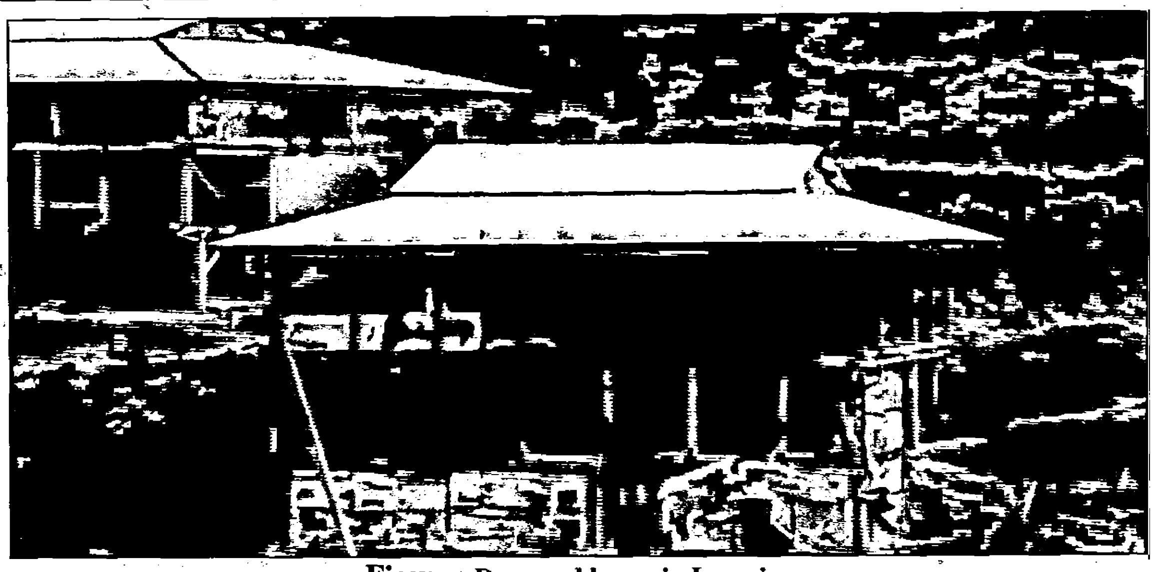

Figure: Damaged house in Lamnian

3.2 METHODOLOGY

Geographical and population area for sample collection was selected based upon extent of damage in earthquake affected areas. 15-20 sites of AJK and KPK were selected which were severely affected during the earthquake. Open and closed ended methodologies were adopted for collection of data from different populations through open interviews and consultations, followed by community consultations through group discussions and filling of survey form.

Following steps were adopted to achieve the overall objectives of the research study.

- Data collection
- Statistical Analysis of Data
- Interpretation of results

3.2.1 DATA COLLECTION

The data used for research was of two types

1. Primary data

2. Secondary data

Secondary data

The secondary data was collected from the following sources:

1. Pakistan Earthquake Reconstruction &Rehabilitation Authority
2. Asian Development bank
3. IUCN
4. UNDP
5. Data from others International Organization, NGOs, Interested Groups.

Primary data

The primary data was collected through field survey.

Data collection tools

The tools adopted for data collection were:

1. Consultation
2. Interview
3. Focused group discussion
4. Individual questionnaire

Public consultation in Leepa

Filling questionnaire (Mansehra)

Step I:

List of 15-20 sample sites of union councils of AJK and KPK was prepared by consulting experts for collection of data. Basic criteria behind the selection of sites were the extent of damage caused by earthquake and level of destruction of housing infrastructure. Questionnaire was developed after consulting experts.

Step II

Running of sample questionnaire/Pretesting

The questionnaire was tested on 10 people initially. It was modified according to community response.

STEP III

Field visit

The field visit to the 15 to 20 project sites at union council level of AJK and KPK was carried out. During field survey 239 households were consulted in 60 villages of 32 union councils to get detailed information regarding relationship between reconstruction activities and environmental deterioration.

The most remote UCs of Leepa was visited to get the assessment for timber usage, which was already a hot spot for the use of fuel wood from local forests due to long winter season.

3.2.2 Statistical Analysis of Data

Statistical analysis of the data collected from surveyed area was performed. Area wise, district wise and union council wise percentages of households used timber for reconstruction of houses, percentages of new and old timber used for reconstruction of houses, percentages of sources of timber obtained for reconstruction of houses, percentages of number of persons cut down trees for timber and percentages of land sliding due to excavation during reconstruction activities were determined.

3.2.3 Interpretation of results

Interpretation of results was done by doing union council wise, district wise and area wise comparison of all parameters. Bar graphs were plotted to show the comparisons as listed below.

- Comparison of timber utilization in reconstruction of houses in union councils of districts of KPK.
- Comparison of timber utilization in reconstruction of houses in union councils of districts of AJK.
- Comparison of timber utilization in reconstruction of houses in districts of KPK.
- Comparison of timber utilization in reconstruction of houses in districts of AJK.
- Comparison of timber utilization in reconstruction of houses in AJK and KPK

Chapter 4

DATA ANALYSIS, RESULTS, AND DISCUSSION

In the earthquake of 8 0ctober, 2005 most 0f the significantly affected areas were in Khaber Pakhtunkhwa and Azad Jammu and Kashmir. Districts of KPK, Manshera, Abbottabad, Battagram and Shangla, districts of AJK, Rawalakot, Bagh, and Muzaffarabad were the worst hit areas. 600, 000 houses were destroyed, reconstruction of destroyed houses was the great challenge. From environmental aspect issue of deforestation and timber use for reconstruction of rural houses have the significant importance. 239 households were visited in 63 villages of 32 union councils of 7 districts of KPK and AJK to get an elaborated statistics regarding relationship between timber utilization and reconstruction activities.

The following comparisons were performed in this connection:

- Comparison of timber utilization in reconstruction of houses in union councils of districts of KPK.
- Comparison of timber utilization in reconstruction of houses in union councils of districts of AJK.
- Comparison of timber utilization in reconstruction of houses in districts of KPK.
- Comparison of timber utilization in reconstruction of houses in districts of AJK.
- Comparison of timber utilization in reconstruction of houses in AJK and KPK.

The detail of comparisons is given below:

4.1 Timber utilization in district Mansehra

Table 4.1.1 Timber utilization in district Mansehra

S.No	Union Council	No of Households Interviewed	Percentage of households used timber		Percentage new/old timber used		Source of timber used in construction in Percentage					
			Yes	No	New	Old	Market	Forest Dept	Forest	Legal	Illegal	Others
1	Batal	25	92%	8%	68%	32%	48%	0%	26%	9%	13%	4%
2	Chattar Plain	13	77%	23%	5o%	50%	50%	0%	0%	0%	20%	30%
3	Hillkot	1	100 %	0%	50%	50%	100 %	0%	0%	0%	0%	0%

In union council Batal, 92 percent households used timber for reconstruction of their houses. 68% used new timber while 32% recycled the old timber. 48% got timber from market, while 26% got timber from forest, 9% legal, 13% illegal and 4% got timber from other sources.

In union council Chatter Plain, 77% households used timber for reconstruction of their houses. 50 percent used new timber while 50% recycled the old timber. 50 percent got timber from market, while 20% illegal and 30% got timber from other sources. In union council Hillkot, 100% persons used timber for reconstruction of their houses. 50 percent used new timber while 50% recycled the old timber.100 percent got timber from market.

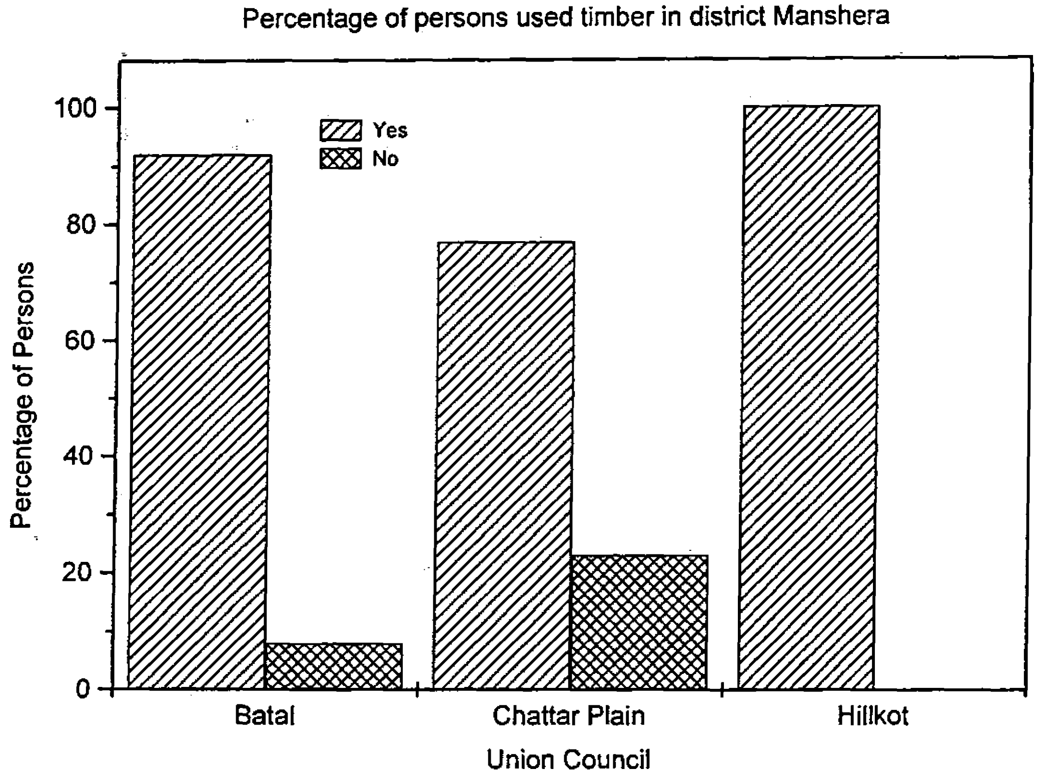

Figure 4.1.1 Percentage of households used timber in district Manshera

Fig 4.1.1 shows that in union council Hillkot there was maximum usage of timber for reconstruction while in Chattar Plain, there was minimum usage of timber for reconstruction.

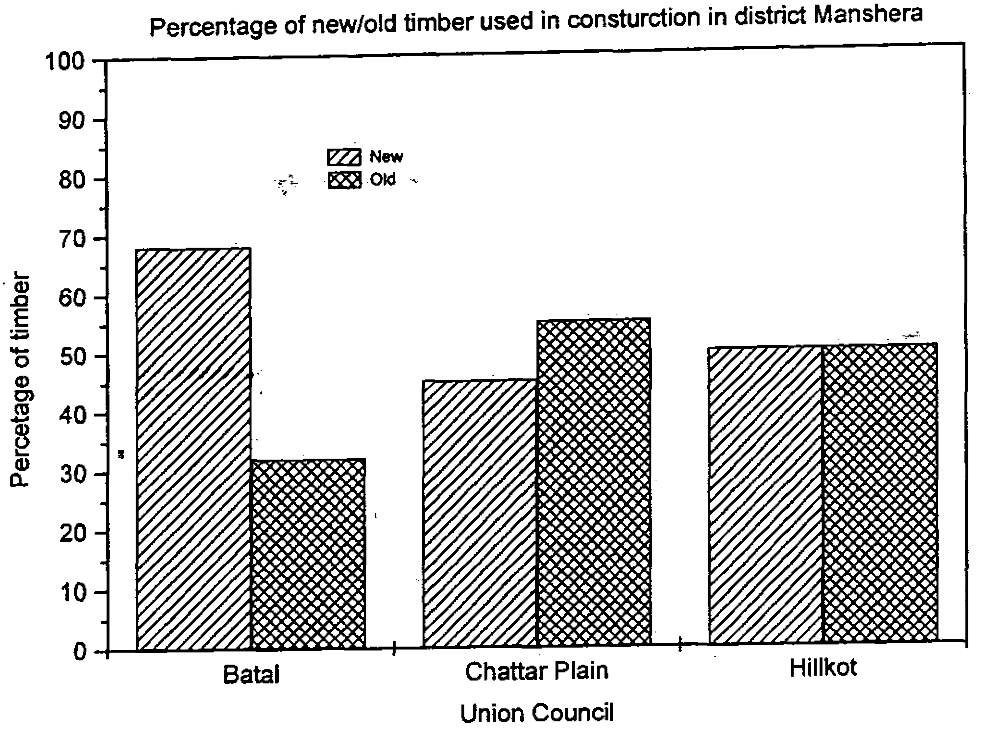

Figure 4.1.2 Percentage of new/old timber used in construction in district Manshera

Fig 4.1.2 shows that in Batal, there was maximum use of new timber for reconstruction, while in Chattar Plain. There was maximum recycling of old timber. In Hillkot, there was equal use of new and old timber.

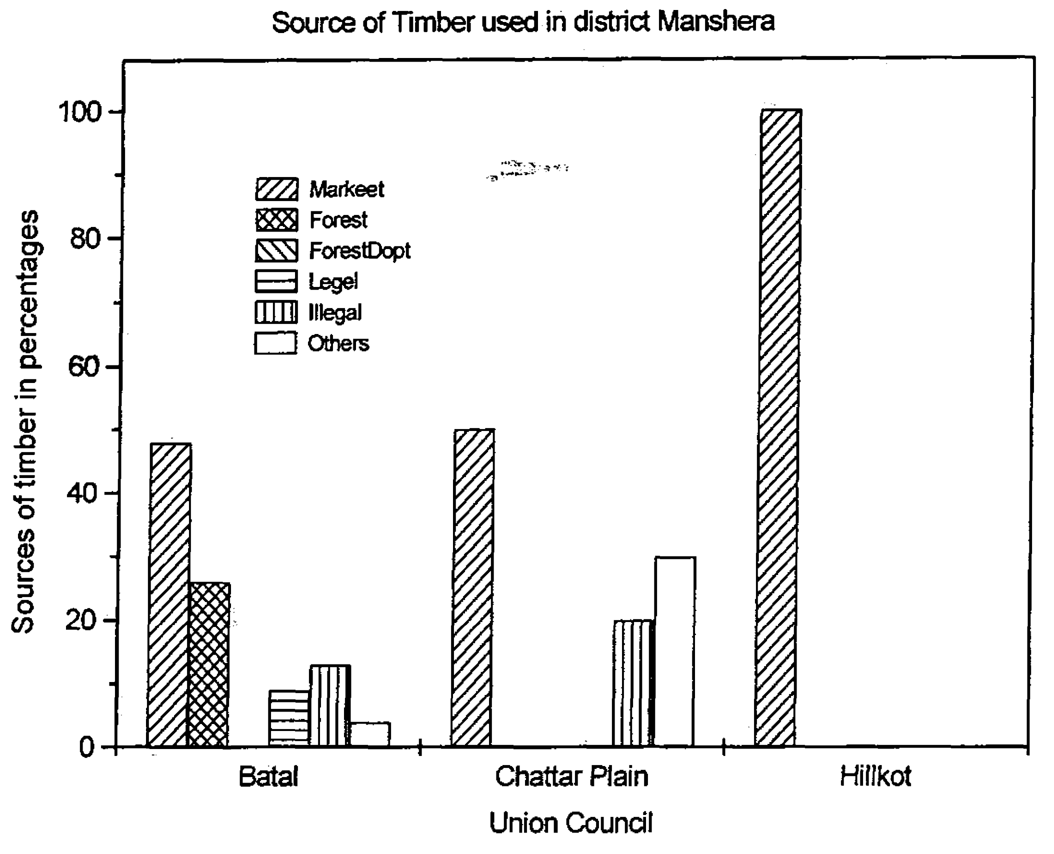

Figure 4.1.3 Source of timber used in district Manshera

Fig 4.1.3 shows that in Batal. Maximum timber got from market for construction, while timber also got from forest, legal, illegal and other sources. In Chattar Plain, maximum timber got from market for construction, while timber also got illegally and from other sources. In Hillkot, all the timber used for reconstruction got from market.

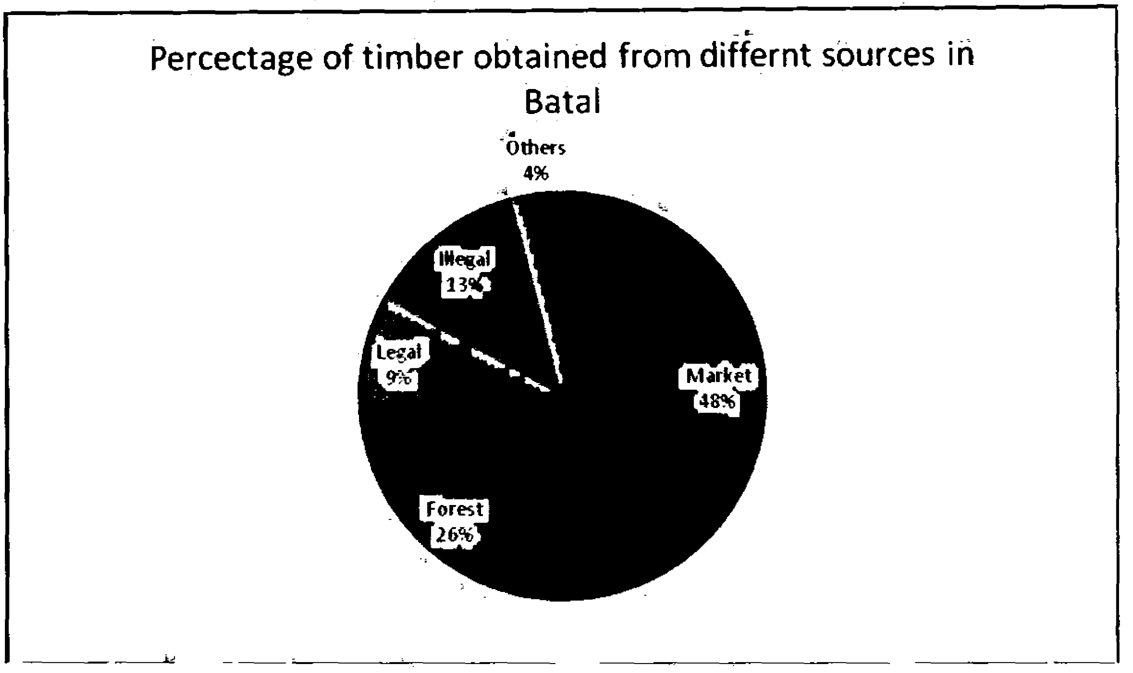

Figure 4.1.4 Source of timber used for reconstruction in Batal

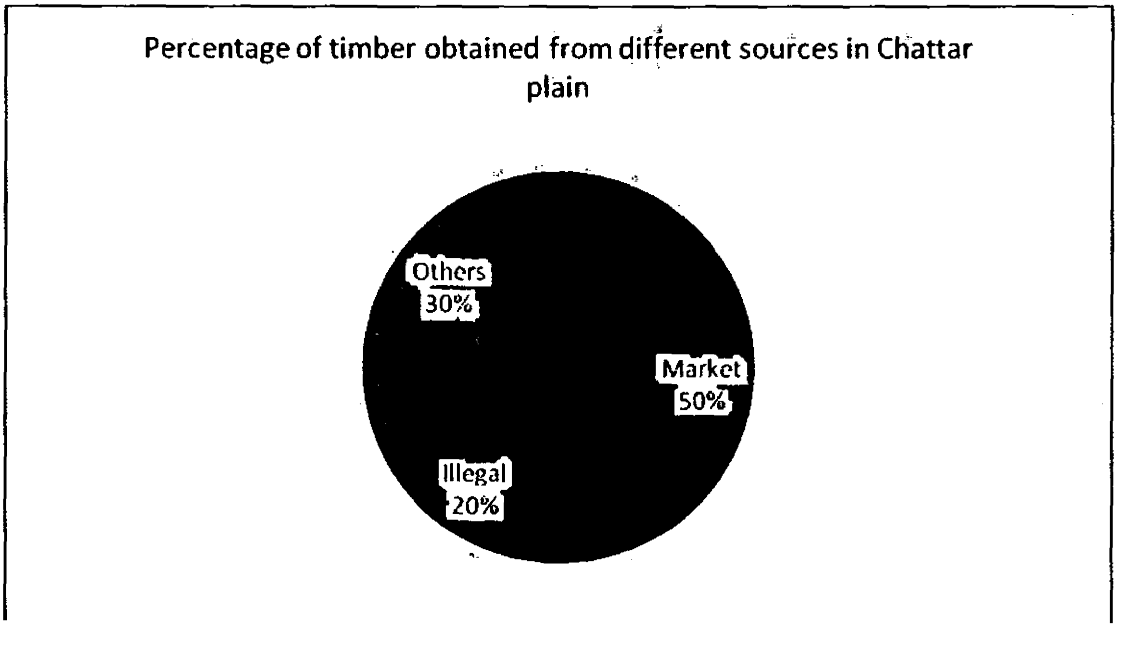

Figure 4.1.5 Source of timber used for reconstruction in Chattar Plain

Table 4.1.2 Timber Utilization in District Mansehra

S.No	Union Council	No of Households interviewed	Percentage of households who cut trees for reconstruction		No of trees removed	Land sliding due to excavation	
			Yes	No		Yes	No
1	Batal	25	16%	84%	5	8%	92%
2	Chattar Plain	13	0%	100%	0	0%	100%
3	Hillkot	1	0%	100%	0	0%	100%

Data collected from surveyed area shows that in Batal, 16% households removed trees for reconstruction and 5 trees were removed, while 8% land sliding was due to excavation. In Chattar Plain and Hillkot, there was no tree removal and no land sliding was due to excavation.

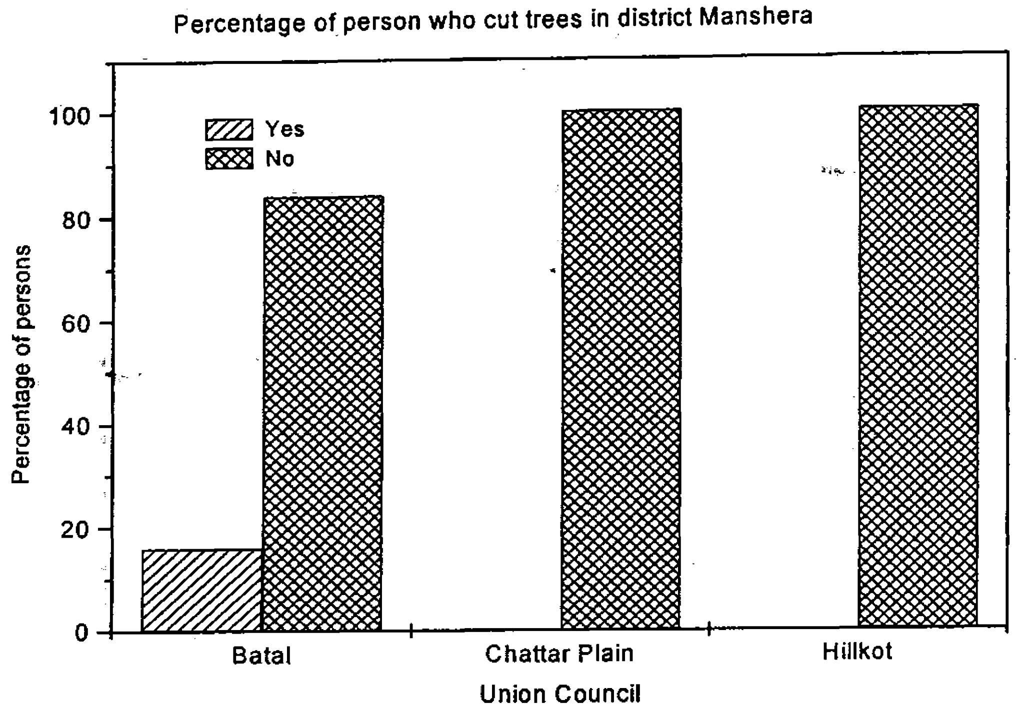

Figure 4.1.6 Percentage of households who cut trees in district Manshera

Figure 4.1.6 shows that only in Batal, households removed trees for reconstruction.

Table 4.1.3 Type of Material Used for Houses (Manshera)

District	Union Council	Construction	Cement	Bricks	Blocks	Mud	CGI Sheets	Wood	Stone Masonry
Mansehra	Batal	25	23	6	8	7	15	23	13
	Chattar Plain	10	8	2	7	0	6	10	8
	Hillkot	1	1	0	1	0	1	1	1
Total	3	36	32	8	16	7	22	34	22

Data collected from surveyed area shows that in Batal and Chattar plain, all the surveyed households were used cement, bricks, blocks, mud, CGI sheets, wood and stones for reconstruction of their houses. In Hillkot, cement, blocks, CGI sheets, wood and stones were used for reconstruction of houses.

4.2 Timber utilization in district Shangla

Table 4.2.1 Timber Utilization in District Shangla

S.No	Union Council	No of households Interviewed	Percentage of households used timber		Percentage new/old timber used		Source of timber used in construction in Percentage					
			Yes	No	New	Old	Market	Forest Dept	Forest	Legal	Illegal	Others
1	Maira	13	92%	8%	97%	3%	0%	92%	8%	0%	0%	0%

Data collected from surveyed area shows that 92 % households used timber for reconstruction of their houses. 97 % households used new timber while 3 % recycled the old timber for reconstruction. 92 % households got timber from forest department while 8 % got timber from forest.

Figure 4.2.1 Percentage of persons used timber in district shangla

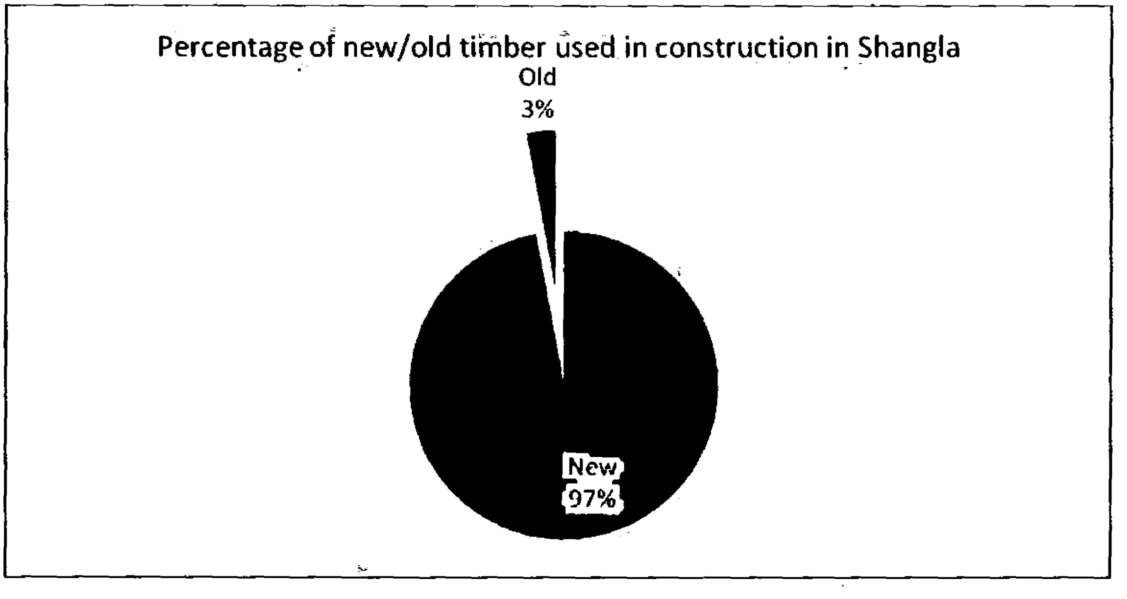

Figure 4.2.2 Percentage of new\old timber used in reconstruction in District shangla

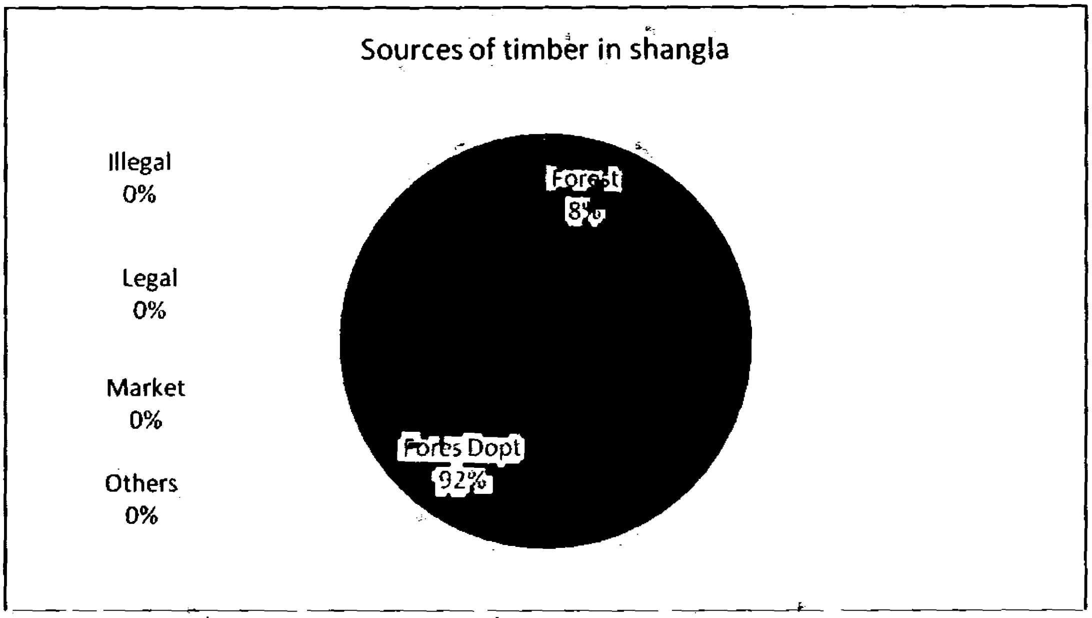

Figure 4.2.3 sources of timber in district shangla

Table 4.2.2 Timber Utilization in District Shangla

S.No	Union Council	No of Households Interviewed	Percentage of households who cut trees for reconstruction		No of trees removed	Land sliding due to excavation	
			Yes	No		Yes	No
1	Maira	13	8%	92%	1	0%	100%

Table 4.2.2 shows that in union council Maira, 8% households cut trees for reconstruction, only 1tree was removed, and there was no land sliding due to excavation.

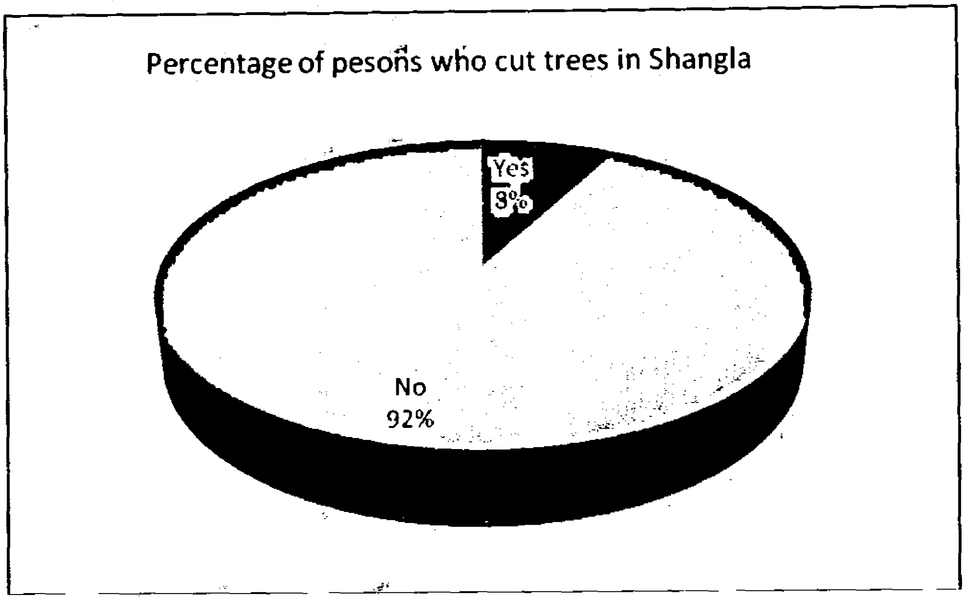

Figure 4.2.4 Percentage of households who cut trees for reconstruction in district Shangla

Table 4.2.3 Type of material used for reconstruction in district shangla

District	Union Council	Construction	Cement	Bricks	Blocks	Mud	CGI Sheets	Wood	Stone Masonry
Shangla	Maira	12	12	8	7	5	11	9	1
Total	1	12	12	8	7	5	11	9	1

Data collected from surveyed area shows that in union council Maira, all the households were used cement, bricks, blocks, mud, CGI sheets, wood, and stones for reconstruction of their houses.

4.3 Timber Utilization in District Battagram

Table 4.3.1 Timber Utilization in District Battagram

S.No	Union Council	No of households Interviewed	% of households used timber		% new/old timber used		Source of timber used in construction in Percentage					
			Yes	No	New	Old	Market	Forest Dept	Forest	Legal	Illegal	Others
1	Ajmera	14	100%	0%	100%	0%	58%	0%	7%	0%	7%	28%
2	Rajdhari	4	100%	0%	65%	35%	50%	0%	25%	0%	0%	25%
3	Batagram	8	75%	25%	47%	53%	83%	0%	0%	0%	0%	17%
4	Battamori	7	100%	0%	81%	19%	57%	0%	43%	0%	0%	0%
5	Shamlai	17	94%	6%	80%	20%	25%	25%	31%	6%	6%	6%
6	Hattal Battkol	10	80%	20%	66%	34%	62%	0%	13%	25%	0%	0%
7	Thakot	8	100%	0%	88%	12%	12%	0%	38%	0%	12%	38%
8	Pamal Sharif	2	100%	0%	100%	0%	50%	50%	0%	0%	0%	0%
9	Batkol	6	100%	0%	92%	8%	83%	0%	17%	0%	0%	0%

Table 4.3.1 shows that in union council Ajmera, 100% households used timber for reconstruction of their houses.100% used new timber while 0% recycled the old timber. 58% got timber from market, while 7% from forest, 7% illegal and 28% got timber from

other sources. In union council Rajdhari, 100% households used timber for reconstruction of their houses.100% used new timber while 0% recycled the old timber. 50% got timber from market, while 25% got timber from forest, and 25% got timber from other sources. In union council Batagram, 75 percent households used timber for reconstruction of their houses. 47 percent households used new timber while 53% recycled the old timber. 83 percent got timber from market, while 17% got timber from other sources. In union council Battamori, 100 percent households used timber for reconstruction of their houses. 81 percent used new timber while 19% recycled the old timber. 57 percent persons got timber from market, while 43% got timber from forest. In union council Shamlai, 96 percent households used timber for reconstruction of their houses. 80 percent households used new timber while 20% recycled the old timber. 25 percent got timber from market, 25% got timber from forest department, 31% got timber from forest while 6% illegal, 6% legal, and 6% got timber from other sources. In union council Hattal Battkol, 80% households used timber for reconstruction of their houses. 66 percent used new timber while 34% recycled the old timber. 62 percent got timber from market, 13% got timber from forest while 25% got timber from legal sources. In union council Thakot, 100% households used timber for reconstruction of their houses. 88 percent used new timber while 12% recycled the old timber. 12 percent got timber from market, 38% got timber from forest while 12% illegal and 38% got timber from other sources. In union council Pamal Sharif, 100% households used timber for reconstruction of their houses. 100 percent used new timber while 0% recycled the old timber. 50 percent got timber from market, 50% got timber from forest department. In union council Batkol, 100% households used timber for reconstruction of their houses. 92 percent used new timber while 8% recycled the old timber. 83 percent got timber from market, 17% got timber from forest.

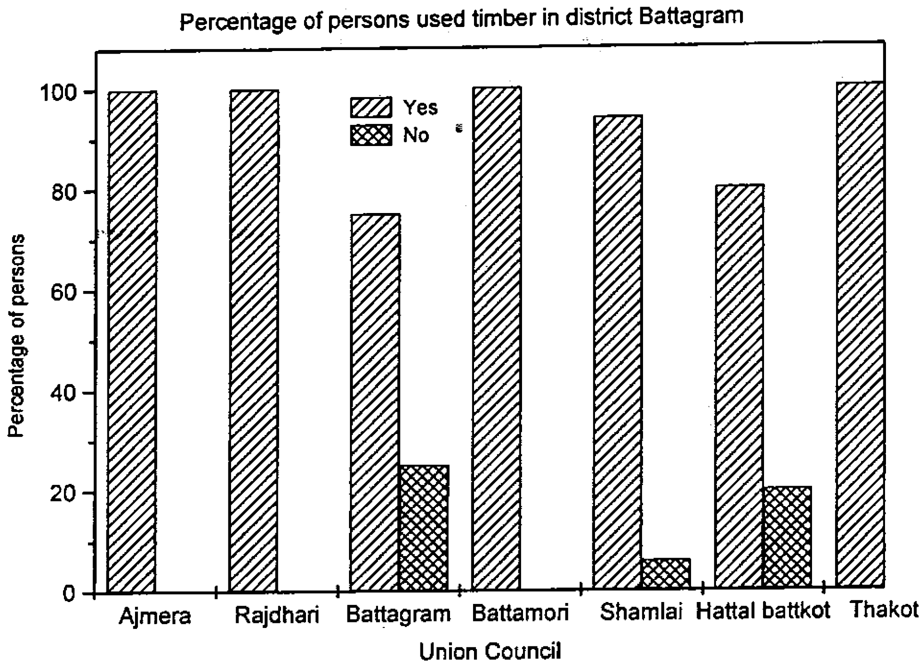

Figure 4.3.1 Percentage of households used timber in district Battagram

Figure 4.3.1 shows that in union councils Ajmera, Rajdhari, Battamori, and Thakot, there was maximum usage of timber for reconstruction. In union council Battagram, there was minimum usage of timber for reconstruction.

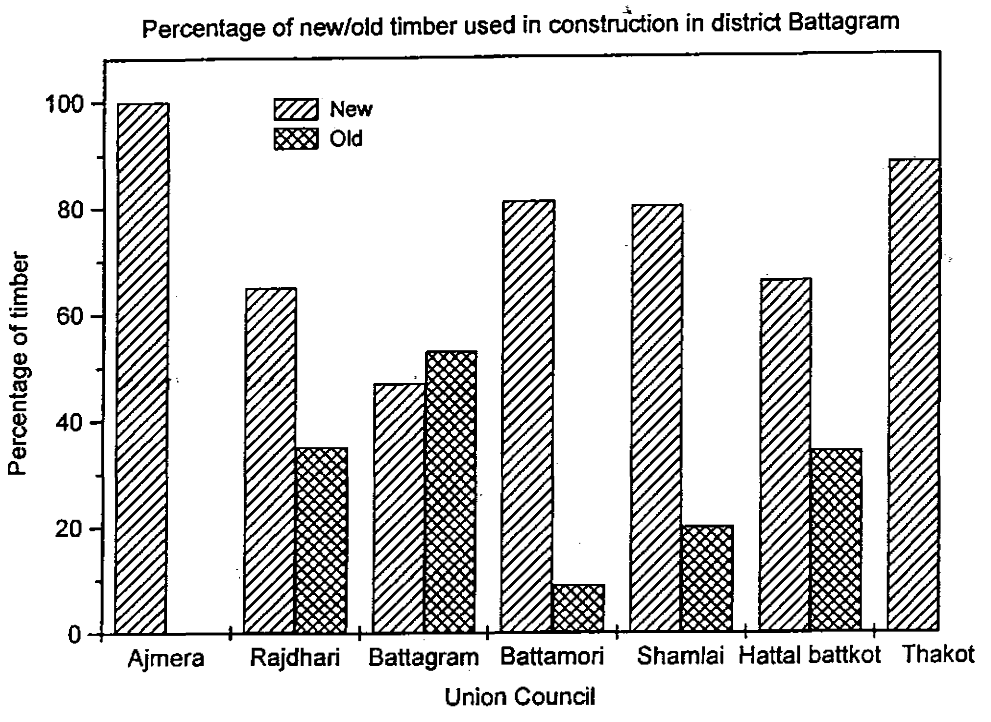

Figure 4.3.2 Percentage of new/old timber used in construction in district Battagram

Fig 4.3.2 shows that in union council Ajmera and Pamal sharif, there was maximum usage of new timber, while in union council Battagram there was maximum recycling of old timber for reconstruction of houses.

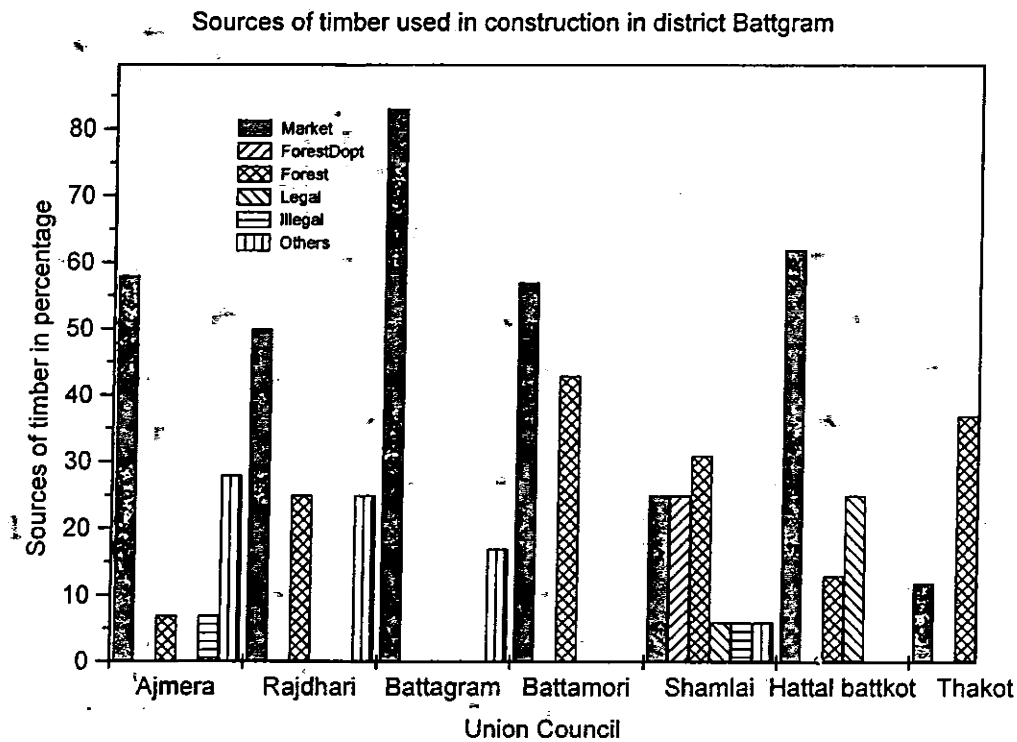

Figure 4.3.3 Sources of timber used in construction in district Battgram

Fig 4.3.3 shows that maximum timber was obtained from market for reconstruction in union council Battagram, while maximum timber got from forest in union council Battamori as compared to other UC' s of Battagram. In union council Shamlai, maximum timber was obtained from forest department as compared to other union councils.

households removed trees for reconstruction while there was no land sliding due to excavation. In Battamori, 14%, households removed trees for reconstruction and one tree was removed, while there was no land sliding due to excavation. In Shamlai, 41%, households removed trees for reconstruction and 22 trees were removed, while 12% land sliding was due to excavation. In Hattal battkol, 10%, households removed trees for reconstruction and one tree was removed, while there was no land sliding due to excavation. In Thakot, 25%, households removed trees for reconstruction and four trees were removed, while 25% land sliding was due to excavation. In union councils Pamal Sharif and Batkol, there was no tree removal and no land sliding was due to excavation.

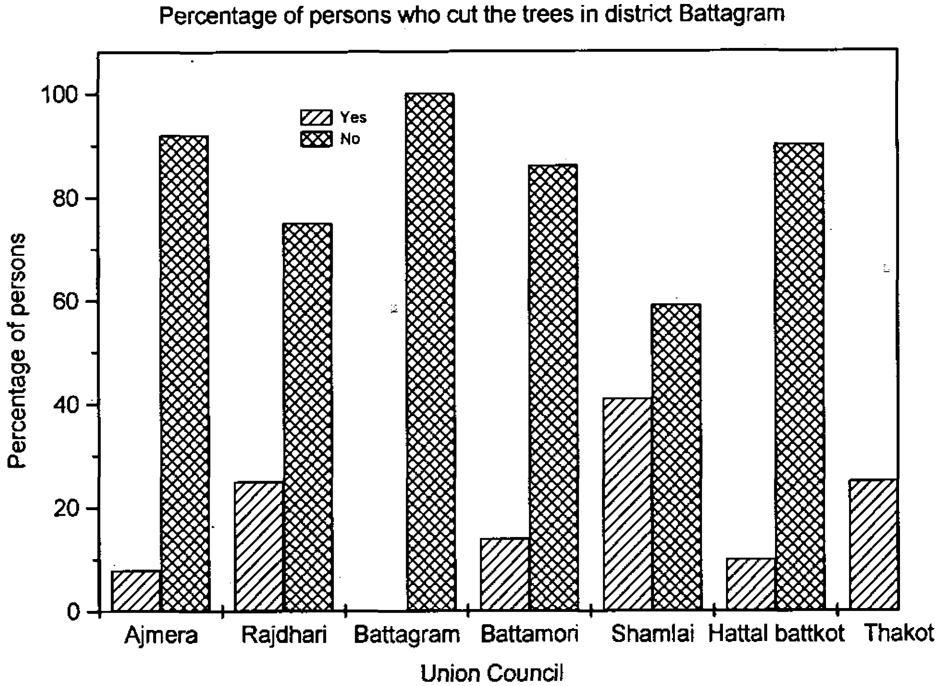

Figure 4.3.4 Percentage of households who cut the trees in district Battagram

Figure 4.3.4 shows that in union council Shamlai there was maximum tree removal for timber for reconstruction of houses, while in union council Battagram the households did not remove trees for reconstruction.

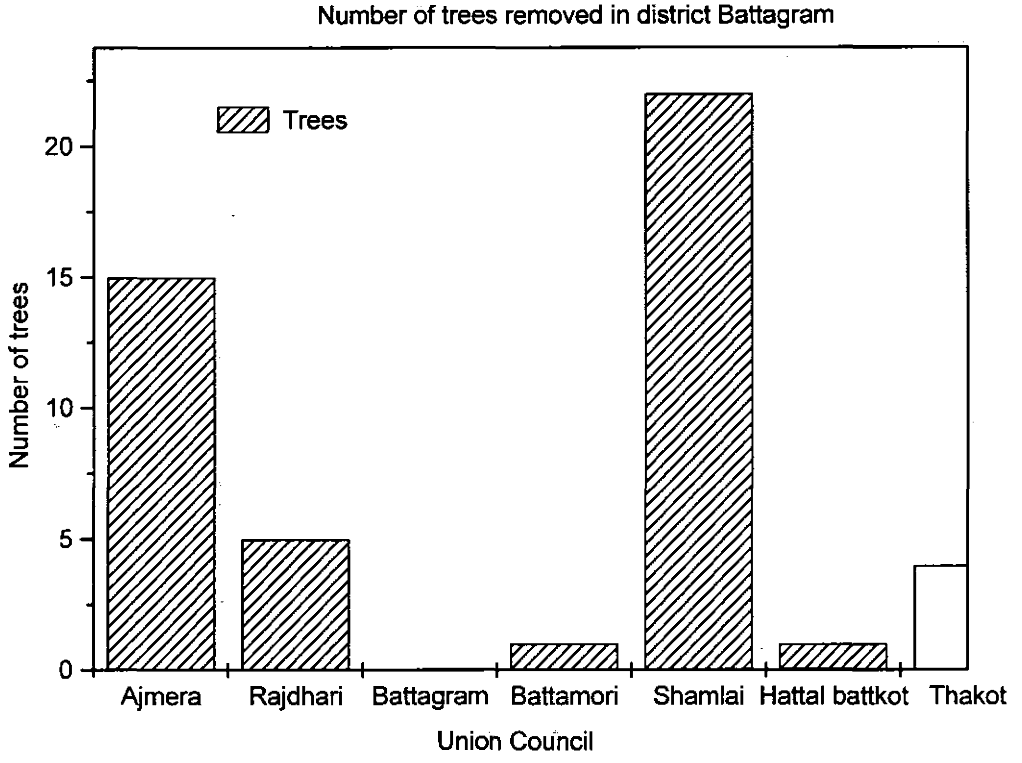

Figure 4.3.5 Tree removal in district Battagram

Figure 4.3.5 shows that in union council Shamlai there was maximum tree removal for timber for reconstruction of houses, while in union council Battagram the households did not remove trees for reconstruction.

Table 4.3.3 Type of Material Used for Houses (Battagram)

District	Union Council	Construction	Cement	Bricks	Blocks	Mud	CGI Sheets	Wood	Stone Masonry
Battagram	Ajmera	14	13	6	9	6	8	14	12
	Rajdhari	4	4	0	4	0	3	4	0
	Battagram	7	5	2	4	4	5	6	4
	Battamori	7	5	2	4	2	4	7	3
	Shamlai	16	15	3	13	5	12	16	13
	Hattal battkot	10	10	2	4	0	2	8	1
	Thakot	8	5	0	5	2	4	8	2
	Pamal Sharif	2	2	0	2	0	0	2	0
	Batkol	6	5	2	5	4	5	6	5
Total	9	74	64	17	50	23	43	71	40

Table 4.3.3 shows that in union councils Ajmera, Battagram, Battamori, Shamlai, and Batkol households used cement, bricks, blocks, mud, CGI sheets, wood, and stones for reconstruction of their houses. In union council Rajdhari, households used cement, blocks, CGI sheets, wood, and stones for reconstruction of their houses. In union council Hattal batkol households used cement, bricks, blocks, CGI sheets, wood, and stones for reconstruction of their houses. In union council Thakot, households used cement, blocks, mud, CGI sheets, wood, and stones for reconstruction of their houses. In union council Pamal Sharif, households used cement, blocks, mud, and wood for reconstruction of their houses.

4.4 Timber Utilization in District Abbottabad

Table 4.4.1 Timber Utilization in District Abbottabad

S.No	Union Council	No of Households Interviewed	Percentage of households used timber		Percentage new/old timber used		Source of timber used in construction in Percentage					
			Yes	No	New	Old	Market	Forest Dept	Forest	Legal	Illegal	Others
1	Berot Kalan	8	100 %	0%	64 %	36 %	0%	25%	0%	75%	0%	0%
2	Bakot	32	94 %	6%	48 %	52 %	3%	17%	33 %	40%	13 %	33%

Table 4.3.1 shows that in union council Berot Kalan, 100% households used timber for reconstruction of their houses. 64 percent used new timber while 36% recycled the old timber. 25% got timber from forest department, 75% used legal timber for reconstruction of their houses. In union council Bakot, 94% households used timber for reconstruction of their houses. 48 percent used new timber while 52% recycled the old timber. 3 percent got timber from market, 17% got timber from forest department, 33% got timber from forest while 13% illegal, 40% legal, and 33% got timber from other sources.

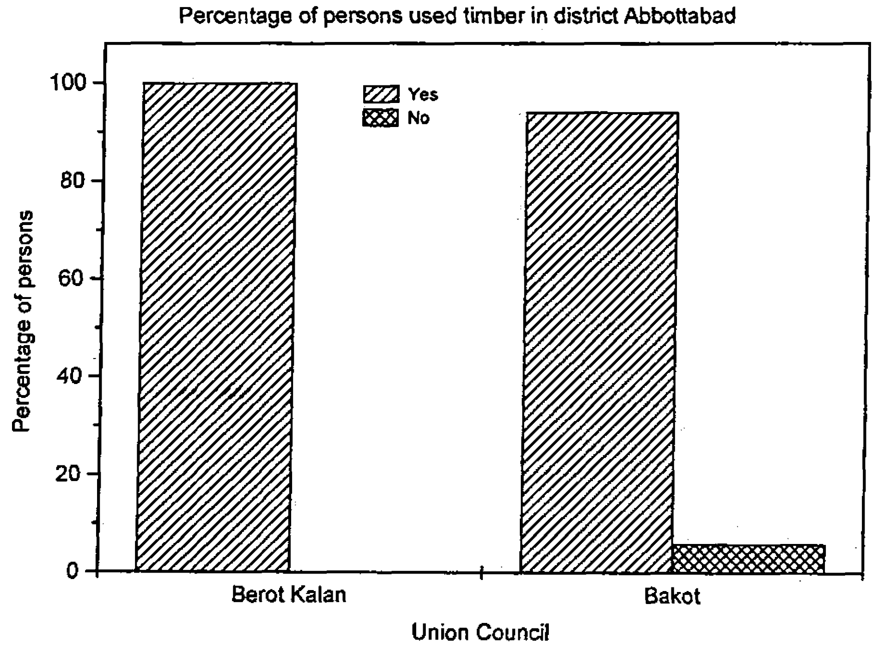

Figure 4.4.1 Percentage of households used timber in district Abbottabad

Fig 4.4.1 shows that in union council Berot Kalan there was more timber utilization for reconstruction as compared to union council Bakot.

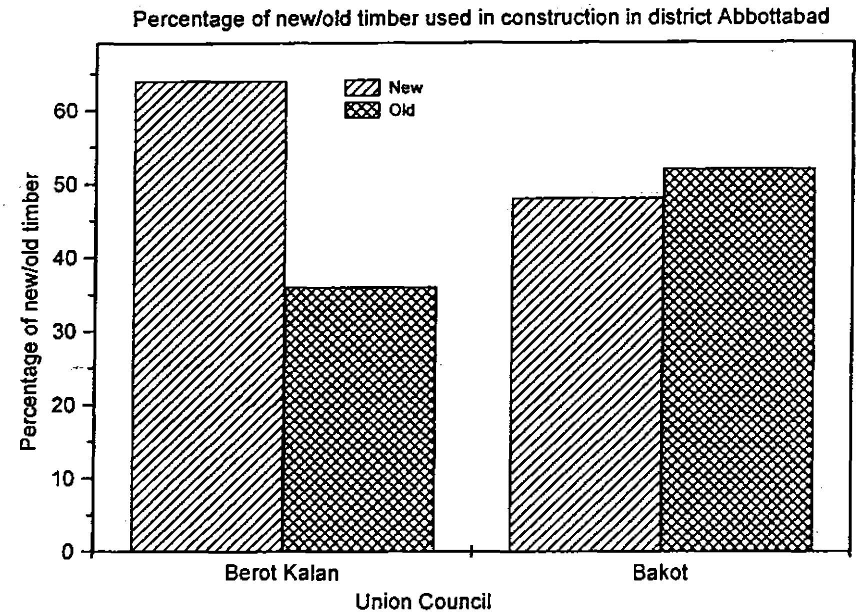

Figure 4.4.2 Percentage of new/old timber used in construction in district Abbottabad

Fig 4.4.2 shows that in Berot Kalan, there was maximum usage of new timber for reconstruction as compared to union council Bakot. In Bakot, there was maximum recycling of old timber for reconstruction as compared to union council Berot Kalan.

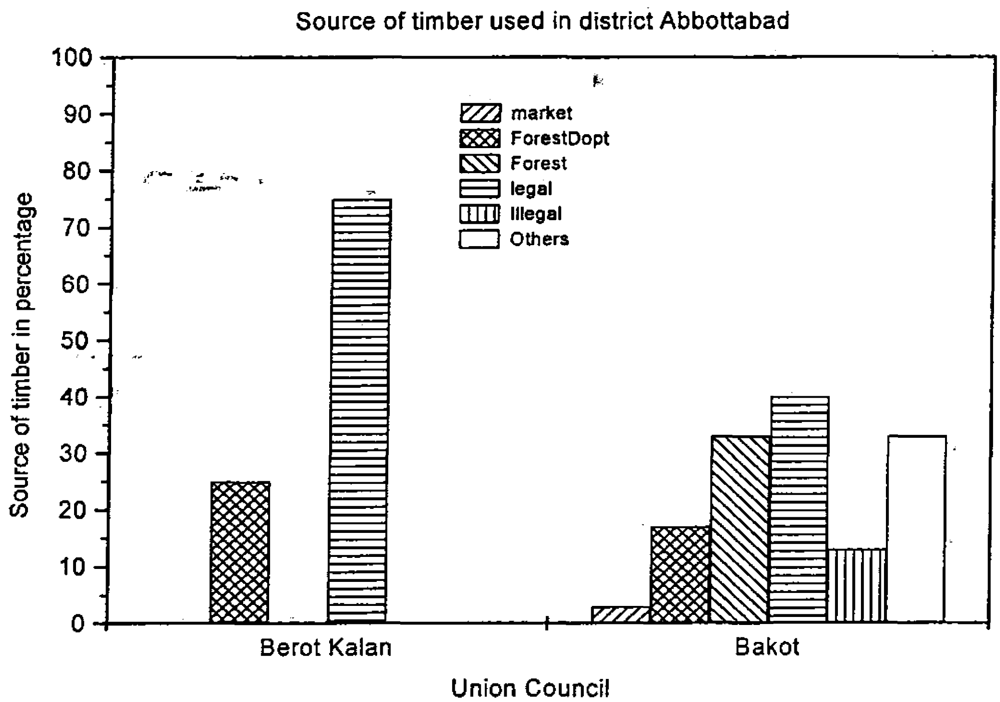

Figure 4.4.3 Source of timber used in district Abbottabad

Table 4.4.2 Timber Utilization in district Abbottabad

S.No	Union Council	No of Households Interviewed	Percentage of households who cut trees for reconstruction		No of trees removed	Land sliding due to excavation	
			Yes	No		Yes	No
1	Berot Kalan	8	13%	87%	3	13%	87%
2	Bakot	32	43%	57%	18	6%	94%

Table 4.4.2 shows that in union council Berot Kalan 13 percent households removed trees for reconstruction and 3 trees were removed, while 13% land sliding was due to

excavation. In Bakot, 43%, households removed trees for reconstruction and 18 trees were removed, while there was 6% land sliding due to excavation.

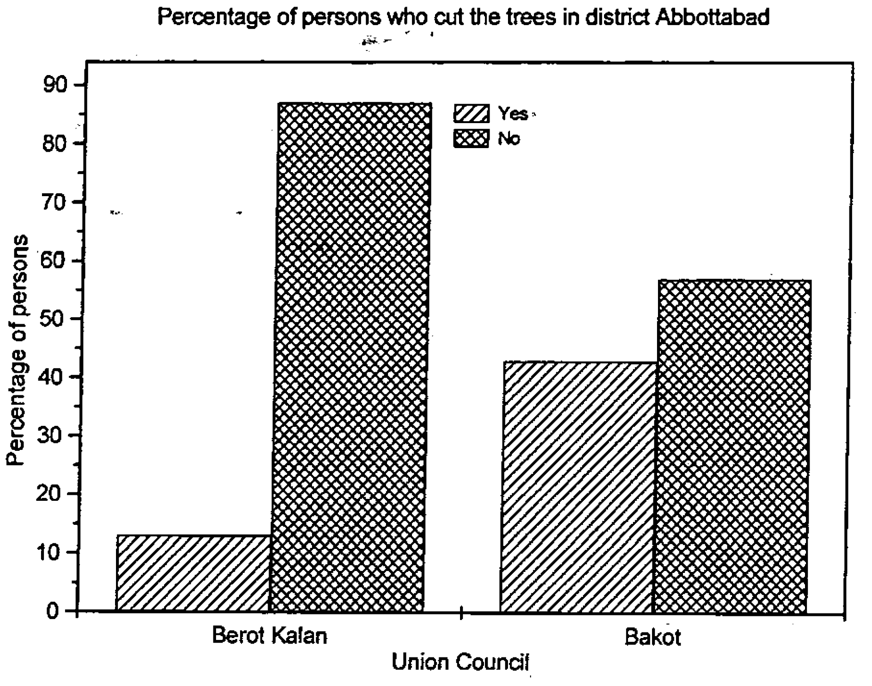

Figure 4.4.4 Percentage of households who cut the trees in district Abbottabad

Fig 4.4.4 shows that in Bakot greater percentage of households was removed trees for reconstruction of their houses as compared to households of Berot Kalan.

Table 4.4.3 Type of Material Used for Houses (Abbottabad)

District	Union Council	Construction	Cement	Bricks	Blocks	Mud	CGI Sheets	Wood	Stone Masonry
Abbottabad	Berot Kalan	8	7	2	8	3	8	8	7
	Bakot	32	3	5	19	12	23	30	28
Total	2	40	10	7	27	15	31	38	35

Table 4.4.3 shows that in union councils, Berot Kalan and Bakot households used cement, bricks, blocks, mud, CGI sheets, wood, and stones for reconstruction of their houses.

Timber Utilization in District Muzaffarabad

Table 4.5.1 Timber Utilization in District Muzaffarabad

S.No	Union Council	No of Households Interviewed	% of households used timber		%e new/old timber used		Source of timber used in construction in Percentage					
			Yes	No	New	Old	Market	Forest Dept	Forest	Legal	Illegal	Others
1	Lamnian	12	100%	0%	42%	58%	8%	42%	17%	17%	8%	8%
2	Salmia	4	100%	0%	43%	57%	0%	0%	50%	50%	0%	0%
3	Ressehian	5	100%	0%	88%	12%	0%	0%	60%	20%	20%	0%
4	Nakot	1	100%	0%	15%	85%	0%	0%	100%	0%	0%	0%
5	Banamola	3	100%	0%	47%	53%	100%	0%	0%	0%	0%	0%
6	Chakkar	4	100%	0%	31%	69%	0%	0%	50%	0%	50%	0%

Table 4.5.1 shows that in union council Lamnian, 100 percent households used timber for reconstruction of their houses. 42 percent households used new timber while 58% recycled the old timber. 8 percent households got timber from market, 42% got timber from forest department, 17% got timber from forest while 8% illegal, 17% legal, and 8% got timber from other sources. In union council Salmia, 100 percent households used timber for reconstruction of their houses. 43 percent households used new timber while

57% recycled the old timber. 50 percent households got timber from forest and 50% got timber from legal sources. In union council Ressehian, 100 percent households used timber for reconstruction of their houses. 88 percent households used new timber while 12% recycled the old timber. 60 percent households got timber from market, 20% got timber from forest legal sources and 20% got timber from illegal sources. In union council Nakot, 100 percent households used timber for reconstruction of their houses. 15 percent households used new timber while 85% recycled the old timber. 25 percent got timber from market, 100% households got timber from forest. In union council Banamola, 100 percent households used timber for reconstruction of their houses. 47 percent households were used new timber while 53% recycled the old timber. 100 percent households got timber from market. In union council Chakkar, 100 percent households used timber for reconstruction of their houses. 31 percent households were used new timber while 69% recycled the old timber. 50% households got timber from forest and 50% households got timber from legal sources.

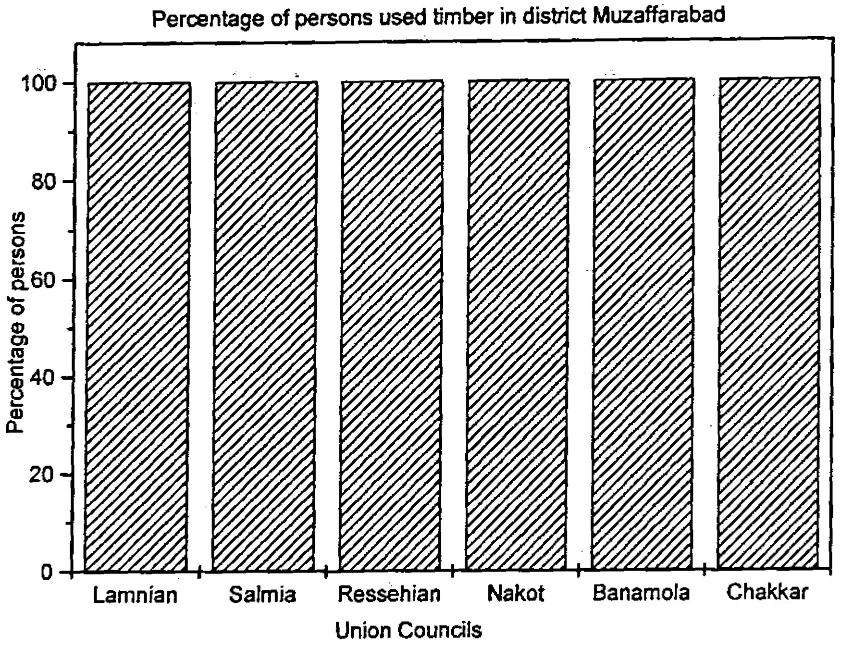

Figure 4.5.1 Percentage of households used timber in district Muzaffarabad

Figure 4.5.1 shows that in all surveyed union councils of district Muzaffarabad there was maximum number of households used timber for reconstruction of their houses.

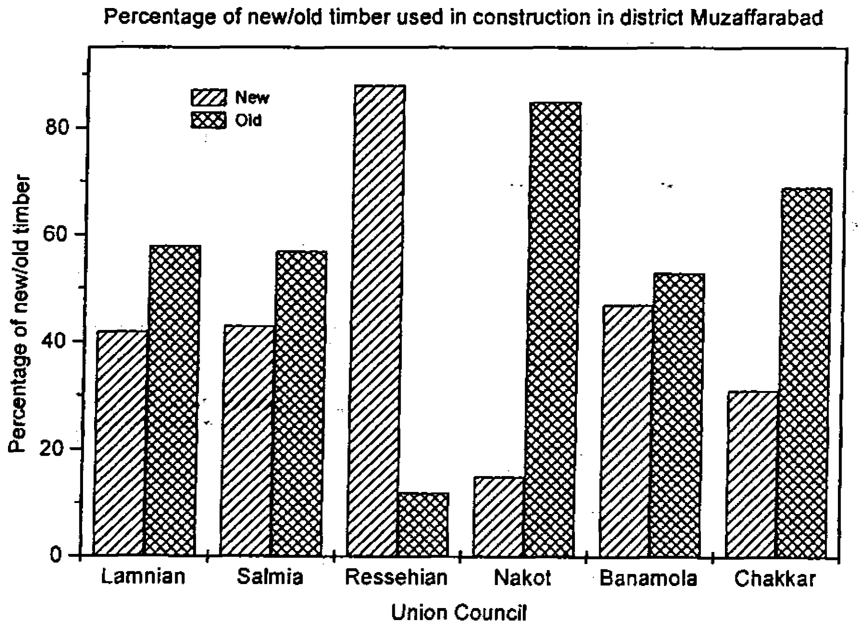

Figure 4.5.2 Percentage of new/old timber used in construction in district Muzaffarabad

Figure 4.5.2 shows that in union council Nakot, there was maximum recyclization of old timber for reconstruction of houses, while in union council Ressehian, there was maximum usage of new timber for reconstruction of houses.

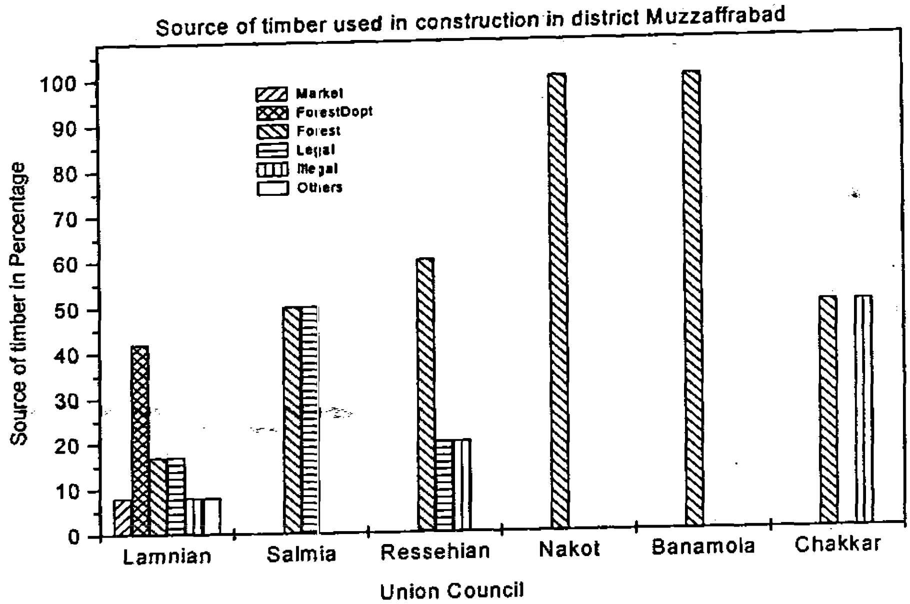

Figure 4.5.3 Source of timber used in construction in district Muzzaffrabad

Table 4.5.2 Timber Utilization in District Muzaffarabad

S.No	Union Council	No of Households Interviewed	Percentage of household who cut trees for reconstruction		No of trees removed	Land sliding due to excavation	
			Yes	No		Yes	No
1	Lamnian	12	25%	75%	4	33%	67%
2	Salmia	4	25%	75%	9	50%	50%
3	Ressehian	5	60%	40%	8	60%	40%
4	Nakot	1	100%	0%	10	100%	0%
5	Banamola	3	100%	0%	10	0%	100%
6	Chakkar	4	50%	50%	4	0%	100%

Table 4.5.2 shows that in Lamnian, 25 percent households removed trees for reconstruction of their houses and 4 trees were removed, while 33% land sliding was due to excavation. In Salmia, 25 percent households removed trees for reconstruction of their houses and nine trees were removed, while 50% land sliding was due to excavation. In Ressehian, 60 percent households removed trees for reconstruction of their houses and 8 trees were removed, while 60% land sliding was due to excavation. In Nakot 100 percent households removed trees for reconstruction of their houses and 10 trees were removed, while 100% land sliding was due to excavation. In Banamola, 100 percent households removed trees for reconstruction of their houses and 10 trees were removed, while there was no land sliding due to excavation. In Chakkar, 50 percent households removed trees for reconstruction of their houses and four trees were removed, while there was no land sliding due to excavation.

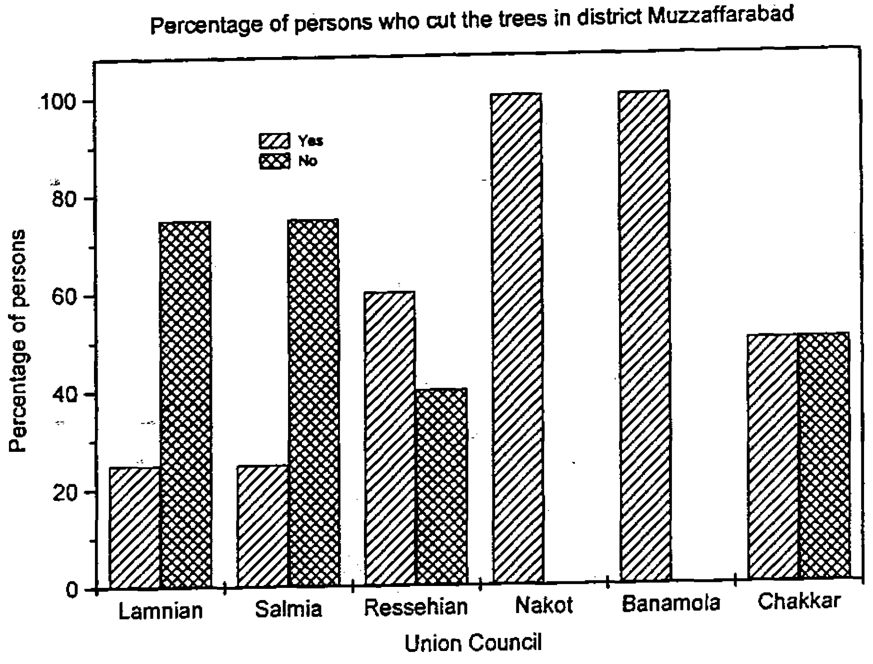

Figure 4.5.4 Percentage of households who cut the trees in district Muzzaffarabad

Fig 4.5.4 shows that in Nakot and Banamola maximum households were removed trees for reconstruction. In Lamnian and Salmia minimum households were removed trees for reconstruction of their houses.

Table 4.5.3 Type of Material Used for Houses (Muzaffarabad)

District	Union Council	Construction	Cement	Bricks	Blocks	Mud	CGI Sheets	Wood	Stone Masonry
Muzaffarabad	Lamnian	12	4	0	5	5	9	12	6
	Salmia	4	3	0	0	3	4	4	4
	Ressehian	5	1	0	1	1	4	5	4
	Nakot	1	1	0	0	1	1	1	1
	Banamola	3	2	0	1	1	3	3	3
	Chakkar	4	3	1	2	0	4	4	2
Total	6	29	14	1	9	11	25	29	20

Table 4.5.3 shows that in Lamnian, Ressehian and Banamola, households were used cement, blocks, mud, CGI sheets, wood and stones for reconstruction of their houses. In Salmia and Nakot, households were used cement,mud, CGI sheets, wood, and stones for reconstruction of their houses. In Chakkar, households were used cement, bricks, blocks, mud, CGI sheets, wood and stones for reconstruction of their houses.

Timber Utilization in District Bagh

Table 4.6.1 Timber Utilization in District Bagh

S.No	Union Council	No of households Interviewed	% of households used timber		Percentage new/old timber used		Source of timber used in construction in Percentage					
			Yes	No	New	Old	Market	Forest Dept	Forest	Legal	Illegal	Others
1	Herigal	1	100%	0%	50%	50%	0%	0%	100 %	0%	0%	0%
2	Naeshar Ali	8	100%	0%	74%	26%	13%	13%	24%	50%	0%	0%
3	Jaglarri	4	100%	0%	60%	40%	50%	0%	25%	25%	0%	0%
4	Bani Basri	7	100%	0%	28%	72%	14%	14%	14%	44%	14 %	0%
5	Bagh	4	100%	0%	30%	70%	0%	0%	0%	0%	0%	0%
6	Salian	1	100%	0%	20%	80%	0%	0%	0%	100%	0%	0%
7	Hillsurong	1	100%	0%	0%	100 %	100 %	0%	0%	0%	0%	0%

Table 4.6.1 shows that in union council Herigal, 100 percent households used timber for reconstruction of their houses. 50 percent households used new timber while 50% recycled the old timber. 100 percent households got timber from forest. In union council Naeshar Ali, 100 percent persons were used timber for reconstruction of their houses. 74 percent households were used new timber while 26% recycled the old timber. 13 percent households got timber from market, 13% got timber from forest department, 24% got

timber from forest while 50% got from legal sources. In union council Jaglari, 100 percent households used timber for reconstruction of their houses. 60 percent households used new timber while 40% recycled the old timber. 50 percent households got timber from market, 25% got timber from forest while 25% got timber from legal sources. In union council Bani Basri, 100 percent households used timber for reconstruction of their houses. 28 percent households used new timber while 72% recycled the old timber. 14 percent households got timber from market, 14% got timber from forest department, 14% got timber from forest while 14% illegal, 44% households got timber from legal sources. In union council Bagh, 100 percent households used timber for reconstruction of their houses. 30 percent households used new timber while 70% recycled the old timber. 25 percent households got timber from legal sources and 75% got timber from other sources. In union council Salian and Hillsurong, 100 percent households used timber for reconstruction of their houses. 100 percent households got timber from market. 100 percent households recycled the old timber in Hillsurong while there was 80% recycling of old timber in Salian.

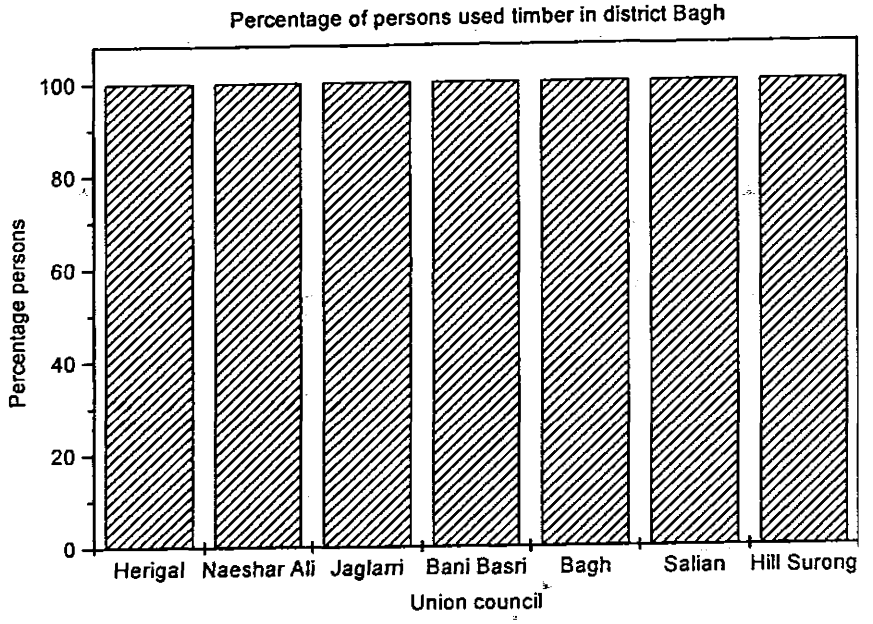

Figure 4.6.1 Percentage of households used timber in district Bagh

Fig 4.6.1 shows that in all surveyed union councils of district Bagh maximum households were used timber for reconstruction of their houses.

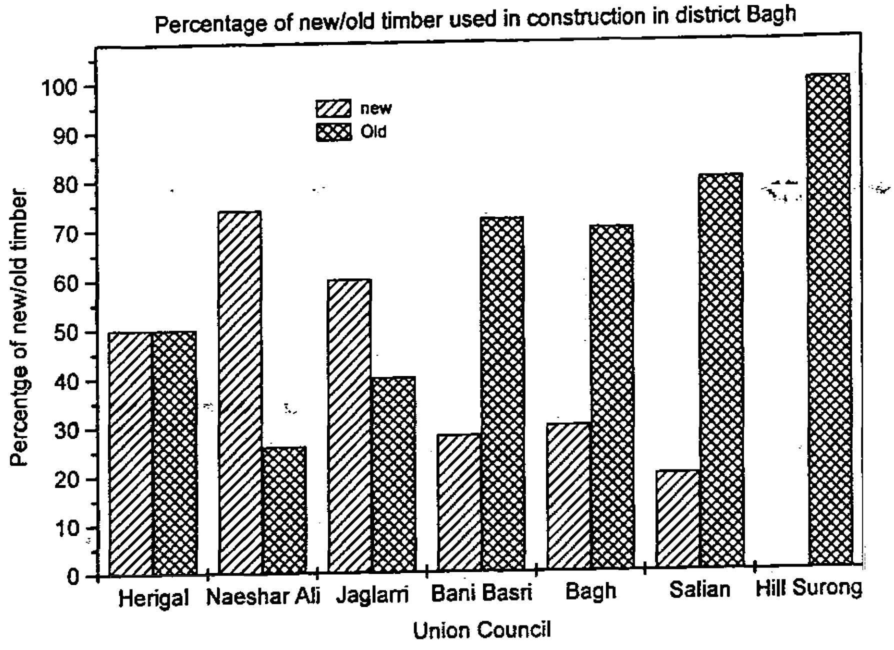

Figure 4.6.2 Percentage of new/old timber used in construction in district Bagh

Figure 4.6.2 shows that in union council Hill Surong, there was maximum number of households used old timber for reconstruction of their houses while in Naeshar Ali, there was maximum number of households used new timber for reconstruction of their houses.

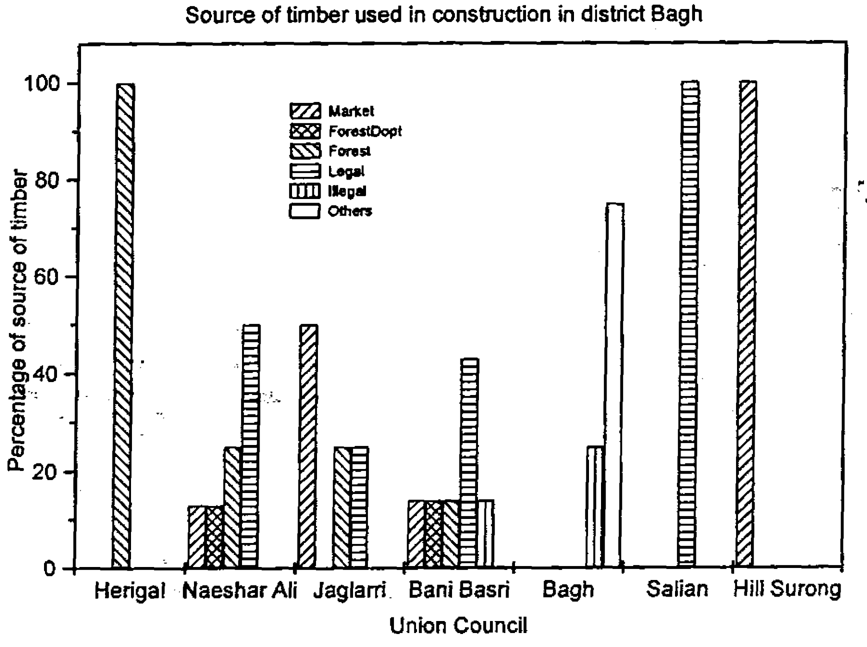

Figure 4.6.3 Source of timber used in construction in district Bagh

Figure 4.6.3 shows that maximum number of households of union council union Herigal got timber from forest for reconstruction, maximum timber got from market in Hill Surong and maximum timber got from legal sources in Salian.

Table 4.6.2 Timber Utilization in District Bagh

S.No	Union Council	No of Households Interviewed	Percentage of households who cut trees for reconstruction		No of trees removed	Land sliding due to excavation	
			Yes	No		Yes	No
1	Herigal	1	100%	0%	5	0%	100%
2	Naeshar Ali	8	25%	75%	7	13%	87%
3	Jaglarri	4	50%	50%	4	0%	100%
4	Bani Basri	7	43%	57%	10	0%	100%
5	Bagh	4	0%	100%	0	25%	75%
6	Salian	1	100%	0%	1	0%	100%
7	Hillsurong	1	0%	100%	0	0%	100%

Table 4.6.2 shows that in Herigal, 100 percent households removed trees for reconstruction of their houses and 5 trees were removed, while there was no land sliding due to excavation. In Naeshar Ali, 25 percent households removed trees for reconstruction of their houses and seven trees were removed, while 13% land sliding was due to excavation. In Jaglarri, 50 percent households removed trees for reconstruction of their houses and four trees were removed, while there was no land sliding due to excavation. In Bani Basri, 43 percent households removed trees for reconstruction of their houses and 10 trees were removed, while there was no land sliding due to excavation. In Bagh, there was no tree removal, while 25% land sliding was due to excavation. In Salian, 100 percent households removed trees for reconstruction of their houses and one tree was removed, while there was no land sliding due to excavation. In Hillsurong, there was no tree removal and no land sliding was due to excavation activities.

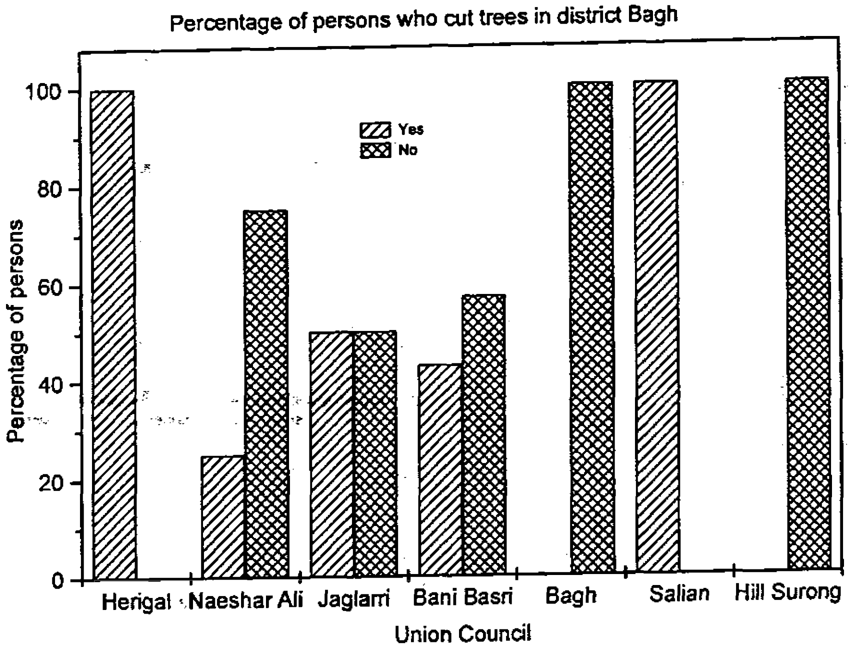

Figure 4.6.4 Percentage of households who cut trees in district Bagh

Fig 4.6.4 shows that in Salian and Herigal maximum number of households were removed trees for reconstruction while in Bagh and Hill Surong there was minimum tree removal.

Table 4.6.3 Type of Material Used for Houses(Bagh)

District	Union Council	Construction	Cement	Bricks	Blocks	Mud	CGI Sheets	Wood	Stone Masonry
Bagh	Herigal	1	0	0	0	1	0	1	0
	Naeshar Ali	8	6	0	4	1	5	8	3
	Jaglarri	4	4	0	2	1	4	4	3
	Bani Basri	7	5	0	6	1	6	7	3
	Bagh	4	3	0	3	2	4	4	0
	Salian	1	1	0	1	1	1	1	0
	Hill Surong	1	1	0	0	0	0	1	1
Total	7	26	20	0	16	7	20	26	10

Table 4.6.3 shows that In Naeshar Ali, jaglarri and Bani Basri, households were used cement, blocks, mud, CGI sheets, wood and stones for reconstruction of their houses. In Bagh and Salian, households were used cement, blocks, mud, CGI sheets, and wood for reconstruction of their houses. In Herigal, households were used mud and wood for reconstruction of their houses. In Hill Surong, households were used cement, wood and stones for reconstruction of their houses.

4.7 Timber Utilization in District Rawalakot

Table 4.7.1 shows that in union council Dhammni, 100 percent households used timber for reconstruction of their houses. 80 percent households used new timber while 20% recycled the old timber. 43 percent households got timber from market, 29% got timber from legal sources, and 14% from illegal sources and 14% got timber from other sources. In union council Bunjosa, 50 percent households used timber for reconstruction of their houses.100 percent households were used new timber.100 percent households got timber from market.

Table 4.7.1 Timber Utilization in District Rawalakot

S.No	Union Council	No of Households Interviewed	Percentage of households used timber		Percentage new/old timber used		Source of timber used in construction in Percentage					
			Yes	No	New	Old	Market	Forest Dept	Forest	Legal	Illegal	Others
1	Dhammni	7	100%	0%	80%	20%	43%	0%	0%	29 %	14%	14%
2	Bunjosa	2	50%	50 %	100 %	0%	100 %	0%	0%	0%	0%	0%
3	Darakik	5	100%	0%	62%	38%	60%	40%	0%	0%	0%	0%
4	Ghala	2	100%	0%	100 %	0%	0%	0%	50 %	0%	0%	50%

In union council Daraik, 100 percent households used timber for reconstruction of their houses. 62 percent households were used new timber while 38% recycled the old timber.

60 percent households got timber from market and 40% got timber from forest department. In union council Ghala 100 percent households used timber for reconstruction of their houses. 100 percent households were used new timber. 50 percent households got timber from forest and 50% got timber from other sources.

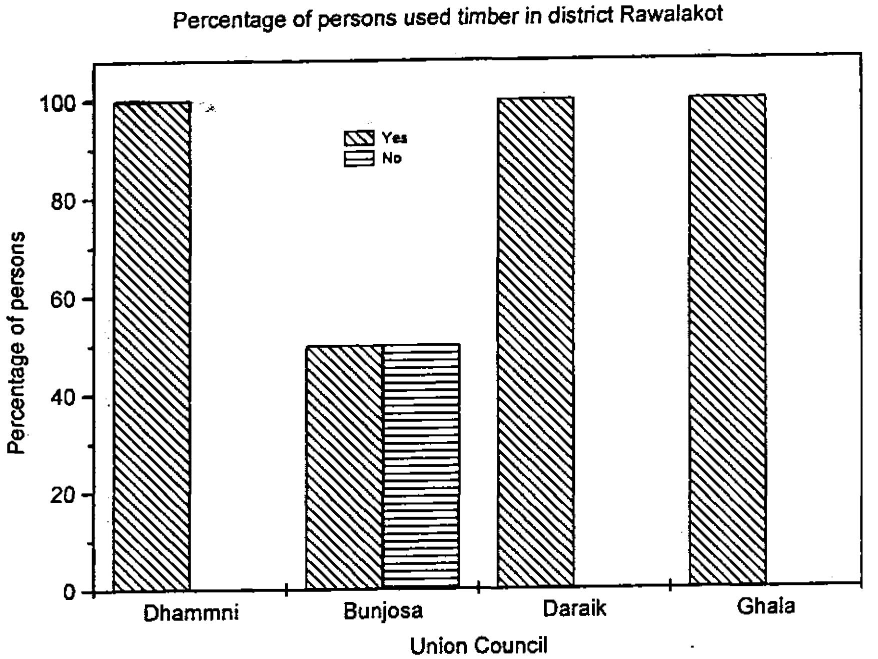

Figure 4.7.1 Percentage of households used timber in district Rawalakot

Fig 4.7.1 shows that in Dhammni, Darik and Ghala, maximum number of households were used timber for reconstruction of their houses.

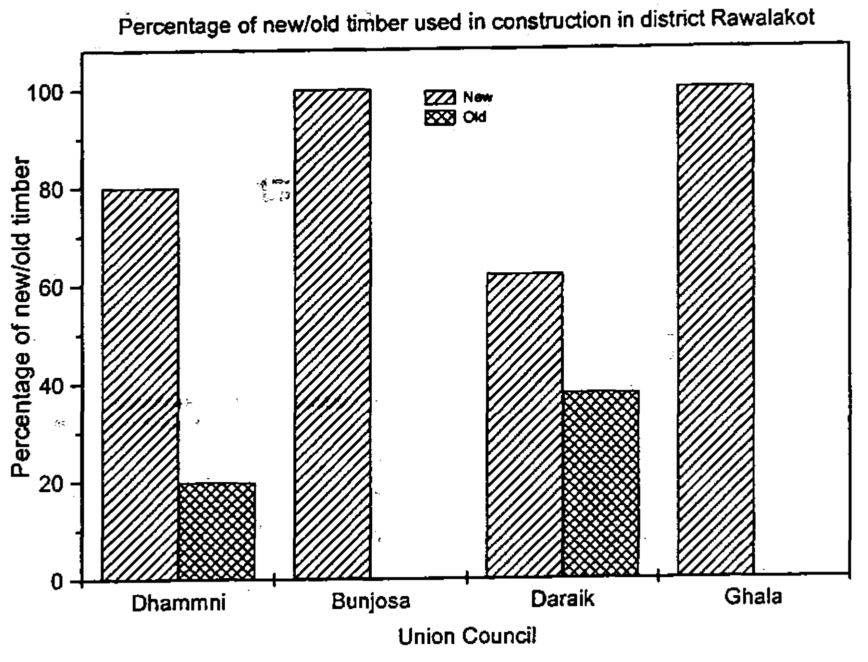

Figure 4.7.2 Percentage of new/old timber used in construction in district Rawalakot

Fig 4.7.2 shows that in Ghala and Bunjosa, there was maximum usage of new timber for reconstruction of houses, while there was maximum recycling of old timber in Daraik.

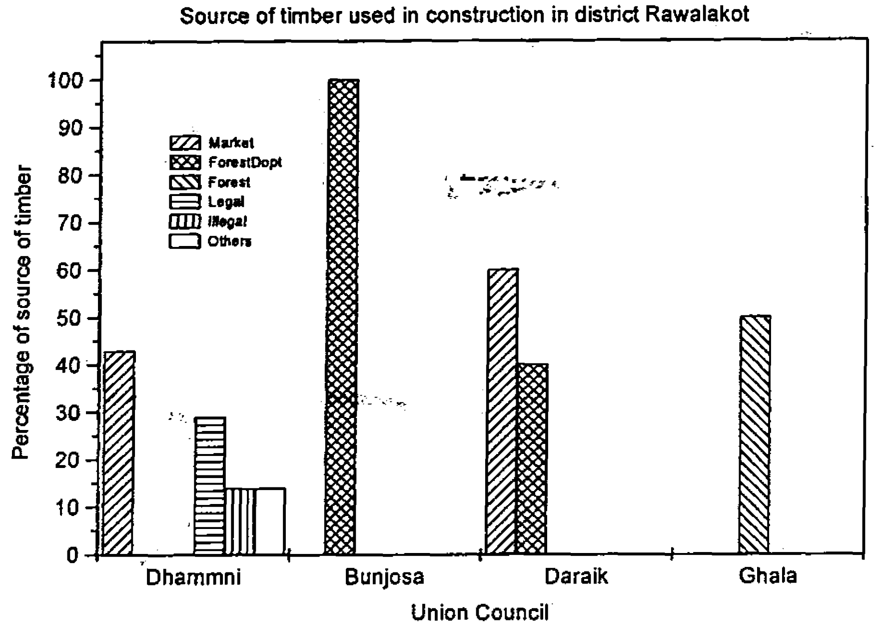

Figure 4.7.3 Source of timber used in construction in district Rawalakot

Figure 4.7.3 shows that maximum timber for reconstruction of houses was obtained from forest department in Bunjosa. Maximum timber for reconstruction of houses was obtained from market in Darik and maximum timber was gotten from forest in Ghala for reconstruction of houses.

Table 4.7.2 Timber Utilization in District Rawalakot

S.No	Union Council	No of Households Interviewed	Percentage of households who cut trees for reconstruction		No of trees removed	Land sliding due to excavation	
			Yes	No		Yes	No
1	Dhammni	7	43%	57%	27	14%	86%
2	Bunjosa	2	0%	100 %	0	0%	100%
3	Darakik	5	20%	80%	1	100 %	0%
4	Ghala	2	100%	0%	5	50%	50%

Table 4.7.2 shows that in Dhamni, 43 percent households removed trees for reconstruction of their houses and 27 trees were removed, while 14% land sliding was due to excavation. In Bunjosa, there was no tree removal and no land sliding was due to excavation. In Daraik, 20 percent households removed trees for reconstruction of their houses and one tree was removed, while 100% land sliding was due to excavation. In Ghala, 100 percent households removed trees for reconstruction of their houses and 5 trees were removed, while 50% land sliding was due to excavation.

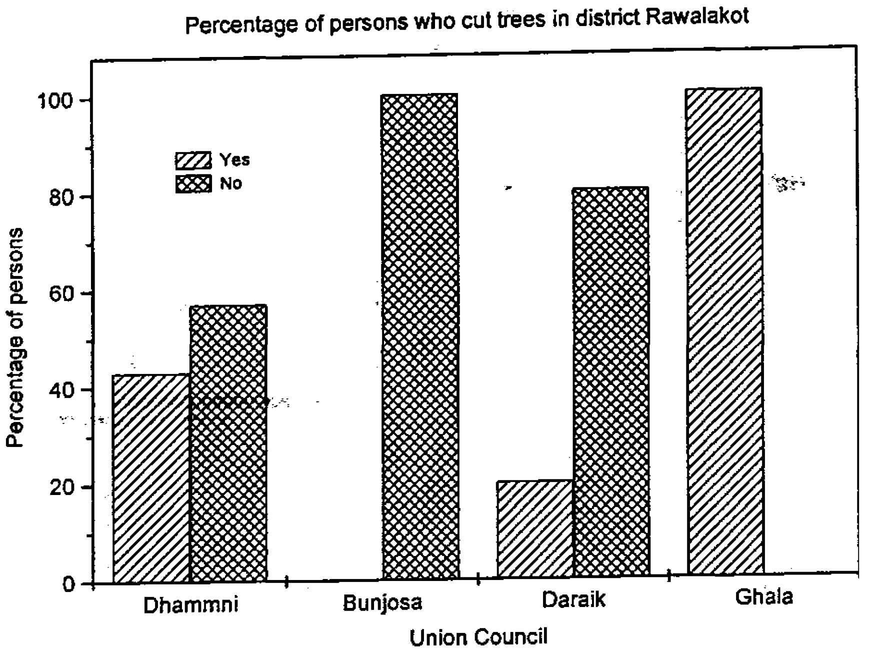

Figure 4.7.4 Percentage of households who cut trees in district Rawalakot

Table 4.7.3 Type of Material Used for Houses (Rawlakot)

District	Union Council	Construction	Cement	Bricks	Blocks	Mud	CGI Sheets	Wood	Stone Masonry
Rawalakot	Dhammni	7	7	1	4	1	5	7	3
	Bunjosa	2	2	2	0	0	0	1	1
	Daraik	5	5	0	5	3	4	5	0
	Ghala	2	2	0	2	1	2	2	1
Total	4	16	16	3	11	5	11	15	5

Table 4.7.3 shows that in Dhammni, households were used cement, bricks, blocks, mud, CGI sheets, wood and stones for reconstruction of their houses. In Bunjosa, households were used cement, bricks, wood, and stones for reconstruction of their houses. In Daraik households were used cement, blocks, mud, CGI sheets and wood for reconstruction of their houses. In Ghala, households were used cement, blocks, mud, CGI sheets, wood, and stones for reconstruction of their houses.

4.8 Timber Utilization in KPK

Table 4.8.1 Timber Utilization in KPK

S.No	Districts	No of Households Interviewed	% of households used timber		Percentage new/old timber		Source of timber used in construction in Percentage					
			Yes	No	New	Old	Market	Forest Dept	Forest	Legal	Illegal	Others
1	Abbottabad	40	95	5	56	44	3	18	26	42	11	26
2	Mansehra	39	87	13	53	47	50	0	18	6	12	12
3	Battagram	76	93	7	80	20	49	7	21	4	4	14
4	Shangla	13	92	8	97	3	0	92	8	0	0	0

Table 4.8.1 shows that in district Abbottabad, 95 percent households were used timber for reconstruction of their houses. 56 percent households were used new timber while 44 % recycled the old timber for reconstruction of their houses. 3 percent households got timber from market, 18 % households got timber from forest department, 26 % got timber from forest while 11 % illegal, 42 % legal, and 26 % got timber from other sources for reconstruction of houses. In district Mansehra, 87 percent households used timber for reconstruction of their houses.13 percent households used new timber while 53 % recycled the old timber for reconstruction of their houses. 50 percent households got timber from market, 18 % households got timber from forest while 12 % illegal, 6 % legal, and 12 % got timber from other sources for reconstruction of houses. In district Battagram, 93 percent households used timber for reconstruction of their houses. 80 percent households used new timber while 20 % recycled the old timber for reconstruction of their houses. 4 percent households got timber from market, 7 % households got timber from forest department, 21 % got timber from forest while 4 % illegal, 4 % legal, and 14% got timber from other sources for reconstruction of houses. In district Shangla, 92 percent households used timber for reconstruction of their houses. 97 percent households used new timber while 3 % recycled the old timber for reconstruction of their houses. 92 percent households got timber from forest department, 8 % got timber from forest for reconstruction of houses.

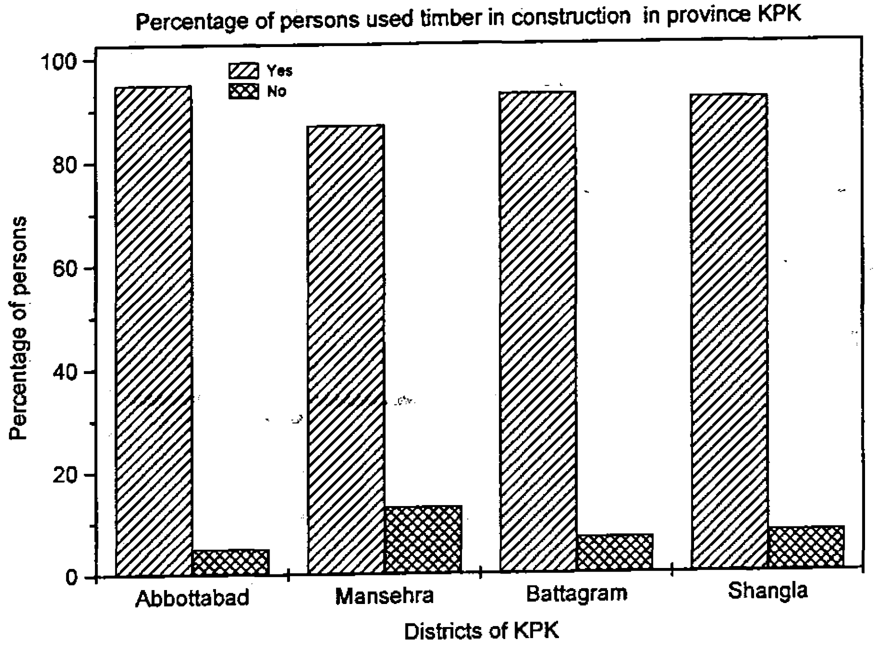

Figure 4.8.1 Percentage of households used timber in construction in province KPK

Fig 4.8.1 shows that in KPK in district Abbottabad maximum number of households was used timber for reconstruction and in district Mansehra minimum number of households was used timber for reconstruction of their houses.

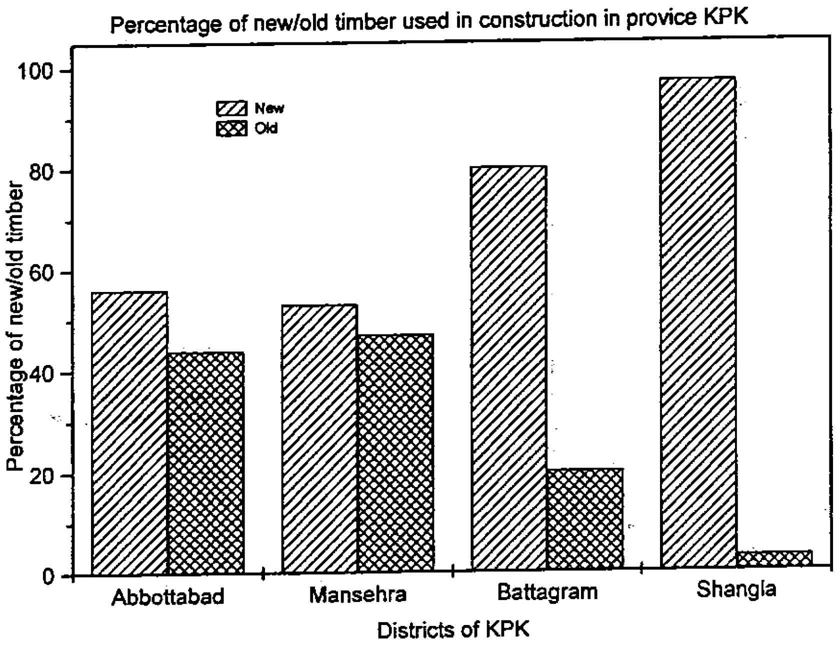

Figure 4.8.2 Percentage of new/old timber used in construction in province KPK

Fig 4.8.2 shows that in KPK in district Mansehra, there was maximum usage of old timber for reconstruction of houses and in district Shangla, there was maximum usage of new timber for reconstruction of houses.

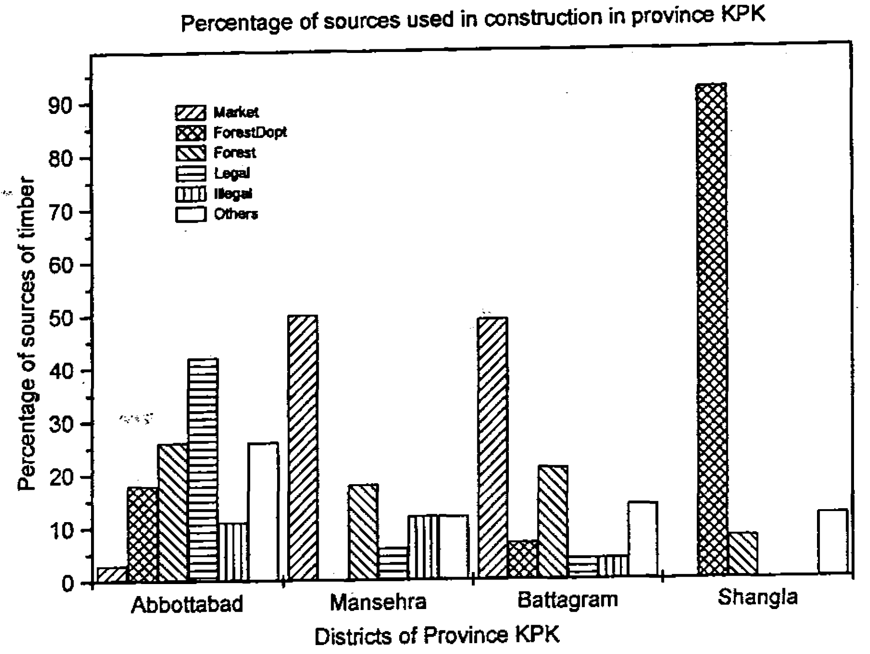

Figure 4.8.3 Percentage of sources of timber used in construction in province KPK

Figure 4.8.3 shows that in KPK in district Manshera, maximum timber got from market, maximum timber got from forest department in district Shangla and maximum timber got from forest in district Abbottabad.

Table 4.8.2 Timber Utilization in KPK

S.No	Districts	No of Households Interviewed	Percentage of households who cut trees for reconstruction		No of trees removed	Land sliding due to excavation	
			Yes	No		Yes	No
1	Abbottabad	40	37%	63%	21	10%	90%
2	Mansehra	39	12%	88%	5	5%	95%
3	Battagram	76	17%	83%	48	12%	88%
4	Shangla	13	8%	92%	1	0%	100%

Table 4.8.2 shows that in district Abbottabad, 37 percent households removed trees for reconstruction of their houses and 21 trees were removed, while 10% land sliding was due to excavation. In district Mansehra, 12 percent households removed trees for reconstruction of their houses and 5 trees were removed, while 5 % land sliding was due to excavation. In district Battagram, 17 percent households removed trees for reconstruction of their houses and 48 trees were removed, while 12% land sliding was due to excavation. In district Shangla, 8 percent households removed trees for reconstruction of their houses and 1 tree was removed, while there was no land sliding due to excavation.

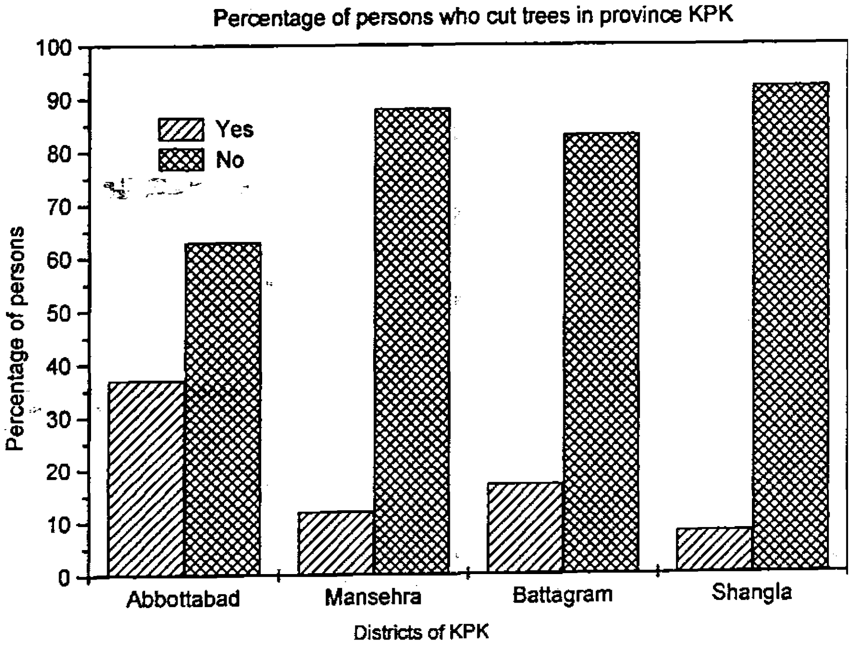

Figure 4.8.4 Percentage of households who cut trees in province KPK

Fig 4.8.4 shows that in KPK in district Abbottabad maximum number of households cut down trees for reconstruction of their houses.

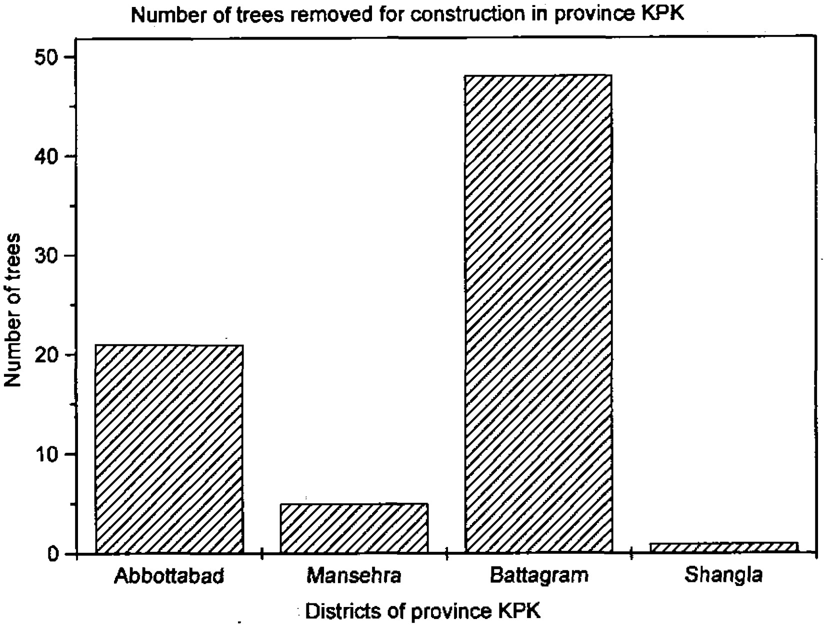

Figure 4.8.5 Tree removal for reconstruction in province KPK

Fig 4.8.5 shows that in KPK in district Battagram, maximum number of trees was removed for reconstruction and there was minimum tree removal in district shangla.

4.9 Timber Utilization in AJK

Table 4.9.1 shows that in district Rawalakot, 94 percent households used timber for reconstruction of their houses. 86 percent households used new timber while 14% recycled the old timber for reconstruction of their houses. 40 percent households got timber from market, 20% households got timber from forest department, and 13% got timber from forest while 7% illegal, 13% legal, and 7% got timber from other sources for reconstruction of houses. In district Bagh, 100 percent households used timber for reconstruction of their houses. 38 percent households used new timber while 62% recycled the old timber for reconstruction of their houses. 19 percent households got timber from market, 8% households got timber from forest department, and 19% got timber from forest while 8% illegal, 30% legal, and 16% got timber from other sources for reconstruction of houses.

Table 4.9.1 Timber Utilization in AJK

S.No	Districts	No of Households Interviewed	% of households using timber		Percentage new/old timber used		Source of timber used in construction in Percentage					
			Yes	No	New	Old	Market	Forest Dept	Forest	Legal	Illegal	Others
1	Rawalakot	16	94%	6%	86 %	14 %	40%	20%	13%	13 %	7%	7%
2	Bagh	26	100%	0%	38 %	62 %	19%	8%	19%	30 %	8%	16 %
3	Muzaffarabad	29	100%	0%	45 %	55 %	17%	41%	10%	0%	26%	0%

In district Muzaffarabad, 100 percent households used timber for reconstruction of their houses. 45 percent households used new timber while 55% recycled the old timber for reconstruction of their houses. 17 percent households got timber from market, 41% households got timber from forest department, and 10% got timber from forest while 26% households got timber from illegal sources for reconstruction of their houses.

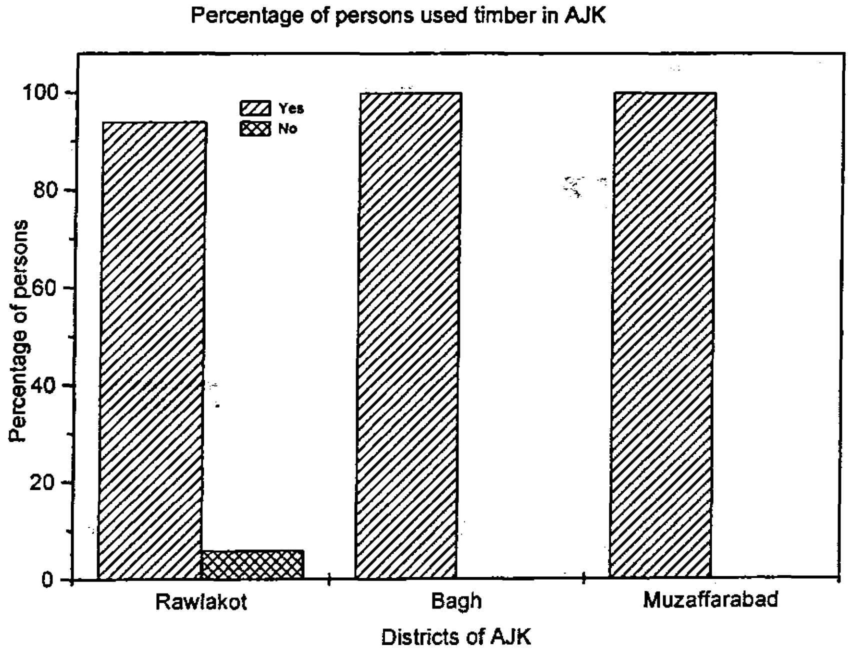

Figure 4.9.1 Percentage of households used timber in AJK

Figure 4.9.1 shows that in AJK in district Bagh and Muzaffarabad, maximum number of households was used timber for reconstruction and in district Mansehra, minimum number of households was used timber for reconstruction of their houses. Figure 4.9.2 shows that in AJK in district Bagh, there was maximum usage of old timber for reconstruction of houses and in district Rawalakot, there was maximum usage of new timber for reconstruction of houses. Figure 4.9.3 shows that in AJK in district Rawalakot, maximum timber got from market, maximum timber got from forest in district Muzaffarabad and maximum timber got from legal sources in district Bagh.

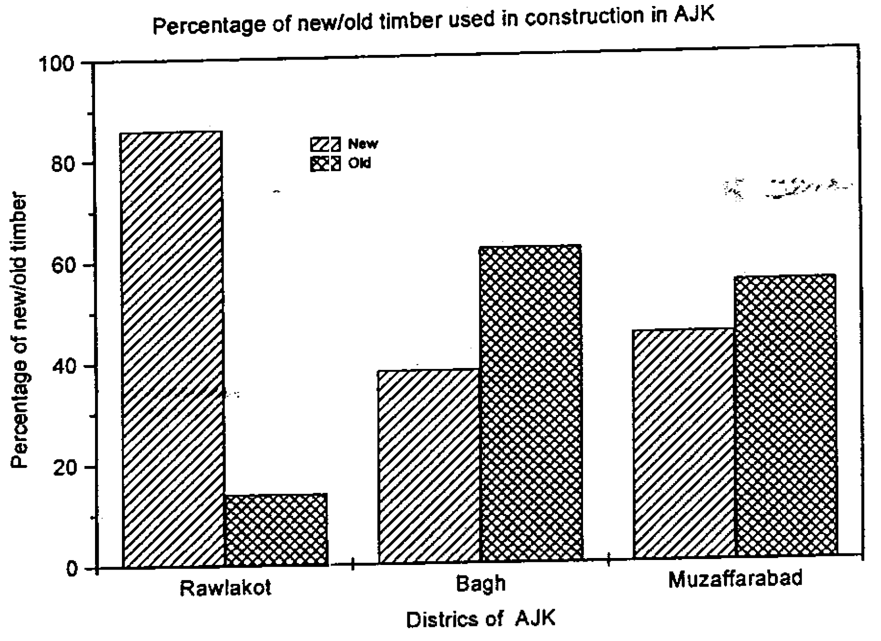

Figure 4.9.2 Percentage of new/old timber used in construction in AJK

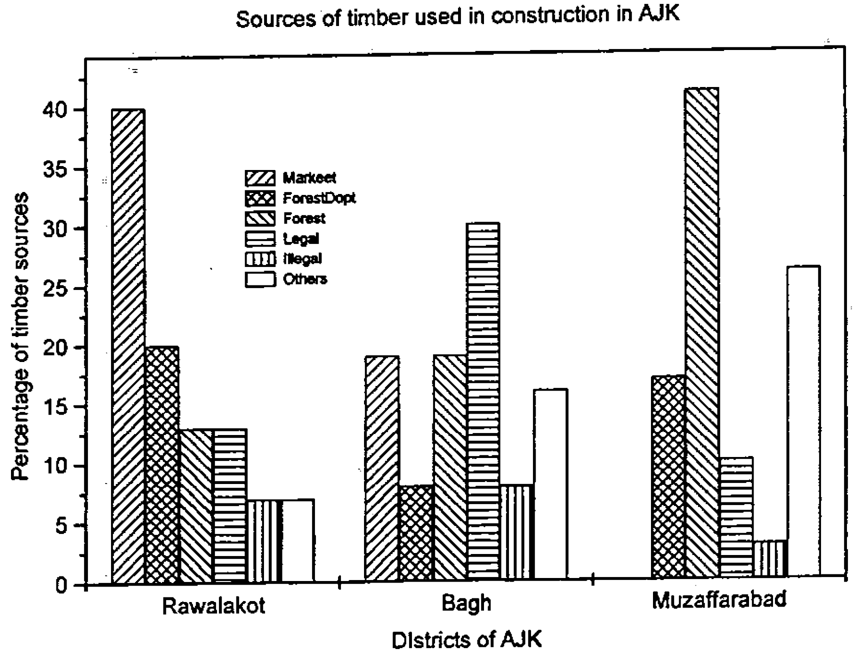

Figure 4.9.3 Sources of timber used in construction in AJK

Table 4.9.2 Timber Utilization in AJK

S.No	Districts	No of Households Interviewed	Percentage of households who cut trees for reconstruction		No of trees removed	Land sliding due to excavation	
			Yes	No		Yes	No
1	Rawalakot	16	38%	62%	33	50%	50%
2	Bagh	26	30%	70%	22	8%	92%
3	Muzaffara bad	29	45%	55%	45	38%	62%

Table 4.9.2 shows that shows that in district Rawalakot, 38 percent households removed trees for reconstruction of their houses and 33 trees were removed, while 50% land sliding was due to excavation. In district Bagh, 30 percent households removed trees for reconstruction of their houses and 22 trees were removed, while 8% land sliding was due to excavation. In district Muzaffarabad, 45 percent households removed trees for reconstruction of their houses and 45 trees were removed, while 38% land sliding was due to excavation.

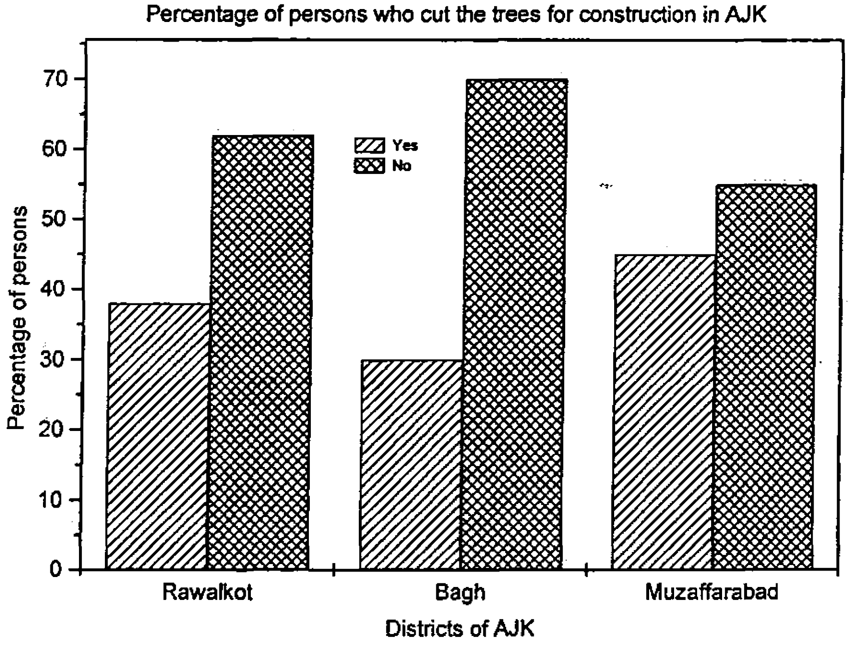

Figure 4.9.4 Percentage of households who cut the trees for reconstruction in AJK

Fig 4.9.4 shows that in AJK in district Muzaffarabad, maximum number of households cut down trees for reconstruction of their houses and in district Bagh, minimum number of households was removed trees for reconstruction.

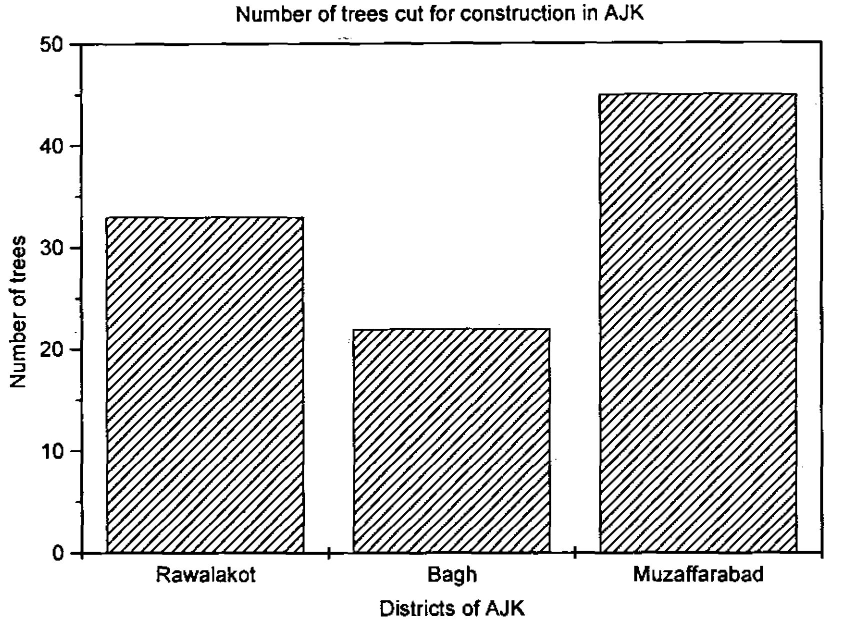

Figure 4.9.5 Tree removal for reconstruction in AJK

Figure 4.9.5 shows that in AJK in district Muzaffarabad, maximum number of trees was removed for reconstruction of houses.

Chapter 5

CONCLUSIONS AND RECOMMENDATIONS

After earthquake of 8 october, 2005 large number of houses were destroyed in rural areas of KPK and AJK. Recronstruction of houses in these areas has number of negative environmental consequences, timber usage for reconstruction of houses is one of those environmental consequences. Forest degradation results in loss of land potential, soil erosion, land sliding and loss of biodiversity. Based on extensive data analysis on timber utilization in earthquake affected areas of AJK and KPK provided in chapter no 4 following conclusions were made.

- In both KPK and AJK timber was used excessively for reconstruction of houses. Excessive use of new timber was caused degradation of natural forests which ultimately resulted into soil erosion, depletion of water resources, land sliding and global warming. In district Battagram, Abbottabad, Rawalakot, Bagh and Muzzaffarabad maximum number of households were used timber for reconstruction of their houses. Significant number of trees were removed for reconstruction of houses. In these areas location and distance of population from nearby forest was the most important factor which played a vital role for timber extraction. If the population located nearby forest then there was more chance and easy to cut trees from forest for timber. In union council Shamlai of district Battagram forest was nearby the population so here maximum number of trees were removed. In union council Rashin of district Muzaffarabad in the artea of Katha all the houses were made of timber frame viz Dhajee with extensive use of timber.

- Most of timber got from forest and forest department in earthquake affected rural areas of KPK and AJK. Trees were removed without any permit, illegal logging was common and some elements of forest department was involved in excessive illegal extraction of timber.
- Sustainable use of timber was less. Though some households used recycled and old timber for reconstruction of their houses but new timber was used in excess. In AJK 44% households used recycled timber for reconstruction of their houses.
- Overall in comparison of timber utilization in AJK and KPK it was found that in AJK more degradation of natural forests as compared to KPK. In case of KPK timber utilization was different from one area to another due to availability of concrete and cement for RCC type of reconstruction. In upper areas like Battagram timber had been used excessively but Dhajee like structure was not found as it in Leepa Valley and Rashian area of AJK.
- In earthquake affected areas, one of major problem was reconstruction of houses on land with dangerous structure which can pose serious threat to community. 20% land sliding reported in AJK and KPK during reconstruction activities. Shortage of leveled land in high mountainous areas, so in these areas

more chance of land sliding. Maximum number of households faced the problem of land sliding during reconstruction were reported in district Muzaffarabad, Abbottabad and in Battagram.

RECOMMENDATIONS

Based on all the facts described above following recommendations suggested to avoid degradation of forests due to reconstruction activities after the disaster.

- Strictly prohibit the cutting of timber for reconstruction activities. Govt should provide the alternative construction materials for reconstruction of houses on low rates and excess to these materials should be made easy.
- Excessive use of wood in roofs and walls of buildings should be prohibited. Dhajee like structure should be strongly condemned.
- Forest department should be properly monitored. Most of timber lost due to forest department, legally they are not allowed to give permits to people to cut down trees but they do this crime for sake of money. Forest department is insufficient and some elements of deparment are corrupt. Corruption and timber mafia should be controled to avoid illegal loggings of timber. Fines and penalties for corruption should be implemented.
- Awareness campaign about importance of forests should be launched that the persons get awareness about value of forests. Protection and management of forests by local people play important role in controlling deforestation. Environmental awareness may be given through various sources like meetings, workshops and mosques.

- Environmental assessment should be carried out once every year to cover all reconstruction and rehablitation activities. Moreover dedicated environmental coordinators should be appointed at regional level for monitoring of rural reconstruction projects.
- Concept of sustainable management of forests should be applied. Replantation, good governance and sustainable use of timber all are important steps that should be taken to control the forest degradation due to rural reconstruction activities.
- Govt should launch the forestry projects to compensate the forest loss during earthquake and post reconstruction activities.

DATA COLLECTION SURVEY FORM

Questionnaire / Survey

District		Tehsil	
Union Council		Village/Town	
Number of Houses in village		Population in village	
Distance to nearest Forest		Compensation Received from ERRA	

Name of Person interviewed ______________________________

Male/female with Family Size M------------F--------C------------------------

CNIC Number: ______________________________

MOU # with ERRA (if Available)

____

S.No.	Catagories	Findings
Timber Utilization		
1.	Timber was used in Construction of House Yes ☐ No ☐	**Estimated Quantity** Source New ☐ Used ☐
2.	From where timber was obtained for construction of house?	Market ☐ Forest Depot ☐

	(Any Detail Here)	From forests ☐ Legal ☐ Illegal ☐ Others
3	In case of construction at new site, how many trees removed for site clearance?	N/A Trees removed ☐ Number of trees ☐
4	Percentage of Source of Timber	Recycled New Any Other
5	Land sliding due to excavation and construction activities	
6	Type of material used for house construction Cement Bricks Blocks Mud CGI Sheets Wood Stone Masonry Others	 Yes ☐ No ☐ Yes ☐ No ☐ New☐ Reused ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ New☐ Reused ☐ Yes ☐ No ☐ New☐ Reused ☐

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