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Land and Water Resources Degradation in Phek District, Nagaland

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Abstract

Land and water are the two most vital natural resources that provide the most basic needs of mankind. But these two most vital resources are degrading at an alarming rate due to various activities. It is estimated that over 70% of soil depletion, degradation of land and deterioration of water resources in Nagaland are attributed to the practice of shifting cultivation, without proper conservation measures. In addition, natural factors like hilly terrain coupled with heavy rainfall in the state cause soil erosion through runoff water resulting in low food grain production. As such, the farmers continue to remain the poorest of the poor among the society.

As land and water resources are limited, it is absolutely necessary that sustainable and scientific management practices are adopted and applied without imparting the ecological and environmental status.

Keywords: *Land, Water, Resources, degradation, Nagaland*

Materials and Methods

The data used in this study is both primary and secondary. Drainage basin is used here as a geomorphic unit for the study of land and water resources degradation in the catchments namely Garukra, Lozache, Murhepu and Sopu. Identification of land and water resources degradation was done by conducting surveys in the selected catchments. Land resources degradation in the selected catchment ecosystems is estimated through simultaneous field check and use of Toposheet 83k/2, 83k/6 and 83k/10 covering parts of Phek district of Nagaland. Data for the determination of status and severity of soil degradation in Nagaland were collected from Dept. of Soil & Water Conservation, Nagaland. Data collected were analyzed using statistical technique (average) to explain the degree of degradation.

Result and Discussion

Land resources degradation: The diminishing worldwide availability of productive land resources is such that continued degradation of productive land is a clear threat to the survival of the human race. There are mounting social, economic, political and ecological reasons why the land may not be suitable for development. Land and soil degradation, which are natural phenomena but are often accelerated by human activity, affect currently productive lands and are even more likely in near

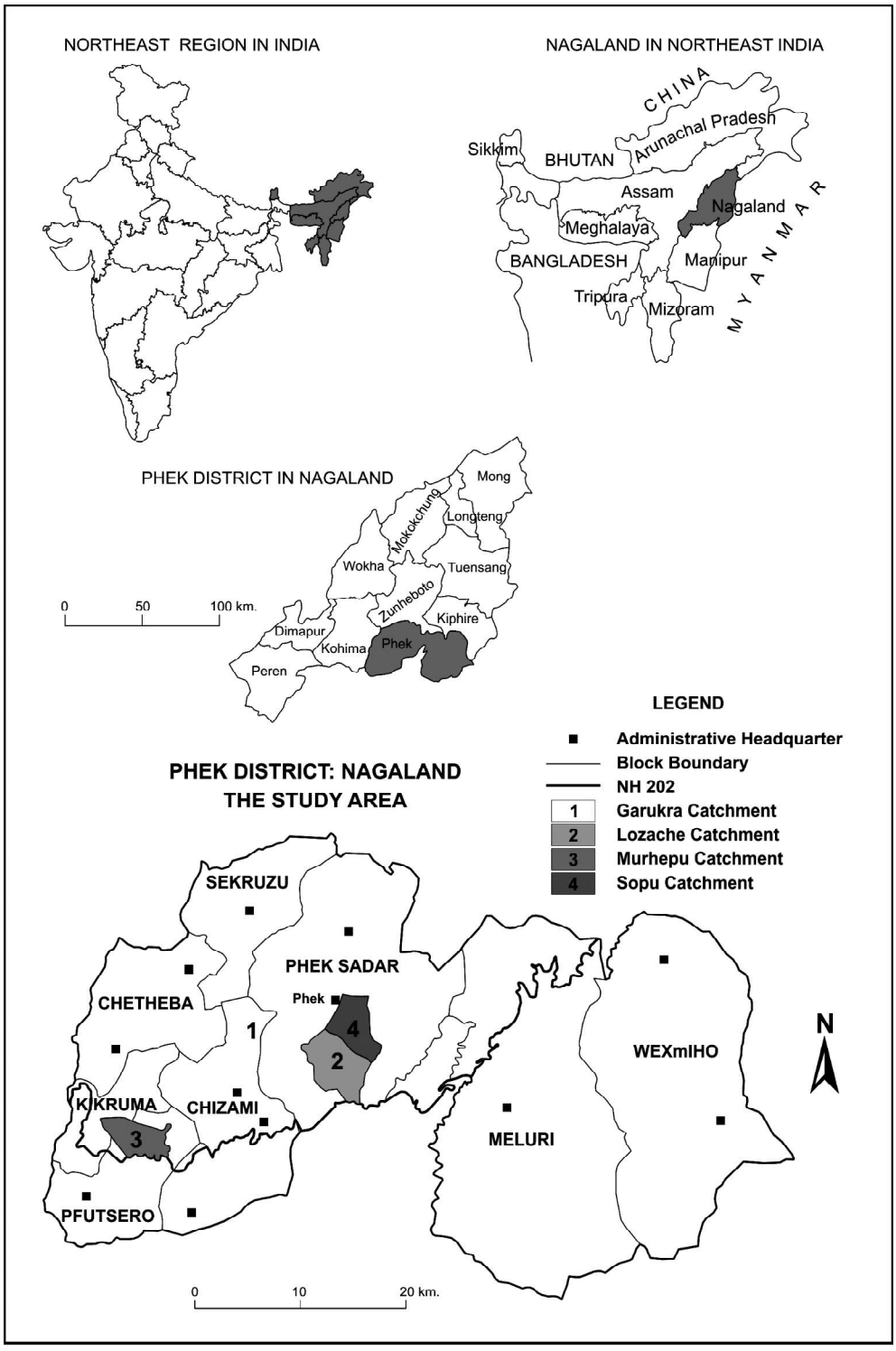

Fig. 1: Location map of Phek District, Nagaland and its four Selected Degraded Catchment Ecosystems

future. Land degradation may be defined on the basis of biological productivity and the human expectations about the land. Generally, land is considered to be degraded when soil is eroded, water dries up or gets contaminated, natural vegetation decreases, biomass production deteriorates, resulting in loss of biodiversity. Land degradation has been defined in a number of ways. "Land degradation is the reduction or complete loss of natural capacity to produce healthy and nutritious crops resulting from erosional loss of nutrient-rich surface soil, leaching of nutrients, reduced water retention, surface sealing, hardpan formation and accumulation of toxic chemicals etc. The loss of productivity occurs in spite of very favourable climatic and other non-edaphological factors". The above definition includes the key processes of land degradation. Natural and man-made fires are also responsible for exposing soil to degradation.

Causes of land resources degradation: The more important and direct causes of land resources degradation are inappropriate land uses and farming systems, lack of investments for land improvement, lack of awareness and knowledge about conservation strategies, over-grazing, poor water management, poorly maintained irrigation systems etc. However, among the various causes, soil erosion (by water and wind) is the most and dominant process and extensive form of degradation facing mankind today. Agriculture on sloping lands has contributed to serious problems of soil erosion. Soil erosion is not the outcome of a single factor but a multiplicity of factors. Amongst these mention may be made of deforestation, overgrazing by cattle, shifting cultivation practiced by tribals, unscientific farming techniques, diversion and obstruction of natural drainage courses by transport and communication lines and unscrupulous mining activities. In general man plays a dominant role in accelerating the process of soil erosion. In fact modern concept of development based on material comfort has led to the over exploitation of environmental resources causing immense damages to eco-system. Soil is an important natural resources and a part of ecosystem. The causes of soil erosion are directly related to improper land use, and are, therefore, entirely man-made.

In Phek district of Nagaland, soil erosion is mainly caused by-deforestation, faulty cultivation method, shifting cultivation, Overgrazing by kiwi *mithuns*, Destruction of drainage channels by roads construction (Plate 3 see page 212), lack of proper surface drainage, denuding forest fires, etc. Soil erosion is the major soil degradation process among the various kinds of soil problems. Steep lands with high rainfall are often subjected to soil loss by water erosion and landslides. In Phek district, nearly one-third (651.16 sq km) of the area is exposed to the threat of severe soil erosion. In fact, the whole of Phek district is under moderate to severe soil erosion. Severe soil erosion is observed in the eastern parts of the district bordering Myanmar and south of Kiphire district (Fig.1.2).

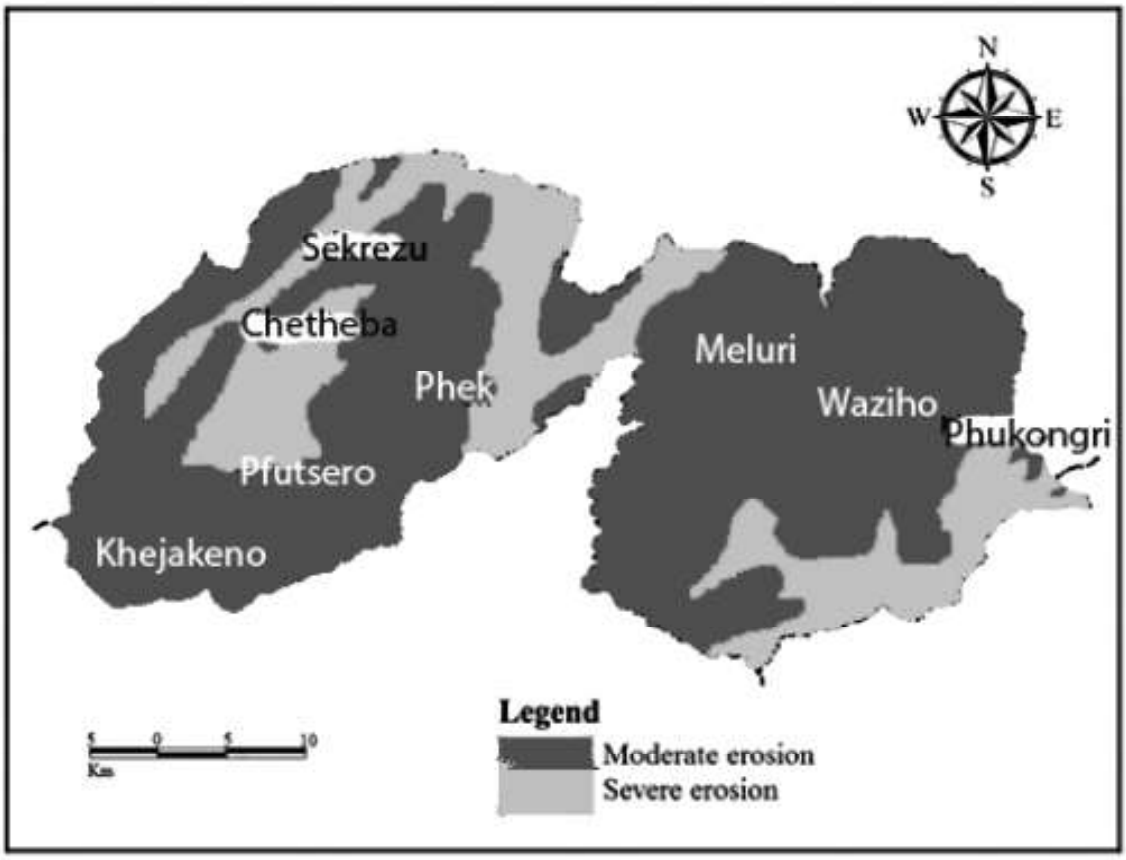

Fig..2: Erosion Map of the Phek District, Nagaland

Large tracts of severe soil erosion are also observed in the west and North West of Phek town and north western parts of the district covering Chozuba and Chetheba Circles. Severe soil erosion is observed mostly in and around Zanibu range because of steep slope and deforestation due to jhuming. The land resources degradation data of the selected catchment ecosystems are presented in Table 1.

Table 1 : Land resources degradation (in sq.km) in the Selected Catchment ecosystems of the study area.

Name of the Catchment	Total Area (sq.km)	Degraded Area (sq.km)				% Degraded to Total Area	Forest Cover in	
		Terrace area (sq.km)	Settlement Area (sq.km)	Jhum/ fallow Area (sq.km)	Total		sq.km	%
Garukra	26.33	1.16	0.24	15.8	17.2	65.32	9.13	34.68
Lozache	27.59	3.18	0.47	15.84	19.49	70.64	8.1	29.36
Murhepu	17.5	1.07	0.53	14.78	16.38	93.59	1.12	6.41
Sopu	18.2	4.077	1.175	10.44	15.69	86.74	2.5	13.74

It is observed from Table 1.1, that the degraded land area in Garukra, Lozache, Murhepu and Sopu catchments stand at 65.32%, 70.64%, 93.59% and 86.74% respectively. The average of all the four selected degraded catchments stands at 79.07% as land degradation. This is an indication of highly degraded land of the selected catchments with only 21% (average) of the area under forest cover. It may be mentioned that forest of Phek District of Nagaland covers an area of 56593.36 hectares of land constituting 28% of the total area of Phek district.

Effect of soil erosion: Due to erosion the fertile top soil is lost, this decreases the content of organic matter and other nutrients. As a result, the soil structure gets impoverished, available plant food along with mineral material is carried away and the ability of the land to supply moisture for plant growth is reduced and the beneficial activity of micro-organisms lessened. Due to these bad effects, the yields are lowered. Paddy fields are filled with sands. Soil erosion in the catchments' areas of streams due to deforestation and other destructive activities leads to silting of streams and rivers. This reduces the capacity of the rivers/streams and become prone to overtopping of water during the rainy season. Such examples occur in Lanye and Sedzu Rivers which has been exposed to silting because of large scale deforestation in the hills and have become an annual phenomenon now (Plate 1 see page 212).

Soil degradation in Nagaland: Nagaland is a hilly state except a narrow belt of the hills bordering Assam and small valleys in the lower range of the western and north eastern flank. Therefore, loss of top soil is encountered in all the soil units. Soil degradation is strong in most of the cases and it covers all the degrees, viz. slight, moderate and strong depending on the slope of the affected terrain. Terrain deformation is moderate to strong in Nagaland (Table 2).

Table 2: Status of Soil degradation in Nagaland

(*Since the degradation is a complex type in all the cases, the maximum area covered under a particular degree of degradation indicates the total area. Figures in the parenthesis indicate per cent coverage of total geographical area).

Soil degradation type	Degree of degradation (Area in '000 ha)				Total
	slight	moderate	strong	extreme	
Water erosion					
Wt loss of top soil	49 (2.9)	179 (10.8)	767 (46.3)	--	995 (60.0)
Wd terrain deformation	--	66	667 (40.2)	--	733 (40.2)
Chemical deterioration					
Cn loss of organic matter, loss of nutrients, acidification	49 (2.9)	179 (10.8)	767 (46.3)	--	995 (60.0)
Total area*	49 (2.9)	179 (10.8)	767 (46.3)	--	995 (60.0)
Stable terrain					
Sn under natural condition					

Source: NBSSLUP. Deppt. of soil & water conservation, Nagaland 2000

Severity of water erosion is medium to very high in the state and covers about 60% area of the state (Table 3). Chemical degradation and the removal of natural vegetation are found to be the main causative factors of soil degradation.

Table 3: Severity of soil degradation in Nagaland

(*Since the degradation is a complex type in all the cases, the maximum area covered under a particular degree of degradation indicates the total area).

soil degradation type	Severity class (Area in '000 ha)				total	% of TGA
	low	Medium	high	Very high		
Water erosion	--	48	327	620	995	60
Chemical deterioration	--	48	327	620	995	60
Total area*	--	48 (3)	327 (20)	(37)	995 (60)	60

Source: NBSSLUP. Deppt of soil & water conservation, Nagaland 2000

In general, improved agricultural practices need to be adopted. Tillage on higher slopes should be avoided, while contour phoughing on slopes prone to erosion may help in maintaining the soil depth. Planting of shelter belts and stubble mulching, help in conserving the soils. Gullies should be plugged to prevent head ward erosion. The pressure of livestock on pastures in hilly slopes has to be reduced in order to avoid overgrazing. There is no question about the need to prevent land degradation or the need to improve degraded lands.

Water resources degradation: It refers to the lowering quality and quantity of water resources. When the quality of water resources in any area is deteriorated consequent upon the deterioration of physical components of the environment due to anthropogenic pollution activity, it can be said that water resources are degraded. Though water as other natural substances has self purifying capacity during recycling processes, but growing agricultural and industrial activities of man during recent years have created twin problems of water shortage and pollution. Deforestation has lead bare vast stretch of hills. This has a direct effect on water and soil resources. The fact that so many mountain springs and streams have dried up in recent years is the direct result of the reduction in the number of trees on our hills. The lowered quality as well as the reduced discharge of mountain springs and streams is also an indication of water degradation.

Scarcity of drinking water is another form of expression of water degradation. If the national goal to keep a minimum of one-third geographical area of the country under forest (25 % in the plains and 60 % in hilly areas) is truly followed, then scarcity of drinking water should not be a problem, being basically in the hilly forested mountains. In fact, it should be plentiful. But the ecological significance of two-third under forest cover in the hill areas is often flouted in many parts. This has resulted in the degradation of water in mountainous and hill areas like ours. Water degradation has cascading effects- low moisture contain in

the soil because of less infiltration due to non interception trees and grasses, Low fertility and low production for those crops that are more water demanding, Reduce availability of water for man and irrigation for fields, Reduce habitats and Lower quality of water for man and all other living organisms.

Surface water pollution: Surface water includes river water, lake water and pond water but here under this heading only river/ stream water pollution has been discussed. Major source of water is precipitation. It is polluted through mixing of different quantities of dissolved inorganic matter in the form of ions. Most of the villages get a large part of their drinking water from rivers. Hence growing pollution of the rivers constitutes the biggest threat to the health.

Use of chemical or power generator for catching fish/collection of sea foods from Garukra River and its tributaries has degraded the quality of the water for human use as well as organisms. Similarly, Tizu River is under constant threat of being polluted because of use of chemicals and fishing bombs for catch. The story of Sedzu River is not different. Use of both chemicals and power generators in catching has polluted the river water to such an extent that regeneration of the marine organisms is difficult because power generator shocks and kills all the living organisms of the river irrespective of whether they are mature enough for food or edible or not. This type of collection of food should be banned so as to save water from been degraded/polluted and save organisms. One example worth to follow suit is-

Kho-Phola Vetho-Verhu Krotho (group) Resolution: one of the agreements/ resolutions concerning the protection and management of environment in Garukra catchment system is banning of use of chemical or power generator for catching fish/collection of sea food from Garukra River and its tributaries. Failing to abide by the resolution, penalty is imposed.

Conservation of water bodies

Water has relationship to human habitation and civilization. The existence of water bodies-whether natural or artificial- indicates the rich life sustaining habitat including flora and fauna and other micro-organisms. Water on the other hand is essential for generation of power, agriculture, industry and also to support various life forms including conserving the rich water ecosystem. One of the main functions of water body is to recharge the ground water sources which not only makes water available for human consumption but also improves/ supports vegetative growth and various life populations.

Phek district has limited water bodies due to its hilly topography. But these water bodies are unique and they often support a host of various life forms of the mountain ecosystem. These natural reserved water bodies are often rendered isolated or even neglected. Thus they are on the brink of extinction unless some urgent measures are taken to restore them. There is also an absolute urgent need to save these dying wetlands before they are completely wiped out from the wetland map of the state. The two prominent water bodies that are found in the district are Shilloi (locally known as Lachem), the biggest natural wetland of the state and Zanibu Lake. Another small lake Ache (Pfutsero) is also found in the district (Plate 2 see page 212).

There is a need to conserve and manage water resources such as streams, lakes, ponds, swampy areas, marshy lands, and other wetlands which generate a mosaic of flora and fauna in and around its surrounding ecosystem. They also conserve and provide ecosystem services such as livelihood opportunities-fishing, farming, domestic utility, tourism and other aesthetic values, ground water recharge, water hole for migratory birds and animals, soil conservation, contain the process of climate changes, etc. Therefore, there is a need to change in the mindset of the local people inhabiting wetlands to save few surviving/remaining water bodies by way of creating awareness programmes and restorative works such as, treating its catchment areas, protection of water bodies, prevention of pollution in the surrounding areas, proper drainage and sewage system, setting up committees to regulate the water bodies, conducting meetings, publications, providing amenities for people living in and around these water bodies and promotion of tourism in these areas. The department of soil and water conservation, Nagaland formulated a water policy so as to adopt various measures to accelerate ground water recharge and harnessing available water resources-both surface and underground water regime in the state.

Construction of well and renovation of traditional/ancestral wells:

The natural springs and traditional wells which earlier profusely bore storage of water are now gradually drying up due to human errors. Therefore, the department of soil and water conservation has launched a comprehensive plan to protect such existing wetlands and also construct/create water bodies wherever feasible to streamline water resources of the state that include renovation of traditional/ancestral wells in the vicinity of the villages and other human habitation covering all the district of Nagaland.

Conclusions

The present study on Land and water degradation in Phek District of Nagaland has been conducted during 2007 to 2014 and in four Selected Catchment ecosystems.

Land and water in the study area has been degraded by the land use change, mainly due to shifting cultivation, deforestation, road construction, slash and burn on hillslopes, accelerated soil erosion, landslidings, use of both chemicals and power generators in catching marine food and the dwindling water resources.

Nearly one-third (651.16 sq km) of the Phek district area is exposed to the threat of Severe soil erosion. In fact the whole of the study area comes under moderate to severe soil erosion.

Severe soil erosion is also observed in the West and North-West of Phek town and North Western parts of the district covering Chozuba & Chetheba Circles in and around Zanibu range

Use of chemical or power generator for collection of sea foods has degraded the quality of the water for both human use and marine organisms. Tizu, Sedzu and Lanye Rivers and its tributaries are under constant threat of being polluted because of use of chemicals and fishing bombs for marine catch.

Almost all the villages get a large part of their drinking water from rivers. Hence growing pollution of the rivers constitutes the biggest threat to the health.

Phek district of Nagaland has limited water bodies due to its hilly topography. Nevertheless these water bodies are unique and often support numerous life forms. But they are often neglected and are on the brink of extinction unless urgent measures are taken to restore them back before they are completely wiped out from the wetland map of the state.

There is a need to conserve and manage water resources to get quality ecosystem services, ground water recharge, water hole for migratory birds and animals, soil conservation, contain the process of climate changes, etc. The mindset of local people inhabiting wetlands needs to be changed and awareness programmes and restorative works need to be carried on.

Need Construction/creation of water bodies and renovation of traditional/ ancestral wells in the vicinity of the villages and other human habitation.

References

Annual Administrative Report (AAR), 2012-13: Soil and Water Conservation, Deptt., Govt. of Nagaland.

NBSSLUP. Deppt. of Soil & Water Conservation, Nagaland 2000

Rajaram, Kalpana (2007): Geography-A concise over view of the subject published by Spectrum Books Pvt Ltd. AI 291, 1st floor, Janakpuri, New Delhi-110 058 pp566-568

Rawat, M.S (2011): Environmental geomorphology and water shed management- A study from Central Himalaya published and printed by Concept publishing Company Pvt. Ltd Regd. Office: A/ 15-16, Commercial Block, Mohan Garden New Delhi- 110059 (India).pp 29 & 251-286

Sexana, H.M (1999): Environmental Geography published by Prem Rawat for Rawat Publications 3-Na-20, Jawahar Nagar, Jaipur 302 004 India pp28-55

State Jhum Land Survey (SJLS) Report 2005-05

Statistical Handbook Handbook 2011

Tiwari, R.C (2006): Geography of India published by Prayag Pustak Bhawan 20-A University Road Allahabad-211002 India p- 206 & 921-930

Tiwari, R.C. and Yadav, H.S., (1983) Ecosystem, pollution and environmental management: an introductory survey, in Environmental management, Ed. By L.R.Singh, et at. Allahabad Geographical society, Allahabad. pp59-72

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