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Demographic trend in Swat Valley and Natural Resource Use: A Case Study for Clean Development Mechanism and Carbon Sequestration as Mitigation Measure

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Abstract

Pakistan is signatory of Kyoto protocol. Although Pakistan is not in list of Carbon dioxide emitter, still can become part of Clean Development Mechanism (CDM) under the article 12 of Kyoto Protocol. For this Pakistan has already prepared CDM Operational Strategy on April 2006. The CDM is focus on two main areas, to identify renewable energy resources and to remove CO2 from the atmosphere. For proper implementation of CDM it is important to have a detail look and identify suitable areas for CO2 removal. For this a holistic approach is required. The northern mountainous areas of Pakistan are under pressure and need to be developed as majority of the river systems emerged from these mountains. It is therefore important to handle the CO2 emission both directly and indirectly. Proper aforestation is one of the methods which must be focus along with available water resources. The main finding of the study is that population of study area (Swat Valley) is toward increase which has got high pressure on soil resources. Due to which there is a shift toward the forest resources are toward decline and not only to think about aforestation and reforestation activity but also to divert labor force to other areas like tourism, forestry and make the area suitable for carbon absorption.

Key Words: *Demographic, Mitigation, Development, Swat.*

Introduction

Climate change is a global phenomenon but its roots of causes and mitigations are localized. Climate change is mostly contributed by carbon dioxide emission (Arnell N.W. 1999). The evidences are now visible to everywhere, especially in the mountainous areas (Gonzalez C et al 2008). International community is with continuous efforts to overcome on green house and ozone depleting gases. Montreal protocol is one of the successful examples where CFCs have been addresses (Steinbacher et al 2008). Similarly Kyoto protocol is in progress (Springer, 2003). It was hoped that in Copenhagen conference it will get materialized and the industrialized countries, forty in number (also called as annex-I countries) will agree on four green house gases (carbon dioxide,, methane, nitrous oxide, sulphur hexafluoride) and two ozone depleting gases (hydro fluorocarbons CFCs and per fluorocarbons). In this CO2 is the most objectionable gas, which is comparatively emitted in large amount (Sutherland, 2009). Two possible approaches were suggested in Kyoto protocol, 1) to reduce its emission and 2) to remove CO2 from the atmosphere (Muller-Furstenberger and Stephan 2007).

For emission reduction a country has to adopt technological measure in the form of shift toward renewable energy resource. While for removal a possible through aforestation and reforestation activity (Carbon sequestration). This will be accomplished through economic incentive and disincentive (Gonzalez et al 2008). Such as carbon tax is one of the disincentive while purchase of carbon credits, also called flexible mechanism. In this (flexible trade) an annex-I country can purchase carbon credits form another annex-I country or other developing country with the condition of clean development mechanism. In this the industrialized country has to encourage and support used

of renewable energy resource or forest related activity. For both CO2 removal or CDM, forestation is a common solution. In this way the increasing trend of temperature may be decrease. Besides other benefits will regulate glacier loss and river water fluctuation.

Swat valley is one good example form such activities decorated with River Swat and its tributaries (more than 100). River Swat water is fluctuating for the last 10 years with a lot of destruction in the form of erosion and property losse4s. this increase in flow is attributed to two possible reason 10 deforestation and 2) climate change, again deforestation is considered as one of the reason of climate change as the barren surface emit more radiation as compared to vegetation and also increase in CO2 removal.

In this paper an attempt has been made to review the deforestation trend in comparison with river Swat water discharge with the objective to find out suitable solution. The various related aspects highlighted are population increase, soil erosion, and public involvement for possible use of water resources.

Introduction of Swat Valley

Swat valley is famous for its greenery decorated with surface water resources (river, spring, glacier and river-lets) Due to these has got great attraction for tourists. Its total area is 5337 Km^2 with 2.3million population which is 11.82% of the total Khyber Pakhtunkhwa (Table 01). The total area of River Swat Watershed is 8220 sq.km (Inam & Viaro, 2002), which are 11.03% of the total province. The seasonal fluctuation has created a big problem in the form of suspended load and creating problem in the downstream districts. River Swat and its tributaries are mainly used for irrigation throughout its entire stretch not only in the valley but also in the downstream districts including Mardan and Charsadda.

On the other hand 40% of the labor force is attached with soil, which making use of River Swat in the form of irrigation. If we store water, or manage it, what benefit we can attached for the local to make is part of the water management practices or adoption of climate change mitigation measures like forest or rangeland. This is one big question that is not addressing during policy designing and has problem in policy implementation.

Table 1: Population (000) of district/Thesil situated in River Swat Watershed

Tehsil/Distt	1998	1999	2000	2001	2002
Swat Ranizai	260	272	282	292	302
Sam Ranizai	192	200	207	213	220
Total Malakand Distt	452	273	489	505	522
Swat	1006	1052	1088	1125	1163
Matta	252	262	271	280	289
Swat Distt:	1258	1314	1359	1405	1452
Timergara S/D	528	553	571	591	611
Jandool S/D	189	198	205	212	219
Total Lower Dir	717	726	751	776	803
Total River Swat Watershed	2040	2139	2212	2288	2365
Total NWFP	17738	18408	18927	19460	20009
%age	11.50	11.62	11.68	11.75	11.82
Note, Sama Ranizai and Jandool are excluded because it is not part of River Swat Watershed.					
Source: NWFP district Census Reports, 1998 published by department of Population Census, Govternment of Pakistan, Islamabad. http://www.nwfpbos.sdnpk.org/nwfpds/2000/13.htm					

In 1998 the average population density of NWFP was 236 persons per Km^2. In terms of population density Peshawar appeared on the top with a population density of 1606 persons per Km^2. Population density of Lower Dir, Swat and Malakand were 453, 236 and 475 persons per Km^2 respectively. Considering the demographic trend, a tremendous increase in population occurred, where people are mainly attached with agriculture, which has ultimately negative impacts on natural resources.

According to the questionnaire survey conducted in 50 selected villages, (Table 2) only 25% household size is five or below, while 50% household size is ranging from 9-11. Similarly the numbers of children are on increasing side, which is 35% of the population size. The work force is 16-25 and 26-50 year of age, which account for 40% of the total while almost half of that is female and a very limited portion of that is part of the work force. According to PRA survey, it is estimated that almost 50% in rural area and 10% in urban areas observed as female workers. In rural areas women folk are active in fuel wood collection, and in some area like lower Dir and Malakand they are also visible in the agriculture field. In urban area mostly females are housewives and some are government employees. In this way limited workforce is available in the study area, which needs proper attention.

Table 2: People's major occupation and income generating activities of 50 selected villages in River Swat Watershed

Location	Agriculture	Govt jobs	Abroad jobs	Forestry	Hotel and tourism	Fisheries	Shop keeping and related business
Upper Swat	28.35	13.72	14.02	15.85	15.85	2.74	9.45
Middle Swat Mingora Side	40.11	11.85	17.57	9.74	8.47	3.39	8.89
Middle Swat Matta Side	46.03	12.27	19.95	9.21	3.61	0.90	8.03
Lower Swat Malakand	47.98	14.54	19.06	4.85	1.94	3.72	7.92
Lower Swat Chadara Area	51.38	9.98	22.02	5.39	1.38	3.44	6.42
Average	42.77	12.47	18.52	9.01	6.25	2.84	8.14

Most of the people of Swat Valley are dependent on agricultural activities (soil + water Resources). In this way the major water use, besides domestic is in the form of irrigation. The attachment with forestry or fishery is very less (18.52 and 2.84% respectively). Being as mountainous area with bulk of available fresh water resources this is very less. But there is an opportunity to involve people in this sector and will be helpful to encourage Re-forestation and water management related activities.

Trends in Deforestation and over grazing

Forest cover directly affects soil quality in terms of erosion and nutrients loss. Total forest cover in Pakistan is 4.8% (4.224 mha) of the total area (Qiang, 1999), which is considered as poor (Table 3). For batter economy and balance ecology of a country must have at least 20-25% forest cover (Anwar. 2002). Comparatively North West Frontier Province (NWFP) appeared lucky in terms of forest cover. The total forest cover of this area is 17% (Yar and Rafiq, 1997).

In River Swat watershed the forest is protected forest and under the control of forest department subjected to the payment of royalty ranging from 60 to 80%. The forest resources of the study area are under severe pressure. The area is mountainous and the soil is week in texture therefore, there the forest cover must be above 40%. The PRA survey reveled that in upper Malakand the deciduous forest is decreased by 55% in Lower Dir by 65% and Swat 35% in the last 30 years (Table 03). Now Malakand appeared poor most when compared with other three districts,

where only 5% of mountain has got scattered forest. The figure in lower Dir is 10% and in Swat 20%. In Swat 50% of the timber forest is converted into rangeland in the last 30 years. It is still on the way toward decline. Which is a serious threat to soil resources.

Table 3: Area of Major Forest Type of Pakistan (Km^2)

Forest Cover/Land Use Class	AJK	Baluchistan	Northern Area	NWFP	Punjab	Sindh	Total Area
Conifer	160	420	6600	9400	300	-	1,9130
Scrub	10	5040	-	5390	1320	-	1,1910
Riverain	-	200	-	130	270	1120	1730
Mangrove	-	20	-	-	-	2050	2070
Irrig. Plantation	70	10	-	-	790	230	1030
Farmland trees	-	230	60	700	3060	540	4660
Linear planting	100	-	-	20	140	-	160
Misc. Planting	2410	-	-	1200	200	50	1550
Total	2750	5920	6660	1,6840	6080	3990	4,2240 (4.8%)
Source: FAO; http://www.fao.org/docrep/x2613e/x2613e2s.htm#pakistan							

Reasons of Deforestation

One of the reasons is population burden. Forest is removed for fuel wood, construction and livelihood. This area (lower Swat), although have no forest, is coming under the category of protected forest. Forest department (in Malakand and Lowe Dir) have no such forest stuff to earn revenue from it. Most of the revenue is coming from the check-post used to stop smuggling for running their office.

Almost 30% area of the lower Swat covered by mountain. Mountain area is considered as common property or state property. In this way no one is taking care, although, forest department is trying their best to rehabilitate these barren mountains. But support from the community is non-existing, although they are using it for grazing and as source of fuel wood. The main reason behind that is ownership. There are some areas where mountain has been acquired as individual property, where dense plantation is visible. These areas include Amandara, Dahdara, Khairabad etc. As observed during interview survey, in upper Swat such as Miandam and Sarai, people are hesitant to go for plantation and preferring to use it as agriculture land. This is because trees are considered as state property and agriculture products are considered as individual property, which they can utilize for their personal use, and can also cash it in the market. Therefore, one of the solutions is to consider mountain as individual property, at least in the area where mountains are clear barren. Commercial and unscientific forest harvesting is one of the big drain toward deforestation.Forest in the River Swat watershed is used as revenue. In 1984-85 the revenue generated was 138.166 million rupees generated, which was increased to 461.580 million rupees up to 1995-96 (Table 4).

The third reason is subsistence agriculture, which is again a linkage with population increase. The rain fed area is steep (25-60%) is used for agriculture. The dominants area includes upper Swat, Matta, where 70% of the Damani land is used for agriculture. In the lower Swat 30% of the Damani land has got high slop and is not suitable for agriculture. People are behind encroachment to acquire land for houses and agriculture activities. Un-employment and lake of education in the rural community is another reason, that results in illegal cutting. Proper awareness may work, but will take time. Other reason includes, forest fire, snow fall and land sliding, non-participatory approach of forest department, over cutting that need proper attention.

Table-04: Annual Revenue of NWFP Forest Department (in million Rs)

S .No	Year	Expenditure	Revenue
1	1984-85	44.713	138.166
2	1985-86	55.490	157.061
3	1986-87	72.446	145.069
4	1987-88	85.493	186.500
5	1988-89	76.043	178.810
6	1989-90	100.841	311.420
7	1990-91	106.431	297.966
8	1991-92	131.794	369.799
9	1992-93	130.919	409.961
10	1993-94	146.862	351.892
11	1994-95	173.514	503.000
12	1995-96	178.552	461.580

Grazing is another problem affecting soil quality negatively. Due to the lack of time, this aspect has been analyzed only qualitatively. The middle and lower part of River Swat watershed always remained under pressure from over grazing. In summer this area was receiving nomads from Afghanistan and in winter from the Upper Dir and Upper Swat. While the people of the area themselves have cattle's for milk. According to the PRA survey till eighties every house had got two to four sheep and/or one cow, which decreased with the passage of time. Now some people have adopted cattle keeping as profession. Nomads forms Afghanistan are no more visiting Pakistan. Since 1970 it started decreasing and after nineties almost completely stopped. While nomads from upper Dir and Swat-Kohistan are still visiting lower regions in winter.

Throughout the history there exist no evidence where grazing has been regulated. Besides, nomads there are *Gujar* (profession buffalos keeping using milk as livelihood) in each village, have adopted cattle farming as a profession and still utilizing the mountains for grazing. In lower Swat they are there for a long stay (June-September) along with their cattle's. During their stay they allow the cattle's for open grazing, while collect grasses daily and also store it in dry form for rainy days. Besides, Open grazing is also active throughout the year.

Land Capability Classes

Pakistan has defined eight classes for agriculture capabilities (IUCN- GOP, 1993). In NWFP, to develop land capability classes, soil survey of Pakistan surveyed 9139 thousands hectares out of total 10174 thousand hectares area. Classes identified for NWFP were Class-I (187.3 thousand hectares), Class-II (524.4 thousand hectares), Class-III (665.8 thousand hectares), Class-IV (581.6 thousand hectares), Class-V (70.1 thousand hectares) Class-VI (827 thousand hectares), Class-VII (2603.8 thousand hectares), Class-VIII (2974 thousand hectares), and unclassified as 704.9 thousand hectares. (Alim et al 1993)

Out of the total area 61.03% fall in class-VII and VIII while in the remaining 39% only 0.75% is good forest or range land. On most area poor or moderate Agriculture account for 13.64% of the total surveyed area. Class-I and II account for 7.74% only (Figure: 01).

In River Swat watershed the situation is different and is more sensitive. It is combination of District Swat (80.81%) Lower Dir (11.98%) and Malakand 7.21%). For land capability satellite images, aerial photographs and questionnaire survey was conducted. It was observed that 75% area is mountainous and should be used for forestry, while, it is encroached and people are using it for agriculture. Area included in class-I (very good agriculture land) is 7.359% of the studied area. This is the area situated in the surroundings of River Swat and

regularly irrigated form River Swat or its tributaries. Class-II area include4 (good agriculture land) 15.862% which lie in surrounding of class-I. This is the area which is good in soil texture but has got limited agriculture utility because of non availability of water. Class-III (Moderate agriculture land) is that land which is not only deficient in water but also week in terms of texture as well as slope. Class-IV (poor agriculture land) includes mostly encroached areas or area of the flood plain used for agriculture.

Class-V to VII is purely mountainous. Class-V (Good forest or rangeland) is mostly situated in the upper Swat, Class-VI (Moderate Forest or rangeland) is situated in the middle Swat and Class-VII (Poor forest or rangeland) is situated in the Lower Swat including upper Malakand and Lower Dir.

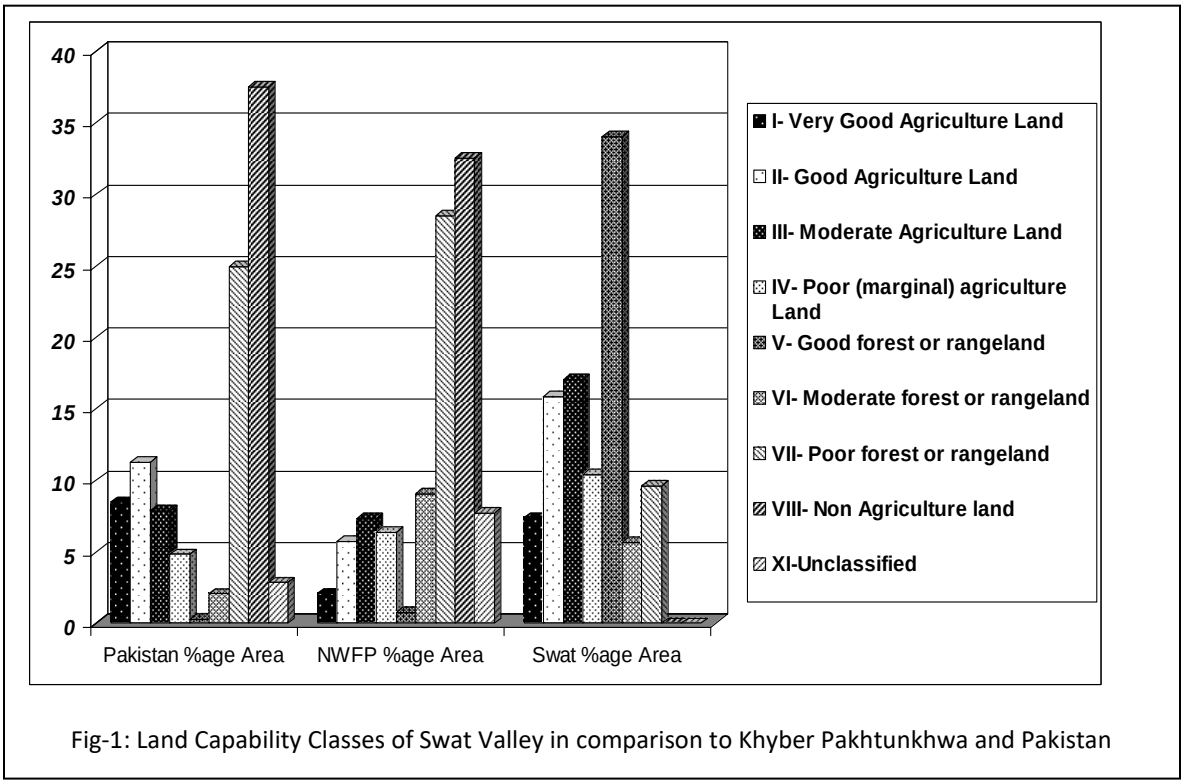

Fig-1: Land Capability Classes of Swat Valley in comparison to Khyber Pakhtunkhwa and Pakistan

Very good and good agriculture land is situated in the surrounding of River Swat and its tributaries with a threat of erosion. The type of land which need policy attention is marginal and poor agriculture land the percentage of which is low when compared with that of NWFP or Pakistan but this is the land which is encroached form mountainous area. The percentage of these two categories is toward increase at the cost of good and marginal forest or rangeland. People are indented to use it as for agriculture while it should be used as forest land due to property ownership as agriculture production belong to farmer while wood or wood products belong to state. In we want to encourage the forestation activity and arrest erosion, enhance water holding capacity of these land, we have to re-phrase the policy matter related to forest and land resources.

Conclusion

The mountainous areas of Pakistan in general and Swat Valley in particular has got a great potential for arresting carbon dioxide from the atmosphere. To increase the water holding capacity and best water uses the policy

designing the livelihood opportunity must be addressed with bottom-top approach. In this way the forest cover will be improved which will have impact on other land capability classes with the ultimate positive impacts on fresh water resources.

References

Arnell N.W. 1999. Climate change and global water resources, Global Environmental Change, 9(1):S31-S49

Gonzalez C., Dupont L.M., Behling H., Wefer G. 2008. Neotropical vegetation response to rapid climate changes during the last glacial period: Palynological evidence from the Cariaco Basin, Quaternary Research, 69 (2):217-230.

Gonzalez C., Dupont L.M., Behling H., Wefer G. 2008. Neotropical vegetation response to rapid climate changes during the last glacial period: Palynological evidence from the Cariaco Basin, Quaternary Research, 69 (2):217-230.

Muller-Furstenberger G., Stephan G.2007. Integrated assessment of global climate change with learning-by-doing and energy-related research and development, Energy Policy, 35 (11):5298-5309.

Springer U.2003. The market for tradable GHG permits under the Kyoto Protocol: A survey of model studies, Energy Economics, 25 (5):527-551.

Steinbacher M., Vollmer M.K., Buchmann B., Reimann S.2008. An evaluation of the current radiative forcing benefit of the Montreal Protocol at the high-Alpine site Jungfraujoch, Science of the Total Environment, 391 (2-3):217-223.

Steinbacher M., Vollmer M.K., Buchmann B., Reimann S.2008. An evaluation of the current radiative forcing benefit of the Montreal Protocol at the high-Alpine site Jungfraujoch, Science of the Total Environment, 391 (2-3):217-223.

Sutherland K. 2009. What can we expect from Copenhagen? Filteration Industry Analyst, 2009(8): 5.