

## **SOCIO-ENVIRONMENTAL IMPACTS OF CLIMATE CHANGE ON GREEN ECONOMY AND ITS CONSEQUENCES: A CASE STUDY OF SWAT VALLEY, KHYBER PAKHTUNKHWA-PAKISTAN**

\*SOHAIL ABBAS\*, MIAN SABIR HUSSAIN\*\*, NAUSHEEN MAZHAR\*\*\*, KHADIJA SHAKRULLAH\*\*\*\*, SAADIA SULTAN WAHLA\*\*\*\*, MAREENA KHURSHID\*\*\*\*\*

\* Department of Geography, Climate Research Institute (CRI), Konkuk University, Korea

\*\* Department of Geography, Konkuk University, Korea

\*\*\* Department of Geography, Lahore College for Women University, Lahore, Pakistan

\*\*\*\* Department of Geography, Forman Christian College (A Chartered University) Lahore- Pakistan

\*\*\*\*\* Department of Geography, Govt. Postgraduate College for Women, Bahawalnagar-Pakistan

\*\*\*\*\* Department of Geography, University of the Punjab, Lahore, Pakistan

\*Corresponding authors E-mail: [sohailclimate@konkuk.ac.kr](mailto:sohailclimate@konkuk.ac.kr)

### **ABSTRACT**

The purpose of this study is to analyze the socio-environmental impacts of climate change on the green economy and its consequences in the Swat Valley- the Switzerland of Pakistan from 1981-2015. The current investigation also identifies the climatic impact on the green economy and infrastructural development. It also explores the failure of green sector progress that can be attributed to the poor water supply systems, rough topography, weak drainage networks, unsustainable management practices, lack of traditional knowledge and modern technologies, overpopulation, and lack of community participation. The statistical analysis was applied to indicate the effects of climate on agriculture, tribal conflicts, and its distribution. The results revealed that rainfall and temperature have an insignificant association with green economic growth. The analysis shows that snow, water bodies, natural forest, agricultural land, and settlements presented less variation between 2005 and 2010. While snow, agriculture, and forest cover area show the highest percentage in the year 2005. The agriculture, and forest cover was lowest in 2015 as compared to the water body which shows the highest percentage in 2015 and the lowest was in 2000. The forest covers decreased by 16.3% in the first five years and 5.5% in the last five years. Tribal conflict events prove that it was due to relocation, displacement, and residential shifting due to human activities directly affecting the climate of the area. The local community of Swat was also being directly affected by this tribal conflict and overpopulation. It can be concluded that the Government compulsory to design specific sustainable development goals (SDGs) within the framework of sustainable development goals that would indicate the priority objectives and plan implementation, which can include measures like the expansion of green investment at the local level, Institutional development at the regional and local level.

**KEYWORDS:** Climate change, Tribes, local community, rough topography, Pakistan

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## INTRODUCTION

The concept of the green economy is very vast and has become an issue for economists and environmentalists, alike. The green economy is a cyclical use of natural resources that ensures better efficiency of the ecosystem and reduces its climate risk (Maclean and Plascencia 2012). Due to climatic pressure and brain drain, the ecosystem infrastructure has deteriorated, which creates hurdles for sustainable development and economic stability (Kang 20). Green Economy is the approach for achieving sustainable development (World Bank 2007). There are many green economic approaches, but the most important is green economic development through advanced technology and innovation in green sectors (OCED 2011). Green economic development depends on the social integrity, ecological and economic stability in the society (Valliance et al. 2011).

Previous studies have explained that forest area is converted into agricultural land increased the CO<sub>2</sub> emission in the Swat district, Pakistan (Khan 2011; Abbas et al. 2016a, c; Barinova et al. 2013; Qasim et al. 2013; Ilyas et al. 2013, 2015, Ahmed et al. 2015). Qasim et al. (2013) also reported that forest area is decreasing due to the high level of deforestation in the HKH region of Pakistan. Barinova et al. (2013) also exhibit that forest area is being converted into agricultural land in the district of the Upper Dir in the Kubrat valley. The rate of forestation is found less, and land is being converted into agricultural land in the Swat valley. Furthermore, the trend of grazing is increasing, and land degradation is also increasing (Ilyas et al. 2013, 2015; Khan 2011). Abbas et al (2016b) also indicated that Reduced emissions from deforestation and forest degradation (REDD) have negative impacts on the green economic growth and development in the swat valley Pakistan. It is typically linked to concrete and relevant intangible elements (Fleischer 2011, Abbas et al. 2020b). The action in the Swat district under the supervision of the government army has led to the dislocation of hundreds of local people from their local territory. By end of operation against tribes in the year 2009, government agencies decided on local community development, but they failed to describe the man's responsibilities and address sociocultural issues.

The Taliban society did not consist of about 95% of the total Afghanistan population, by the end of the year 2000 (Fleischer 2011; Orakzai 2011). Different types of attempts have been reported to resolve and settle the conflict, e.g., management through consultation remained ineffective. The solution to this dispute can give surety for large numbers of social, cultural, and economic developments (Imran Ullah, 2011). Those

actions that create radicalization of social harmony in society include aspects of religion. Rather, it has a direct effect on the socio-economic features of the valley of Swat (Bangash 2012).

The sustainable development approaches, which include inactive mobilization of the methods, conflict management analysis, cooperation, intervention, and resolution, serve as the objective for the constructive framework. This framework can create social change in the view of the basic needs and benefits of the local community development (Baig et al. 2020). This also emphasizes the basic need to address and explain the structural challenges that these people face (Ramsbotham et al. 2011). The multi-disciplinary mechanism explains the basic five figures, each one has a basic and vital role for peaceful development in societies, these five figures include functional investigation of the causes of economic growth, disaster approach, calamity relevancy, avoidance, and transformational processes (Crocker et al. 2005; Rome 2010; Orakzai 2011; Rahi 2011).

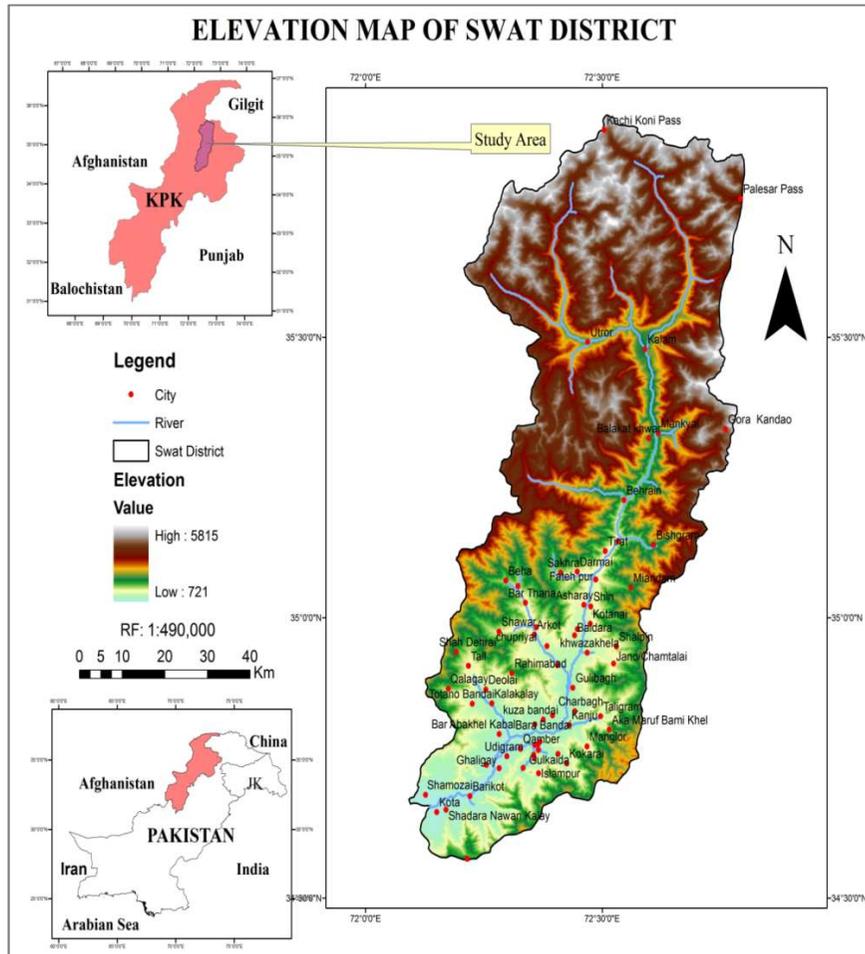
The land conversion from forest to agricultural is due to the speedy flow of water and soil erosion (Opeyemi 2006). The man-made actions on the earth and the environment that deteriorates the structure of the land. This has created a problem for human beings due to the negative impacts of social-ecological mobility (Abbas and Khan 2020b; UN 2013). This study investigates how tribal conflicts affect the green economy. The research also explores the tribe's conflicting effects on green economy growth as this area is becoming specialized in the agriculture sector. The main source of livelihood is agriculture, which also causes internal displacement of the socio-economic scenario of the population. The study also examines how the social system and relations in society changed in the Swat valley of Pakistan. The main objective of this study is to investigate the social-environmental impacts of climate change in the green economy and its consequences in the Swat Valley, KPK.

## **Data and Methodology**

### **Study area**

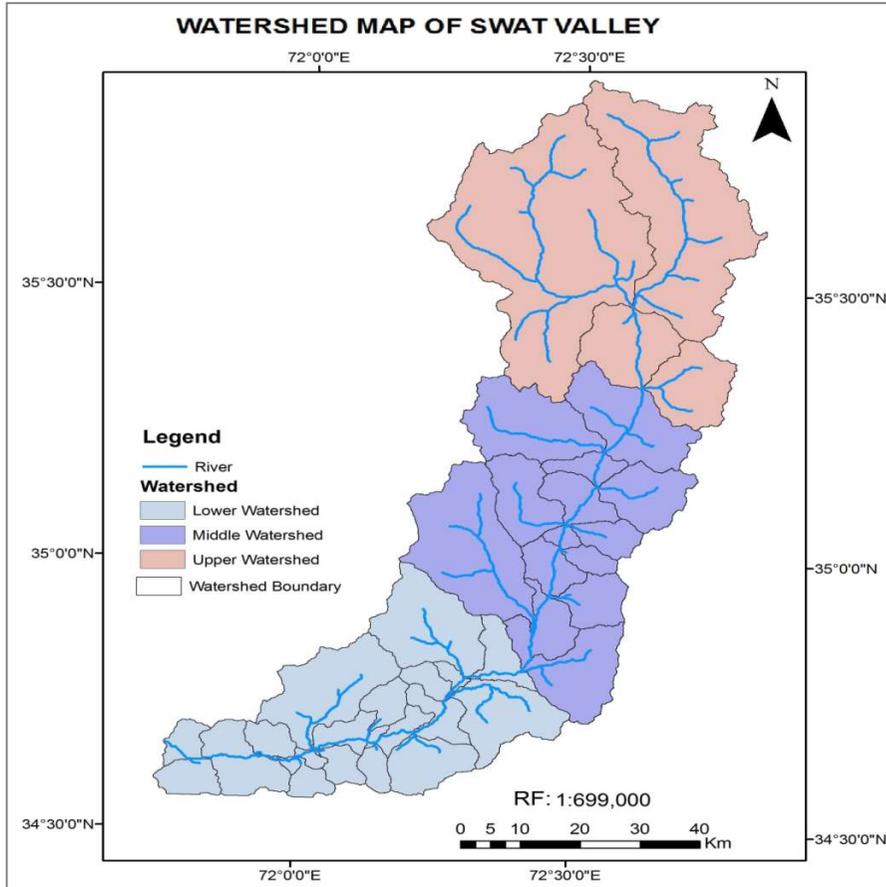
The mostly valley of Swat is covered with lush green mountains that have an elevation from 682-5821 meters. It is situated on the hills of the KHK region (Figure 1). Naturally, Swat is blessed with Swat River. The river is covered with glaciers, green sectors as forest, and lush high valleys. Such valley, which is known as the *Switzerland* of Pakistan, is rich in specific flora and fauna. According to the population census organization (1998), the total area is found 5337 km<sup>2</sup> & the population density 236 per km<sup>2</sup> in the Swat valley.

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**Figure 1.** Physiographic map of the Swat Valley, Pakistan.

Furthermore, the total population of Swat is 1257715 while the average annual growth rate is 3.37. The total area is categorized into two tehsils namely Matta (683 km<sup>2</sup>) and the Swat (4654 km<sup>2</sup>). Swat valley is a lush green valley with ice-cold lakes and flower-covered slopes, which make it an ideal location for tourism development. There is 35.38% of forest cover in the Swat district. The region has land-use classes such as agricultural land, alpine pasture, barren land, and forestland. Figure 2 indicates the watershed levels of the Swat valley. The Swat watershed is categorized into lower, middle, and upper watershed.



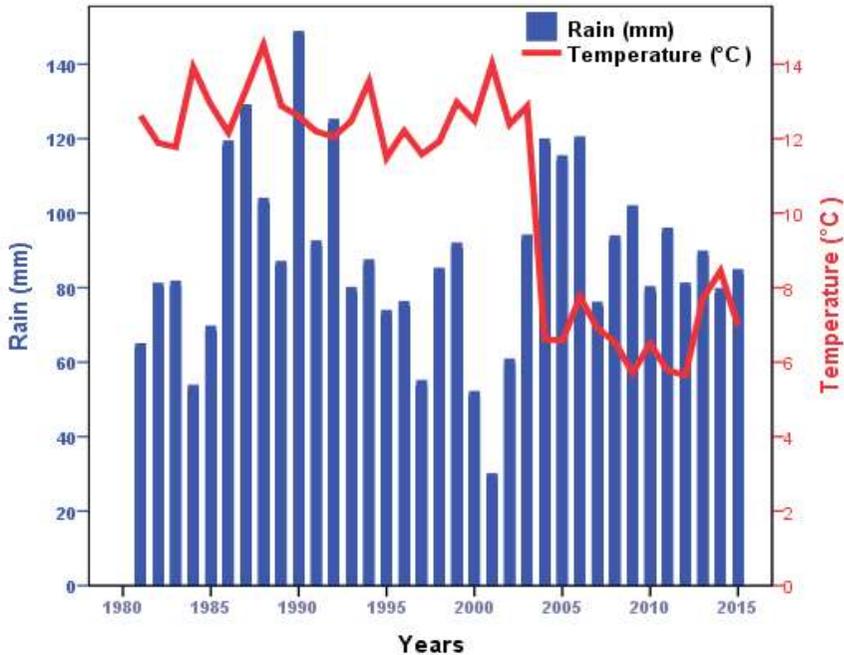
**Figure 2.** Watershed Map of the Swat Valley, Pakistan

### Data validity and analysis

A flow diagram in Figure 3 has been constructed to represent the integration of sequences and basic maps and material used in the planning and execution of fieldwork as well as in the preparation of land use maps thereafter.



2017). The variation of the rainfall and temperature affect the yield and productivity but vary from region to region in the world (Droogers and Aerts, 2005). The highest average temperature recorded in the study area was in winter i.e., 14.51°C in 1988 which is much more than 7.69 °C in 2012. The highest average rainfall recorded in winter is 147.51mm in 1990, which is much more than 28.76 mm in 2001 (Figure 4).

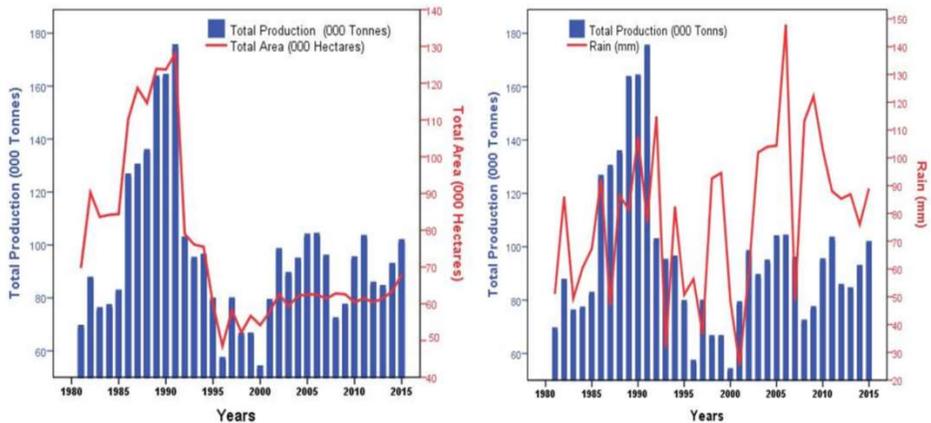


**Figure 4.** Relationship between rainfall (mm) and temperature (°c) of Swat, KPK

The highest average rainfall recorded in summer is about 102.5 mm in 1991, which is greater than 60.53 mm recorded in 2001. The Winter season in Swat valley is harsh. The severe climate variability varies from December to March with the minimum temperature being 6 °C. The rain and snowfall occur during the winter season, which extends from October to March. The highest rainfall of 387 mm was witnessed in April of 1991. The weather is the same as the Jarai place at the local level. Sometimes, snowfall turns into thunderstorms from mid-January to the end of February. Sustainable agricultural development depends on the reduction in environmental degradation. The sustainable development goals were achieved by taking the advanced technology for green economic development (Abbas et al. 2020). According to Development Statistics of Khyber Pakhtunkhwa 2014, the total Rabi crop production in 1991 was 174.6 tons, which was high compared to 83.65 tons, produced in 2015 is.

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Moreover, the total crop area also decreased from 1995 to 2015 i.e., from 128.1 hectares to 49.18 respectively, due to land utilization of the orchards increasing from 2014-2015 by about 4951 hectares (Figure 5).



**Figure 5:** Total production (Wheat and Barley) and total area, total production vs. rainfall Swat, Kpk.

### **Per Capita availability and total productivity (Wheat and Barley)**

Estimated per capita Rabi crop production of wheat and barley is analyzed for different periods from 1981-2015. The significant impact of the wheat and barley production in the Swat district is analyzed in the study. However, the current findings show the growing trend of the Swat population. Due to such a trend, the phenomenon of food insecurity seems to be. The results indicate that in 2015 the per capita availability of Wheat and Barley was 4.04 Kg, while in 2011 it was 5.30 kg, which shows decreasing trend of per capita availability (Table 1).

For the rainfall scenarios, we find that the production of all crops was increasing with increasing rainfall. It would increase the trend of per capita availability of Rabi crops in the District. However, a decrease in rainfall would reduce total production. Therefore, per capita availability would also be reduced. Results revealed that the increase in population and a decrease in production harm climate parameters. Sustainable agriculture practices would increase productivity, simultaneously ensure food security, counteract carbon emissions, and stimulate developed access to green product markets such as organic foods. The industrial sector's growth depends on two main aspects. The first is the quality level of water, which is affected by the number of metabolites; the second is a utilization mechanism for the participatory approach in the context of green economic development (Rahman and Shaw 2017; Abid et al. 2017).

**Table 1.** Per capita rabi crops availability in changing temperature

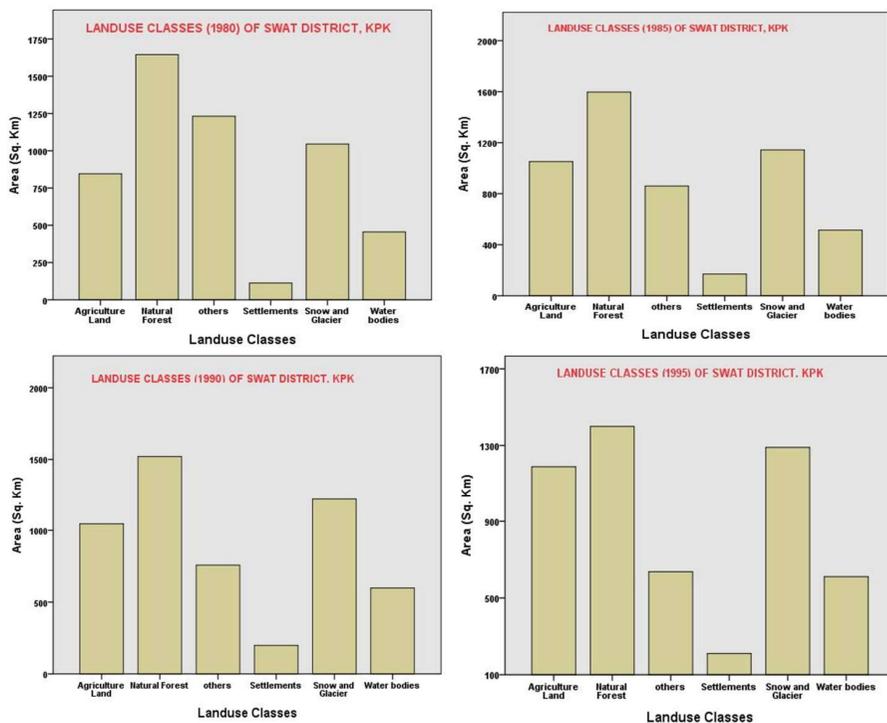
<b>Years</b>	<b>Swat Population (million)</b>	<b>Total Production (000 tons)</b>	<b>Per Capita Availability (Kg)</b>
1999	12.99983	65.70	5.05
2000	13.43792	53.30	3.97
2001	13.89078	78.40	5.64
2002	14.3589	97.60	6.80
2003	14.84279	88.60	5.97
2004	15.34299	94.00	6.13
2005	15.86005	103.10	6.50
2007	16.94703	95.10	5.61
2008	17.51814	71.50	4.08
2009	18.1085	76.60	4.23
2010	18.71876	94.50	5.05
2011	19.35086	102.60	5.30
2012	19.64192	84.91	4.32
2013	19.88319	80.65	4.06
2014	20.45589	81.45	3.98
2015	20.67543	83.54	4.04

### **Climatic effects on land use and land cover changes (LULCC)**

Results revealed that an Increasing trend of land cover is observed from 1972-1988 while decreasing was found in 1989-2016. A similar trend was measured till 2017. Land use classes included the Natural Forest, Settlements, Water Bodies, Barren Land, Snow and Glacier, Shrubs and Bushes, Fruit Orchard, Agriculture Land, Rangeland and Alpine Pastures. The major land use classes in Swat Valley are Natural forests, Alpine Pastures, Snow and glaciers, and Agriculture Land with 35.38%, 19.96%,

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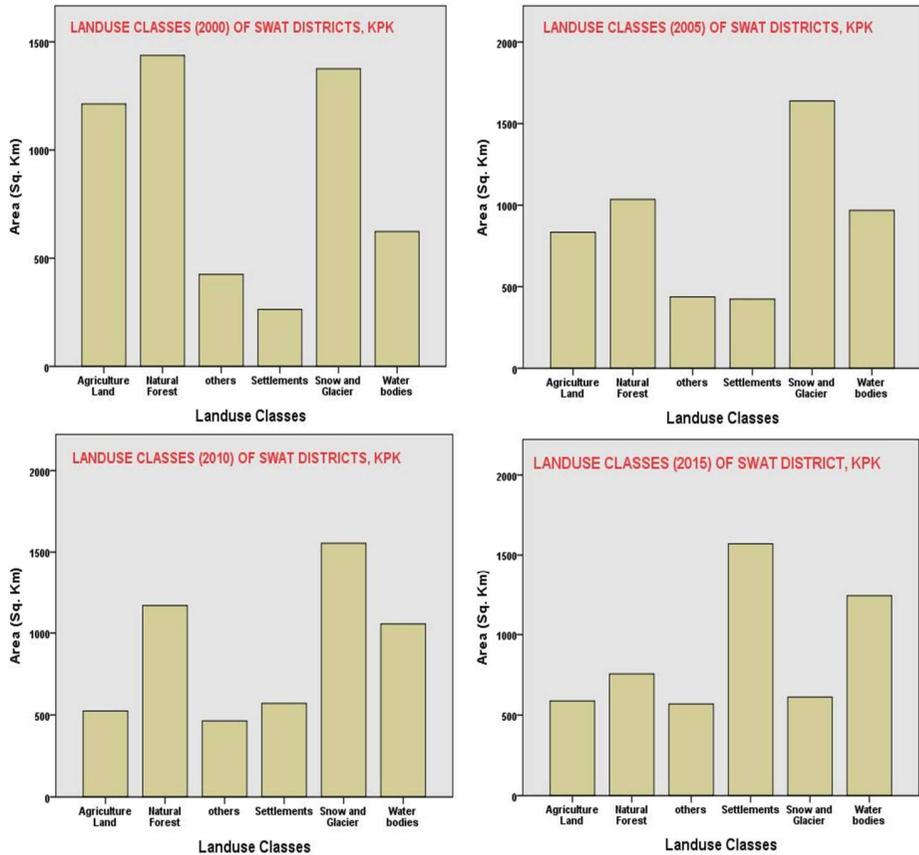
19.29%, and 15.99 % respectively (Figure 5). The result also showed that the snow cover remains constant. From the analysis, The water bodies are found 12 to 26 %. While deforestation area is increasing, and huge change is found in the settlements. The land use due to other factors decreased from 37 to 7 %. Furthermore, in the first four years period, the area of the snow cover is found to be high and there is a gradually fast reduction in the last five years. The trend of Agriculture land class seems to present a decline from 2000 to 2015.



**Figure 6.** Land use classes (1980, 1985, 1990, 1995) of Swat District, KPK.

This can be ascribed to the rise in worldwide temperature. The land use for settlement class indicates a consistent rising at the start. Over the most recent five years, there is a speedy expansion in the settlement class because of expanding human populaces. There is a consistent expansion in water class. The pattern shows a speedy expansion over the most recent five years. The forest and cover show a sharp decrease during the investigation period. This is because of deforestation and an increase in building and settlement areas. The results also showed that precipitation and forest cover have shown a direct straight relationship from 2000 to 2005 and 2010 to 2015. As both declined from 2005 to 2010, when the

temperature experienced change by 0.36 %. Forest cover debased to the least, by 5.5 %, and the precipitation expanded the most by 27 %. In the middle of 2010-2015, precipitation diminished straightly by 6.9%, while the backwoods region declined by 7%, for a similar period (Figure 7).



**Figure 7.** Land use classes (2000, 2005, 2010, 2015) of Swat district, KPK

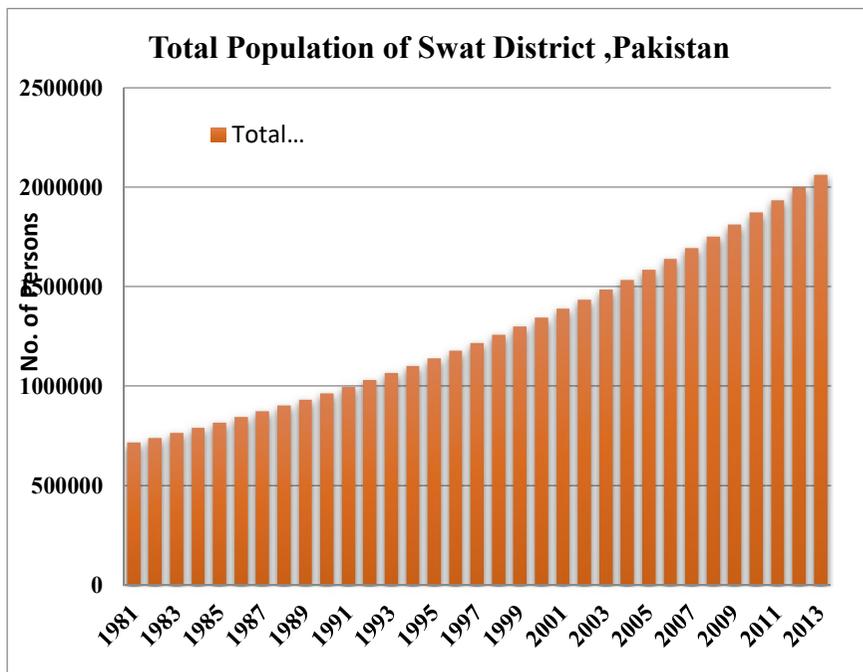
### Socio-environmental impacts of climate change on the local community

#### Demographic Changes

The trend of population growth of Swat District has decreased according to the per capita share of land. The predictable population in 2013 is about 2067708, while as compared the urban population from total population increased during 1981-2013 above five times, compared with over three times growth in total population. The basic features of the employed labor force are important to regulate the economic structure and potentials of Swat valley, provided information concerning the distribution of the labor force in the agriculture sector. The most influential tribe in the region is the Yusufzai, particularly at the individual level. Their contribution in population is 30% and the smallest tribe is Gujars with a 7% contribution to

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the total population depending upon the green sector. They trekked from Afghanistan and had been living in Swat before the Yusufzai voyaged. In the present day, there is almost no conflict in the Swat district among different ethnic groups. It is due to large land ownership, which is settled through different Sharia courts and Jirga. Yusufzai tribes lived in tehsil Barakat, Babozai, Metta, and Kabel and whereas Gujars lived in the tehsil Kalam (Fig. 9). The Yousufzai tribe has a population of 214781, 377281, 539223, and 619054 in 1981, 1998, 2010, and 2013, respectively. Whereas Gujar tribe contributed the 50116, 88032, 125819, and 144446 in 1981, 1998, 2010, and 2013 respectively (Fig.8)

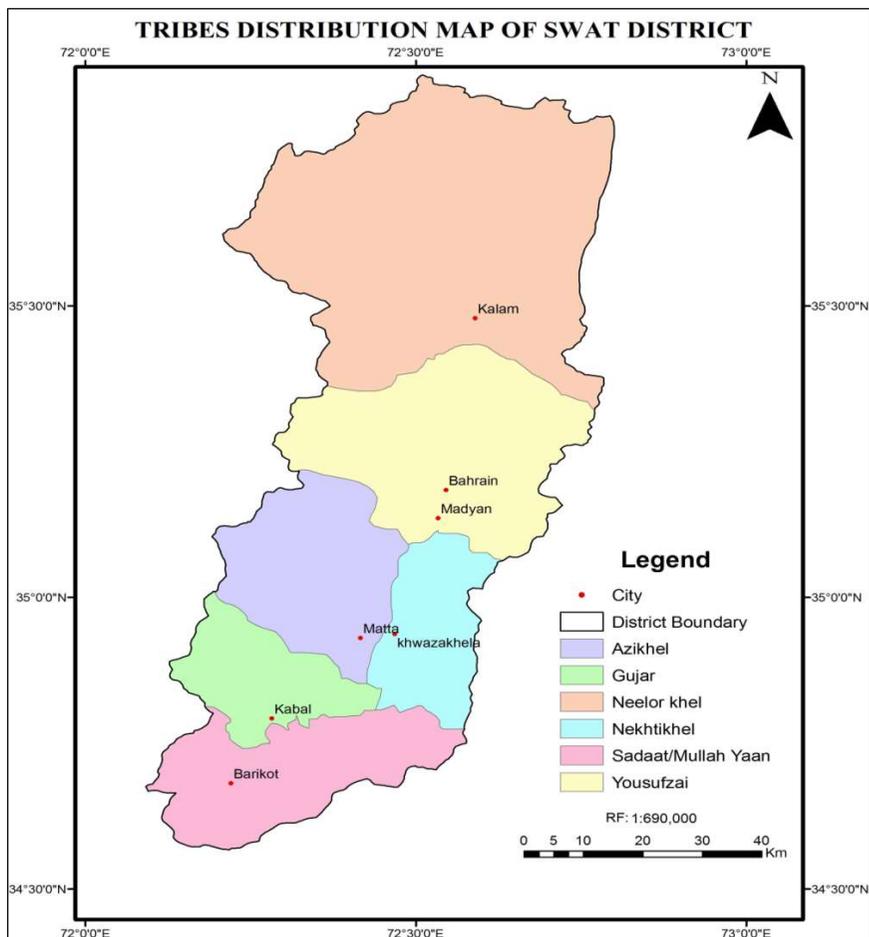


**Figure 8.** Showing total population trend of Swat, Pakistan

Due to an increasing trend in urbanization and brain drain, a total area of crops is less cultivated. The main weakness of the green economy is that it is underprivileged, ignoring the power of poor farmers. Also, this describes the entire urban population, where slum dwellers are ignored, along with pavement traders, and most informal sectors, many of which live in the poorest in the village. This approach also ignores the need to put pressure on the lives of the workers. According to the Development Statistics of the (KPK) 2015, the population growth rate was low compared to the 1998, census, due to a high trend of migration towards urban areas. At present,

43.50 percent of the population lives in urban and suburban areas of the Swat valley.

The trend of the population has decreased according to per capita of land in the Swat district. The predictable population in 2015 is about 2067708, while as compared the urban population from total population increased during 1981-2015, above five times compared with over three times growth in total population. The agriculture sector facilitates the major labor force. About 41% of the total population are rural employment 829151 is recorded in this sector during 2014-15 (PSLM survey). About 38 percent of the rural labor force is working in the agriculture sector. About 38% to 50% urban labor force respectively is working as an employee from the total population (Figure 10).

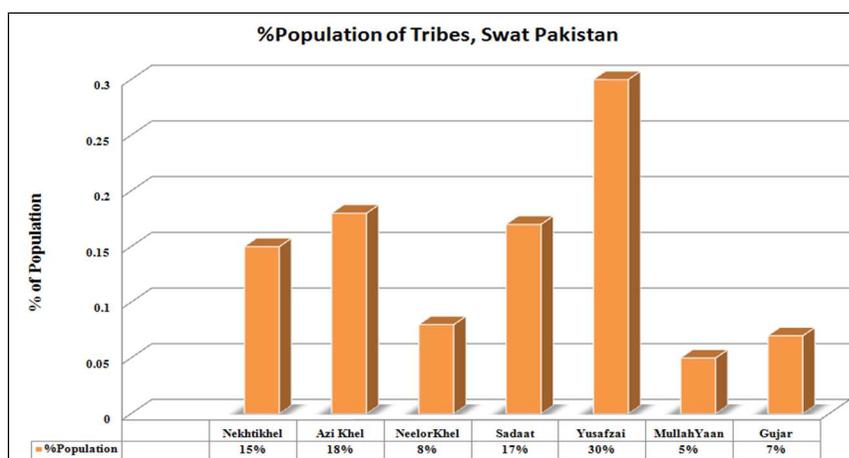


**Figure 9.** Different tribe’s distribution in the Swat District, Pakistan.

This population is taken from “Development Statistics of Khyber Pakhtunkhwa” 2015. 29 % of the total rural population takes a part in the

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agriculture sector. The self-employed (own-account workers) groups are 48% and 21% in urban and rural areas respectively during 2012-13 (PSLM survey). According to a 1981 District Census Organization, the total employed labor force is 252297 which is less than 630115 labor force as compared to 1998 in the agriculture sector. According to the Development Statistics of Khyber Pakhtunkhwa, 2014 the total population of Swat District is 2067708, while the labor force in the agricultural sector is 829151.



**Figure 10.** Population (%) of different tribes in Swat valley, Pakistan.

### **Household Size and its impacts on green economy**

The basic unit of the socio-cultural life in the household, size of the local community development in the Swat valley. All the members work in unity, jump their income, sometimes may cook jointly and the males are family heads. The categories of landless families usually have the element value, while comparatively the bigger owners of land mostly have fluctuated families. The house members were to follow the decision taken by the head of the house. According to a 2014 report of Development Statistics of Khyber Pakhtunkhwa, the household size was in 1998 is for 110679 persons low as compared to 2013 projected estimated is for 248145 persons due to unplanned modernization in the Swat valley for sustainable development. The estimated population of the Swat 2013 is about 2067708 while the household size is 248145 persons. According to Development Statistics of the (KPK) 2014, population growth rates were low as compared to the 1998 census due to high migration towards urban areas for better livelihood prospects.

Agricultural production and tourism industry growth depend on enhancing natural resource conservation. At present, 13.50 percent population lived in the urban and sub-urban areas of the Swat valley. There should be necessary land utilization planning and ecological balance in nature which are directly interlinked with urban and suburban areas. The trend of population growth of the Swat district has decreased according to the per capita share of land. The indigenous community development in such type of mountainous regions would provide a lack of basic infrastructure, education, and housing, and food resources in the Swat district. The province Population Welfare Department (2008) estimated that 41% of the population is below the poverty line. The community of Swat district is highly based on agriculture, trade, and tourism. Some of the effects of conflict on local communities and green economic development are enlisted:

- I. There are the basic security checkpoints to pass through, which does surely enter a certain type of market.
- II. Limited recovery options due to the psychological stress of violence and insecurity.
- III. Structural damage to the crop, which recognizes the environmental effect that has a direct effect on the crops and trees.
- IV. The environmental effects of the local community and green economic development. There is the scenario of the growing recognition of the social, economic, and ecosystem values.
- V. The urbanization process has a remarkable effect on the sociocultural changes of the mountain valley of the Swat district.
- VI. The concept of the brain drain was developed. The migration of skilled persons from rural to urban decreases the growth and efficiency of the local community development, which deteriorates the infrastructure of socialism.
- VII. Local community conflict creates poverty and landscape degradation, which disrupts the ecosystem necessary for their livelihood.

## **CONCLUSIONS**

From the analysis of land use, snow, water bodies, natural forest, Agricultural land, and Settlements, the least changes were identified between 2005 and 2010. The Snow, Agriculture, and Forest cover area showed that the highest percentage was founded in 2005 and lowest in 2015 as compared to the Waterbody class that had the highest percentage in 2015 and the lowest in 2000. A sum of 30 % of the population of Swat was found to be dependent on forests and they provide the source of

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livelihood for them. The flood of 2010 (KPK) was the source of deforestation in the Shangla and Swat districts.

It tends to be presumed that there is a need to lead research for a gigantic scope to investigate the social promise of naturally positive and damaging land-use practices. So traditionalists and strategy creators can plan the novel and development of growth-management institutions. There is a serious need for the board plans at the local and public levels. Zonation of the investigation region is required, and each zone ought to have an adjusted proportion of horticulture, backwoods, settlements, and nearby local area advancement. So that, each zone may take part in its capacity and thus guarantee generally social stability.

The government should launch a readiness mechanism for reduced emission from deforestation and forest degradation that will sustain and manage the forest system by implementation of four components included like National strategic action plan, National forest monitoring system, National forest reference emission level/ forest reference level, and Safeguard information system. There should be the promotion of sustainable production and consumption, which maintain and regulate economic growth, social integrity, and environmental protection. The designing of specific sustainable mountain development goals (SMDGs) within the framework of sustainable development goals (SDGs), should be made compulsory, which would indicate the priority objectives and plan implementation which includes the expansion of green investment at the local level, institutional development at regional and local level, vertical & horizontal pattern of green economic development for sustainability.

### **CONFLICT OF INTEREST STATEMENT**

All authors have no conflict of interest.

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