CLIMATIC CHANGES AND THEIR EFFECT ON WILD LIFE DISTRICT DIR LOWER PAKISTAN

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PAKISTAN

Session: 2012-2016

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A thesis submitted in partial fulfillment of the requirements for the Degree of BS (4-years) In Environmental Sciences

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Allah in the Name of the most Affectionate, the Merciful"

"And who made earth a bed for you, and sky a structure and caused water to come down from heaven hence brought forth there with some fruits for your food, therefor do not set up equals for Allah knowingly"

(Surah 02-Al-Baqarah, Ayah 2

CERTIFICATE

The thesis of Asadullah and Syed Iftikhar Ahmad is accepted in its present form by the Department of Environmental Sciences, Gulabad Degree college, University of Malakand at Chakdara, as satisfying the thesis requirement for the degree of BS (4 years) Environmental Sciences.

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DECLARATION

Asadullah and Syed Iftikhar Ahmad, declare hereby that this is a true reflection of my own research, and that this work, or part thereof has not been submitted for a degree in any other institution of higher education.

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DEDICATION

I dedicate this work to my family, especially to my brothers and sisters for always believing in me and encouraging me even in instances when I felt like giving up.

ACKNOWLEDGEMENTS

I have no words to thanks Allah almighty who gives me the opportunity to complete my studies. I feel obliged to my parent department “Environmental Sciences” and the “Govt: Degree College Gulabad, University of Malakand” for providing me financial support during my studies.

I heartily appreciate my supervisor Mr. Rafi Ullah, Department of Environmental science for his keen interest, kindness and his valuable views and experience shared with me.

I would like to thank Chairperson, Department of Environmental Sciences Mr. Rafi Ullah for timely providing me all the necessary facilities and administrative support.

Thanks to all my teachers especially. Rafi Ullah, Mr. Ijaz Ahmad Mr. Ali Bahadar, Mr. Ali Shah and all students of Department of Environmental Sciences, Govt; Degree College Gulabad and of course University of Malakand for sharing expertise and for providing a friendly environment.

I would like to thank my senior, Syed Abdullah for his collaboration in my research work. In last I am greatly thankful to my parents who provide me support and put me on this track I would never thank them enough.

ABSTRACT

Climatic changes and its impact are increasingly evident in Pakistan, especially in mountainous regions. Mountain ecosystems are considered to be sensitive indicators of global warming, even slight variations in temperature can lead to significant shifts in local climate, which can in turn drastically affect natural environment and subsequently on people's life and wildlife. The targeted area for research work was District: Dir Lower, K.P.K, Pakistan. The study gathered the required information from primary and secondary sources. Secondary data on temperature and precipitation was obtained from various sources i.e. local CBO, including WWF Pakistan. On the basis of information gathered on climate change and wildlife, questionnaire was designed. A format was designed to feed in the field data gathered. The data analysis procedure involved preliminary coding and sorting of data, mostly through data reduction and data reconstruction. The data was presented in narrative report of findings with descriptive and interpretative detail. Results showed that no regular pattern of increase was found in temperature since year 2010 to 2015, same is found for rain fall decrease pattern. Results show that main causes of climatic changes is increase in greenhouse gases due to pollution by industries, vehicles, and crush plants, deforestation and some natural phenomena such as floods. The study showed, more than 80% responded were agreed that climatic effect have great impact on wildlife i.e. wildlife become in danger due to climatic changes because of habitat change where wildlife can't survive thus in consequences it leads to migration, low growth rate, increase in morbidity and mortality rate, and at last extinction of the species or population. It is conclude from the study that climatic change is being severely notice by people and their main causes were greenhouse gases and deforestation. So it is important to decrease those activities which are responsible for the greenhouses gases and also decrease deforestation and promote forestation locally as well as globally. It is also concluded that there is no or less conservation tool applied in targeted area, low budget for forest safety and wildlife conservation. To control climatic changes and wild life extinction we need policy for forest conservation, wild life conservation, prevent hunting, industrial pollution control, vehicle pollution control, increase in plantation, awareness of policy for control of climatic changes.

CONTENTS

Certificate ..... **I**

Declaration ..... **II**

Dedication ..... **III**

Acknowledgements ..... **IV**

Abstract ..... **V**

List of figures ..... **VIII**

1. Introduction: 1

1.1 Main Causes and consequences of Climate changes: 2

1.2 Role of Greenhouse gases in climatic changes: 2

1.3 Role of deforestation in climatic changes: 3

1.4 Role of Industrialization in climatic change: 4

1.5 Role of public transportation in climatic changes: 4

1.6 Global warming: 5

1.7 Wild Life in DIR lower: 6

1.7.1 Flora: 6

1.7.2 Fauna: 6

1.7.2.1 Mammals: 6

1.7.2.2 Birds: 6

1.8 Causes of Wild Life Extinction: 6

1.9 Consequences of extinction: 7

1.10 Conservation Tool for Extinction: 8

2. Study Approach 10

2.1 Targeted Area 10

2.2 Duration field: 10

2.3 Structure and Methodological Approach: 10

2.3.1 Research Design 10

2.3.2 Research Instrument 10

2.4 Research Phases and Activities: 10

2.5 Preliminary Research: 10

2.6 Questionnaire: 10
2.7 Field Visit Plan: 10
2.7.1 Pre-testing 11
2.7.2 Data Collection: 11
2.7.3 Database Development 11
2.7.4 Data Analysis: 11
3. Results: 12
3.1 The Rate of Monthly Rain: 12
3.2 Monthly Mean Minimum Temperature: 13
3.1 Monthly Mean Maximum Temperature: 14
3.3 The climatic change observed: 15
3.4 Changes in Different Factors Effecting Climate: 15
3.5 Role of Different Factors in Cause of Climatic Change: 16
3.6 Main Causes of Global Warming: 17
3.7 Rain fall Rate at Present year as compare to past 10 Years: 18
3.8 Deforestation Rate at Present year as compare to past 10 Years: 19
3.9 Changes Observed in Different Environmental Effecting Factors: 20
3.10 Flora Diseases in Targeted Area: 21
3.11 Total Wild Life Growth and Number: 22
3.12 New Species of Birds Found in Targeted Area: 23
3.13 Changes and Causes of decrease in Birds diversity and Number: 24
3.14 Effect on Wild Animal's Diversity and Number through Different Factors: 25
3.15 Conservation Tools for Wild Life Applied on District Lower Dir: 26
4. Discussion: 27
4.1 Changes in climate: 27
4.2 Effect of Climatic Change on Wild Life: 27
5. Conclusion 29
6. Reference 30
Questionnaire **34**
Maps of Targeted Area. **37**
Map of Khyber Pakhtunkhwa **38**

LIST OF FIGURES

Figure 1. Global greenhouse gas emissions in 2000, by source WRI, CAIT, 2007. 2

Figure 2: Time series of area weighted mean daily temperatures averaged over each year. 5

Figure 3. Monthly total rain rate (mm) of past five years (2010-2015) 12

Figure 4: Monthly mean Minimum temperature of past five years (2010-2015). 13

Figure 5: Monthly mean maximum temperature of past five years (2010-2015). 14

Figure 6: Changes in Different Factors Effecting Climate 15

Figure 7: Role of Different Factors in Cause of Climatic Change 16

Figure 8: Main Causes of Global Warming. 17

Figure 9: Rain fall Rate at Present year as compare to past 10 Years. 18

Figure 10: Deforestation Rate at Present year as compare to past 10 Years 19

Figure 11: Changes observed in different environmental effecting factors. 20

Figure 12: Flora Diseases in Targeted Area 21

Figure 13: Total Wild Life Growth and Number 22

Figure 14: New Species of Birds Found in Targeted Area. 23

Figure 15: Changes and Causes of decrease in Birds Species and Number 24

Figure 16: Effect on Wild animal's diversity and number through different Factors 25

Figure 17: Conservation Tools for Wild Life Applied on District Lower Dir. 26

1. **Introduction:**

Climate changes and its impact are increasingly evident in Pakistan, especially in the mountainous regions. Mountain ecosystems are considered to be sensitive indicators of global warming, even slight variations in temperature can lead to significant shifts in the local climate, which can in turn drastically affect the natural environment and subsequently on the people's life and wildlife (WWF Pakistan. 2008,http://www.climatescience.gov). Climate is defined as long-term weather patterns that describe a region (IPCC, 2001). Climate changes could occur naturally as a result of change in the sun's energy or Earth's orbital cycle (natural climate forcing), or it could occur as a result of persistent anthropogenic forcing, such as the addition of greenhouse gases, sulfate aerosols, black carbon to the atmosphere and through land-use change (National Academy of Sciences (NAS) 2001).

Since 1900 the global surface temperature of the Earth has risen by about 0.8 °C, and since in the 70s by about 0.5 °C. This temperature increases occur during significant increase of atmospheric concentration of greenhouse gases, especially CO_2 and CH_4, which is known to be mainly due to human emissions. Many scientists believe that further emissions of greenhouse gases could endanger humanity (Rockstrom J, et al., 2009).

Climate changes will have significant effects on the health of wildlife, domestic animals, and humans. According to scientists increasing temperatures combined with changes in rainfall and humidity, may have significant impacts on wildlife, domestic animal, and human health and diseases. Climate change is also having detrimental effect on micro-habitats. Amphibian and reptilian populations have declined in the lowland forests in Costa Rica in part through the effect of climate change on the humid leaf litter micro-habitat of the forest floor (Whitfield, S.M et al., 2007). Fewer sightings of wildlife – bird diversity dropped and Black Bear, Markhor, Himalayan Ibex, Wolf and Snow Leopard no longer seen in northern Pakistan (Peter Shadi, IUCN Asia 2009).

1.1 Main Causes and consequences of Climate changes:

There are lots of causes of climate change like greenhouses gases, deforestation, industrialization, urbanization etc. which may leads to the global warming, Glaciers melting, disasters, floods, Migration of Birds and Wild Animals, Wild Life and other species Extinction.

1.2 Role of Greenhouse gases in climatic changes:

Greenhouse gases like carbon dioxide absorb heat emitted from the earth. Increase of these gases in atmosphere leads to warm earth by trapping more and more heat. Human activity like burning woods and fossil fuels leads to the formation of greenhouse gases, air pollution, and increasing atmospheric carbon dioxide up to 40% (EPA 2012 report), with more in half the increase occurring since 1970s. Since 1900 the global temperature was rise 0.8°C (1.4°F). Most of the studies showed that the increase in temperature is due to increase in release of CO_2 and other greenhouse gases. Further increase in these gases will cause further climate change, include substantial increase in global average surface temperature and changes in regional climate. Long time over many decades depend only the amount of greenhouses gases (CO_2) emitted, as result of human activities.

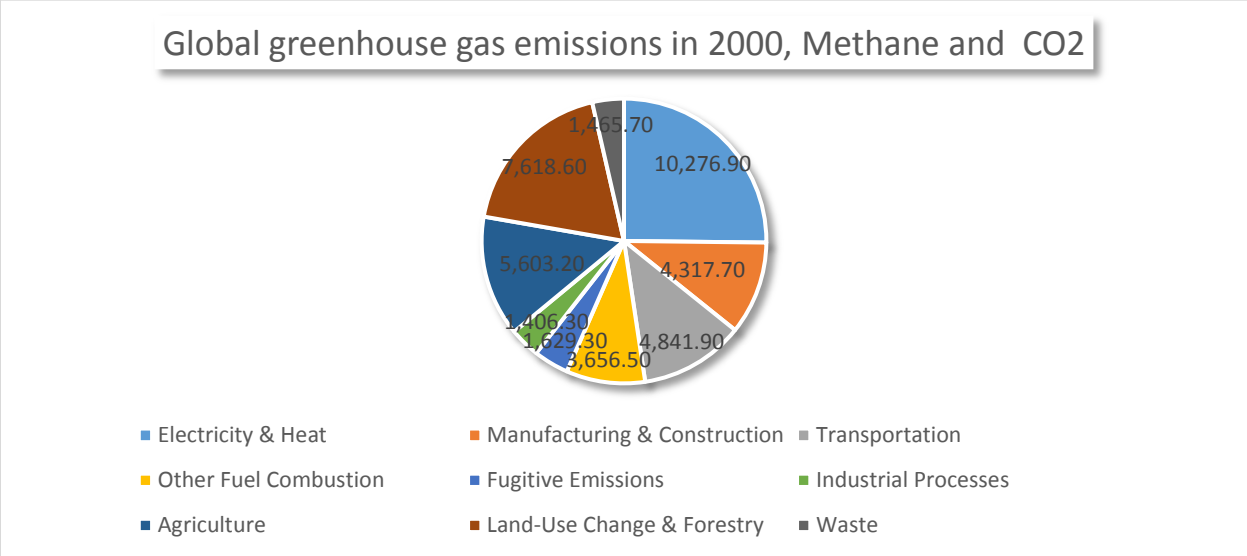


Figure 1. Global greenhouse gas emissions in 2000, by source WRI, CAIT, 2007.

1.3 Role of deforestation in climatic changes:

The deforestation is a key role in climate change which alternatively effect on wild life in sense of migration, endanger and extinction. Deforestation is the main issue for decade's leads to greater loss of species and biodiversity. It is predicted that up to 21% of southern Asian forest species will be lost by 2100 because of past and ongoing deforestation. Deforestation rate is increased i.e. by UN Food and Agriculture organizations (FAO) in 2005 indicate that about 13-million-hectare tropical natural forest is being lost each year. Forests are the main sources of medicinal plants, timber products, and specially a shelter for most endangered wild life species. In addition an estimated, 1.6 billion people rely on forest for their livelihood, while 60 million indigenous people depends on forest for subsistence. Another critically important function of forests increasingly and acknowledged now is that help to protect planet from climatic changes, by absorbing Carbon dioxide, a main greenhouse gas. Reducing deforestation and forest degradation must be part of the solution to the global climate problem. World Wildlife Funds (WWF's) climate report indicates that if emission form deforestation and forest degradation are not controlled, the possibility of success of preventing dangerous climate change is extremely reduced. A large portion of the country's forests are in Khyber Pakhtunkhwa, and majority of the people of this area are related with agriculture and forest sector. "According to an estimation Khyber Pakhtunkhwa contribute 40% of the total forest in the country" (Ahmad *et al* 2012). The total forest cover of Dir Lower is 133858 acres. Dir lower is part of Malakand division which is consist of seven Tesil which are Timergara, Khal, Blam bat, Adnzai, LalQila, Samar bagh, Munda and contain 37 Union Concils. But the rate of deforestation in this area is also high and thus at more risk to climatic changes such as flooding, drought, ice caps melting, decline in biodiversity, etc. The flooding of 2010 in Pakistan represents an example of climatic changes all over the world. Out of the 1767 deaths in 2010 flooding, 1156 were occurred in K.P.K and 1193 injured out of the 2701. Similarly, only in Khyber Pakhtunkhwa 200,799 houses were damaged and 43, 659, 09 people were affected (Kroonstad *et al* 2010). Thus these two factors lead the people of Lower Dir to unemployment and over use of the natural resources such forests, wildlife, etc. The main natural resource of this place are coniferous forest occurs 1,000 to 4,000 m. The total forests cover area of Dir Lower is 133858 Acers (2012 data record).

1.4 Role of Industrialization in climatic change:

Electrical Power Industries accounts for 33% of emission of greenhouse gases (EPA) and other Industries accounts for 19% of total emission greenhouse gases, so the total emission of green houses for all industries is 52% (U.S EPA). Industry demand constitutes around 30 per cent of global final energy demand and is responsible for around 40 per cent of all energy-related emissions, with iron and steel, cement, chemicals and petrochemicals, pulp and paper and aluminum production being the most carbon intensive (International Energy Agency 2009 report).The human-emitted component of GHGs in the atmosphere has risen considerably since the first industrial revolution. Industrialization contributes towards Greenhouse gases emissions through contributing to general GDP (gross domestic product) growth, having a dramatic overall impact on energy demand and use, and using carbon-intense production methods. The (International Energy Agency) IEA (World Energy Outlook 2009) expects that at current rates, CO2 emissions would continue to rise from 28.8 Gt (gigatons) in 2007 to 40.2 Gt in 2030. This is estimated to push average global temperatures up by 6 degrees Celsius and result in CO2 levels of more than 1000 ppm. In addition the waste byproducts released by industries increasingly involve in endangering aquatic and terrestrial life. Also in many countries industrialization also leads to deforestation in consequences wild life become endangered.

1.5 Role of public transportation in climatic changes:

Transportation accounts for 29% of U.S greenhouse emission (U.S EPA). Carbon dioxide makes up 95% of all transportation-related greenhouse gas emissions. Cars, SUVs, and pickup trucks running on conventional gasoline, diesel, and other fuels emit carbon dioxide. Combined, these vehicles account for roughly two-thirds of transportation-related emissions. So the second major source of greenhouse gases increasing day by day leads to global warming. Reducing greenhouse gas emissions from transportation will likely require a broad range of strategies, including increasing vehicle efficiency, lowering the carbon content of fuels, and reducing vehicle miles of travel. Public transportation can be one part of the solution.

1.6 Global warming:

Increase in global or earth surface temperature by release of greenhouse gases and greenhouse effect is called global warming, leads to several different worse conditions like Floods, disaster, extinction of wild life and other species, health problems, drinking water problem, agriculture problem as many more. Over the entire 1900–2002 period, the surface temperatures rose linearly by 0.069°C per decade; warming spurts occurred from the late 1910s to 1945 and from 1970 to the present. Since 1970, the warming rate of the Earth has accelerated to 0.17°C per decade, about three times as fast than the average rate for the past century. However, this comparison (while often made) is somewhat misleading because the actual rate of warming in 1915- 1945 was 0.16ºC per decade, essentially the same as for 1970 to the present.

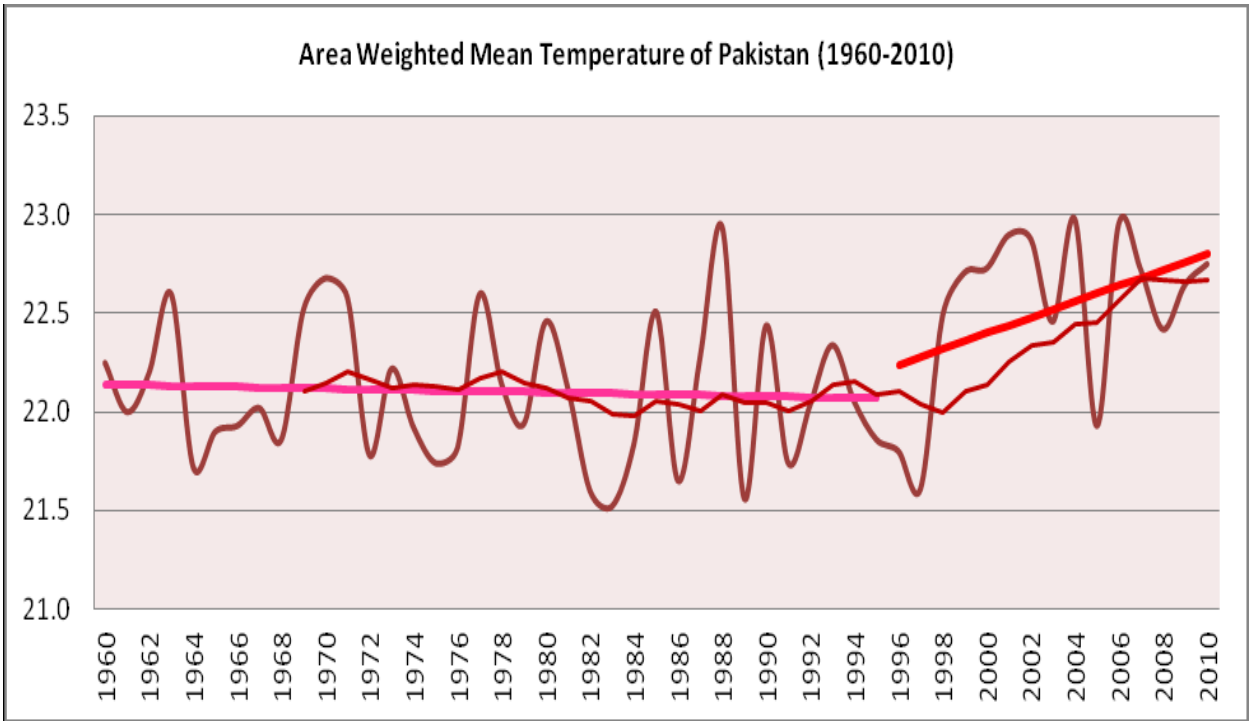


Figure 2: Time series of area weighted mean daily temperatures averaged over each year.

Time series of area weighted mean daily temperatures averaged over each year shows a sharp rise in temperature during the first decade of 21st century except the year 2005.

1.7 Wild Life in DIR lower:

1.7.1 Flora:

Chir (*Pinus roxberghii*), Fir (*Abies pendrow*), Spruce (*Picea smithiana*), Deodar (*Cedrus deodara*), Kail (*Pinus wallichiana*), Pholai (*Accacia modesta*), Babul (*Accacia nilotica*), Baker (*Adhathoda vasica*), Ghuraski (*Dodonaea viscosa*), Loor (*Grewia oppositifollia*), Zaithoon (*Olea ferroginea*), Bera (*Zizyphus jujuba*), Markhanay (*Zizyphus mauritinia*), Gurgura (*Reptonia buxiolia*), Ghooz (*Juglans regia*), Chinar (*Platenus orientalus*), Khuray (*Berberis lycium*), Bekhyana (*Ailanthas Altissima*), Bhang (*Cannibis sativa*), Panirak (*Malva sylvestris*), Podina (*Mentha spicata*), Velany (*Mentha longifolia*) and Enzar (*Ficus cerica*).

Source: Resourece management plan for Dir and Samarbagh Forest by Abdul Manan (DFO working plan, FMC)

1.7.2 Fauna:

1.7.2.1 Mammals:

Wolf (*Canis lupus*), Jackal (*Canis aurcus*), Jungle cat (*Fellis chaus*), Parco pine (*Hystris cristata*), Hare (*Lepu aspp*), Musk deer (*Moscus moscuferus*) and Common leopard (*Panthra pordis*)

1.7.2.2 BIRDS:

Chakur (*Alectoris chakur*), See See (*Ammoperdix griseogularis*), Blue rock pigeon (*Columba livia*), Quail (*Carcoturnix carcoturnix*), Black partridge (*Francolinus franculinus*), Gray partridge (*Franculinusp ondiciranus*), Sparrow (*Passer mountanus*), Bulbul (*Pyenonotis leucogenys*).

Source: Dir Wildlife Division Timergara.

1.8 Causes of Wild Life Extinction:

Every organism is adapted to live within a particular range of environmental conditions. If abiotic factors such as temperature, precipitation or oxygen concentration shift outside the range required by a particular species, the existence of that species in that particular habitat becomes impossible. Changes in global temperatures have wide-ranging effects on environmental conditions and are expected to cause population declines in species ranging from tropical corals to Midwestern mammals. Many scientists believe that human activities, such as the burning of fossil fuels, are contributing to increases in global temperatures. Other scientists dispute this claim, arguing that temperature increases are part of Earth's natural climate cycle. Just how many species are being lost each year is also hotly debated. Various estimates range from a few

thousand to more than 100,000 species being extinguished every year, most without ever having been scientifically described. Some events can instantly eliminate all individuals of a particular species, such as an asteroid strike, a massive volcanic eruption, or even a rapid loss of large areas of unique and critical habitat because of deforestation. Evidence to date suggests that deforestation is currently, and is projected to continue to be, the prime direct and indirect cause of reported extirpations. For example, it is predicted that up to 21% of Southeast Asian forest species will be lost by 2100 because of past and ongoing deforestation. Similar projections exist for biotas in other regions. The ecosystem and biological community changes precipitated by invasive species represent another leading cause of biodiversity loss. Human-mediated climate change represents a potentially disastrous sleeping giant in terms of future biodiversity losses. Climate warming can affect species in five principal ways: Alterations of species densities (including altered community composition and structure); Range shifts, either pole-ward or upward in elevation; Behavioral changes, such as the phenology (seasonal timing of life cycle events) of migration, breeding, and flowering; Changes in morphology, such as body size; and Reduction in genetic diversity that leads to inbreeding depression (Sodhi NS et al., 2009).

1.9 Consequences of extinction:

The extinction of certain species such as large predators and pollinators may have more devastating ecological consequences than the extinction of others. Ironically, avian vulnerability to predation is often exacerbated when certain large predatory species become rarer in tropical communities. For example, although large cats such as jaguars (Pantheraonca) do not prey on small birds directly, they exert a limiting force on smaller predators such as medium-sized and small mammals (mesopredators), which become more abundant with the former species' decline. The corollary is that abundant mesopredators inflict an above-average predation rate on the eggs and nestlings of small birds. Although this ''mesopredator-release'' hypothesis has been applied largely to mammals (e.g., Australian dingoes, Canis lupus, suppressing foxes and cats; coyotes in California controlling cat abundance), the loss of large predatory birds such as the harpy eagle (Harpiaharpyja) may have similar ecosystem effects (Sodhi NS et al., 2009).

1.10 Conservation Tool for Extinction:

Global climate change is already having significant effects on species and ecosystems (Gitay et al. 2002;Parmesan 2006). Conservation biologists have traditionally focused on the study of the independent declines, extirpations, or extinctions of individual species while paying relatively less attention to the possible cascading effects of species co-extinctions (e.g., hosts and their parasites). Essential ecosystem functions provided by forest invertebrates are also highly susceptible when species are lost after habitat loss and degradation. Indirect Strategies Strategies Related to Land and Water Protection and Management:1) Increase the extent of terrestrial and aquatic habitat protected from non-climate anthropogenic threats (McNeely &Schutyser 2003; Mitchell et al. 2007). 2) Representation attempts to build a more comprehensive portfolio of protected areas (e.g., protecting examples of all major ecosystem types within a country), whereas replication attempts to conserve multiple examples of each ecosystem type (Julius & West 2007). 3) It may be possible to offset some of the small-scale effects of climate change in protected areas through direct management activities (Mitchell et al. 2007). 4) It may be possible to design new natural areas and restoration sites to enhance the resilience of natural systems to climate-change effects (Lovejoy 2005). 5) This strategy represents a refinement of strategies 1 and 2 and would direct protection efforts toward areas and regions that have been deemed essential for climate-induced wildlife movements (Allan et al. 2005). Such areas might include movement corridors for terrestrial species (Inter-secretarial Commission on Climate Change 2007), habitat islands that could serve as stepping stones between larger reserves, stopover areas for migratory waterfowl, or refugia where climate-change impacts are predicted to be less severe (Julius & West 2007). 6) This strategy focuses on increasing broader landscape connectivity and permeability to species movement (da Fonseca et al. 2005).Strategies Related to Direct Species Management are: This strategy would invest resources in the maintenance and continued survival of those species most likely to become extinct as a result of global climate change. Although this strategy is not explicitly described in the policy documents reviewed for this study, it is implicit in efforts such as the campaign to prevent polar bear extinction. The International Union for Conservation of Nature (IUCN 2008), the approach recommends moving animals, plants, and other organisms from sites that are becoming unsuitable due to global climate change to other sites where conditions are thought to be more favorable for their continued existence. Other names for this strategy include assisted dispersal, assisted migration, and assisted colonization

(Julius & West 2007; McLachlan et al. 2007; Mitchell et al. 2007; Hoegh-Guldberg et al. 2008). This approach would initiate captive maintenance programs for species that would otherwise become extinct due to climate change. Such an approach would necessarily serve as the strategy of last resort for species otherwise facing extinction (Hansen et al. 2003). Seed, sperm, and egg banking represent extreme forms of this strategy (Guerrant et al. 2004). This strategy seeks to reduce or remove other, non-climate stressors to give wildlife species the maximum flexibility to evolve responses to climate change (Lovejoy 2005; Robinson et al. 2005; Julian & West 2007; Mitchell et al. 2007). The strategy of conservation:The biodiversity resources of the Province are being managed through the following multifaceted conservation strategy (Government of Khyber Paktunkhwa, 2007):

1. Establishment of Wildlife organization
2. Enforcement of Wildlife Laws
3. Establishment of Protected Areas for the protection of Endangered Species and Habitats
4. Conservation Awareness
5. Community Participation in Wildlife Conservation
6. Species and habitat conservation
7. Human Resource Development and Capacity Building

This study has been conducted in congruence with other research work being conducted. This means that the study highlights areas not completely addressed by existing studies. It thus serves as an ancillary tool that support the ongoing studies on biodiversity, glaciers, wildlife and forestry all directly affected by climate change patterns.

2. STUDY APPROACH

2.1 Targeted Area

The study area that we targeted were, the District: Dir Lower, KP, Pakistan.

2.2 Duration field:

The field study for the case of study was conducted from 10 June-10 November 2016.

2.3 Structure and Methodological Approach:

2.3.1 Research Design

The study was gathered the required information from primary and secondary sources. Primary field data was collected through documenting observations of local communities.

2.3.2 Research Instrument

A survey questionnaire was used to gathered primary data for the study.

2.4 Research Phases and Activities:

The study process was involved several steps, including:

2.5 Preliminary Research:

Secondary data on temperature and precipitation was obtained from various sources the local CBO (community base organization), including WWF (world wide fund for nature) Pakistan. Other literature and internet based research helped in identifying the main climate change concerns specific to areas.

2.6 Questionnaire:

On the basis of information gathered on climate change and wildlife, a questionnaire was designed, the questionnaire included, Information on climate change and its impact on wild life and information on Wild life affected by climate changes.

2.7 Field Visit Plan:

The field visit schedule encompassed the following components. Targeted area, Villages was covered by each of the two survey teams sample size was selected in each village, for the survey total number of household members (male and female) were interviewed date of visits were made by each of the two survey teams

2.7.1 Pre-testing

The approved questionnaire was pre-tested in a village called Hoppy. Base on the interview conducted, slight revisions were made in the questionnaire, to incorporate contextual evidence and to make the tool more focused (on climate change related indicators) and concise, so that utility and targeted response was ensured.

2.7.2 Data Collection:

The field of survey was conducted by project partners, data was collected from the interviewees and In addition to interview sessions with general community members, local key persons were also be interviewed.

2.7.3 Database Development

A format was designed to feed in the field data gathered. The entire information gather was consolidated and stored electronically.

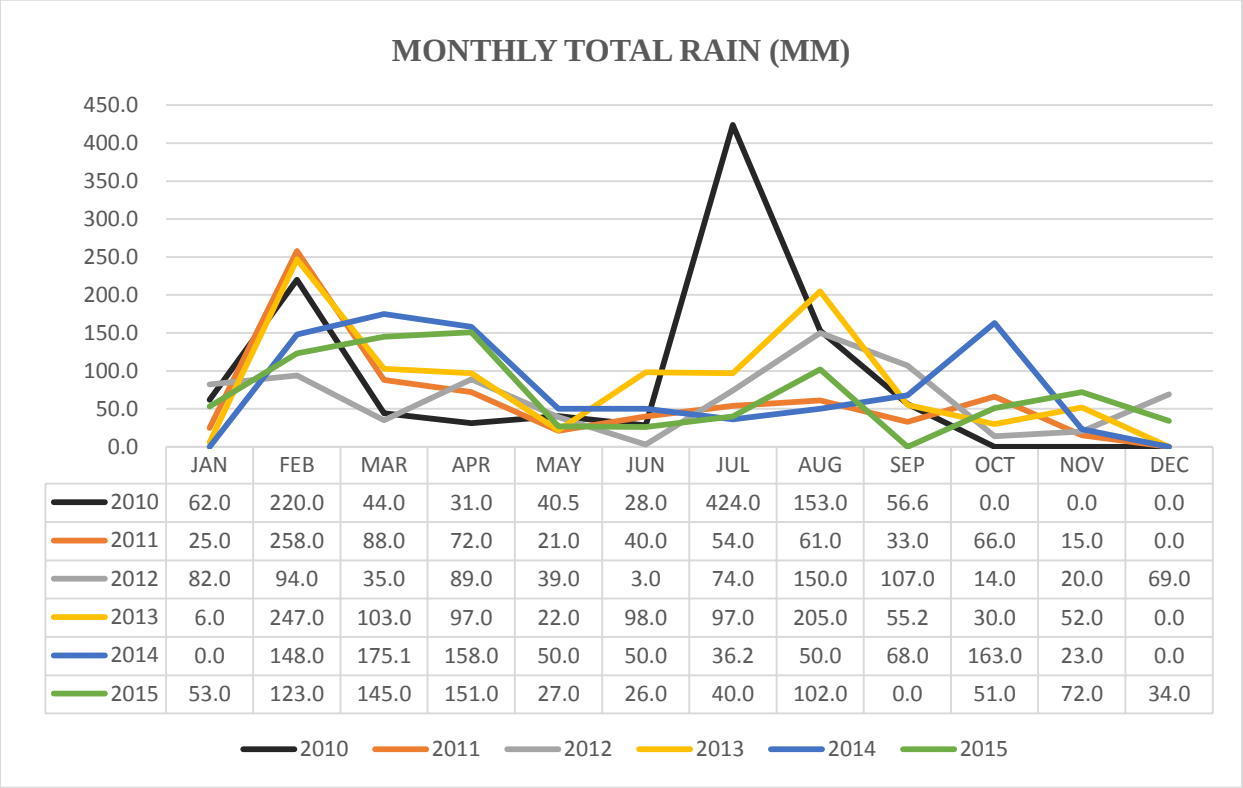
2.7.4 Data Analysis:

The data analysis procedure involved preliminary coding and sorting of data, mostly through data reduction (write-ups of field notes) and data reconstruction (development of categories, findings, conclusions, connections to existing literature, integration of concepts). The data was then presented in a narrative report of findings with descriptive and interpretative detail.

3. RESULTS:

3.1 The Rate of Monthly Rain:

As global temperature change the rain rate in DIR Lower change. As shown in the graph No.1 (Pakistan Meteorological Department). At Jan and Feb, 2010-2015 there is sharp increase up to 250mm except found 2010 and 2015. And then sharp decrease 50 mm in April and may in 20102011, 2013, and 2014, 2015 respectively. In June and August sharp increase 100mm-200mm found 2010- 2015 except 2011. In September and October the rain rate was found mostly below 50 mm expect 2014 there was a sharp increase up to above 150 mm. At November and December there was mostly linear rate below 50 mm. The graph shows two regular sharp increase at January and July and regular sharp decrease at May and September, while mostly the Increase and Decrease in raining rate in not regular specially and March, April, June and October.

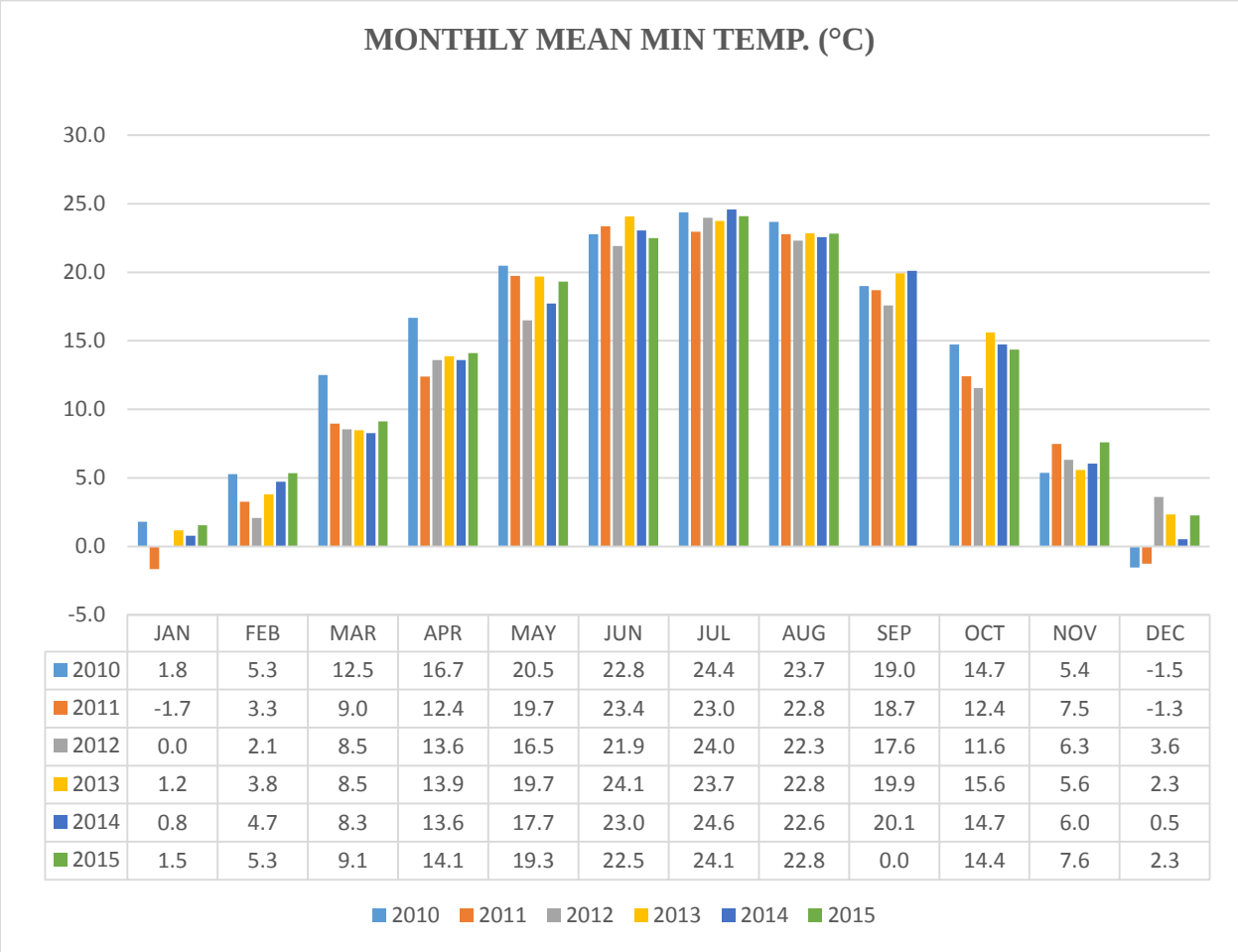


	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2010	62.0	220.0	44.0	31.0	40.5	28.0	424.0	153.0	56.6	0.0	0.0	0.0
2011	25.0	258.0	88.0	72.0	21.0	40.0	54.0	61.0	33.0	66.0	15.0	0.0
2012	82.0	94.0	35.0	89.0	39.0	3.0	74.0	150.0	107.0	14.0	20.0	69.0
2013	6.0	247.0	103.0	97.0	22.0	98.0	97.0	205.0	55.2	30.0	52.0	0.0
2014	0.0	148.0	175.1	158.0	50.0	50.0	36.2	50.0	68.0	163.0	23.0	0.0
2015	53.0	123.0	145.0	151.0	27.0	26.0	40.0	102.0	0.0	51.0	72.0	34.0

Figure 3. Monthly total rain rate (mm) of past five years (2010-2015)

3.2 Monthly Mean Minimum Temperature:

The data were collected from the Pakistan Meteorological Department which shows variation clearly in minimum temperature as the year past. While 2010 is seem warm as compare to next 3 years (2011 2012 and 2013), while next 2 years (2014-2015) is warm more than past two years (2012 and 2013). Thus a little increase is found over all in last five years. The average minimum temperature in last five years was 13.0°C. The lowest temperature was found in 2011 -1.3°C followed by -1.5 in December 2010.

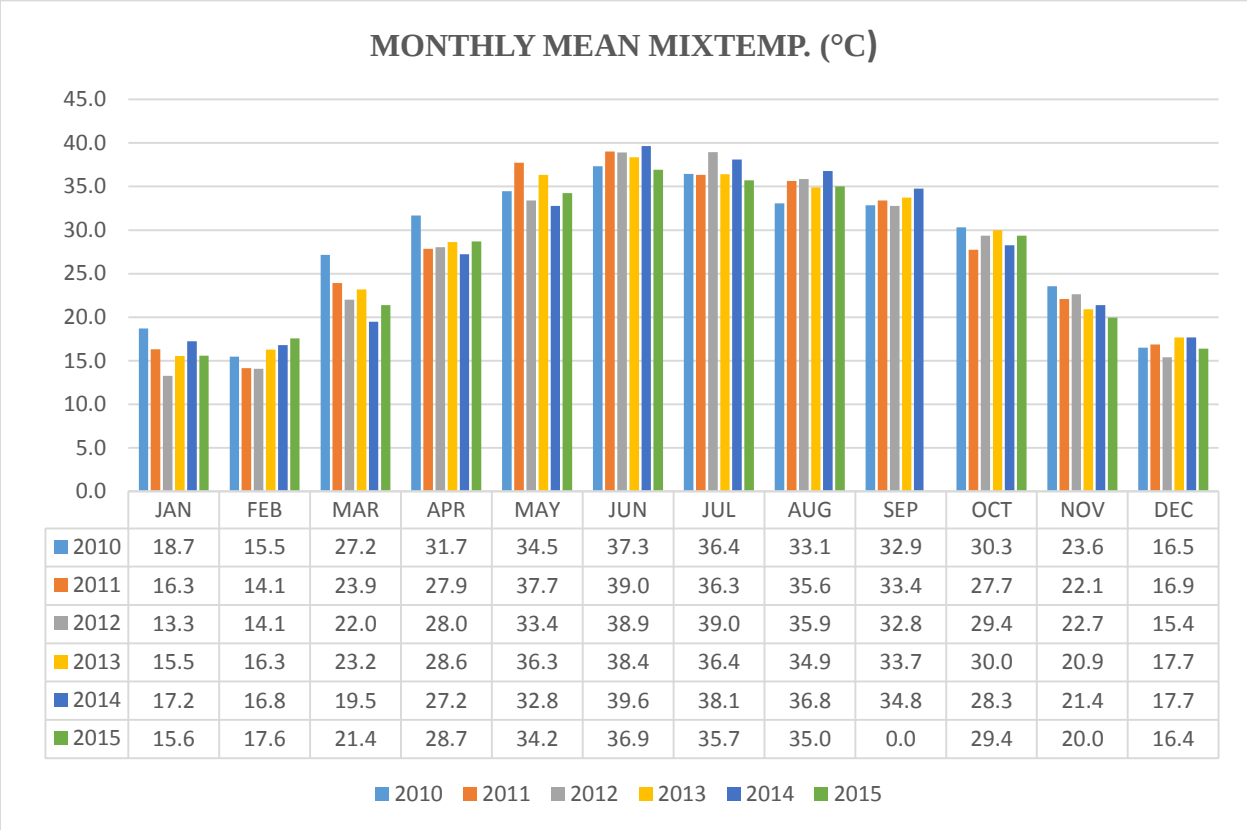


	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2010	1.8	5.3	12.5	16.7	20.5	22.8	24.4	23.7	19.0	14.7	5.4	-1.5
2011	-1.7	3.3	9.0	12.4	19.7	23.4	23.0	22.8	18.7	12.4	7.5	-1.3
2012	0.0	2.1	8.5	13.6	16.5	21.9	24.0	22.3	17.6	11.6	6.3	3.6
2013	1.2	3.8	8.5	13.9	19.7	24.1	23.7	22.8	19.9	15.6	5.6	2.3
2014	0.8	4.7	8.3	13.6	17.7	23.0	24.6	22.6	20.1	14.7	6.0	0.5
2015	1.5	5.3	9.1	14.1	19.3	22.5	24.1	22.8	0.0	14.4	7.6	2.3

Figure 4: Monthly mean Minimum temperature of past five years (2010-2015).

3.1 Monthly Mean Maximum Temperature:

The data were collected from the Pakistan Meteorological Department which shows variation clearly in maximum temperature as the year past. 2010 was the warmest year in past five years. The next year 2011 was also warmer while the little variation was found in the 2012 and 2103 mostly at January and February, while the 2014 is the second warmest year in last five years followed by 2015. The overall values show little increase in last five year. The highest temperature was found in July in 2014 39.6 °C followed by 39.0°C in June 2011 and July 2012.



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2010	18.7	15.5	27.2	31.7	34.5	37.3	36.4	33.1	32.9	30.3	23.6	16.5
2011	16.3	14.1	23.9	27.9	37.7	39.0	36.3	35.6	33.4	27.7	22.1	16.9
2012	13.3	14.1	22.0	28.0	33.4	38.9	39.0	35.9	32.8	29.4	22.7	15.4
2013	15.5	16.3	23.2	28.6	36.3	38.4	36.4	34.9	33.7	30.0	20.9	17.7
2014	17.2	16.8	19.5	27.2	32.8	39.6	38.1	36.8	34.8	28.3	21.4	17.7
2015	15.6	17.6	21.4	28.7	34.2	36.9	35.7	35.0	0.0	29.4	20.0	16.4

Figure 5: Monthly mean maximum temperature of past five years (2010-2015).

3.3 The climatic change observed:

Through questioners survey we observed that mostly all the respondent agreed that changes in climate have been occur during past 10 years. The responded also give some reasons responsible for their changes like increase in pollution, fertilizers uses etc.

3.4 Changes in Different Factors Effecting Climate:

Through questionnaire survey we observed that most of responders were agreed, that changes have been occurred in Temperature, Rain fall rate, Snow fall rate, Floods and Droughts Showed in fig no 4. Mostly all responders were (100%) agreed that temperature, rain fall rate and drought has been increased. About 72% responders agreed to decrease in Snow fall and 28% responders agreed to decrease in Snowfall. About 78% responders agreed to increase in Floods and 22% disagreed with increase in Floods.

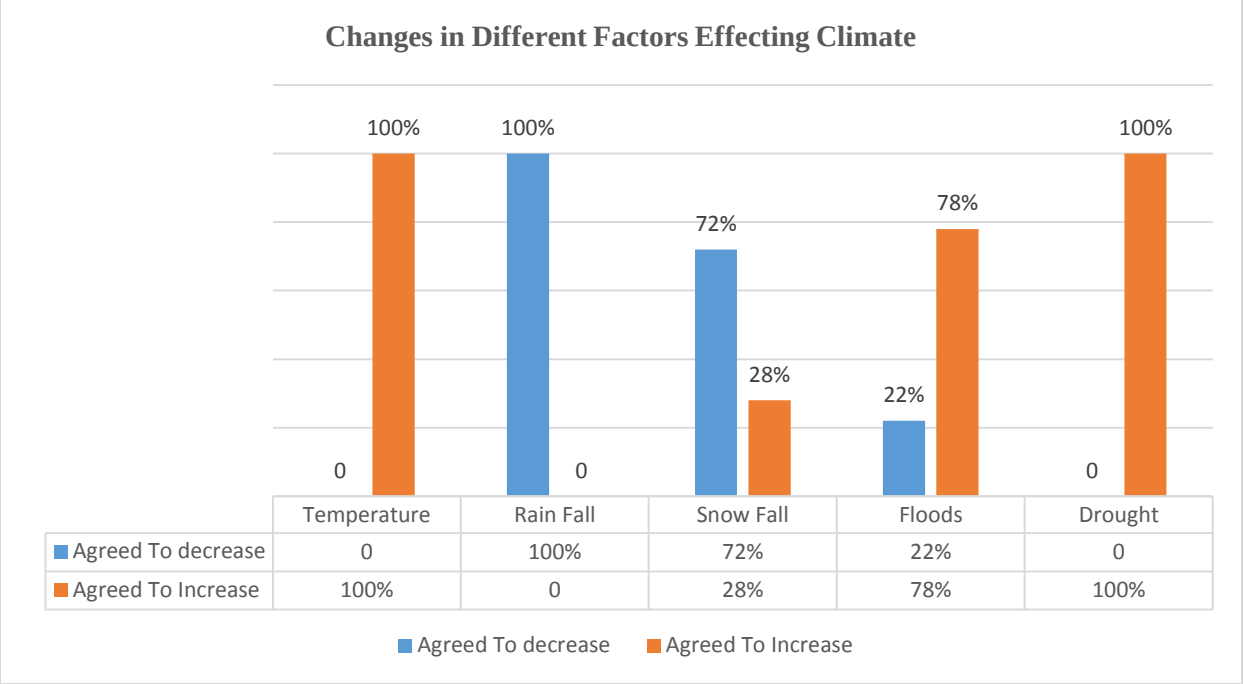


Figure 6: Changes in Different Factors Effecting Climate

3.5 Role of Different Factors in Cause of Climatic Change:

Through questionnaire survey we observed that most of responders agreed to causes of climatic change have been occurred due to deforestation, pollution, population increase and natural phenomena, as shown in fig no 5. Responders were 100% agreed that deforestation, pollution increase and natural phenomena have high impact on climate change. While 40% agreed to increase in population is also one of the cause of climate change while 60% disagreed with this statement.

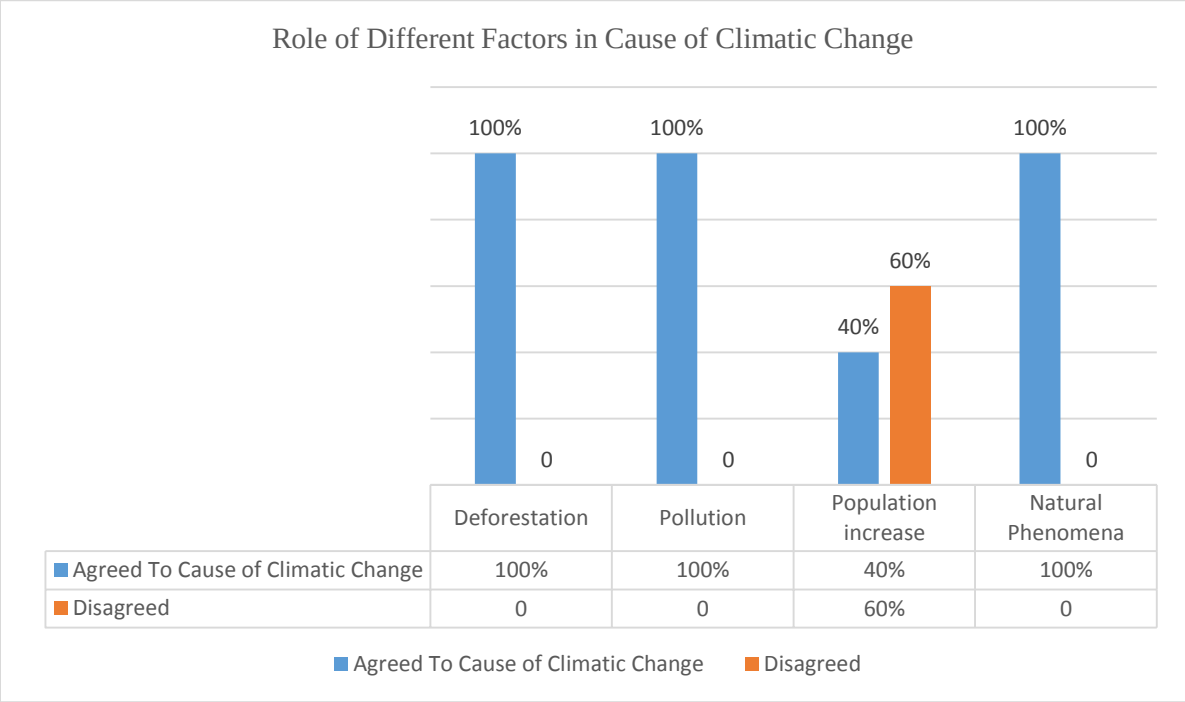


Figure 7: Role of Different Factors in Cause of Climatic Change

3.6 Main Causes of Global Warming:

Through questionnaire survey we observed that mostly all the responders were agreed 100% that increase in temperature, decrease in rate of rainfall and snowfall, increase in industrial Pollution, vehicles Pollution, crush plants Pollution, and carbon dioxide level have great impact on global warming, which is directly impact on wild life as shown in fig no 6.

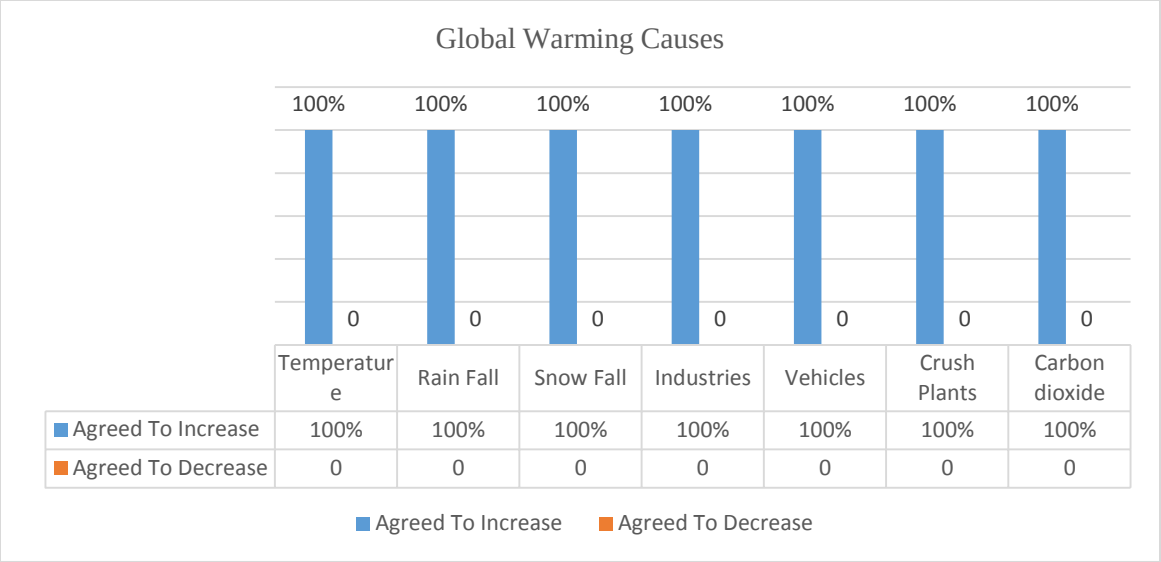


Figure 8: Main Causes of Global Warming.

3.7 Rain fall Rate at Present year as compare to past 10 Years:

Through questionnaire survey we observed that the most of the responders agreed that change in rate of Rainfall has been observed in past10 years, as shown in fig no 7. Responders were agreed 100% that rainfall was high at summer past 10 years while lower past and present year. Similarly the rainfall rate at winter past 10 years was high, 100% responded were agreed. On the other hand 100% responders agreed that the rainfall rate at winter past and present year was lower as compare to past 10 years, similar case with spring and autumn seasons regarding rain fall.

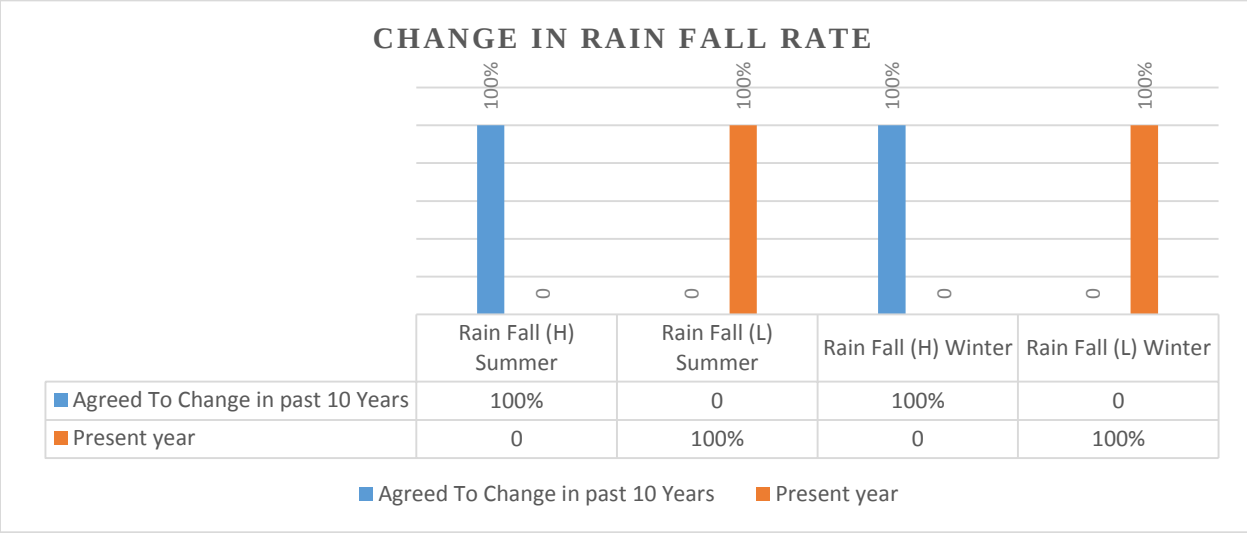


Figure 9: Rain fall Rate at Present year as compare to past 10 Years.

3.8 Deforestation Rate at Present year as compare to past 10 Years:

Through questionnaire survey we observed that deforestation is increase as compare to past 10 years, as shown in fig no 8. Most of the responders about 70% were agreed that deforestation is increased 5% as compare to past 10 year while 23% agreed to 10 % increase, 4% agreed to 15% increase and 3% agreed to 20% increase in deforestation. On the other hand 40% responders agreed that deforestation rate increase Past 10 years, 10% agreed to 10% increase and 0% agreed to 15% and 20% increase in deforestation past 10 years.

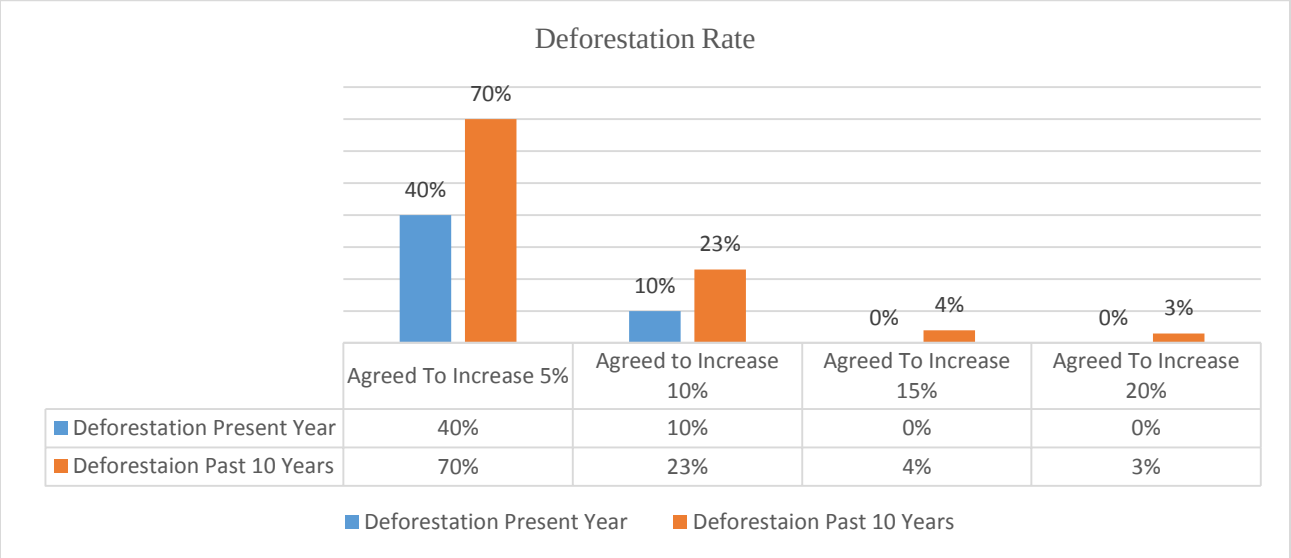


Figure 10: Deforestation Rate at Present year as compare to past 10 Years

3.9 Changes Observed in Different Environmental Effecting Factors:

Through Questionnaire survey we observed that most of the responders agreed to found high changes (increase) occurs in different factors effecting climate and wild life i.e. Cyclone, earth quakes, droughts, outbreaks, hails, sliding, floods as shown in fig no 9. 90% responders were agreed that high change (increase) has been found in cyclones, while 10% disagreed. Similarly 88% responders were agreed that earth quakes are highly increased while 12% disagreed. Responders 100% agreed to that drought has been highly increased. About 52% responders were agreed that outbreaks increased highly while 48% disagreed. Similarly 48% responders were agreed that hail is increased highly while 52% disagreed. Most of the responders about 73%observed that sliding has been increased highly while 27% disagreed. Similarly, 78% responders were agreed that floods have been increased while 22% disagreed.

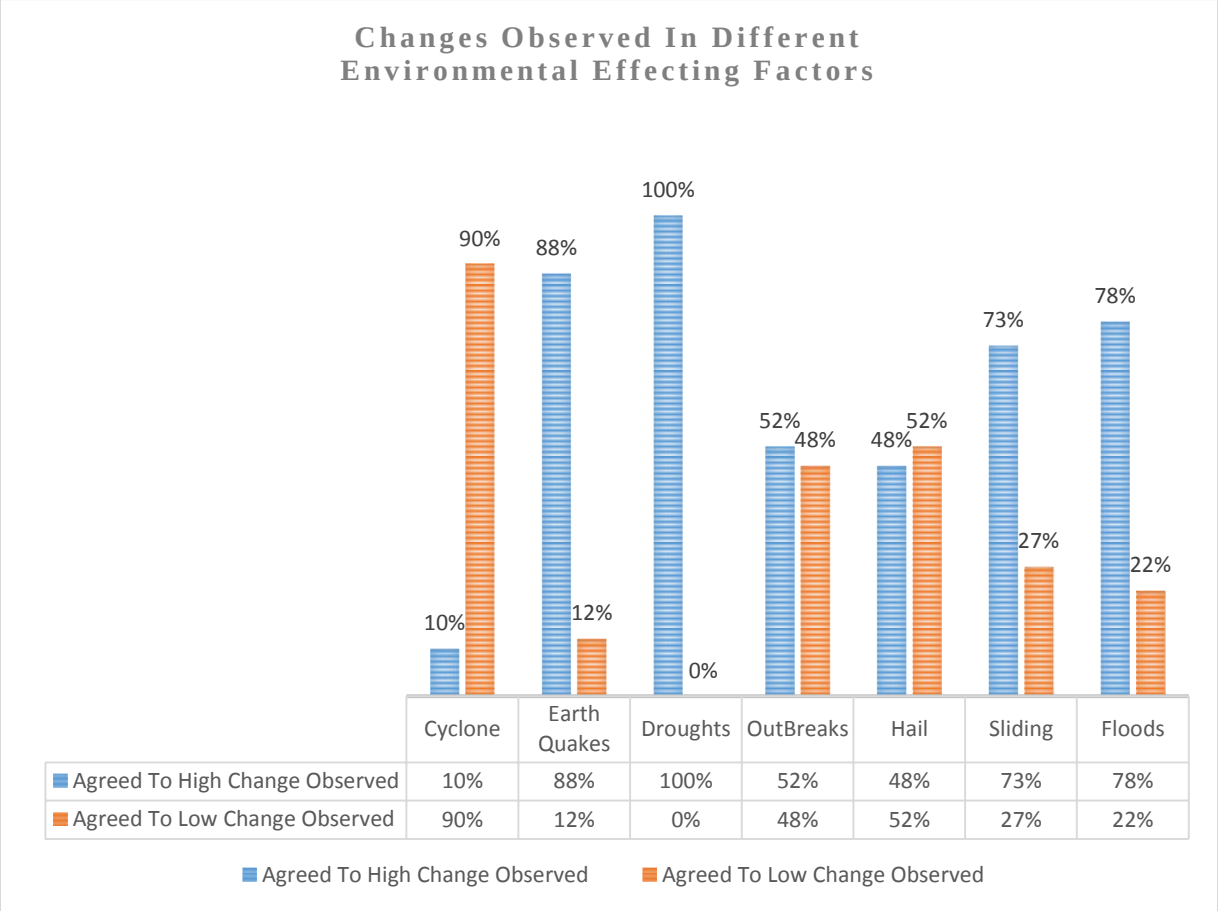


Figure 11: Changes observed in different environmental effecting factors.

3.10 Flora Diseases in Targeted Area:

We observed through questionnaire survey that diseases related to flora frequently increase in past 10 years as shown in fig no 10. 75% and 22% responders agreed to 5% and 10% increase in Present Year in flora diseases respectively. While 65% and 12% agreed to 5% and 10% increase in flora diseases in Past 10 Year respectively.

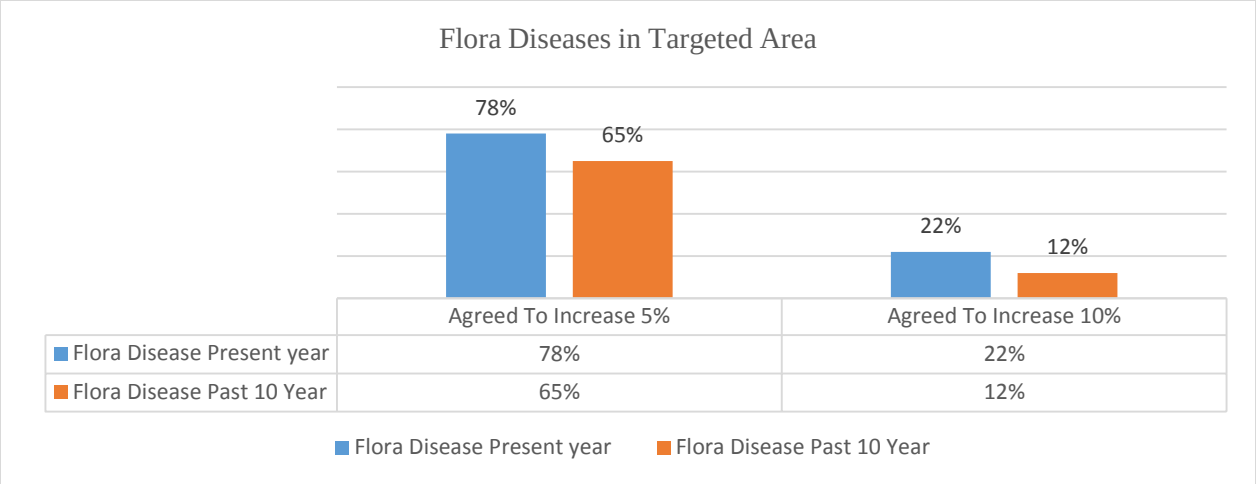


Figure 12: Flora Diseases in Targeted Area

3.11 Total Wild Life Growth and Number:

Through questionnaire survey we observed that most of the responders were agreed to total growth decrease of wild life effected by many factors such as diseases, low reproduction rate, hunting, migration due to unsuitable environment etc. 21%, 20%, 45%, 65%, 40%, and 56% responders agreed to increase in wild mammals, wild birds, migrated birds, insects, fishes and reptiles found in targeted area respectively. While 79%, 80, 55%, 35%, 60%, and 45% responders agreed to decrease in wild mammals, wild birds, migrated birds, insects, fishes and reptiles found in targeted area respectively. The overall observation showed that most of responders agreed to found decrease in wild life growth and number.

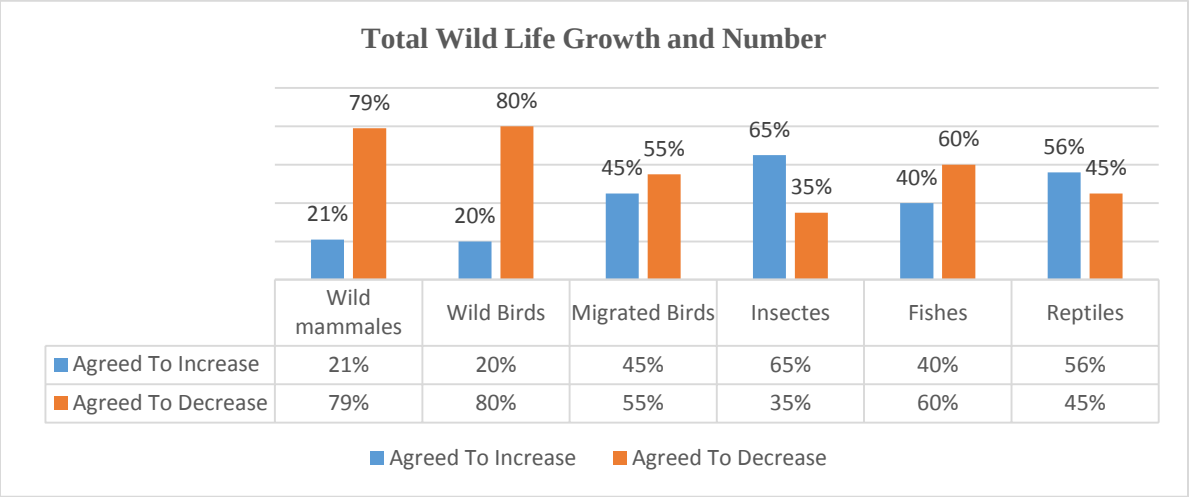


Figure 13: Total Wild Life Growth and Number

3.12 New Species of Birds Found in Targeted Area:

Through questionnaire survey we also observed individually that as new birds species are found in targeted area or not as shown in fig no 12. Mostly responders agreed to decrease or found no new species except migrated birds. About 76%, 24% and 10% of responders were agreed to found new species in migrated, transferred birds and captive breeding birds respectively in targeted area, while 24%, 76% and 90% responders were agreed to found no increase in migrated birds, transferred birds and captive breeding birds respectively in targeted area. The overall result shows that no new species is introduced and also some birds are migrated from high warm area.

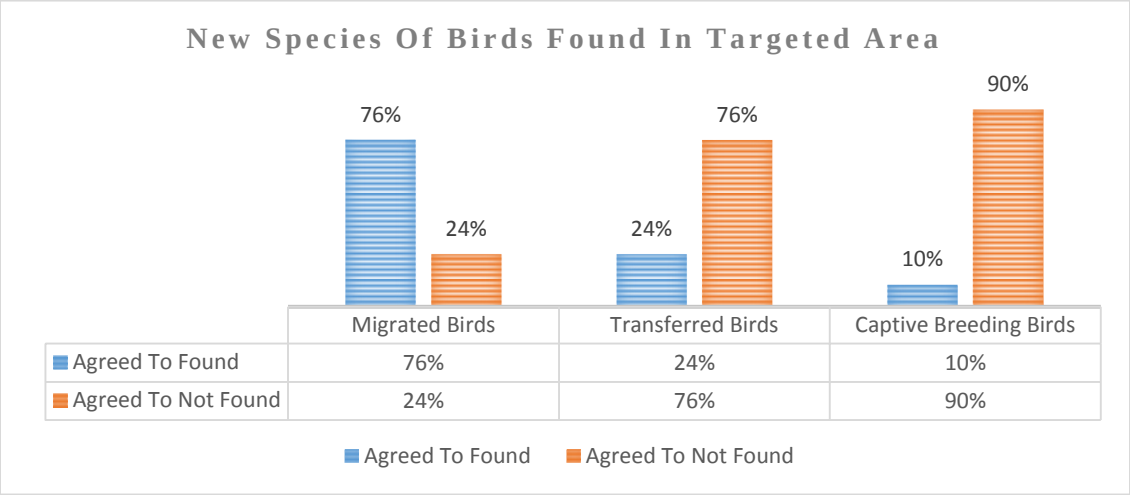


Figure 14: New Species of Birds Found in Targeted Area.

3.13 Changes and Causes of decrease in Birds diversity and Number:

Through questionnaire survey we observed that different factors how much effect the decrease in bird species and numbers as shown in fig no 13. The responders were agreed to found decrease due to different factors such as mortality, morbidity migrating, hunting, low growth, affected by climatic change or environmental effect. About 50%, 20%, 66%, 40%, 77% and 80% responders were agreed to decrease in bird by increase in morbidity rate, increase in mortality rate, Migration, low growth rate, Effect of climatic change respectively in targeted area.

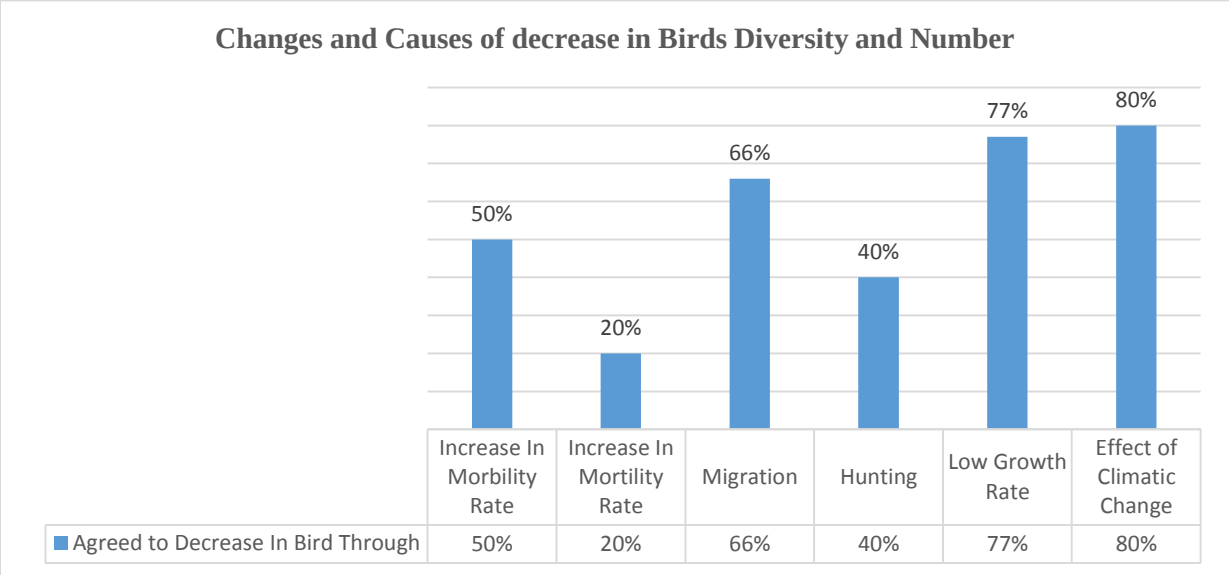


Figure 15: Changes and Causes of decrease in Birds Species and Number

3.14 Effect on Wild Animal's Diversity and Number through Different Factors:

The survey through Questionnaire, we observed that the most of responders were agreed to decrease in wild animals by different factors such as hunting, increase in morbidity rate, increase in mortality rate, Migration, low growth rate, Effect of climatic change as shown in fig no 14. The responders were agreed 100%, 20%, 13%, 100%, 65%, 22% and 70% to decrease in wild life through different factors hunting, increase in morbidity rate, increase in mortality rate, Migration, low growth rate, Effect of climatic change respectively in a targeted area.

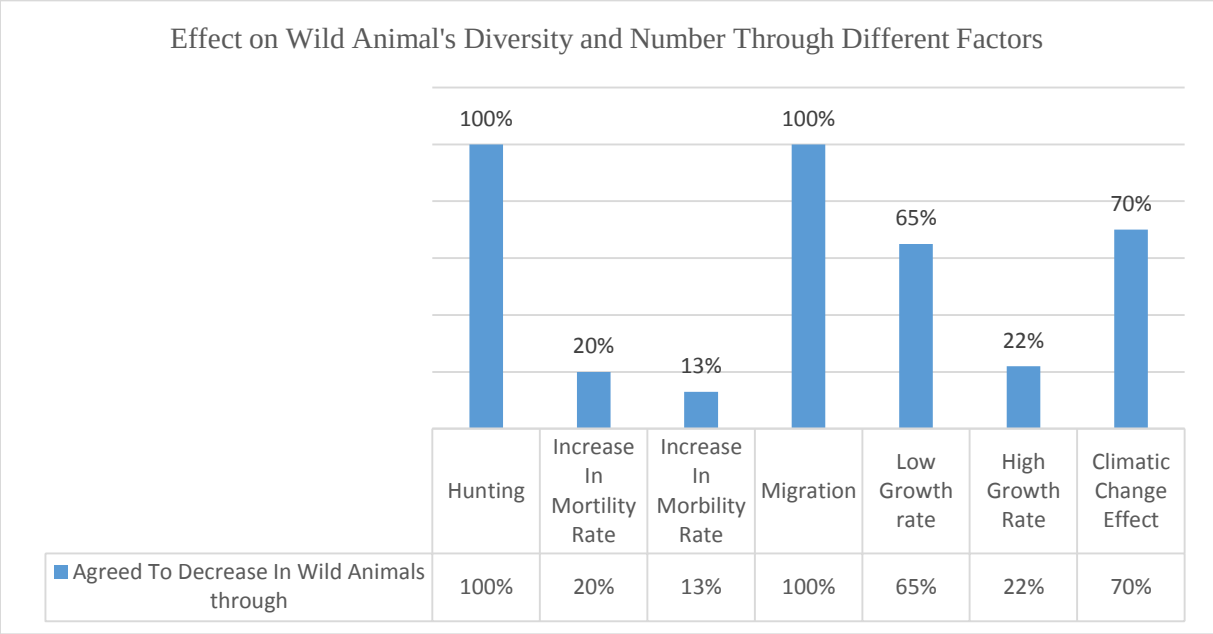


Figure 16: Effect on Wild animal's diversity and number through different Factors

3.15 Conservation Tools for Wild Life Applied on District Lower Dir:

Through Questionnaire survey we that there are some major tools applied for wildlife conservation such as Afforestation, Plantation, Pollution Control, Education (awareness), policy making, Local body action, Captive breeding, transferred from other areas, Communal Pooling, Trades, seed variety price, Human and animal medicines, stated current efforts, in the targeted area. Thus Responders responded vary to different conservation tools in sense of activeness in targeted area. The graph represent that there are several tools which are applied/working properly and responders agreed 100% to such tools as mention, Afforestation, Plantation, education or awareness, Policy making, local Body action, and human and animal medicines price. While other tools are also applied but not very frequent. Responders agreed to found activeness is such tool 75%, 84%, 72% and 84% for Pollution Control, communal pooling, trades and seed variety price for crops and other plants respectively. The three tools which are less applied and more important for the conservation of biodiversity of wildlife is Captive Breeding, Transferring from other areas, and Stated Current, for which responders vote 30%, 33% and 45% respectively.

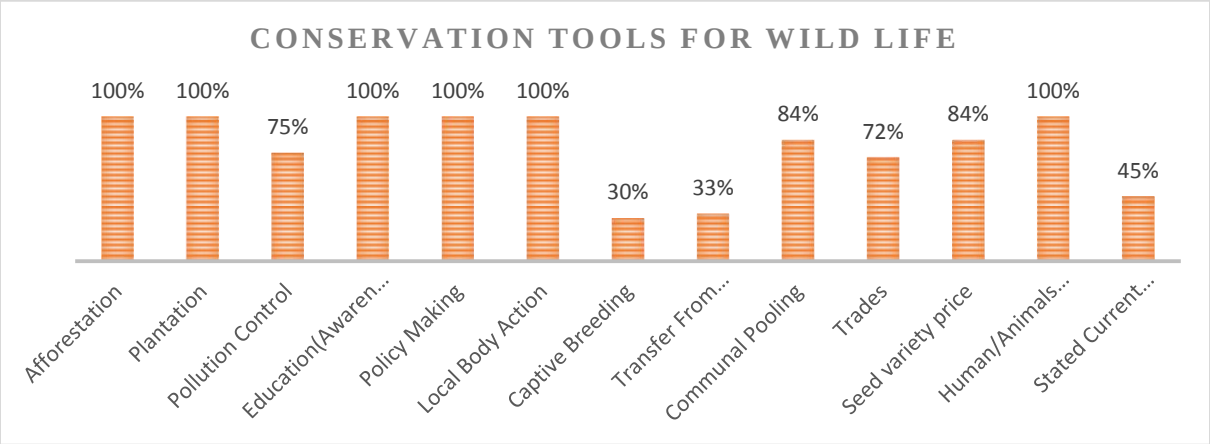


Figure 17: Conservation Tools for Wild Life Applied on District Lower Dir.

4. DISCUSSION:

Results shows that there is a notable change found in Temperature, rate of rain fall and snowfall, drought, deforestation which indirect effect on climate. Also the effect of climatic change has been observed and the most notable effect is on wild life and human health.

4.1 Changes in climate:

Through results analysis we observed that there are many factors which have adverse effect on climate and these factors are dominating day by day. The change in climate is observed by most of the people and the human activities with natural phenomena enhance the effect of these factors. As our result showed that temperature is somewhat change and high variation is found in past 8 years, many other surveys like The study of Farooqi, A.B et al., (2005) showed that Analysis of past depicts that our climate is changing and the main factors involve are greenhouse gas emissions, natural phenomena etc. and their effect on water resources, and subsequently affect food supply, health, industry, transportation and ecosystem sustainability. Our study also mentions that the major causes of climatic change is deforestation, mostly 100% responders were agreed. It is major factor contributing to the climate change in this area, which is in line with the previous study of Malik et al, (2012). Our study showed that rapid deforestation has also a major contribution to decrease in rain fall and increase in Green houses gases and subsequently causes climatic change, same wise the previous study of the previous study of Dias,(2008) showed the same effect. According to the current study the incidence of diseases has main effect on wildlife growth rate, caused by polluted water which is caused by deforestation, flooding, industrialization, urbanization, sewages etc. Same results were obtained by the study of Malik et al (2012).

4.2 Effect of Climatic Change on Wild Life:

As the results showed that there is dramatic changes occur in the climate and which leads to serious problem such as Wild life extinction, health problems, decrease in crop production and decrease in drink water and many more. The climatic changes cause the rapid habitat loss of wild life and pollution which force to displace or eliminate or extinct. When an environment is altered abruptly or systematically at a rate above normal background change, or beyond the capacity of adaptation via natural selection, specialist species with narrow ecological niches often bear the

brunt of progressively unfavorable conditions such habitat loss and degradation studied by Sodhi, N. S et al., 2009.

Study of Us department of interior , fishes and wild life Manchester showed that One-third of the 165 species of wetlands breeding birds show medium or high vulnerability to climate change, and black ducks have been identified as particularly susceptible to sea-level rise associated with a warming climate.

Our study mention all the threats toward wild life especially through climate change while same case were Studied by Seppala, buck and katila at 2009, showed that the moderate climatic change puts some of this biodiversity at considerable risk, the rise in average global temperature will influence the length and severity of season and the frequency and severity of floods and drought, increasing the prevalence of fire and predisposition to pests and pathogens- with expected impact on forest habitats and species. About one quarter of vascular plants and higher animals on the globe are estimated to be at increasingly high risk of extinction as temperature rise by 2- 3C above pre-industrial levels. It is very likely that even more modest losses in biodiversity would affect the ecosystem services.

As global average temperature continue to rise, it is important to develop strategies to conserve species and habitats that are unable to adopt, measure to reduce the impact of other human pressure, which still exceed those of climate change in most case are also likely to help reduce the overall vulnerability of forest ecosystem to climate change, more radical measure for adopting forests and wildlife to climate change include modifying or newly creating habitats, trans-locating whole animal and plant communities and moving boundaries of protected area.

5. Conclusion

- It is concluded from the study that climatic change is being severely notice by people and their main causes were greenhouse gases and deforestation. So, it is important to decrease those activities whose is responsible for the greenhouses gases and also to decrease deforestation and promote forestation locally as well as globally.
- It is also conclude from the study that the industrialization and vehicles are responsible for the greenhouses gases which cause global warming in consequences their effect on environment are, decrease in rain rate, increase in diseases, migration of birds, decrease in drink water for human and wildlife.
- As the climatic changes increase the life of wildlife become in danger and leads to migration or extinction.
- The rules for the environment protection is less implemented and there is low awareness that how to keep our environment sustain and prevent from climatic changes.
- There is no or less conservation tool applied in the targeted area, low budget for forest safety and wildlife conservation.
- To control the climatic change and wild life extinction we need policy for forest conservation, wild life conservation, prevent hunting, industrial pollution control, vehicle pollution control, increase in plantation, awareness of the policy for control of climatic change etc.
- This study provides a new line for next researcher to provide a solution for the conservation of forestry and wildlife and also apply different tools to minimize the environmental change which have adverse effect on climatic change.

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Appendix No.1 Questionnaire

QUESTIONNAIRE

Name: …… Age: 20-30, 30-40, 40-60 Gender: M or F

1 Are you seen any change in climate from past 10 years.

a. YES

b. NO

2 What types of changes occurred which effected climate?

a) Temperature ……..Increase or Decrease

b) Rainfall……..Increase or Decrease

c) Snow Fall …….Increase or Decrease

d) Floods ……..Increase or Decrease

e) Drought ……Increase or Decrease

3 What are the main reasons for Climate change? Tick Mark for Include and Cross mark for Exclude.

a) Deforestation…… Include/ exclude

b) Population Increase…… Include/exclude

c) Natural Phenomena…….Include/exclude

d) Pollution increase…….include/ exclude

4. Are the winters getting warmer? If yes, explain how,

a) Yes (temperature, rainfall. snowfall, vehicles, industries, crush plants etc.)

b) No

5 Rainfall pattern increased or decreased? Cross mark for Decrease and Tick mark for Increase.

a) This air, seasons (summer, winter, spring, Autumn)

b) Past ten year (summer, winter, spring, Autumn

6. How much deforestation increased or decreased? In %age.

a) Present (5%. 10%, 15% 20 %)

b) 10 year ago(5%. 10%, 15% 20 %)

7 Has there been any change in the incident of natural disasters? If yes mention it

a) Yes (floods, cyclone, Earthquake, Draughts, outbreak flu, hail, sliding etc.) b) N

5. Flora diseases / pests?

a) Present,

b) 10 year ago

8. Any changes found in forest flora? (Flora like Pines, Chir pine, Olive, Deyar, Gurgara etc.)

a) Yes (increase/ decrease)

b) No

9. Has any increase or decrease in wild animals been noticed in recent years? (rabbit, jackal, bear, wild dogs, wild cats, monkeys, foxes, bat)

a) This year (increase/ decrease)

b) Past 10 years (high/low number)

10. Have you found any new species in wildlife? if yes give Names.(cuckoo, crow, woodpecker)

a) Yes

b) No

11. Have you noticed any change in the bird species in the region? (e.g. migratory birds, crow, dove partridge). if yes what is that? (migrating, dying, low growth rate, high growth rate, diseases occur,)

a. Yes (increase/ decrease),

b. No

12. Have you noticed any change in mammals / reptiles / amphibian species in the region? (e.g. Markhor, ibex, blue sheep, Urial, Marco Polo sheep, snow leopard, brown bear, wolf). if yes what is that? (Increase or decrease, migrating, dying, low growth rate, high growth rate, diseases occur)

a) Yes

b) NO

13. What do you think is being done, can be done or needs to be done to deal with the changing natural conditions? Please Tick mark for suitable options.

(e.g. afforestation, plantation, education, local action body, awareness, migration, storage, diversification, communal pooling, trade, seed variety/price, human/animals medicine, less polluting machines) State current efforts (communal transformation external support)

MAPS OF TARGETED AREA.



Pakistan has diverse terrain with flat Indus plain restrain deserts in the east, mountain in the north and northwest, Baluchistan Plateau in the west. The surface elevation ranges from 0 m, near the Arabian Sea (in south), to 8,611m (in north). Since from the start of the 20th century, in Pakistan the annual mean surface temperature increase from 0.6^{o}C to 1^{o}C, the winter and summer rainfall decrease at the rate of 10 to 15 %, monsoon rainfall increase at the rate of 18 to 32%, humidity decrease by 5% and an increase occur in the solar radiation by the rate 0.5% to 0.7% over southern part of Pakistan (Farooqi *et al* 2005).

MAP OF KHYBER PAKHTUNKHWA



Khyber Pakhtunkhwa is the province of Pakistan, which is more sensitive to climatic changes and deforestation due to the presence of climate-sensitive sectors, as compare to the other provinces of the country. “Khyber Pakhtunkhwa is lies in the North West side of the country.



District Dir Lower is located in the North-West Province of Pakistan. The district is bounded by swat District to the east Bajour Agency to the west Upper Dir to the north and Malakand District in south. It lies in Hidukush range between 35° 10 to 35° 16 N Latitude and 71° 50 to 71° 83 E Longitudes. According to Ali et al., (2008) the area once occupied by the state (5284 km^2), now forms two districts of Pakistan - Upper Dir and Lower Dir (15,85km).