

FJWU (Economics) Working Papers

Policy Brief

WP2026:5



Climate Change Risk and Human Security: A Study of Selected Districts of Punjab

Bushra Yasmin

Iffat Irshad

Sadia Sherbaz

Department of Economics

Fatima Jinnah Women University

FJWU (Economics) Working Papers

WP2026:5

Climate Change Risk and Human Security: A Study of Selected Districts of Punjab

Bushra Yasmin

Iffat Irshad

Sadia Sherbaz

Department of Economics

Fatima Jinnah Women University

**Department of Economics
Fatima Jinnah Women University
2026**

Editorial Committee

Dr. Bushra Yasmin

Dr. Saira Tufail

Dr. Sadia Sherbaz

Disclaimer:

The Department of Economics, *FJWU* Working Paper Series disseminates the findings of work in progress to encourage the exchange of ideas. The papers carry the names of the authors and should be cited accordingly. The findings, interpretations, and conclusions expressed in this paper are entirely those of the author (s). Copyrights to this FJWU Economics Working Paper remain with the author (s). The author (s) may publish the paper, in part or whole, in any journal of their choice.

Recommended Citation :

Yasmin, B., Irshad, I., & Sherbaz, S., (2026). Climate Change Risk and Human Security: A Study of Selected Districts of Punjab. FJWU Economics Working Paper Series (WP2026:5). Fatima Jinnah Women University. Rawalpindi.

Department of Economics, Fatima Jinnah Women University,
The Mall, Rawalpindi

Email: ecowps@fjwu.edu.pk

Website: <http://fjwu.edu.pk>

Contact: 051-9292900, Ext: 2072

Climate Change Risk and Human Security: A Study of Selected Districts of Punjab

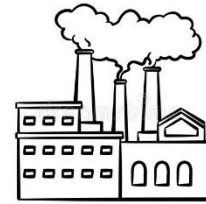
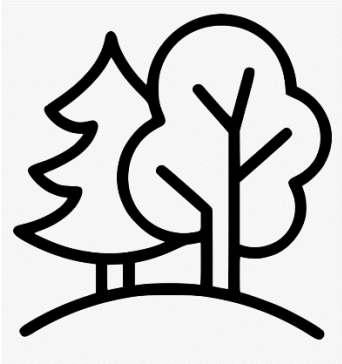
Bushra Yasmin, Iffat Irshad and Sadia Sherbaz

Executive Summary

Climate change risk, from floods to droughts, threatens land, livestock, crops and food supplies and has become a global environmental challenge from all aspects: exposure, sensitivity and mitigation. Non-traditional human security, a widely debated multifaceted phenomenon encompasses food, health and economic security where each security depends on a coherent set of factors. Pakistan has incurred economic loss to climate-induced calamities worth US\$ 3.8 billion from 2000-2019 while the risk-related vulnerability shows a loss of 0.52 % GDP per unit, despite the fact that Pakistan's position has fallen from 5th to 8th most vulnerable country to climate change according to Global Climate Risk Index by German watch (2021). As the individuals are being considered as appropriate reference for their own security more than any other factor, the climatic profile when taken along their demographic profile, perpetuating poverty and low adaptive capacity of the households offer interesting insights. By incorporating people's perception-based measure of climate change instead of relying merely on an environmental account of climate change, this study offers wider information on exposure, sensitivity and adaptability towards climate change risk and yields evidence-based policy implications. The study uses Intergovernmental Panel on Climate Change (IPCC) definition of vulnerability for Climate Change Risk (CCR) that adds scores on exposure and sensitivity and deduct adaptability score while four major climatic events namely, temperature, rainfall, floods and windstorm are considered, for 1000 households of four districts of Punjab namely Bahawalpur, Rawalpindi, Sialkot and Lahore, with an equal representation of rural and urban areas. Those households are selected who have been living in the area for at least last 20 years, as the formation of perceptions around the climate change is a long-term phenomenon. The regression analysis of the study shows climate change as a major security risk to the households and consistently yields negatively significant impact on human security and for all its constituents. Of the constituents of climate change risk, sensitivity and exposure

exert consistently negative effect on human security and its components. While adaptation mostly remains insignificant but consistently positive indicating low level of adaptation on the part of the household and communities. Most of the households in our sample (73%) have moderate human security, while only 8.2% of households are highly secure. The overall human security index has the average value 0.723, with only about 8% of the households in the sample being highly secure, compared to 19% coping with high human insecurity. Specifically, in terms of food security about 73.3% of the households in the sample are highly secure and the average value of food security index is quite high (0.79). Only 13% of the households have high health security however average value of health security index is 0.76, slightly less than that for food security index. In terms of economic security 19% of the household in our sample are highly secure while about 20% of the households are experiencing high economic insecurity with an average score of economic security of about 0.62, the lowest among the components of human security. The average value of climate change risk index is about 0.56 with a standard deviation of 0.199. Among the four districts being studied Bahawalpur and Sialkot shows more human insecurity as compared with that of Lahore and Rawalpindi. The study indicates high to moderate security risk to the household due to climate change risk for being high on exposure and sensitivity and low on adaptation score. This calls in question the adaptation plans taken up by the household themselves on the one hand, nevertheless also portrays large potential to adopt suitable strategies on the other. The area being investigated needs high level adaptation at household and community level both. At the household level, they can be urged to plant more trees and take up home gardening. They can strengthen the efforts by covering door and windows, grooming trees and shrubs regularly, using green cloth to cover dwellings and can educate their children regarding climate change and its affects. At the community level various initiatives like plantation drives, cleaning/recycling drives, petitioning local government representatives and pursuing rigorous awareness campaigns are required. Curriculum at all levels is required to be climate change-inclusive and can offer a wide range of courses & programs to sensitize youth to play their part effectively. The social protection programs should be given better coverage of vulnerable households for financial sustainability in the wake of climate related disasters. The sensitization and awareness campaign via social media (videography), door-to-door dissemination of brochure and conduct of symposiums play vital role in gaining realistic and evidence-based socio-economic impact. The policy brief remains pivotal in suggesting evidence-based informed policy choices. Acknowledgement: This policy brief is based on HEC funded NRPU Project 11739.

CONTENTS



INTRODUCTION & BACKGROUND

SUMMARY OF RESEARCH



RESEARCH FINDINGS

POLICY RECOMMENDATIONS



CONCLUSION

LIST OF FIGURES

Figure1	Human Security, Food Security, Health Security and Economic Security at District Level
Figure 2	Climate change risk, Adaptation, Sensitivity, and Exposure at District level

LIST OF ACRONYMS

ADB	Asian Development Bank
CCR	Climate Change Risk
COP27	27th Conference of the Parties
ES	Economic Security
ESRI	Environmental Systems Research Institute
EU	European Union
FS	Food Security
GDP	Gross Domestic Product
GHG	Greenhouse Gas
HS	Health Security
HSI	Human Security Index
IDB	Inter-American Development Bank
IPCC	Intergovernmental Panel on Climate Change
MOU	Memorandum of Understanding
NCS	National Conservation Strategy
NGO	Non-Government Organizations
OCHA	Office for the Coordination of Humanitarian Affairs
PDNA	Post-Disaster Needs Assessment
SDG	Sustainable Development Goals
UN	United Nations
UNDP	United Nations Development Program
USD	United States Dollar
WB	World Bank

INTRODUCTION

Climate change, according to the United Nations, refers to long-term shifts in temperatures and weather patterns. Since the advent of the 19th century, human activities have been one of the main drivers of climate change, primarily due to carbon emissions caused by burning fossil fuels in different forms for different purposes.

While scientists have been warning the world of imminent catastrophes for an exceptionally long time, governments and the policymakers started taking it seriously not earlier than the end of 20th century when real-life quantifiable changes became prominent as well as acute. Climate-related natural disasters have increased five-fold over the last 30 years, mostly affecting the low-income population of the world.

Today, as the world population crossed the eight billion mark, the calamity of Climate Change has already affected thirty-three million people in Pakistan and the rising severity of the issue is changing the narrative of Climate Change to help achieving SDG # 13 (climate action).

The catastrophic floods in 2022 not only brought out the structural weaknesses as well as the lack of political will. This also highlighted the lack of institutional capacity, governance structure and financial constraints in strengthening the climate-resilient physical, social and financial infrastructure and adaptation to climate change. Pakistan stands at number 152 in Climate Vulnerability Index yet 0.9% in GHG emissions. The targeted goals to bring 50% reduction in emission by 2030 cannot be promised until it is equally supported by global financial assistance.

Various approaches can be adopted to tackle the climate change risk however core solution remains in true identification of the problems, collecting evidence and suggesting evidence-based policy actions. Our policies need to be geared up for strengthening our capacity from the grass-root level. The major lacuna in the realistic policy action has remained the lack of data which can provide an informed choice to the policymakers. The policy recommendations must be based on the evidence from the direct reference i.e., households and community. And sensitization of the reference group along with communities and local governments should be at the core of climate action which will help to build a resilient yet strong framework for a future Roadmap to Climate Change Mitigation and adaptation plans in Pakistan.

BACKGROUND

The climate issue is one of the greatest and most complex challenges of today. Climate experts on the UN Climate Panel, IPCC¹, agree that the concentration of greenhouse gases in the atmosphere is gradually increasing and subsequently rising temperature leads to extreme weather conditions in the form of drought, heat waves, flooding, and hurricanes. Researchers

¹ IPCC refers to Intergovernmental Panel on Climate Change, a UN based panel on climate which evaluates the climate-related research worldwide.

are also in agreement that the use of fossil fuels for market-driven activities and by industrialized world (Global North) has contributed tremendously to global warming and the least developing countries, term as Global South, are bearing its consequences.

The consequences of climate change can be profoundly serious and have impact on both dimensions of traditional and non-traditional human security. The regional cooperation and global agreement have been emphasized to deal with climate change risk at macro level. However, many important questions remain unanswered regarding fair division of responsibility between the countries and devising mechanism to deal with phenomenon through technical and financial support.

From the context of Pakistan, country has been striving hard to handle climate change risk and efforts to introduce legislation for environmental protection were initiated back in 1977. Pakistan complemented its initiative by actions like the billion-tree tsunami, resolve to limit deforestation, building mangroves, etc., ESRI project, signing of MOUs with UAE and others for green energy projects, etc. A more cautious approach was adopted in national planning in the 1990s and several environmental regulations and protection laws have been laid down by successive governments to handle the issue effectively. Pakistan adopted the National Conservation Strategy in 1992 for the conservation of natural resources, and sustainable development which proved a crucial step in transforming public attitudes and practices and in modifying consumption patterns. Environmental protection agencies were the hallmark of sustainability in Pakistan in the late 80s and early 90s at the federal and provincial levels both.² This was followed by Environmental Protection Act (1997) and National Conservation Policy (2005) under National Environmental Protection Plan to restore the efforts for sustainable development by offering an overarching framework to address the country's environmental issues.³

However, recent floods and droughts have shown high vulnerability in the form of rising exposure and sensitivity, low adaptation on the part of local administration, provincial and national governments as well as on the part of the households.⁴

²Accessed from https://www.commissiener.nl/docs/os/sea/casestudies/16_pakistan_national_conservation_strategy.pdf

³Nadeem et. al (2022) The Effect of Fiscal Decentralization on Sectoral Green Total Factor Productivity in Pakistan: An Empirical Evidence, *Pakistan Journal of Economic Studies*, 51(1):329-354

⁴ “total damages to exceed USD 14.9 billion, and total economic losses to reach about USD 15.2 billion. Estimated needs for rehabilitation and reconstruction in a resilient way are at least USD 16.3 billion, not including much needed new investments beyond the affected assets, to support Pakistan's adaptation to climate change and overall resilience of the country to future climate shocks.”

Post-Disaster Need Assessment Report (October 2022) by Ministry of Planning, Development and Special Initiatives

Such tragic climate-related disasters must be treated as a turning point to move rigorously towards climate resilience and adaptation, resources mobilization and efficient allocation and well-informed public choices and policies.

SUMMARY OF RESEARCH

This project is an attempt to investigate the human security by incorporating its multiple dimensions including economic, food and health security. Furthermore, people's perception-based measure of climate change is incorporated instead of relying merely on an environmental account of climate change. The main objectives of the study is to assess the level of human security and its constituents and to measure the household's climate change risk captured through adaptation, exposure and sensitivity. The study provides important insight into significantly rising threats of human insecurity and climate change risk to humanity.⁵

Human security is a multidimensional phenomenon, we have used its three major dimensions: food security, economic security and health security. The main objectives of the study is to assess the level of human security and its constituents and to measure the household's climate change risk captured through adaptation, exposure and sensitivity. Furthermore, a comparative analysis is done for the climate change risk and health security of selected districts of Punjab. Study also analyses the impact of climate change risk on human security through inferential statistics. The impact of other demographic and socio-economic characteristics like age, gender and education of head of household, location of residence, family type, gender ratio, dependency ratio, living standard of the households, indebtedness, employment and poverty status are also controlled. Similarly, understanding of the climate change risk is gauged through questions like, if household have noticed any changes in the pattern of climatic events like their timings, frequency and severity of rains, windstorms, floods and heatwaves during the past few years; taken up measures to combat adverse effects of change in the given phenomena at community, local and national level by households, NGOs, civil society.

This study used the non-probability sampling method for collection of data from 1000 households from four districts of Punjab: Rawalpindi, Sialkot, Bahawalpur and Lahore through well-structured questionnaire. Data was collected in year 2021 from all Tehsils of selected districts. The pilot survey was conducted from households residing in Rawalpindi and the questionnaire was further rationalized.

⁵ As pointed out by Karfakis et al., (2012), individuals are being considered as appropriate reference for their own security rather than other macro-economic indicators of human security, this study takes due account of this fact by incorporating personal assessment of the household's human security and have focused on perception-based measures of climate change rather than relying on an objective environmental calculation, households vulnerability to climate change and adaptive capacities.

Construction of Indices

$$\text{Food Security (FS)} = \frac{\text{Total obtained score}}{\text{maximum possible score}}$$

$$\text{Health Security (HS)} = \frac{\text{Total obtained score}}{\text{maximum possible score}}$$

$$\text{Economic Security (ES)} = \frac{\text{Total obtained score}}{\text{maximum possible score}}$$

$$HSI_i = 1/3(FS_i + HS_i + ES_i)$$

$$CCRIndex = \frac{CCR - \min}{\text{Max} - \min}$$

Equations

$$FS_i = \beta_o + \beta_1 CCR_i + \sum_{j=2}^n \beta_j X_{ij} + v_i$$

$$HS_i = \gamma_o + \gamma_1 CCR_i + \sum_{j=2}^n \gamma_j X_{ij} + e_i$$

$$ES_i = \lambda_o + \lambda_1 CCR_i + \sum_{j=2}^n \lambda_j X_{ij} + \varepsilon_i$$

$$HSI_i = \alpha_o + \alpha_1 CCR_i + \sum_{j=2}^n \alpha_j X_{ij} + \mu_i$$

*HSI & CCRI refers Human Security Index and Climate Change Risk Index, respectively

RESEARCH FINDINGS

The findings suggest that sensitivity and exposure to climate change reduces the human security of households while adaptation enhances human security. The frequency distribution shows that most of the households have moderate health, and economic security, while food security is at high score for majority households. The cross tabulation of climate change risk with human security index attaches high level of climate change risk experience with low level of human security. While, economic and food security tends to increase due to adaptation strategies.

However, a comparison of dimensions show that adaptation is inadequate to compensate for the decline in human security. This might be due to fact that most households are unaware as to which adaptation strategies should be implemented when climate-related stress occurs.

GENDER DIMENSION OF CLIMATE RESILIENCE

The gender household head coefficient is positive and significant for overall human security which postulates that if the household's head is male they are at high human security points than female headed households. Generally women become head of the household when an

incident occurs in her life like becoming widow or orphan, health issues of the primary breadwinner, abandonment etc., hence becoming household head seems to be coming out of necessity not choice in this case and provides the justification for our gender-dimension of the results.

RURAL-URBAN DIVIDE

The households living in urban areas have significantly negative standings on economic and food security while the coefficient of location has positive and insignificant relationship with health security. Urban households' human security (food and economic security) is less compared to rural households while urban households are more health secure than rural individuals.

Rural health security is not in good shape because they have no access to health care centres. Rural households are superstitious and preferred their cultural norm for treatment of diseases.

NON-POOR HOUSEHOLDS ON HIGHER SECURITY SCORES

The non-poor households have better human security than poor households. Poor households experience consistently low political power, and are deprived socially that leads to worsening to chronic deprivation and worsening health over generation.

INTERDISTRICT DISPARITIES

The coefficient of district dummy Rawalpindi shows significant and positive for human security, economic security and health security and insignificant for food security. Rawalpindi households have higher scores of human security in all its constituents than Lahore households (base category). For other districts it remains insignificantly different from Lahore.

CLIMATE-INDUCED HEALTH OUTCOMES

Households face problem of eating healthy food, and accessing enough food for eating during the occurrence of natural disaster because price of food gets high. Climate change affects the health of individuals directly. Due to high temperature vector-borne disease (dengue and malaria), waterborne disease (cholera and dysentery), and heat waves increase. Households' expenditure on health increases which put mental stress and households feel depressed and hopeless to continually increasing health problem. Households' efficiency of working is also affected by extreme temperature.

EDUCATION PAYS OFF

Findings suggest that educated head of household are more aware of health, food and economic security of their family. Educated household head provide hygienic food, better health facilities and better residential condition to their family, so that food, health and economic security is high.

Educated household head is expected to have better wage outcome in market and higher rate of return in investing in education, can utilize technologies efficiently and are more productive leading towards higher economic security. They also appreciate the climate change risk and are able to manage it appropriately and respond quickly before occurrence of any disaster.

FINANCIAL SOUNDNESS MATTERS

If the households have any asset ownership, then they have more human. Such type of households have strong financial condition so they not only meet their basic needs (nutritional food) but can afford better living condition as well. Indebtedness coefficient shows negatively significant association with human security. Indebted households' most of income share is spent on interest payment.

Moreover, the asset holding of households' get them deal with climate change risk effectively in affecting their security.

More specifically,

- In terms of food security about 73.3% of the households in our sample are highly secure and the average value of food security index is quite high (0.79).
- Only 13% of the households have high health security however average value of health security index is 0.76, slightly less than that for food security index.
- While only 19% of the household in our sample are highly economically secure while about 20% of the households are experiencing high economic insecurity with an average score of economic security of about 0.62, the lowest among the components of human security.
- About 73% of the households in our sample have moderate exposure to climate change risk, about 15% of the households experience high exposure while 12.3% of households experience low exposure.
- About 18% of the households experience low sensitivity compared to 12% experiencing high sensitivity to climate change. Both sensitivity and exposure combine to raise climate change risk.
- Adaptation on the other hand can be instrumental in reducing the climate change risk. Most households in our sample (75.4%) have moderate levels of adaptation. While 13% have low adaptation.
- Both the average exposure and sensitivity score is high i.e., 0.77 and 0.72, respectively with low standard deviation. Whereas, the average adaptation score is comparatively low i.e., 0.521.

Figure 1 Human Security, Food Security, Health Security and Economic Security at District Level

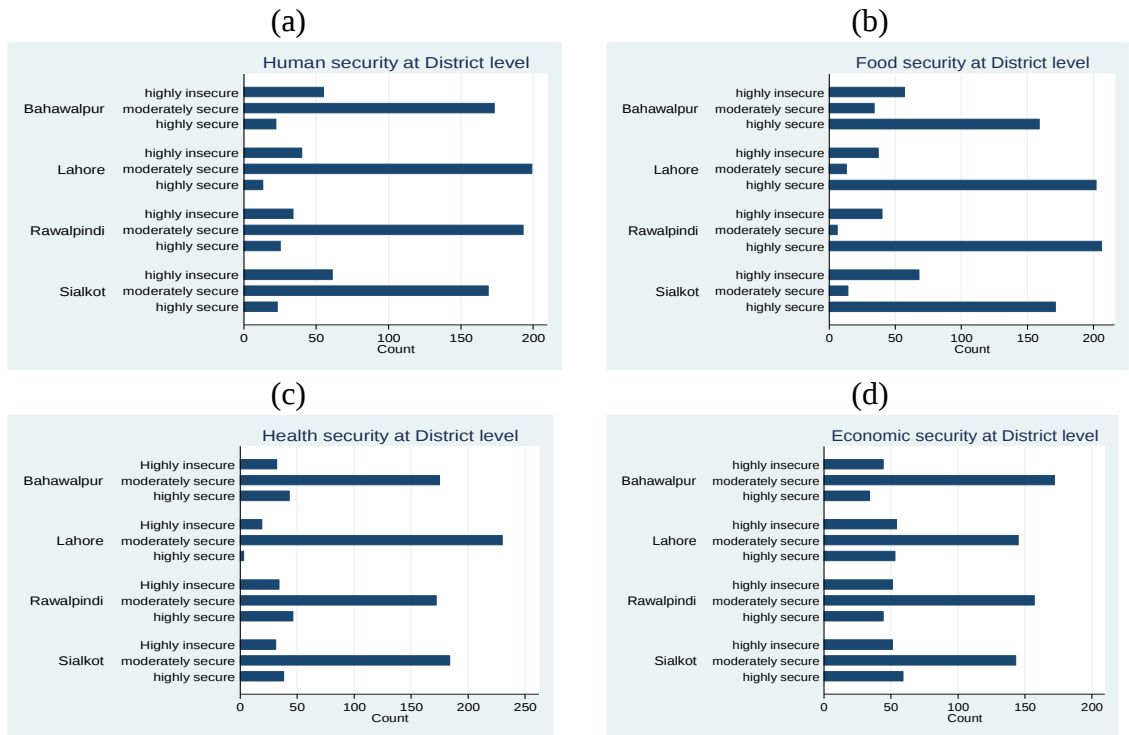
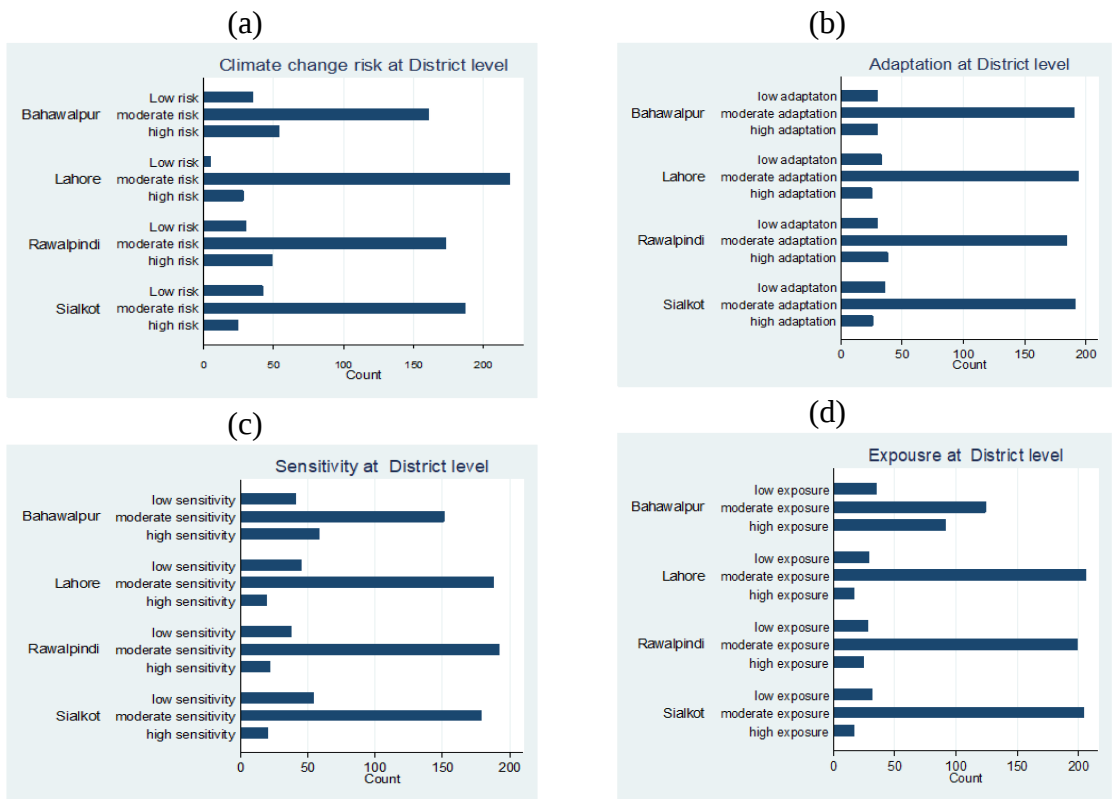


Figure 2 Climate change risk, Adaptation, Sensitivity, and Exposure at District level



POLICY RECOMMENDATIONS

Keeping in view the research findings, following policy recommendations are laid out in order to reach an attainable *Climate Action Plan*:

- ◆ Capitalise on micro financing scheme to increase the employment & entrepreneurship opportunity, and skill improvement program to increase income level of households
- ◆ Micro level planning and adaptation strategy to improve the climate-related security of households
- ◆ Subsistence farming and organic food production at household level to improve the food security and to improve the environmental quality
- ◆ Proper drainages and water management system implementation at household level to lessen the effect of heavy rainfall on health
- ◆ Pro-active role by local government for provision of food and health services as they possess the most up-to-date knowledge on the local environment and population
- ◆ Combining the climate-related indigenous knowledge and scientific research outcomes.
- ◆ Investing in social capital to strengthen the ability of local government to respond to climatic change and leveraging the scarce resources of local governments
- ◆ The community-wide ownership and commitment to adaptation and adoption strategies to ensure robust climate response

INTEGRATED APPROACH TO ACHIEVE SDGS

FOOD POLICY

As SDG#2 No Hunger is a top priority and termed as finalistic sustainable development goal, it is important to devise a comprehensive, sustainable food policy linking it to our agricultural policy, overhauling commercial policy keeping in view the risks of climate change disasters such as droughts and floods.

HEALTH POLICY

Keeping in view another finalistic goal SDG#5 Good Health & Wellbeing, the health sector needs to be strengthened including service delivery, education, financial planning & access, infrastructure, preventive care, inclusion in disaster risk & mitigation planning.

EDUCATION FOR ALL

To address the loss of education as a result of climate change, we need to ensure inclusive and equitable quality education, SDG#4. It includes all spheres of education ranging from primary & secondary education to the technical, vocational and tertiary education with a particular focus on sustainable development and global citizenship. Since it encompasses all

the targets, attaining sustainable education can help in building resilient communities and can develop skills in climate-related technology and fields.

SECTORAL DEVELOPMENT

Climate-friendly policies need to be introduced in all sectors like agro-green economy in agriculture sector for better climate adaptation and ensuring resource efficiency following SDG# 9, preventing pollution, imposing carbon tax in industrial sector. In the trade and commerce sector, we need to promote innovation and sustainable business models via subsidies and institutional support from banks/incubators.

DEPARTMENTAL COLLABORATION & INVOLVEMENT OF ALL STAKEHOLDERS

The staggered research on climate change needs to be collated and research data repository is to be maintained. The Ministry of Planning and Development and Special Initiatives and Planning Commission can lead the collaborative efforts among all stakeholders. The national and sub-national level government, NGOs and INGOs, households, communities, economists, urban planners, environmental scientists, and financial experts can be gathered under the umbrella of ministry's framework.

CONCLUSION

Climate change is a reality and its consequences have been apparent in the form of extreme heatwaves, storms, droughts and floods. In the backdrop of COP27, we have raised our concerns over climate justice and proposed three main elements; direct support from the international community, to agree to a loss and damage framework, and debt relief for climate-affected middle-income countries like Pakistan. However, we cannot afford to sit and wait anymore (the pledged money is primarily the project loans) we need to have parallel indigenous solutions and have to generate tangible and intangible resources to deal with the interconnected human and climate change security threats effectively. The adaptation and mitigation strategies go hand in hand, and it is high time for policy action instead of passing resolutions alone. Climate justice cannot be promised until we join hands as community leaders to handle the issue as a collective responsibility.

Let's build and strengthen regional & global alliances to find a way forward, access technology advancement in climate change scenario and other actions, we need to plan and execute coherent policies keeping in mind both our constraints and needs for a way forward to sustainable development.