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Urban Planning a Challenge to Climate Change: A Study of Lahore

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Abstract

This study examines the effectiveness of urban planning measures in addressing climate change impacts in Lahore, Pakistan's second-largest city. It assesses the implementation of national and provincial climate policies, focusing on Punjab's 2021 Climate Change Action Plan. The research investigates awareness levels among Lahore's residents regarding urban planning's role in climate change mitigation and adaptation, and evaluates policy implementation and institutional performance in achieving climate resilience. This study employed mix method approach whereas data was collected from primary and secondary sources.

1. Introduction

Climate change has become a global concern, almost every country is suffering from climate-related challenges. Pakistan is among the topmost vulnerable to climate change impacts. The country's unique geography and diverse ecosystem make it inclined to climate-related disasters such as droughts, floods, and heat waves. In response to these global efforts, Pakistan has taken significant steps to address climate change. Pakistan made its first climate change policy in 2012, then Pakistan made its climate change act in 2017 with stronger institutional framework. After the 18th amendment in the 1973 constitution climate subject was delegated to the provinces to enact their climate change policies. Following the instructions, province put efforts to make their climate change policy, Khyber Pakhtunkhwa and Sindh frame their first Climate Change policy in 2022. Punjab is most populated province of Pakistan, formulate its climate change action plan in 2021 to reduce greenhouse gases and to combat climate change impacts. Lahore is one of the most urbanized cities of Punjab Pakistan facing severe climate challenges in the form of heatwave to poor environmental conditions, and health issues. On the other hand, urbanization became another man-made challenge that affected the climate of the city. Punjab climate change action plan sets adaptation and mitigation measures for various sectors including urban planning.

The purpose of this research is to understand the challenges, problems, and level of implementation of urban planning mitigation and adaptation measures to combat the climate change impacts. Through this research, we will come to know the level of awareness among people in Lahore, about the importance of urban planning and its impact on climate change. Furthermore, which policy measures adaptation or mitigation were successfully implemented in Lahore and which needs to be improved.

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2. Research Methodology

The historical descriptive method is employed to develop an understanding of the topic. Data collection from primary and secondary sources. The study employed a quantitative research methodology to investigate public awareness regarding the impact of mitigation and adaptation measures of urban planning and its impact on climate change in Lahore. A convenient sampling method was opted for the survey. A survey questionnaire was administered to a sample of 200 respondents among the population of Lahore. The data was analyzed using SPSS software. The level of Awareness of respondents regarding climate change was checked through frequency analysis. Cross-tabulation analysis was performed to examine the relationships between categorical variables such as the relationship between gender and awareness of urban planning initiatives. Furthermore, correlation analysis was conducted to identify the strength and direction of relationships between variables. Secondary sources were Government Reports, Academic Articles, Policy Documents, and NGO reports, Sources of data were primary and secondary. The survey was conducted by the general public to collect public perception and awareness about the climate change policy measures of the Government of Punjab (GOP).

3. Literature Review

Gomstyn (2024), Climate change, a continuous process that began 4.6 billion years ago. It has been a global issue, since the 1800s due to human activities and the Industrial Revolution. The burning of fossil fuels, such as coal, oil, and gas, releases large amounts of greenhouse gases, which increase the chances of rapid global warming. The increasing population contributes to the increase in consumption of these fossil fuels, leading to more greenhouse gas emissions. Little (2023), The history of climate change can be traced back to the 19th century, when scientists first began to understand the role of gases in trapping heat in the atmosphere. International efforts have been made to address climate change, with global temperature records established in the late 19th and early 20th centuries. IPCC (1988), The Intergovernmental Panel on Climate Change (IPCC) was formed in 1988 to provide a comprehensive evaluation of climate change and help policymakers. Understanding climate change is crucial for everyone, as it creates crises at larger levels. The Kyoto Protocol, adopted in 1997, was the first international agreement to reduce greenhouse gas emissions. It aimed to achieve an average reduction of 5.2% below the 1990s level. Target was six key gases. However, it faced challenges in implementation and enforcement. The European Union launched the Emission Trading System in 2005 to encourage emissions reductions economically and ensure overall emissions stay within set limits. Stern (2018), The Paris Agreement, ratified in 2015, aims to keep global warming below 2 degrees over the preindustrial level with a 1.5-degree maximum target. With the participation of both developed and developing nations, the Paris Agreement is considered a legally binding treaty on climate change. Advancements in climate science have led to more accurate projections of future climate scenarios and a better understanding of climate change's impact on the environment, economy, and society. Roberts (2016), The Paris Agreement establishes a strong framework for climate mitigation, adaptation, and commitments by nations, requiring progressive measures to reduce their carbon footprint. EPA,(2020) The G7 countries, EU27, the United States, the UK, ,Canada, Italy, France Germany and Japan, including China, Russia India are the largest contributors to global carbon dioxide emissions. These countries generate 62.4% of global GDP and contribute 67.8% of global fossil fuel consumption. South Asia, with 0.62% of global carbon dioxide emissions, faces challenges such as desertification, water degradation, biodiversity loss, air quality, issues.

SAARC (2008), South Asian countries have taken steps to address climate change through initiatives like the SAARC action plan, Dhaka declaration, and Agreement on Natural Disaster Response Mechanism. Moreover one of the objective of SAARC is to strengthen regional efforts to mitigate climate change impacts.

Ahmad (2023), Pakistan shape its first climate change policy in 2012. Moreover in 2017 Pakistan establish its first Climate Change Act to align the country's efforts with international commitments. The Climate Change Act 2017 in Pakistan aims to provide a legal framework for addressing climate change issues in the country. It establishes institutions, mobilizes funding for climate-related activities, educates people on climate change effects, and spreads awareness.

Khan R.U. (2017), The Pakistan Climate Change Council, Pakistan Climate Change Authority, and Pakistan Climate Change Fund are responsible for setting climate policy, coordinating efforts, and providing strategic guidance. The Ministry of Climate Change coordinates and oversees the implementation of national climate change policies, which aim to reduce climate change impacts in sectors like water resources, agriculture, health, and disaster management.

Afzal (2021), Pakistan Updated its climate change policy in 20121. Policy focuses on renewable energy resources, promoting green transport systems, reforestation projects, better water resource management, and climate-resilient agricultural practices.

4. The Historical Development That Leads to The Climate Change Act 2017

Pakistan has been recognizing the importance of environmental issues driven by climate change since the early years. The Pakistan Environmental Protection Ordinance (PEPO) was established in 1983 to establish environmental governance institutions. In 1992, Pakistan worked hard to improve its environmental laws, prescribing rules called "National environmental Quality Standards" (NEQS) to limit pollution from industrial sectors and other resources. In 1997, Pakistan introduced the Pakistan Environmental Protection Act (PEPA), which replaced the existing ordinance and became stronger due to its strong rules to protect the environment. (Hasan, 2002)

The country participated in several international agreements related to environment protection, including the UNFCCC Framework Convention on Climate Change in 1994 and the Kyoto Protocol in 2005. In November 2016, Pakistan ratified the Paris Agreement and became part of the international climate community. To meet the obligations of these international agreements, Pakistan framed its Climate Change Act, called CCA, in 2017. This act provided a proper legal framework for climate policies and strategies to be implemented properly. (Yaseen, 2018)

The Pakistan Climate Change Act 2017 aims to handle the numerous concerns of climate change by systematic and planned national action. The act created the Pakistan Climate Change Council, Climate Change Authority, and Climate Change Fund, which supervise and coordinate climate action at the nation-wide levels. The 18th Amendment to the Constitution of Pakistan devolved the subject of environment from the federal government to the provincial governments, allowing each province to legislate and manage environmental issues independently. The laws define "environment" broadly, including air, water, land, atmosphere, living species, ecosystems, structures, social and economic circumstances, and their interrelationships. Pakistan has actively participated in international environmental agreements, such as the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. These agreements aim to combat climate-related issues and reduce greenhouse gases. Pakistan's national climate change policy (NCCP) was developed in 2012, focusing on mitigation and adaptation measures for agriculture, health, environment, forestry, transport, and disaster management. The policy emphasizes renewable energy, energy efficiency, and sustainable transportation while raising public awareness and promoting (Mumtaz, 2018)

Pakistan has formed several institutions under NCCP, including the Ministry of Climate Change (MOCC), National Climate Change Commission (NCCC), Provincial Climate Change Cells, Climate Change Authority, National Disaster Management Authority (NDMA), Pakistan Meteorological Department PMD, Pakistan Environmental Protection Agency (Pak-EPA), Climate Change Research Institutions, Interprovincial Coordination Body on Climate Change, and Green Climate Fund GCF.

Each institution works in their respective fields, with the MOCC responsible for implementing climate-related policies and coordinating with other ministries and civil society organizations. (Mumtaz, 2018)

Pakistan has faced multiple climate-related disasters in recent years, including floods, droughts, glaciers melting, and heat waves. These disasters have significantly impacted Pakistan's economy, leading to humanitarian crises, food insecurity, and health problems. Pakistan has committed to reducing greenhouse gas emissions and has implemented policies accordingly (Mohammad A.K, 2015).

Country has actively participated in international agreements since the 1990s, ratifying several conventions, including the Ramsar Convention on Wetland (1971), Convention on Migratory Species (1976), UN Convention On Law Of Sea (UNCLOS) (1982), Vienna Convention on Ozone Layer Protection (1989), Convention on Biological Diversity (CBD) (1992), United Nations Convention to Combat Desertification (1994), and UNFCCC (United Nations Framework Convention on Climate Change) (1994) (Hussain, 2014).

Pakistan has been developing national climate policies and institutions since the 2010 floods, which displaced nearly 20 million people. The country's first climate change policy was framed in 2012, leading to the formation of the Ministry of Climate Change (MOCC) to reduce the risk of climate change and promote adaptation and mitigation. Pakistan faces multiple challenges, including escalating climate vulnerabilities, international commitments, and the need for a legal framework. (MOCC, 2021)

The country's economy heavily relies on agriculture, which is the largest source of foreign exchange earning. The country has faced economic crises due to consecutive floods and droughts, leading to billions of dollars lost annually. The Paris Agreement and the National Environment Policy 2005 were enacted to align Pakistan's national policies with global policies and ensure cooperation with international commitments to overcome climate change (Mumtaz1, 2018).

The Climate Change Council, Climate Change Authority, and Climate Change Act are three main institutions that have played significant functions in Pakistan's climate policy framework. The Council formulates climate-related policies, provides advice to the government, and evaluates the implementation of these policies. The Authority manages projects and programs aimed at reducing greenhouse gases, such as the Green Pakistan Programme and the Ten Billion Tree Tsunami Project. The Climate Change Fund mobilizes and manages financial resources for climate-related projects. In summary, Pakistan has taken several steps to address environmental issues, including the National Conversation Strategy, the Billion Tree Tsunami. Country has implemented several initiatives to address climate change, including the national clean air programme in 2019, the National Water Policy in 2018, and the National Climate Change Policy 2021. The country is ranked 5th most climate-vulnerable to climate change impacts, facing threats from rapid glacier melting, water inflow of the Indus river, and changes in temperature and precipitation patterns. The National Water Policy aims to mitigate climate change's effects, including extreme weather and rising sea levels, by collaborating on water storage, infrastructure rehabilitation, dam development, and storage facility enhancement. (Khan,2015)

5. The National Climate Change Policy (NCCP) 2012

It was approved in 2012 to address climate change mitigation and adaptation challenges in sectors like water, agriculture, forestry, coastal areas, and vulnerable ecosystems. The policy is updated every five years and implemented by collaboration with UNDP, federal and provincial departments Pakistan's fresh water is heavily influenced by climate change, and its fresh water is based on snow, glacier melt, and monsoon rain. The National Water Policy aims to mitigate climate change's effects, including extreme weather and rising sea levels. The government and entities collaborate on water storage, infrastructure rehabilitation, dam development, and storage facility enhancement (MOCC, 2021).

6. Pakistan Climate change Act 2017

It also aims to upgrade Pakistan's ability to respond to the climate change related disasters. This act established 3 important institutions to implement climate change policy and actions Pakistan Climate Change Council (PCCC), Pakistan Climate Change Authority (PCCA), And Pakistan Climate Change Fund (PCCF)

Climate Change Council headed by the Prime Minister, the Council includes ministers, chief ministers of provinces, relevant federal and provincial secretaries, and representatives from civil society, the private sector, and climate change experts. This council approves and manage the execution of comprehensive climate policies and programmes. Connecting with various government and non-governmental organizations advising on climate related legislation and policies.

Pakistan climate change authority (PCCA) Led by a chairperson and supported by a governing body including members from various sectors and climate change experts. Aims to Implementing policies, plans, and projects approved by the Council. And Pakistan climate change fund aims to provide financial support for projects and initiatives aimed at mitigating and adapting to climate change. All these three institutions work systematically. Despite of these institutions there are some other initiatives under the Pakistan climate change act like, implementation of national adaptation plan (NAP). Promotion of climate smart agriculture, etc. Working in different dimensions (Jamal, Sarim, 2018)

7. Updated National Climate Change Policy 2021

The updated NCCP 2021 guides Pakistan toward climate resilient and low carbon development, with the government's Ten Billion Tree Tsunami Programme, Urban Forest Project, Clean Green Pakistan Movement, Protected Areas, and National Park Initiatives.

The objectives of Pakistan's National Climate Change Policy 2021 include integrating climate actions and development planning, focusing on socially and economically vulnerable sectors, promoting cleaner, less emission, and less carbon-intensive development, strengthening inter-ministerial and interprovincial decision-making, and fostering stakeholder awareness. (MOCC,2021).

Adaptation measures include expanding water storage and infrastructure, implementing water conservation strategies, formulating laws and policies for efficient water resource management, protecting glaciers, and raising awareness about water conservation. Agriculture and Livestock are also being prioritized, with the National Food Security Policy-2018 aiming to increase agriculture's profitability, productivity, and resilience to climate change. Human health is addressed through various measures, such as controlling vector-borne diseases and launching Ecosystem Restoration Initiatives (ESRI) and the "Protected Areas initiative" in 2022.

Pakistan's national climate change policy (NCCP) 2021 aims to reduce greenhouse gas emissions and promote sustainable development by focusing on various sectors, including transportation, forestry, agriculture, and energy. The policy encourages the adoption of renewable energy sources, low emission vehicles, and sustainable transportation systems. It also promotes climate-resilient infrastructure, nature-based solutions, cross-sectoral integration, gender-sensitive programming, and youth engagement.

Urban Planning Under Pakistan Climate Change Policy Urban planning is an essential element for both mitigation and adaptation.

To mitigate these impacts, changes in urban planning and buildings are needed. The government launched the Clean Green Pakistan Movement (CGPM) and Clean Green Pakistan Index (CGPI) to improve cleanliness and greenery in cities and neighborhoods. Policy measures include conserving

energy, improving efficiency, installing wastewater management systems, promoting digitalization, establishing zero-emission buildings, controlling rural- to-urban migration, proper land use planning, climate risk assessment, hazard mapping and zoning, and climate resilient rural and urban housing. The federal government will assist provinces in creating their own Action Plans and polices Local governments, AJK, Gilgit-Baltistan, and provincial governments will create their own strategies, plans, and programs for carrying out the policy. Climate Change Policy Implementation Committee will be established at the national and provincial level, with responsibilities of regular monitoring and updating of the National Climate Change Policy. The National Climate Change Policy Implementation Committee consists of the Federal Minister of Climate Change, Ministers of various ministries, representatives from corporate sector, civil society organizations, and the Director General. The Provincial Climate Change Policy Implementation Committees consist of the Provincial Minister for Environment, Planning and Development Department, Agriculture, Forest, Irrigation, Health/Energy Department, and other relevant stakeholders. The provincial committees oversee climate change adaptation and mitigation measures across all provinces of Pakistan, ensuring climate resilience in infrastructure and development projects. Regular monitoring and reporting of these policies ensure effective local implementation, allowing for more targeted and context-specific climate actions, including urban planning initiatives, across all provinces.

8. The Punjab Climate Change Plan 2021

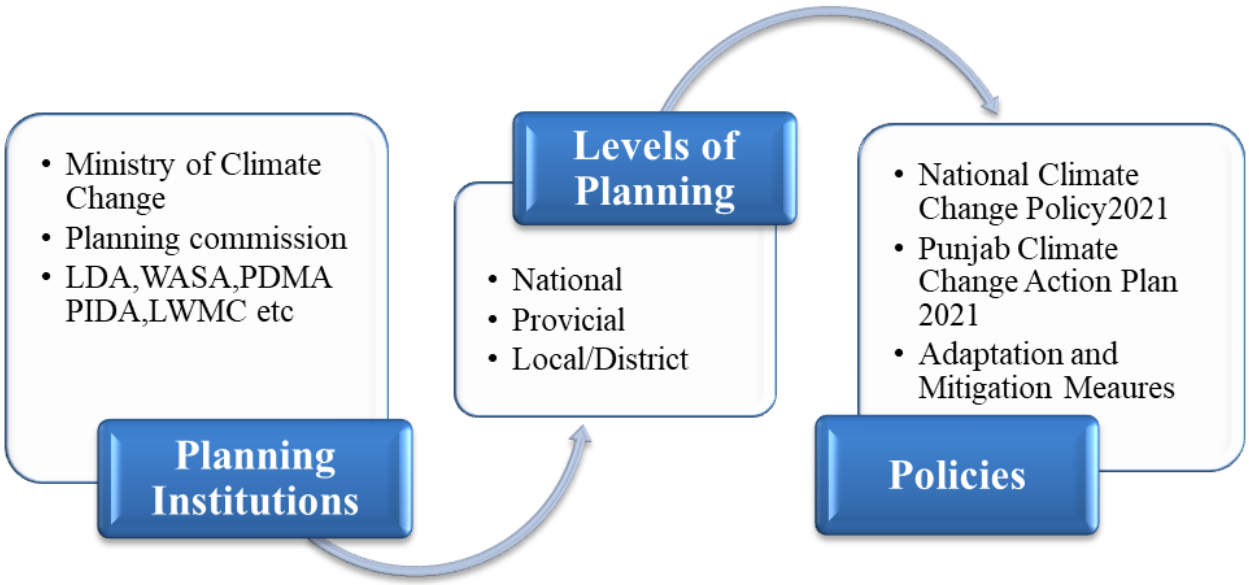
Plan aims to implement integrated water resource management, promote water conservation strategies, and enhance capacity for low-cost energy and water-efficient devices. The plan also aims to develop wastewater recycling and reuse in agriculture, artificial wetlands, and groundwater recharge. It emphasizes public-private partnerships for sustainable water supply systems and risk management. The plan also aims to identify areas severely impacted by the Provincial Agriculture Extension Department and to prevent uneven conversion of agricultural land for town planning, awareness campaigns. It establish a robust regulatory control system, promote heat and drought-resistant crops, and enhance the financial climate to encourage farmers to invest in and use technology to mitigate climate change effects (Baig, 2023)

Urban planning is the process of designing, developing, and managing urban areas, including cities and towns. It involves aspects such as land use, transportation, infrastructure, environmental sustainability, housing, and public places. The goal is to create a functional, sustainable urban environment that meets residents' needs and considers factors like population growth, economic development, and environmental impacts. Urban planning plays a crucial role in shaping urban areas and addressing climate change. It helps prevent or adapt to climate change by analyzing disaster potential and vulnerability, encouraging better public transportation, and promoting renewable energy sources. Effective land use planning prevents urban sprawl and preserves green spaces as carbon sinks. Urban planning also enhances water conversion and management, public health, and safety. Punjab, a province in Pakistan, faces numerous challenges related to urban planning and climate change. These include vulnerability to climate-related disasters, pollution, waste management issues, loss of green spaces, water management challenges, transportation issues, lack of effective governance, and insufficient funding. The Punjab Climate Change Action Plan 2021 aims to address these challenges by implementing adaptation and mitigation measures. (GOP M. o., 2021)

The plan involves three types of measures: short-term measures, mid-term measures, and long-term measures. Short-term measures focus on examining future expansion needs, encouraging private and public residential buildings to reduce energy demands, and converting larger buildings into solar energy. Mid-term measures aim to create agro-based towns with high quality of life and economic opportunities, while mid-term measures focus on reducing rural to urban migration and developing industrial estates and agricultural farms.

Implementing partners include Provincial Town Planning Departments, City Development Authorities, and City Municipal Authorities. They also encourage proper land use planning, vertical expansion of housing projects, and the establishment of high-density townships near parks, gardens, and natural reserves. They also implement hazards mapping and zoning, geological surveys, industrial construction in designated areas, and the creation of natural reserve areas and vegetative barriers. (GOP M. o., 2021)

Urban Planning Adaptation Mitigation Measures at Various levels



In addition to these measures, Punjab is actively linked with the federal government through Climate Change Policy Implementation Committees (NCCPIC) at both federal and provincial levels. This comprehensive integration procedure allows Punjab to contribute effectively to Pakistan's overall climate commitments while addressing province-specific challenges and opportunities.

9. Urban Planning Adaptation and Mitigation Measures in Punjab Climate Change Action Plan 2021, Study of Lahore

Urban planning is crucial in combating climate change and shaping urban form. Golden standards for adaptation and mitigation have been created by studies, including regional, master, and detailed plans. Land use planning can help prevent or adapt to climate change by analyzing disaster potential and vulnerability, limiting land use to resilient uses in disaster-prone areas, utilizing urban greening and high-reflectivity materials, increasing openness to allow cooling winds in warmer areas, and controlling development in high-risk areas to prevent flood impacts. Lahore, home to over 12 million people, faces severe air quality issues due to low-grade-diesel fumes, poor-quality petrol, and crop burning. The city faces intense heat waves in summers and water stress due to altered rainfall patterns, increased population, industrialization, and agricultural needs. Institutions and departments are contributing to Lahore's urban planning to make it climate resilient. Lahore's urban planning institutions are implementing adaptation and mitigation measures to climate change impacts with the help of multiple Urban Planners.

The Lahore Development Authority (LDA), established in 1975, promotes green building codes and land use planning to promote energy efficiency and sustainable construction practices. LDA also

encourages smart planning, promoting mixed-use development, and integrating renewable energy sources like solar panels. They also focus on infrastructure, protecting natural areas, and updating zoning rules to support sustainable practices.

LDA also encourages rainwater harvesting and water treatment, focusing on groundwater resources and ensuring clean water availability, with coordination of multiple institutions. They also promote green cover through public parks and increasing plants and trees to mitigate heat island impacts and improve air quality.

The Lahore Waste Management Company (LWMC) focuses on providing clean air and promoting environmentally friendly disposal methods. They have increased waste collection points and vehicles, and are working on converting solid waste into energy. The Environmental Protection Department (EPD) was established in 1996 and is involved in plastic management strategies, raising public awareness about the dangers of plastic use and monitoring air quality. EPD has undertaken anti-smog campaigns and tree plantation campaigns to address environmental challenges and contribute to Lahore's journey towards becoming a greener city. The Punjab Clean Action Plan aims to increase tree cover in six major cities, including Lahore, Pakistan, by implementing policies such as urban planning, urban roads, and housing societies. The plan also includes emission control systems, capacity building, and raising public awareness about air pollution and its health impacts.

The Water and Sewerage Authority (WASA) in Lahore is responsible for overseeing the development, planning, and maintenance of water supply, sewage, and drainage systems. WASA is implementing a rainwater harvesting project to restore groundwater reservoirs, improving flood management systems, encouraging water conservation practices, and collaborating with international agencies. WASA is also raising public awareness about climate change impacts on water resources and the importance of sustainable water management practices.

The Provincial Disaster Management Authority (PDMA) in Pakistan was established in 2010 to manage both natural and man-induced disasters at the national, provincial, and local levels. PDMA plays a significant role in Lahore's urban planning, particularly in climate mitigation measures. It manages both natural and man-induced disasters, including flood control systems, land use planning, energy response plans, and disaster relief, early recovery, and long-term rehabilitation of affected populations. PDMA also provides training and programs for local authorities and communities to improve disaster response and recovery capabilities.

TEPA is a crucial agency in Lahore's urban planning, focusing on transportation infrastructure development and combating emission challenges. It promotes sustainable transport, including public transport, to reduce private transport usage and greenhouse gas emissions. TEPA also contributes to infrastructure development, conducting traffic surveys and collecting road accident data. The agency designed Pakistan's first intelligent transport system for Lahore, improving efficiency and transportation potential.

The Urban Unit, established by the Punjab government in 2005, is a project management unit that provides technical support for water and sanitation projects, solid waste management, and policy formulation. It is actively involved in climate adaptation and mitigation measures in Lahore urban planning, including a heat wave management plan for 2022-25. The unit also provides data and analysis on urban development patterns, highlighting significant rises in urbanization and losses in forest and agricultural land.

A survey was conducted to assess the implementation of adaptation and mitigation measures in urban planning and their impact on climate change in Punjab Lahore.

10. Awareness among Public about Urban Planning

Table 4.1. Awareness Among Public About Urban Planning

			Enhance public transportation	Increase parks	Planned housing schemes	Waste management	All of these	Total
Gender	**Female**	Count	7	5	7	1	33	53
		% within Gen	13.2%	9.4%	13.2%	1.9%	62.3%	100.0%
		% of Total	3.5%	2.5%	3.5%	0.5%	16.7%	26.8%
	Male	Count	22	13	32	12	66	145
		% within Gen	15.2%	9.0%	22.1%	8.3%	45.5%	100.0%
		% of Total	11.1%	6.6%	16.2%	6.1%	33.3%	73.2%
Total		Count	29	18	39	13	99	198
		% within Gen	14.6%	9.1%	19.7%	6.6%	50.0%	100.0%
		% of Total	14.6%	9.1%	19.7%	6.6%	50.0%	100.0%

In this table, we use the crosstabs method to study the awareness of urban planning measures among males and females. The data shows that both females (16.7%) and males (33.3%) supported all of these measures' categories in urban planning If we look at total response out of 100%, 14.6% respondents think enhance public transportation, 9.1% thinks increasing parks, 19.7% thinks planned housing schemes, 6.6% respondents think waste management and 50.0% thinks all of these are urban planning measures. This table shows 50% think all of these are important urban planning measures.

11. Impact of Use of Water, Air Pollution and Heat Wave over Health of Population

frequently =1, frequently =2, occasionally=3, Rarely=4, never =5

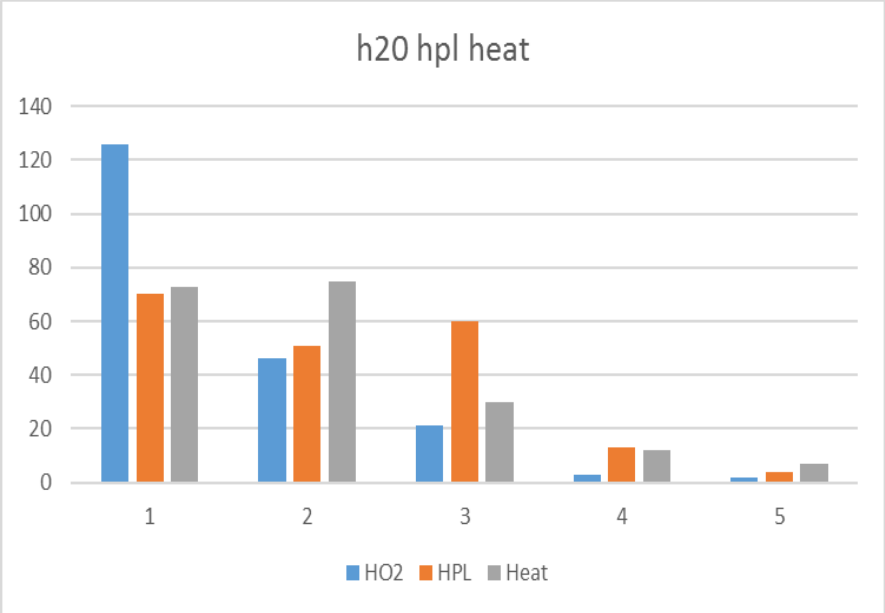


Figure 1: Frequency of Impacts of Climate Related Challenges

H2o =issues of water, hpl=health issues due to air pollution, heat= experience of heat.

This graph shows the frequency of impacts of climate related challenges. 124% respondents faced water issues very frequently, 65% respondents faced health issues due to air pollution very frequently, 70% of respondents experience heat very frequently. While Less than 20% respondents faced issues of water and health issues due to air pollution and experience heat rarely and less than 10% responded never faced issues of water health is due to air pollution and experience of hate.

12. Frequency of Public Satisfaction with the Functions of Departments: The Urban Unit, LDA, LWMC and EPD

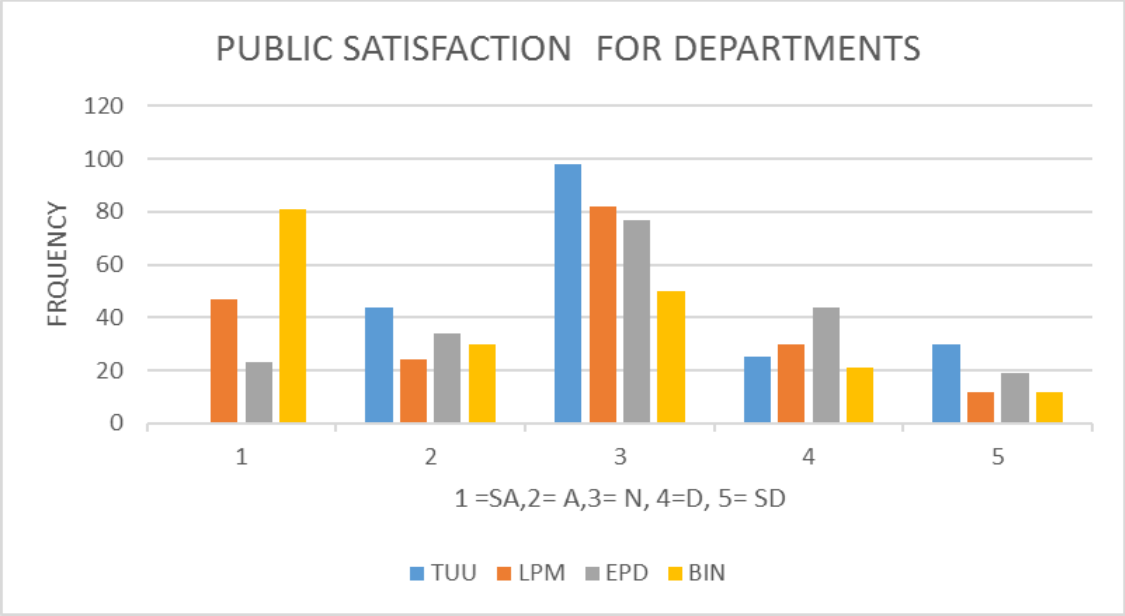


Figure 2: frequency of public satisfaction of the different departments responsible for urban planning

TUU=The urban unit , LPM=Land use planning measures, EPD= Environment protection department , BIN= provision of bins by LWMC

This graph represents the frequency of public satisfaction of the different departments responsible for urban planning. A significant majority stay neutral about the functions of these department-i-e- 98% "The urban unit", 82% about the land use planning measures, 78% with the environmental protection department and, 50% with working of LWMC. While 30% are strongly disagree with functions of the urban unit, 10% strongly disagree with land use planning measures of LDA, 19% EPD, And 10% are strongly dissatisfied LWMC measures

13. Impact of Tree Plantation and Renewable Use of Energy on Climate Change

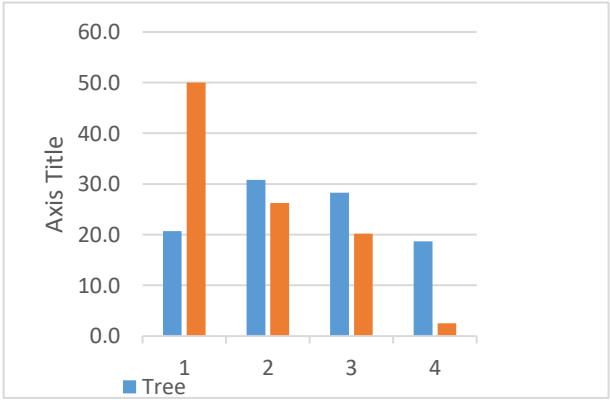


Figure 3: the frequency of impacts of mitigation measures

This graph shows the frequency of impacts of mitigation measures. 21% of respondents strongly agree with that plantation increased in Lahore, 50% respondents that strongly agree that use of renewable energy increased in Lahore 31% respondents are agree that plantation is improve, 27% respondents are agree with that use renewable energy improve , 28% respondents are neutral that plantation is enhance 20% responding neutral that use of renewable energy increase 18% respondents are the disagree with that plantation increase in Lahore and 3% respondents are disagree that use of renewable energy improve. Majority thinks these measures are improve in city.

14. Public Preferences over Transportation, Rising Temperature and Policy Measures in Urban Panning which Impact Climate Change

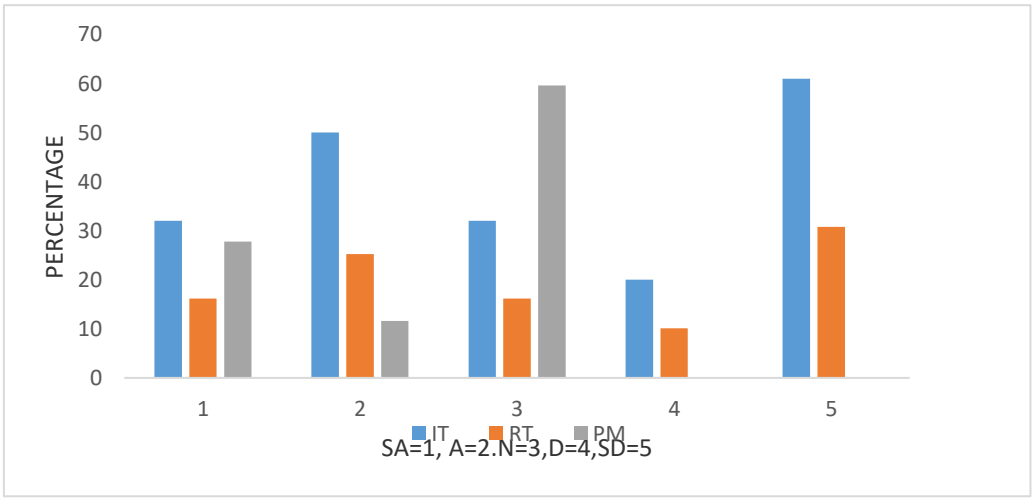


Figure 4: Public Preferences over transportation, rising temperature, and policy measures

IT = improvement in transportation, RT = Rising Temperature, PM = Policy Measures

The study also showed public preference over transportation, rising temperature, and policy measures in urban planning which impact climate change. A significant number of respondents disagreed with significant transportation and rising temperature measures, while a significant majority stayed neutral about the above policy measures.

15. Analysis and Discussion

Government of Punjab enacted its first climate change action plan in 2021. In which they propose adaptation and mitigation measures in various sectors, and urban planning is one of them. Sample of this survey is taken from Lahore To check the implementation and awareness about the mitigation and adaptation measures of urban planning. Lahore is chosen for the study because it is ranks first in population out of all the cities of Punjab. Through the survey we come to know that there is influence of adaptation measures on urban planning. Respondents give positive response over the adaptation measures taken by the institutions it means adaptation measures GOP has positive impact on urban planning. While respondents show less satisfaction with mitigation measures. So, there is need to focus on the improvement of mitigation measures because both adaptation and mitigation measures collectively can help to combat climate change challenges.

16. Conclusion

Climate is global concern, almost all the countries are affected by climate change. In 19th century countries realize that global temperature is rising. In Late 19th century scientist come to know that there is a strong relationship of increasing temperature and industrialization. In 20th century it was a serious matter. In 1988 "Intergovernmental Panel on Climate Change" (IPCC) was established to assess the science related to climate change. In 1992 United Nations Framework Convention on Climate Change (UNFCCC) was adopted at the Earth Summit in Rio de Janeiro, marking the first global agreement on climate change.

Pakistan is among top most vulnerable countries. Its temperature is increasing 0.5°C annually since 1960. After the international agreement it was mandatory for Pakistan to bind national efforts with international commitment. There was environmental protection act, and environmental policies at provincial level but after the flood of 2010. It was clear that Pakistan needs a proper climate change policy. Pakistan frame its first climate change policy in 2012. This policy focuses on adaptation and mitigation efforts, no doubt this policy was a land mark in climate history of Pakistan, but lacks comprehensive framework. Pakistan ratified Paris agreement in 2016 , and also submitted its NDCs in October 2021. These efforts aims to reduce green house gases impacts.

In 2017, Pakistan established a comprehensive framework for addressing climate change issues at the national level called Pakistan Climate Change Act 2017. In this act three main institutions were established climate change council, climate change authority and climate change fund. Provide a framework for climate change adaptation and mitigation policies, plans, programs and projects. This act gives institutional mechanism for implementing federal and provincial climate initiatives. This act empowered the provinces to creation of institutional structures that support climate action across the country, including in Punjab.

Every province put efforts to make their climate change action plans or polices. Pakistan updated its National climate change policy NCCP in 2021, with aims to take Pakistan toward climate and low carbon development. All provinces try their best to frame their climate change polices. Like Sindh formulate its climate change policy in 2022. KPK also formulate its climate change policy in 2022. Punjab framed its climate change action plan in 2021. And Baluchistan's climate change policy is under process.

Punjab's climate change action plan set adaptation and mitigation measures at various sectors, including urban planning. Which aims to adapt and mitigate climate change impacts with the help of urban

planners. Multiple institutions play a part in adaptation and mitigation efforts in urban planning. Like urban planning measures in Lahore. Multiple institutions play a role in achieving targets like WASA, LGA, LWMC, EPD, The Urban Unit, PDMA, PMD and TEPA. They all tries implement adaptation and mitigation measures and they all are integrated in this effort to make Lahore a sustainable and climate resilient. There are multiple challenges faced by these institutions in policy implementation. This put pressure in institutions and they are unable to work properly. The survey result revealed that there is need to improve mitigation measures to address climate change in urban planning.

17. Recommendations

- There should be proper programs, and workshops to raise awareness in Lahore about the importance of mitigation and adaptation measures in urban planning to combat climate change impacts .
- There is a need to improve coordination between the various institutions involved in urban planning , such as LDA, LWMC, WASA, TEPA, The Urban Unit, PDMA, and PMD to ensure that adaptation and mitigation measures both are implemented effectively.
- Government of Punjab should encourage the renewable energy, like solar, wind, biogas to reduce dependence on fossil fuels in order to mitigate climate change impacts.
- Need to strengthen the mitigation effort by institutions like PDMA, WASA, TEPA in Lahore.
- There should be proper monitoring and evaluation of progress of institutions of Lahore involve in urban planning to ensure the progress
- Urban planning institutions should take feedback about their services from local people, it will help them to improve policy execution

References

Ahmed, W. T. (2020). Assessing and prioritizing the climate change policy objectives for sustainable development in Pakistan. *MDPI*.

Baig, z. (2023). *Climate change: report says Punjab on list of most vulnerable regions.* Pakistan : business recorder .

Barnett, W. N. (2022). Climate change affects multiple dimensions of well-being through impacts, information and policy responses. *Nature Human behaviour* , 7.

Beck1, S. (2018). *The IPCC and the new map of science and politics*. Retrieved from google scholar : https://wires.onlinelibrary.wiley.com/doi/full/10.1002/wcc.547

EPA, K. (2022). *Khyber Pakhtunkhwa Climate Change Policy* . KPK.

GCISC. (2019). *Climate Change Impacts and Adaptation in Balochitan.* Balochistan University of Information Technology,.

GOP, M. o. (2021, march). *PUNJAB PROVINCIAL CLIMATE.* Retrieved from enviroment protection department: https://epd.punjab.gov.pk/system/files/Final%20PUNJAB%20ACTION%20PLAN.pdf

GOS. (2022). *sindh Climate Change Policy – 2022.* Retrieved from Government of Sindh: https://docc.sindh.gov.pk/files/DoCC/Sindh%20Climate%20Change%20Policy_June%202022.pdf

Gupta, Anil. (2016). Climate Change and Kyoto Protocol: An Overview. *Science Direct*, 20.

Harmsen, H. (2018, March 1). *Effectiveness of UNFCCC.* Retrieved from researchgate.net: Harmsen/publication/323906120_Effectiveness_of_UNFCCC_in_addressing_climate_change/links/5ab1f120458515ecebecf92a/Effectiveness-of-UNFCCC-in-addressing-climate-change.pdf

Hasan, D. R. (2002). *A handbook on National Enviromental legislation and institutions in south asia* . COLOMBO, SRI LANKA: SOUTH ASIA COOPERATION FOR ENVIRONMENT.

Hussain, A. (2014). Fulfilling Environment Related International Commitments Through Implementation Ofmultilateral Environmental Agreements (MEAS) in Pakistan. *A scientific journal of COMSATS*. Retrieved from http://www.sciencevision.org.pk/BackIssues/Vol18/02_Vol18_Fulfilling_Environment_Ahmad Hussain.pdf

Jamal, Sarim. (2018). Examining the Pakistan Climate Change Act 2017 in the Context of the. *Final LUMS Law Journal*, 9.

Lindwall, C. (2024, October 24). *What Are the Effects of Climate Change?* Retrieved from NRDC: https://www.nrdc.org/stories/what-are-effects-climate-change

MOCC. (2021). *NCCP*. Islambad.

Mohammad A.K, J. A. (2015). The challenge of climate change and policy response in Pakistan. *Enviroment Earth Sci*.

Mumtaz, M. (2018). *The National Climate Change Policy of Pakistan: An Evaluation of Its Impact on Institutional Change*. Retrieved from Earth Systems and Environment: https://link.springer.com/article/10.1007/s41748-018-0062-x

Mumtaz1, M. (2018). The National Climate Change Policy of Pakistan: An Evaluation of Its Impact on Institutional Change.

Sabri, M. (2017). National conservation strategy.

Schleussner, C.-F. (2016, April 21). Differential climate impacts for policy-relevant limits to global warming: the case of 1.5 °C and 2 °C. *Earth System Dynamics*.

Stern, T. (2018). *The Paris Agreement and its future*. Retrieved from BROOKINGS: https://www.brookings.edu/articles/the-paris-agreement-and-its-future/

UN. (1992). *United Nations Framework Convention on Climate Change.* New York: United Nation.

Voisey, A. J. (1998). The 'Rio Process': The Politics and Substantive Outcomes of 'Earth Summit II': Institutions for global environmental change. *Heather Voisey*, 4.

Wang, M. G. (2023). ASPI Climate Action Brief: Pakistan. *Asia Society policy institute* .

Yaseen, I. U. (2018, 1 29). *Implementation of Climate Change Convention in.* Retrieved from https://www.qurtuba.edu.pk/thedialogue/The%20Dialogue/12_4/Dialogue_October_December 2017_347-359.pdf

Abrar, R. U. (2024). Pakistan's Climate Change Act: Evaluating Impacts, Efficacy, And Prospects For Future Progress. *international research journal of social science and humanities*.

Afzal, S. (2021). MAINSTREAMING CLIMATE CHANGE IN POLICY PROCESSES OF PAKISTAN. *ISSRA Papers*.

Ahmad, M. (2023). Analysis Of Climate Change Policy Of Pakistan; Hurdles & Loopholes. *Pakistan Review*.

Ahmad, M. U. (2020). *Decentralization of Environment in Pakistan: Issues in Governance.* Retrieved from scienceopen.com: https://www.scienceopen.com/document_file/c32ea0f6-f3b6-495f-887d-78c3ead63f0d/ScienceOpen/polipers.17.2.0101.pdf

Ahmed, W. T. (2020). Assessing and prioritizing the climate change policy objectives for sustainable development in Pakistan. *MDPI*.

baig, z. (2023). *Climate change: report says Punjab on list of most vulnerable regions.* Pakistan : business recorder .

Baig, Z. (2023). *Climate change: report says Punjab on list of most vulnerable regions.* bussiness recorder.

Barnett, W. N. (2022). Climate change affects multiple dimensions of well-being through impacts, information and policy responses. *Nature Human behaviour* , 7.

Beck1, S. (2018). *The IPCC and the new map of science and politics*. Retrieved from google scholar : https://wires.onlinelibrary.wiley.com/doi/full/10.1002/wcc.547

Bhutto, A. w. (2023). *Lahore's Journey to Climate-Resilient Future: Embracing Clean Air and Sustainable Growth.* Retrieved from https://www.linkedin.com/pulse/lahores-journey-climate-resilient-future-embracing-clean-bhutto-qifzf

Buchner, A. D. (2007). The European Union Emissions Trading Scheme. *The university of Chicago press journal* .

Chaudhry, Q. U. (2017). Climate change profile of pakistan . In Q. U. Chaudhry, *Climate change profile of pakistan* (p. 130). Asian Development Bank (ADB) .

coordination, m. o. (2021). *National Climate Change Policy* . Islambad .

Devadoss, P. S. (2021). Strategies for reducing greenhouse gas emissions from municipal solid waste management in Pakistan. *Sage journal*.

Dilawar, A. (2021). Spatiotemporal shifts in thermal climate in responses to urban cover changes: a-case analysis of major cities in Punjab, Pakistan. *Tylor and francis*.