

CLIMATE BRIEF 2022

Navigating Pakistan's Climate Crisis



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Crisis**

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Introduction

Existential challenges require concerted action, consensus and policy clarity. So far, on climate stress, Pakistan seems to be caught in a commitment trap where at the international level it has promised far more than it can properly measure, let alone deliver. The problem is not a new one, and indicators for vulnerability have steadily gotten worse, not better over the last few years. Yet building consensus on perennial challenges has become a bitterly contested political battle between the centre and provinces, especially on issues like water sharing and controlling air pollution. While climate costs to Pakistan consistently rise, responsibility for action is often positioned as externally located in multilateral forums, where climate injustice at the expense of the Global South has become normalised.

The threat at home is acute. 40% of the population is food insecure, and 80% citizens in urban centres do not have access to clean drinking water. Pakistani cities rank perilously high on the air pollution score in the world, and smog now cuts five years from life spans in Punjab and elsewhere. One in ten deaths among children under the age of five is caused by air pollution, while 128,000 persons die from airborne particulate matter in Pakistan each year.¹

These facts need to be emphasised over and over again. Climate action cannot be postponed to some distant future, nor remain mired in policy reframing. Pakistan may have achieved SDG Goal 13 on climate action a decade earlier, but the haze surrounding policy impact makes it unclear whether we are any closer to achieving climate justice and equity. Meanwhile, the climate crisis

outpaces us in more ways than we have indicators for.

Pakistan remains highly vulnerable to slow onset disasters owing to poor data, administrative incapability and malgovernance. Extreme weather events confirm that our preparedness is grossly inadequate, and the toll for disadvantaged groups will remain high. Recent disaster responses show an urgent need to operationalise adaptation plans that match needs on ground, not just expectations at international climate forums.

As Pakistan makes a case for updating its guiding documents on climate change, decision-makers must consider the extreme potential of social destabilization that compounding vulnerabilities pose to the future, both immediate and medium-term. Resetting policy frameworks eventually serves little purpose if the institutional setting for climate action, and the deployment of resources is indifferent to marginalised groups' suffering, or inadvertently programmed to deliver more inequity. This has been the case for decades.

This policy brief serves as a reminder about Pakistan's longstanding challenges, which are water availability, food insecurity and deteriorating air quality. These domains constitute the bedrock of Pakistan's environmental fragility and human vulnerability. The sections below summarize the major challenges in these areas and submit policy recommendations for decision-makers' attention as well as other policy stakeholders. The information presented here may follow known trendlines, but the urgency to act is much greater than before.

¹ S Khan, "Why Pakistan Has Some of the Most Polluted Cities in the World," DW.COM, November 1, 2021, [https://www.dw.com/en/why-pakistan-has-some-of-the-most-polluted-cities-in-the-world/a-](https://www.dw.com/en/why-pakistan-has-some-of-the-most-polluted-cities-in-the-world/a-59686579#:~:text=In%20Pakistan%2C%20one%20in%2010,from%20air%20pollution%2Drelated%20illnesses.)

[59686579#:~:text=In%20Pakistan%2C%20one%20in%2010,from%20air%20pollution%2Drelated%20illnesses.](https://www.dw.com/en/why-pakistan-has-some-of-the-most-polluted-cities-in-the-world/a-59686579#:~:text=In%20Pakistan%2C%20one%20in%2010,from%20air%20pollution%2Drelated%20illnesses.)

The Water Sector: Addressing the Scarcity Crisis

Pakistan faces a multitude of challenges that are a direct consequence of its acute water shortage. Despite reaching alarming levels, its water scarcity issues continue to worsen due to policy inaction and the lack of an integrated water management system. Inequitable access and distribution of clean water, growing population, rapid urbanization, progressive industrialization, lack of storage capacity, and burgeoning climate risks altogether make water management in the country an almost unmanageable task. The problems that arise directly from water scarcity consequently have a large impact on the country's subsystems such as agriculture, food security, and holistic health. More importantly, the commoditization of water has emboldened water mafias within the country that exploit impoverished and vulnerable groups; this threat combined with climate change and water governance issues is very likely to worsen per capita water availability, and creating further stress on ground. While public outcries and financial losses driven by low crop-yields have led the government to revise the National Water Policy (NWP), solutions that enhance water endowments are likely still a distant reality.

Pakistan is the third most water stressed country and home to the world's fifth largest population. Over the years, there has been an astounding 400% decrease in per person access, coupled with the parallel issue of unclean water. The per capita water storage capacity in Pakistan is a meagre 150 cubic metres. With an estimated stress increase of 32% by 2025, Pakistan will face a severe food shortage

in the near future.² Drought and dried up freshwater resources in rural areas has created a constant flow of migrants to cities, which are water-deficient as well. Moreover, rapid onset hazards like floods create a large cohort of internal displacement persons, in need of water, sanitation and hygiene support. The burden of this stress is borne chiefly by women and children, who have the fewest survival resources to cope with water stress in urban and rural areas.

Agriculture is a water guzzler

At the moment, 97 per cent of fresh water in Pakistan is consumed by the agriculture sector, whose contribution is 18% on average to GDP. Outmoded agricultural practices, flood irrigation, a lack of hybrid seeding and poor water management overconsume Pakistan's precious water resources.



How Pakistan Wastes its Water Resources

Source: DAWN News

There is no system to prevent evaporation or pilferage and over 40% water is lost as a result. Furthermore, 13% cultivatable land is saline and 30% of agricultural land is waterlogged. ³ Water pricing in Pakistan is categorised according to irrigation, domestic and industrial tariffs. Low irrigation tariffs are also responsible for water

² Aneel Salman, "Pakistan's Looming Water Crisis," East Asia Forum, November 13, 2021, <https://www.eastasiaforum.org/2021/11/13/pakistans-looming-water-crisis/>.

³ Ibid.

wastage, and are mired in political controversies. When tariffs for the use of surface water are much lower than for groundwater usage, irregular electricity supply also means farmers rely on other costly alternatives such as diesel power to operate water pumps.

Overuse of groundwater sources

Pakistan is the third largest user of groundwater, consuming about 9% of the global groundwater abstraction and occupying 4.6% of the total groundwater-irrigated areas of the world. This extensive use of groundwater in the country began in the 1960s, when 16,700 drainage wells with a discharge capacity of 0.80 m³ /sec were installed under the state sponsored Salinity Control and Reclamation Projects (SCARPs). The SCARP tube wells were installed to control water-logging and salinity problems, and this model motivated farmers to install their own tube wells, resulting in the massive development of private tube wells, from a mere 30,000 in 1960, to over 1.2 million in 2018.⁴

Until 1980, groundwater was only supplementing surface water supplies because the area under cultivation was less, and the need for irrigation water was rather conservative. After this period, farmers started extensive exploitation of groundwater to increase the cultivated area of wheat and other cash crops such as rice and sugarcane. The unregulated use of groundwater for agriculture have resulted in an excessive lowering of groundwater levels in irrigated areas of the Punjab and Balochistan provinces. At present, 50% of the total cultivated area in Punjab has a groundwater table depth below 600 cm. The declining groundwater levels are also responsible

for the deterioration of groundwater quality. Besides salinity, higher contents of fluoride and arsenic have been found in irrigated areas, owing to the disposal of untreated wastewater into the nearby water bodies. Moreover, higher levels of sodium, and to a lesser extent of chloride, magnesium and potassium have also been found. As a result, the water that 70% of tube wells in Punjab extract is saline sodic, which in turn when used for irrigation is turning irrigated lands into saline-sodic soils.⁵

Damming and Storage

With Pakistan's water storage capacity already limited, the likelihood of climate change induced glacial loss and reductions in the runoff feeding the Indus will further burden its groundwater capacity. At the moment, Pakistan can store only 10% of the average annual flow of its rivers, far below the global average of 40%. The river flows are uneven throughout the year, and agricultural yields depend on storage capacity. Pakistan's annual storage capacity is only 30 days, compared to 700 days in Egypt, 900 days in the US, and 120-220 in India. Pakistan currently has only two major reservoirs, the Tarbela and Mangla dams, which are beset with siltation problems, and have lost about 32 and 20% of their storage capacities, respectively.⁶ Solutions remain under-discussed and beyond the public gaze as issues that merit attention.

Access for Marginalised Groups

Most of the water scarcity burden falls on women in rural areas with very limited access to potable water and longer distances to carry it back, as climate stress increases. According to UN studies, an estimated 70% of households still drink bacterially contaminated water. While Pakistan's

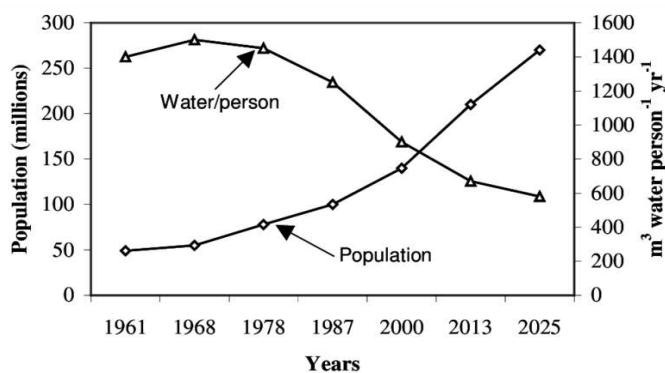
⁴ Qureshi, Asad Sarwar. "Groundwater Governance in Pakistan: From Colossal Development to Neglected Management," n.d. <https://www.mdpi.com/2073-4441/12/11/3017/pdf#:~:text=Currently%2C%201.2%20million%20private%20tubewells,is%20about%2060%20billion%20m3>.

⁵ Ibid.

⁶ Janjua, Shahmir, Ishtiaq Hassan, Shoaib Muhammad, Saira Ahmed, and Afzal Ahmed. "Water Management in Pakistan's Indus Basin: Challenges and Opportunities." Water Policy. IWA Publishing, December 1, 2021. <https://iwaponline.com/wp/article/23/6/1329/84494/Water-management-in-Pakistan-s-Indus-Basin>.

policy documents recognise water management as a critical issue, water rights should be safeguarded through constitutional protections. Safe drinking water and sanitation for all is recognised by the UN as a basic human right, yet the SDG goal of ensuring safe access to drinking water and sanitation by 2030 remains far off track. Existing water management practices do not take into account the needs of women, and discourse itself needs to be gender-sensitised in both rural and urban contexts. Water collection still remains a 'female' burden in rural households, made perilous by insecurity in all parts of the country. Where physical mobility for women is threatened or curtailed, households invariably experience a degradation in water consumption, sanitation and hygiene.⁷

Pakistan's population growth and water usage.⁸



Sustainable Water Management Practices

Climate research shows that there is a dire need to harvest rainwater, particularly in arid areas like

Cholistan, Kohistan, Thar and Thal for agriculture and livestock survival, and especially as rising temperatures trigger droughts and flooding, followed by soil erosion.⁹ Traditionally a crisis that disrupts rural life, flooding has recently been seen in metropolitan centres like Karachi, Lahore and even Islamabad. Improving urban drainage and undertaking non-structural measures is crucial as rapid urban sprawl takes place. All along the Indus Basin, protecting groundwater reserves, recharging and water quality improvement are needs that must be met with immediate action. Moreover, Pakistan has the seventh largest mangrove system in the world that plays a pivotal role in preventing sea incursion. Pollution and reduced glacial melt have endangered the mangrove cover, and coastal areas including Karachi and Ketu Bunder face severe flooding as a result.¹⁰

Governance Framework

Pakistan's water governance framework dates back to partition, and the country's first water policy was notified in 1973. The National Water Policy addresses issues driving Pakistan's water crisis, and identifies strategic priorities such as climate change, drinking water and sanitation, urban water and flood management, water rights and obligations, etc. However, the policy is geared towards mega environmental infrastructure such as dams among other priorities, and has little connection with food security, healthcare or even life expectancy that result from poor water access and quality.¹¹ It also does not incorporate a Basin-wide understanding of water resources, especially when it comes to the

⁷ "Wash: Water, Sanitation and Hygiene." UNICEF Pakistan. Accessed January 25, 2022. <https://www.unicef.org/pakistan/wash-water-sanitation-and-hygiene-0>.

⁸ Qureshi, Asad. (2005). Climate Change and Water Resources Management in Pakistan. In: Climate Change and Water Resources in South Asia. 10.1201/9780203020777.ch8.

⁹ Anwar, Rida. "Water Crisis and Rainwater Harvesting Prospects in Pakistan." Centre for Strategic and

Contemporary Research, September 25, 2020.

<https://cscr.pk/explore/themes/energy-environment/water-crisis-and-rainwater-harvesting-prospects-in-pakistan/>.

¹⁰ "Pakistan's Looming Water Crisis." East Asia Forum.

¹¹ Abubakar, Syed Muhammad. "Pakistan's Water Woes: Assessing the National Water Policy." The Express Tribune, September 14, 2018. <https://tribune.com.pk/story/1795801/10-pakistans-water-woes-assessing-national-water-policy>.

transboundary nature of Pakistan's rivers originating in India and flowing through all the provinces.

One aspect of water law and governance in Pakistan is evident: there is no unified framework for how water is to be managed centrally by the federation, independently by the provinces, or in some form of water-federalism yet to be negotiated. The Constitution of 1973 regards water as a subject of provincial control unless the provinces resolve to let the federation intervene. But the provinces have not done so to date, while contestations over the interpretation and implementation of water-distribution agreements along the basin such as IRSA remain unresolved. Despite the furor that "Pakistan will run dry by 2025", no provincial assembly has ever passed a resolution requesting parliament to make federal laws with respect to water.

In an effort to regulate the distribution of water sources of the Indus River, the Indus River System Authority (IRSA) was established under the Water Appointment Accord (WAA) in March 1991, and soon thereafter approved by the Council of Common Interests (CCI) a week later. A landmark arrangement, it aims to manage the country's water issues amongst the provinces, particularly KP, Punjab and Sindh. The provinces of Punjab and KP are upper riparians, whereas Sindh and Balochistan are lower riparians on the receiving end of both water excess shortage. The government of Sindh has long complained that it does not receive its due share as per the WAA. IRSA and other bodies have tried to patch-over the inter-provincial water strife, often with stop gap measures like water quotas. Yet, this remains a point of contention between provincial administrations.

Water law too is underdeveloped in Pakistan. There are numerous laws that contain an element related to some scale of water, but have yet to be reconciled: provincial water laws, drinking water laws, laws on healthcare and sanitation to name a few. More importantly, within these domains,

deliberation is needed on how to enable reform, equity, gender inclusion and sustainability.



Water Availability Forecast

Source: National Drought Monitoring Cell, Islamabad

Recommendations

1. Improve water storage capacity

The strategic construction of reservoirs and water catchments such as dams and canals in areas that receive more rainfall is key to improving annual water storage and usage capacity. Improving the longevity of these water storage catchments for sustained use throughout the year is also crucial. There are opportunities to store rainwater in urban areas, even within the capacity of households with simple and inexpensive infrastructure for domestic use that municipal governments should consider. Landowners can be incentivised to harvest rainwater in proportion to the size of their land and to recharge groundwater sources.

2. Enable overdue governance tools

Water use efficiency can be improved through monitoring and evaluation at the district and tehsil levels; capacity building of municipal duty bearers; installation of water meters; wastewater management systems; regulations for water treatment plants; awareness of water conservation in schools. Climate resilient agriculture practices and public awareness through campaigns must also be conducted. Local governments and police can work together to enforce a mechanism to control and penalise 'tanker mafias', and ensure that water does not become unavailable to poor communities.

3. Regulate urban growth

Illegal construction leads to overburdened urban centers, whose waterways and drainage systems are choked with solid waste. This has been the direct cause for urban flooding and building damage in urban centres and the northern areas where tourism is booming. Improved systems for solid waste management and urban planning by provincial governments must be implemented to prevent urban flooding and related crises that result in preventable casualties.

4. Invest in clean water projects

Recent initiatives to provide clean water need to be scaled, and further investments in desalination efforts and improvement of rural and urban water infrastructure should be undertaken, especially in districts where there is evident water stress.

5. Leverage technology and innovation

Technology can improve the quality and usability of existing water sources such as sea water desalination plants. Wastewater treatment facilities that treat contaminated water sources must be used. Crops and livestock resistant to heat and water stresses must be diversified, along with efficient controls on water pricing. The widespread and most common use of flood irrigation systems in Pakistan must be replaced with drip and sprinkler irrigation systems, that are known to positively impact crop yield and use water more efficiently. However, care must be taken not to impose technological innovation on small holders, as its acquisition is expensive.

6. Take a Basin-wide approach

Water issues have previously triggered conflict between India and Pakistan. As climate stress worsens the availability of water across South Asia, and makes conflict between India-Pakistan-Afghanistan more likely, multilateral coordination must be undertaken. Preservation of the Basin through investing in river systems management is

needed, as well as assessing the health of eco-systems dependent on rivers.

7. Manage the distribution of water inside Pakistan

The ISRA must take the necessary steps to address the complaints made by all provinces, particularly lower riparians who continue to face acute water shortages. The Council of Common Interests must play a mediating role here, and constitute a committee that includes equal representation from provinces, IRSA and other bodies that can improve the existing protocols over water sharing and management.



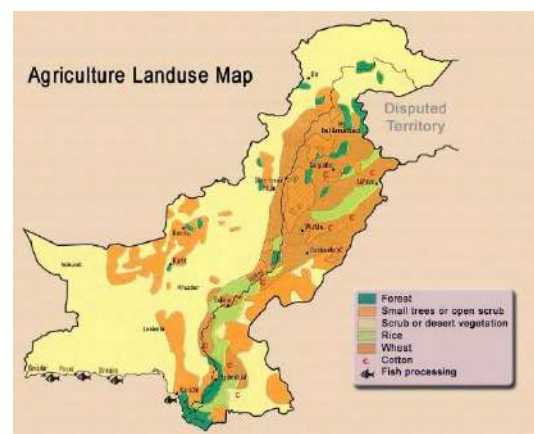
Agriculture: Tackling food insecurity

The agriculture sector is the backbone of Pakistan's economy, providing livelihoods to about 68% of the population living in rural areas, and employing 45% of the national labour force.¹² Unfortunately, this sector is also the most severely impacted from climate degradation, with varying crop yields over recent years. The situation is compounded by water stress that is expected to worsen over coming decades, as the demand for water outstrips availability. The areas of the country that are particularly vulnerable to the impacts of climate change include existing arid and hyper-arid areas, the flood-prone lowland areas in Sindh and Punjab, and the coastal areas at risk of saltwater intrusion.¹³

The agriculture sector is jointly composed of four domains: food and fiber crops; horticulture and orchards; livestock and dairy; fisheries; and forestry. Growth in the agriculture sector today is lower than in other sectors of the economy and its contribution to the GDP is 19.5%, half of what it was 50 years ago.¹⁴ Growth has stagnated around 3.3% for a decade owing to familiar challenges: poor mechanization or technological innovation; very slow technology transfer; varying input quality, quantity, and timing; poor road and transport facilities; unduly strict commercial regulations; difficulty in accessing credit or loans for farm

production and expansion; exploitative trading practices that dispossess smallholders.

Pakistan ranks among the bottom one-third of countries surveyed by the Global Food Security Index (75 out of 113)¹⁵, with only marginal improvements in recent years. During FY 2020, as many as 40% households suffered from moderate to severe food insecurity.¹⁶ 20% of the population in Pakistan is undernourished, and 45% children less than five years of age are stunted as a result of this. Food insecurity is also driven by falling purchasing power of vulnerable groups, who are forced to devote more income to food expenditure. The rise of food inflation is matched by a corresponding increase in malnutrition and vulnerability. Estimates project that an additional 9.32 deaths per million will take place every year by 2050 owing to food insecurity in Pakistan. The graph below indicates variation in malnutrition over two decades.



¹² "PAKISTAN ECONOMIC SURVEY 2020-21," Govt of Pakistan - Finance Division, accessed January 25, 2022, https://www.finance.gov.pk/survey/chapters_21/02-Agriculture.pdf.

¹³ Chaudhry, Qamar Uz Zaman. 2017. Climate Change Profile of Pakistan. www.adb.org. Asian Development Bank. <https://www.adb.org/publications/climate-change-profile-pakistan>.

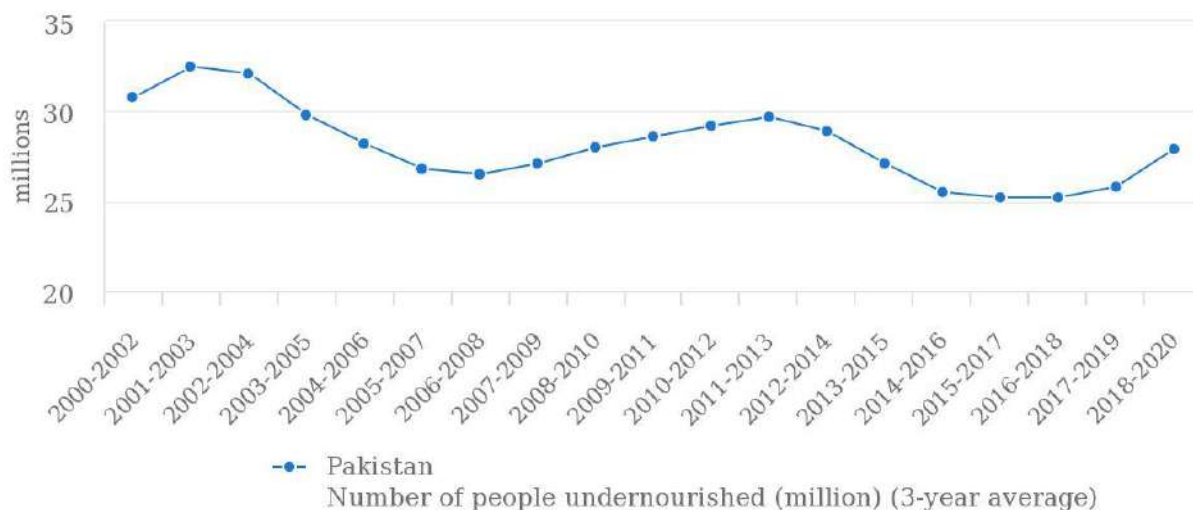
¹⁴ "Agricultural Census 2010 - Pakistan Report | Pakistan Bureau of Statistics." 2020. Pbs.gov.pk. 2020.

<https://www.pbs.gov.pk/content/agricultural-census-2010-pakistan-report>.

¹⁵ "Global Food Security Index (GFSI)." n.d. Foodsecurityindex.eiu.com. <https://impact.economist.com/sustainability/project/food-security-index/index>.

¹⁶ "Survey Shows 40pc Households Facing Moderate or Severe Food Insecurity." n.d. Wwn.thenews.com.pk. Accessed March 22, 2022. <https://www.thenews.com.pk/print/772048-covid-19-survey-shows-40pc-households-facing-moderate-or-severe-food-insecurity>.

Number of people undernourished (millions) (3-year average)



Source: FAOSTAT (Jan 25, 2022)

While extreme weather events threaten food security by causing crop failures and supply chain disruptions, rising temperatures coupled with variations in precipitation and monsoon patterns are resulting in decreased iron, zinc, protein, and the quality of protein in crops. The effects of climate change pose a serious threat to the crop production system of Pakistan's major crops such as wheat, maize, cotton, rice and sugarcane. Temperature increases in South Asia of 0.5°C–2°C could bring about 8–10% loss in agriculture yield, with rice and sugarcane being the worst affected and undergoing a 25% reduction. Some projections warn of a 3°C rise by 2040 and 5–6°C by the end of the century in Asian countries.¹⁷ Pakistan's NDC (2021)¹⁸ appropriately captures the severity of the threat to the agricultural sector, however, in terms of planning ahead and taking adaptation measures,

there is a lot of catching up to do if Pakistan has to respond to this crisis.

Forestry

As for forestry that is included as part of the agriculture sector, Pakistan has only 5% forest cover, and environmental conditions do not support large scale afforestation. Forest resources are inadequate to meet domestic demand for fuelwood. Many indigenous communities depend on forests for subsistence and livelihoods, and rapidly depleting forests have compelled the governments of Gilgit-Baltistan (GB) Khyber Pakhtunkhwa (KP), and Azad Kashmir (AJK) to address illegal felling of trees. There are evident gaps in forest monitoring mechanisms, inter-provincial timber trade needs oversight and there is a high vulnerability to climate degradation. Financial constraints in provinces and deficits in technical knowledge in forest management have led to a rapid deterioration. Pakistan's deforestation rate is 27,000 hectares per annum, chiefly taking place in community owned and private forests.¹⁹

¹⁷ Syed, Areeja, Taqi Raza, Talha Tufail Bhatti, and Neal S. Eash. 2022. "Climate Impacts on the Agricultural Sector of Pakistan: Risks and Solutions." *Environmental Challenges* 6 (January): 100433. <https://doi.org/10.1016/j.envc.2021.100433>.

¹⁸ "THE NATIONAL CLIMATE CHANGE CONTEXT NATIONAL VISION for CLIMATE ACTION 12." n.d.

<https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Pakistan%20First/Pakistan%20Updated%20NDC%202021.pdf>.

¹⁹ Zaidi, S. n.d. Review of 'Climate Equity and Gender: Women as Agents of Climate Action. National Commission on the Status of Women and United Nations Development Programme, Islamabad, Pakistan. 2022.



Pakistan's flagship Ten Billion Tree Tsunami has been lauded internationally for trying to reverse Pakistan's low forest cover.

Agro-ecological zoning

Experts have repeatedly emphasised the need to update the agro-ecological zoning of Pakistan by classifying cultivable areas according to its physiographic features, rainfall potential, soil characteristics, temperature and soil storage etc. The previous zoning has now become obsolete due to shifting weather patterns, introduction of new crop varieties and changes in land use.²⁰ This exercise will aid policy makers in devising strategies for the sustainable use of natural resources, enable farmers to increase yield, and help the agricultural sector better adapt to climate change.

Research, Development and Technology

Seed varieties available in Pakistan are not suitable for a changing climate characterised by frequent droughts, rising temperatures and increasing pest

attacks. There has not been much progress when it comes to piloting adaptability measures like drought-tolerant crop varieties and collaboration on technology and deployment for climate action. It has been pointed out by policy experts that technology transfer and cooperation must be pursued with countries like China that have made remarkable progress in developing wheat varieties that can resist drought as well as rust. In fact, Chinese biotechnologists are working on developing new cotton and vegetable varieties that can be adapted to Pakistani agricultural conditions. Some private initiatives have led to piloting these new seed varieties, but not on a large scale.²¹

Blind Spots in Data

There is a glaring information deficit when it comes to reliable climate data. Despite being

²⁰ Suleri, Abid. 2020. Review of *Turning to Agriculture*. The News. July 19, 2020. "Turning to Agriculture." n.d. www.thenews.com.pk.

<https://www.thenews.com.pk/print/688737-turning-to-agriculture>.

²¹ Ibid.

acknowledged as a national security issue, the impact of climate change is documented with a patchwork of evidence collected by development agencies or private sector platforms. Government data is either securitised, inadequate or misleading. This applies to the agricultural sector as well, and the government concedes that estimates do not exist for new costs associated with infrastructure upgradation, falling crop yields or agricultural productivity, nor are climate stress scenarios known. Additionally, data on long-term and non-economic losses related to internal migration, displacement, rising poverty levels, nutrition, stunting, and gender is also not available.

Adaptation

Currently, a National Adaptation Plan (NAP) is being formulated, so Pakistan may yet be far away from implementing the measures catalogued in its policy wish-lists. Adaptation needs to be on top of the priority list. Of course, financing is an issue, and the government must divert more resources toward adaptation from the national pool instead of a heavy reliance on multilateral funds.

Recommendations

1. Enable the use of modern farming practices

There is a need to incorporate climate-smart agriculture (CSA) practices such as laser land-leveling and solar power-driven irrigation systems, management amendments like crop divergence, appropriate cropping models, and optimised planting dates. Farmers should be encouraged—particularly those in rain-fed areas—to avoid monoculture and, instead, plant a variety of heat and drought resistant low delta crops in order to minimise the risk of crop failure.

It is also imperative to improve post-harvest capacity, such as storage and processing facilities and infrastructure, preferably at the farm level. Also, a proper risk management system must be developed including crop insurance to safeguard

against crop failures due to extreme events such as droughts and floods.

Care must be taken that an over-reliance on technology-based solutions will not benefit smallholders or poor farmers. Where possible, indigenous methods for adaptation must be prioritized to provide cost effective options, such as reviving Balochistan's centuries old *karez* water channels that provided more equitable irrigation possibility to small holders.

2. Bridge glaring data gaps

The information deficit needs to be urgently addressed when it comes to climate related data, particularly in the agricultural sector. Detailed cost benefit analyses on innovation and development must be made available, in addition to a comprehensive political-economic analysis of adaptation costs under rising temperature scenarios. This has been done internationally, but Pakistan needs to have a projection of its own to work with. There is also a need to gather data on long-term and non-economic losses relating to internal migration and displacement, rising poverty levels and implications relating to nutrition, stunting, gender, and other socio-cultural issues. Gender disaggregated data needs to be made available that can assist policy interventions for reducing vulnerability among marginalized groups, especially women's differentiated burdens during climate stress.

3. Update the classification of cultivable areas

Classifications should be made according to physiographic features, rainfall potential, soil characteristics, temperature and soil storage, etc., to better devise strategies for the sustainable use of natural resources. This will assist with increasing crop yield, and aid adaptation in the agricultural sector to the climate crisis. In addition to this, capacity must be developed to incorporate Remote Sensing and GIS techniques to assess temporal changes in land cover in different agro-ecological zones.

4. Undertake land reforms

There is a dire need to undertake land reforms that undercut the control of large landowners over agricultural production, pace of innovation, availability of farming inputs especially water, and price control. Many supply chain disruptions are caused by excessive control of large landholders, who withhold supply of foodgrains for better prices, and create shortages at provincial or even national levels.

Land reforms can also determine an optimal farm size as both large and small land holdings are unproductive. This will incentivise cultivators and tenants to invest in adaptation practices, as well as technologies that increase land productivity.

A related legal issue is the discrimination against women's ownership of assets, especially land tenureship. This must be addressed as part of land reforms. Enabling women's ownership and control over land has increased productivity and community welfare in all documented cases, as well as improved food security for households.

5. Train farmers and improve information systems in agriculture

Farmer's access to information can accelerate adaptation. Information on safe pesticide use, high-yielding varieties, modern cultivation and irrigation technologies, efficient use of inputs, water availability and weather patterns, as well as market related information can help them take decisions that help productivity and reduce losses. This information can be disseminated through public radio and television channels, or through social media which tends to be more diffuse. Early warning signals in natural disasters must also be disseminated through these channels.

Training and education among farmers are known to improve agricultural productivity, and create resilience on ground. Where climate stress is forcing farmers to opt out of agriculture, the availability of information can help families adapt into other livelihoods.

6. Improve access to agriculture inputs

The real change in agriculture will come about when farmers have access to modern agricultural inputs, including improved seeds, fertilizers, crop protection chemicals, and machinery. Farmers will benefit from subsidies on these items, as well as access to credit in availing them, especially technology.



Air Quality: Gasping for Breath

Air pollution has been one of the more prominent fallouts of overall climate degradation, particularly in Pakistan, where city centres become routinely choked with smog and thick layers of visible smoke. These consist of greenhouse gases Carbon Dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O) and particulate matter that combine in a lethal mix. While media coverage of the 'smog season' in Lahore city is known and expected, other cities adjoining Lahore and across Punjab are not faring much better, according to independent air quality monitors. The government's reaction to 2021's public outcry has been to denounce independent data, and develop a new means of calculating air quality altogether.

Source: AFP

The Environment Protection Agency (EPA) decided to adopt a new formula in December 2021, which brought down the air quality numbers by as much as 25%,²² because of its inability to control emissions and shut down polluting industry players. EPA had asked media outlets and researchers to only use its data going forward, which is unverifiable. Even the data 'released' by the EPA is difficult to get access to, considering there is no public platform where this information is readily and regularly released.

Air quality also regularly degrades during the winter months of October to December in Pakistan due to a number of factors, but as pointed out repeatedly, the degraded air quality is a near permanent condition that can be felt more acutely

²² Ali Raza, "EPA to Adopt New Formula to Bring down AQI," The News (The News International, December 16, 2021),

<https://www.thenews.com.pk/print/917082-epa-to-adopt-new-formula-to-bring-down-aqi>.

#	COUNTRY	POPULATION	AVG. US AQI
1	 Bangladesh	164'689'383	162
2	 Pakistan	220'892'331	153
3	 India	1'380'004'385	141
4	 Mongolia	3'278'292	128
5	 Afghanistan	38'928'341	128
6	 Oman	5'106'622	123
7	 Qatar	2'881'060	123
8	 Kyrgyzstan	6'524'191	121
9	 Indonesia	273'523'621	114
10	 Bosnia Herzegovina	3'280'815	113

when air density increases during winter months. At the heart of the matter is increasing emissions—city centres have industrial complexes within or around them—ensuring that emissions continue to remain high throughout the year. Urban centres also get more pollution from vehicular transport, and constant construction and development going on.

The adverse implications for health cannot be emphasised enough. An AQI of between 100 and 150 poses a potential risk to children and people with heart and lung disease—Pakistan's average AQI for 2020 was measured at 153. An AQI of above 150 is unhealthy for everyone, while levels over 300 are classified as hazardous. Air pollution is responsible for millions of deaths worldwide every year, and in South Asia, the health of around 12 million children is at risk, as they are exposed to air pollution six times the safe limit.²³ To put things into perspective, in Pakistan, one in ten deaths in children under the age of five is caused by air pollution. According to the Global Alliance on Health and Pollution, approximately 128,000 Pakistanis die annually from air pollution-related illnesses.²⁴

Source: IQAir

Source apportionment studies conducted over recent years have helped identify where the challenge lies. Provincial governments have strived to curb these emissions at source, but eliminating them entirely is not feasible, as it involves high economic costs in terms of industrial shutdowns or adaptation to new technology which is out of reach of private sector entities as well as citizens. The major source of emissions are small industries; households' usage of biomass or 'dirty fuel' due to gas shortages; brick kilns; vehicular traffic using poor quality fuels; and re-suspended soil dust from construction sites

Energy sector

Energy production accounts for over 44% of Pakistan's total emissions count. This sector is responsible for emissions made through power production, as well as manufacturing industries, construction, transport, and energy consumed for commercial, residential and agricultural consumption. Finally, fugitive fuel emissions or

²³ S. Khan, "Why Pakistan Has Some of the Most Polluted Cities in the World: DW: 01.11.2021," DW.COM, November 1, 2021,

<https://www.dw.com/en/why-pakistan-has-some-of-the-most-polluted-cities-in-the-world/a-59686579>.

²⁴ Ibid

accidental emissions through leakages and faulty equipment are also part of the mix.²⁵

The interrupted supply of energy leads to more, not less emissions. The volatility of supply on the national grid leads to interruptions in power, and hence, production capacity for industries. Manufacturers try to offset this through the use of cheap, inefficient and high-emission fuel in a bid to meet orders and keep the supply line going. This in turn becomes a major contributor to emissions, as evidenced by November and December 2021, where factories were found to be operating in secrecy at night with low-quality fuel in Lahore. Government officials have claimed they lack the capacity to find and force such factories to close down.

The use of biomass by households across the country, including fuelwood, is often compelled by shortages of natural gas, or unaffordable sources of energy. Biomass produces emissions that are hazardous to human health, as well as air pollution.

Brick kilns

Brick kilns are another major source of pollution as they use mainly coal, rubble and shoe soles as fuel, emitting lethal black carbon into the atmosphere. A lot of these are located around urban areas and contribute significantly to air pollution. In addition to air pollution, the traditional techniques result in myriad adverse social and environmental effects including climate change, cardio-respiratory diseases, land use impacts and deforestation. The introduction of zigzag technologies and other carbon-free practices are being adopted by brick kilns users where enforcement is possible, and

where provincial authorities are attentive to the issue of air pollution.

Crop burning

Crop burning is another seasonal contributor to air pollution. Both India and Pakistan regularly face the seasonal issue of stubble burning in agricultural fields where farmers set fire to the remaining straw stubble in an agricultural field after grains have been harvested. This is a quick removal process and considered low effort. It is also a convenient method to get rid of weeds and pests. However, the increase in pollution from smoke and the potential loss of nutrients in the soil means that there is a need to move on from this practice. The government has often claimed that the practice is banned, and yet, there is no enforcement. During the winter months, crops being burned is a common site in Punjab, often even visible on main highways in close proximity to agricultural land.

Vehicular traffic

Estimates for Pakistan's transport emissions vary, but one estimate holds that it is responsible for 43% of the total ambient air pollution in the country.²⁶ Vehicles with poor fitness, and outdated diesel engines have yet to come off the road, especially in smaller cities. Add this to the rapid, vehicle-centric urbanisation of most city centres—as evidenced by the focus on ring roads, underpasses and bridges in cities such as Islamabad, Rawalpindi, Lahore and Karachi in the past decade, which indicates that carbon output due to vehicles is likely to increase. The addition of several hundred thousand new cars each year in the major city centres exacerbates this challenge.

²⁵ Hannah Ritchie and Max Roser, "Pakistan: CO2 Country Profile," Our World in Data, May 11, 2020, <https://ourworldindata.org/co2/country/pakistan>.

²⁶ APP, "Vehicular Emissions Exacerbate Air Pollution," The News (The News International,

September 15, 2019), <https://www.thenews.com.pk/print/527192-vehicular-emissions-exacerbate-air-pollution>.

Agriculture and Livestock

The other major contributor is Agriculture, Forestry and Other Land Use (AFOLU), at over 45% of the total emissions of the country. A majority of this sector is emissions through livestock farming. The excess breeding of cattle, and increase in animal-based diets across Pakistan, has led to the high emissions.

Other industries

Pakistan's emissions through waste and industrial processes and product use, cumulatively only account for 9.69% of the country's emissions. Out of this, a key concern is the mineral industry and waste disposal—both solid waste and wastewater treatment and discharge, which require a more holistic waste management plan and more efficient treatment of wastewater.

Reforms Introduced

The current government has brought about reforms in the sector through emergency measures such as announcing a stricter enforcement and check on vehicle fitness, alongside the guidelines for all fuel providers to switch to Euro5 fuel. However, most of Pakistan is still reliant on the inexpensive and polluted Euro2 quality.

An Electronic Vehicle Policy has also been announced, although the cost of electric vehicles is still very much in the luxury car bracket internationally. With lower-than-average purchasing power of citizens and the lack of any electronic vehicle plants in Pakistan—either foreign or local—buying an electric vehicle in Pakistan is still only possible for a very small fraction of the population in the country.²⁷ Tax exemptions were made for importing electronic car parts, in some cases down to 1%, and 10% on fully

built electronic cars, but a 12% sales tax was imposed on electronic vehicles after a very brief window. The incumbent government aims to put as many as 100,000 electronic cars on the road by 2025, in a major bid to cut back vehicular air



Source: APP

pollution. It is difficult to predict if this transition will come about.

Pakistan's energy grid distribution is also supremely inefficient. With 9 coal-fired, 20 gas-fired and 20 oil power plants currently under operation with a cumulative power generation capability of 23,202 MW, more than half of Pakistan's entire capacity is dependent on non-renewable and high-emission fuel based power plants.²⁸ While 26% of the country's national grid is on hydro-electric power as well, this does not do enough to mitigate the impact of non-renewable energy generation, especially that powered by coal. While there is a moratorium in place on new coal based projects, the import of alternative sources like solar have been heavily taxed which creates a prohibitive effect on both domestic and industrial usage. There

²⁷ "Poor Response to Electric Vehicles Policy," The Express Tribune, January 4, 2022, <https://tribune.com.pk/story/2337165/poor-response-to-electric-vehicles-policy>.

²⁸ "PAKISTAN ECONOMIC SURVEY 2020-21," Govt of Pakistan - Finance Division, accessed January 25, 2022, <http://www.finance.gov.pk/survey/chapters/15-Energy.pdf>.

is 20% tax on solar panels and wind turbines according to recent policy announcements.²⁹

Recommendations

1. Make air quality monitoring more transparent

Instead of the opacity the government is going for, it may be best to let independent data collectors publish daily reports on AQI as the government's own numbers are both inaccurate and not easily accessible. Climate change cannot be beaten by governments alone, and the misrepresentation of data can bring about fatal outcomes.

2. Enforce better regulations for vehicular emissions

Efforts to cut down on transport-related emissions have been lackluster at most. Policy statements aside, implementation on the ground needs to be bolstered. The transition to higher grade fuels needs to be managed at the supply end, through incentivising big industrial players to make the switch. Fitness certification for vehicles needs to be prioritised, especially in cities where vehicular emissions are high.

The targets identified in the Electric Vehicle Policy are not realistic, nor does the policy look to address the question of cost; electric cars are likely to stay expensive, and there is no real incentive for private investors to set up charging stations and other infrastructure if there is no significant consumer base on the horizon.

3. Increase costs for industrial emissions

There are laws and policies already in place to prevent high emissions from industrial plants and factories, but there is no monitoring framework in

place to implement regulations. The National Climate Change Policy 2021 does mention the incorporation of economic incentives to promote emission reduction by upgrading industrial processes and technologies; but this in and of itself is not sufficient. The government must establish a monitoring mechanism for industrial emissions, accompanied by penalties that prohibit emissions. Similar checks have been brought in place for brick kiln owners, with some level of success. This may come with a political fallout in some districts, but it is a step in the right direction.

There must be greater coordination and regulation over industries to manage the level of emissions and ensure that rules such as bans on certain types of fuels are adhered to. Better regulation in the industrial sector on the type of fuel being used must also be prioritised.

4. Curb emissions in livestock farming

The emissions through cattle farming can be countered with an increase in production through herd health and breeding practices, composting, including additives in manure to suppress unwanted biological activity, implementing manure storage covers and anaerobic digesters and finally, feeding cattle based on nutrient needs. Developed countries such as the US and the Netherlands are quickly adapting digital technology in cattle breeding and farming to both reduce emissions and keep livestock healthy, to both maximise yield and use the data to ensure that emissions are kept to a minimum.

²⁹ Sher Ali Khalti, "Taxing Renewable Energy: Political Economy," The News (TNS, March 13, 2022), <https://www.thenews.com.pk/tns/detail/940870-taxing-renewable-energy>.

Conclusion

We have let the climate crisis claim too many previous lives, and cause irreparable damage, out of inadequate preparedness for disasters, and poor adaptation mechanisms. Spurred by international climate commitments, we have rightly undertaken policy and institutional reform, but even now the costs of climate stress are too high for some to bear. The eventual success of any climate implementation framework is through the maximization of security benefits and resource sharing among the widest number of beneficiaries. Any gains achieved through new policy protocols must reflect improvements in key climate sectors, such as water, agriculture, and air quality.

As this brief has tried to demonstrate, there are long-standing challenges in each of these domains that have solutions waiting to be implemented since decades. It is contingent on the motivation of policy planners and implementers how soon these solutions are realized into practice. This brief has examined multiple policy frameworks related to climate action in Pakistan, each of whom have an outsized focus on technical and administrative approaches to adaptation and mitigation, but not much attention is paid to human vulnerability. The ultimate test of any intervention for climate action must be the extent to which it reduces vulnerability and enhances resilience, if not save lives and livelihoods.