

PAKISTAN, CLIMATE CHANGE AND PUBLIC POLICY

A Concept Paper

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The Climate Change Conundrum in Pakistan

Pakistan is at a crossroads in dealing with critical questions related to climate change – either to act urgently on this pressing existential threat or to let business-as-usual dictate its national policy.

To do anything less than taking action on the first option is to jeopardize the future of the country. Few nations in the world today are as vulnerable to the severe impacts of climate change as Pakistan.* Because of its specific geographic location, growing population size, river-fed irrigation system and highly variable weather patterns, without a concerted effort in the near term, the country will experience widespread water scarcity, enormous loss of agricultural productivity, sustained power disruptions, unbearable increases in daytime temperatures, and a steep rise in vector-borne diseases. If by default we choose the business-as-usual option, by the end of this century, Pakistan will essentially be uninhabitable, with a greatly reduced and impoverished population – the victims of social unrest, continuing civil strife, persistent water shortages, along with endemic hunger, malnutrition and chronic diseases – while those who have the means to escape these calamities would have migrated to less impacted regions abroad.

Climate Change is a Daily Reality Now

No seriously thinking policy maker in the country should allow the above grim scenario to prevail. Yet, in some quarters, there is a tendency to believe that the direct or indirect consequences of climate change and global warming is a far distant prospect, one that will not occur in our lifetimes. This point of view needs to be corrected, for in many parts of the world today, the ravages of climate change are observed almost daily. For instance, a number of knowledgeable experts have concluded that the current civil war in Syria was precipitated by a prolonged drought due to climate change in the region. These internal hostilities caused a large-scale migration of war-torn refugees to move into other regions of the Middle East and Europe. In turn, this unprecedented movement of homeless migrants, estimated to be around 5 to 6 million people, brought about widespread opposition and political backlash in a number of host countries that were unable (or unwilling) to absorb such an influx of unaccustomed foreigners in their midst.

Similarly, severe droughts lasting many years in Central America have been linked to the sizeable influx of rural migrants from that region to North America. Unfortunately, the recent

* Pakistan was ranked the 7th most vulnerable country to climate change in Germanwatch's *Global Climate Risk Index* between 1997 and 2016. <https://germanwatch.org/sites/germanwatch.org/files/publication/20432.pdf>

xenophobic political landscape in United States has been shaped to a considerable degree by the movement of these migrant workers seeking a desperate livelihood and food security far away from home. To a larger or smaller extent, the same foreign-averse tendencies may be related to recent internal upheavals and political shifts in other developed countries – e.g., the proposed withdrawal (“Brexit”) of United Kingdom from the European Union, or the recent electoral successes of insular, nationalist parties in Hungary, Slovakia, Poland, Austria and Italy.

Clear and Present Impacts in Pakistan

The more direct impacts of global climate change, such as extreme weather events, can no longer be ignored or denied, since they are increasingly being manifested in different parts of the country and around the globe. Witness the “super” floods in the Indus River basin in Pakistan in July 2010 from heavy monsoon rains, which inundated one-fifth of the country’s land, while affecting the lives of about 20 million inhabitants, including causing an estimated 1,600 to 2,000 deaths. The cost of property damages was pegged at around \$10 billion (with other estimates as high as \$43 billion). This unprecedented flooding event was followed in subsequent years with additional river basin floods: September 2011, affecting over 5 million people in Sindh province; and lesser floods in September 2012, August 2013 and September 2014, in different regions of the country. In addition, severe heat waves were recorded in June 2015 in southern Punjab, Balochistan and Sindh provinces, including metropolitan Karachi, with its 16 million inhabitants. In this large semiarid and coastal region, temperature rose to 49°C (120°F), resulting in more than 1,200 deaths in a four-day period. In April 2018, the city of Nawabshah in Sindh province recorded the highest global temperature for the month, 50.2°C (122.4°F).

Extreme Weather Events Around the Globe

At present, increasing intensity of highly destructive superstorms, typhoons, cyclones and hurricanes are being observed around the globe. Since 2000, such intense cyclonic activities (categories 4 and 5) were frequently recorded (their numbers given in parenthesis) in the North Atlantic (9) and Eastern Pacific (13) oceanic regions. Similar trends were seen in the Western North Pacific (8), North Indian (8), South-West Indian (17), Australian (10), South Pacific (11), and South Atlantic (8) oceanic regions. Additionally, less intense superstorms and cyclonic activities (categories 1 to 3) also occurred in these regions, which nevertheless resulted in torrential rainfalls, widespread flooding and enormous property damages.

These extreme weather events are linked to two main climatic factors: (a) increased oceanic heat content, and (b) growing sea level rise. It is estimated that over 90% of global warming from greenhouse gases are stored in the ocean’s upper layers, providing an enormous reservoir of energy to fuel enhanced storm activities in the Pacific, Indian and Atlantic Oceans. With respect to sea level rise, which causes extensive flooding in low lying coastal areas and severely damaging storm surges, they occur by expansion of warmer waters in the ocean and from the melting of land-based snow and ice.

Other Global Impacts of Climate Change

There are other unmistakable signs of climate change and global warming that are not in dispute in the scientific community:

- Greater number and intensity of forest fires in many drought-stricken areas, such as the Western United States and Canada, Alaska, Chile, Spain, Portugal and Indonesia
- Rapid melting of glaciers and snow covers in all the major mountain ranges of the world, including the Karakoram-Himalaya, Hindu Kush, Alps, Pyrenees, Andes, Rocky Mountain, Cascades, etc
- Enhanced rate of Arctic sea ice loss that exceeds all current computer-based projections
- Permafrost thawing in the Arctic region, releasing high amounts of greenhouse gases, such as carbon dioxide and methane
- Increased incidences of abnormally high temperature days in many urban and rural areas
- Continuing spread of vector-borne diseases from insects and ticks to higher and higher latitudes
- Drastic and irreparable loss of biodiversity, such as fisheries, plants and animal wildlife species in all regions of the globe
- Oceanic acidity leading to severe bleaching of coral reefs, a vitally important marine ecosystem for fish breeding and prevention of coastal erosion

Pakistan's Greenhouse Gas Contributions to Climate Change

Pakistan's past and present contribution to climate change and global warming is *relatively modest* (globally ranked 31st) when compared with other populous countries in Asia, Europe and North America. From data obtained from the 2011-2012 *National Greenhouse Gas Emission Inventory*, Pakistan's total greenhouse gas (GHG) emissions was estimated at 369 million tons of CO₂ equivalent. Here, the bulk of atmospheric carbon emissions was equally divided between the country's energy sector (46%) and its agricultural sector (45%). In terms of per capita GHG emissions, Pakistan globally ranked 135th, mainly due to its low GDP and high population size. However, accordingly to the Asian Development Bank's *Climate Change Profile* report on the country, *Pakistan's total carbon emissions are projected to rise sharply, increasing to over ten-fold during the next three decades, to 4,200 million tons CO₂ equivalent in 2050.*

Potential Impacts of Climate Change in Pakistan

The official Pakistan's *National Climate Change Policy* (NCCP) report, issued by the Ministry of Climate Change in September, 2012, identified the following areas of greatest concern in various regions of the country (excerpted below from the original document):

- *Considerable increase in the frequency and intensity of extreme weather events, coupled with erratic monsoon rains causing frequent and intense floods and droughts;*
- *Projected recession of the Hindukush-Karakoram-Himalaya (HKH) glaciers due to global warming and carbon soot deposits from transboundary pollution sources;*
- *Increased siltation of major dams caused by more frequent and intense floods;*
- *Rising temperatures resulting in enhanced heat and water-stressed conditions, particularly in arid and semiarid regions, leading to reduced agricultural productivity;*
- *Further decrease in the already scanty forest cover, from too rapid change in climatic conditions to allow natural migration of adversely affected plant species;*
- *Increased intrusion of saline water in the Indus Delta, adversely affecting coastal agriculture, mangroves, and the breeding of fish;*
- *Threat to coastal areas due to projected sea level rise and increased cyclonic activity due to high sea surface temperatures;*

- *Increased stress between upper and lower riparian regions in relation to sharing of water resources, and*
- *Increased health risks and climate change-induced migration.*

What we have here is a very harsh and unpleasant picture, for no matter how we look at the situation, the potential impact of climate change in Pakistan could be immensely devastating and catastrophic, both in the short and in the long term. To view these projections from a systems perspective, they should be divided into four distinct, yet interrelated parts: (1) *water scarcity*, (2) *energy security*, (3) *food security*, and (4) *health impacts*. For instance, loss of glaciers and snow cover in the Hindu Kush-Karakoram-Himalayan ranges and the Tibetan Highlands will not only reduce water flow in the Indus River basin[†], it will also cause drastic loss of hydropower generation, provide less cooling water to thermal generating plants and lead to significant decreases of available irrigated water for wheat and rice farming.

Similarly, rising temperatures will not only affect the health and well-being of those living in cities and towns, they will place stress on power production to meet cooling and air conditioning needs, while greatly reducing agricultural productivity in the rural sector. Although recent extreme weather events from cyclonic activities have severely impacted coastal areas, they have also caused untold damages inland from torrential rains and widespread flooding. In other words, the impacts of climate change are not a single phenomenon or a series of separate events. They cut across many facets of people's lives and hence must be viewed in their entirety.

What Must Be Done – Seeing The Big Picture

By now, it is abundantly clear that Pakistan as a nation has an extremely challenging task to combat the problem of global climate change in its region. For policy makers, it is imperative to understand the larger dimensions of the overall problem. While *mitigation and prevention* of carbon emissions must be an immediate option, it is now apparent that *adaptation and building resilience* to the serious impacts of climate change is equally, if not more, important. It is crucially important to realize that mitigation and adaptation policies are not mutually exclusive; they are part of the whole and must be seen as such. By mitigating and reducing GHG emissions, we gain valuable time by lessening the impacts of climate change. At the same time, it is critical to adapt and build sustainable resilient programs in tackling the worst-case scenario of climate changes' impact.

Specific Measures to Address Climate Change in Pakistan

I. Mitigation and Prevention: The Intergovernmental Panel on Climate Change (IPCC) in its most recent published report (AR5, IPCC, 2014) has stated with 95% certainty that *human activities* are responsible for climate change, arising out of atmospheric emission of carbon dioxide and other greenhouse gases. Therefore, the first step is to examine all human activities in the country that significantly contribute to climate change and global warming. Since Pakistan's overall carbon footprint is relatively low in terms of per capita GHG emissions, it should look at those societal behaviors and everyday activities that have the *greatest collective impact* on climate change in its region. In addition, it should take steps to reduce the impacts of climate

[†] The loss of glaciers and snow/ice cover in these mountainous regions in Southern Asia will also seriously impact water flow to the Ganges and Brahmaputra Rivers in neighboring India and Bangladesh.

change on the general population by taking preventative steps. Below is a list of specific mitigation steps that should be considered by policy makers:

(1) Carbon Black Reduction: A number of atmospheric studies have shown that glacier melting in the Hindu Kush-Karakoram-Himalayan ranges is greatly enhanced by the regional presence of heat-absorbing *black carbon soot* that deposits on mountainous snow and ice. While black carbon emission is a global problem, its impact on the sub-continent is more immediate and near term, since it would drastically reduce water flow into the Indo-Gangetic plain in the next few decades (for more information, see Annex I).

- The presence of this air pollution source, arising from both *indoors* (particulate matter from smoky woodstoves), and *outdoors* (“brown fog” derived from crop burning, use of primitive brick kilns, and industrial/transportation emissions), have been linked to adverse health effects in young children and adults.
- The immediate reduction of these particulate matter and black carbon in the atmosphere should be given the *highest priority*.
- This could be achieved by introducing more efficient *smokeless woodstoves* and *solar cookers*, prohibiting *crop burning* practices, developing new *brick kiln technologies* and strictly controlling *air pollution* sources.
- However, these prescriptions require entering into a *bilateral pact with India*, where particulate matter and black carbon are similarly emitted across Northern India in Haryana, Punjab and Utter Pradesh Provinces.
- Above all, this approach would have a *substantial effect in mitigating climate change*, since it addresses the four-fold problem of water scarcity, energy security, food security and health impacts that Pakistan and its neighboring countries will face in the next few decades.

(2) Switching to Renewable Energy Sources: Currently, Pakistan is *heavily invested* in using fossil fuel sources in its energy sector – natural gas (48%), oil (32%) and coal (7%) – with the remaining energy sources derived from hydropower (31%) and nuclear power (2%).

- Since Pakistan possesses the sixth largest global *coal reserve* today, there is considerable pressure to use domestic coal instead on relying on imported crude oil (45 million barrels/year). This policy option should be resisted under all circumstances.
- Given the country’s development goal of achieving higher growth rate (thus increasing its overall carbon footprint), while eradicating poverty in the near future, it would be *highly inadvisable to rely on fossil fuel* as its main energy source.
- Switching to a *carbon-neutral future* during the next ten to twenty years should be one of its major short and long term goals.
- This includes significant public and private investments in *renewable sources* of energy, such as wind, solar, biofuel, mini-hydropower, tidal and geothermal power. In June 2018,

the World Bank approved a \$100 million *Sindh Solar Energy Project* to be developed and put into operation in different regions of the Province.[‡]

(3) **Strategies to Prevent High Temperature Impacts and Vector-Borne Diseases:** Episodes of abnormally high daytime temperatures have increased in Pakistan during the past decade, with intense heat waves occurring more commonly during April to October. In addition, public health authorities have noted that with global warming, many tropical vector-borne diseases (VBD), caused by insects and ticks, have migrated to mid-latitude countries (for further details, see **Annex II**).

- *High Temperature Episodes:* A regionally coordinated *public health campaign* to lessen mortality and morbidity rates from heat wave episodes should be implemented, which includes: (a) providing cost-free cooling stations in urban areas, (b) availability of clean drinking water, (c) first-aid personnel training in schools and public spaces, (d) health clinics and hospital equipped to treat heat-affected patients, (e) buildings and homes designed with reflecting surfaces and greenery, (f) neighborhood volunteers to visit shut-in elderly and chronically ill, (g) initiating school education and public information programs.
- *Vector-Borne Diseases:* Pakistan now faces not only elevated malarial and other VBD cases, it has seen an *unprecedented increase of hitherto little known dengue fever*, with over 21,000 confirmed cases reported since 2005.
- *Prevention Programs:* With an estimated VBD-burden of 1.5 million cases annually, Pakistan should implement a long-range strategic plan to mitigate this growing public health crisis. This includes establishing an *integrated program of preventive measures* as follows:
 - (a) eradicating vector breeding grounds,
 - (b) developing a surveillance, monitoring and reporting system,
 - (c) initiating a public education program in hospitals, health clinics and schools in all regions of the country

II. Adaptation and Building Resilience: As stated earlier, the impact of climate change are no longer in doubt, since it is presently being observed in many regions of the globe, including Pakistan where devastating river basin floods and prolonged heat waves have occurred during the past decade. Regardless of how well one achieves in mitigating the damaging consequences of climate change, it is prudent and wise to anticipate *adapting to the new world of global warming*. The most obvious step to withstand extreme weather events, would be to erect physical infrastructures, such as barrier walls, earth dams, dredged channels, utility pumps and drainage systems, to counter coastal storm surges and inland riverine floods. Secondly, there is a critical need to develop adaptation strategies that are accompanied by well coordinated efforts to build *social, economic, technological and environmental resilience* in the community. Moreover,

[‡] The World Bank's solar project in Sindh would design and implement an array of installations, including solar power plant and solar parks for regional electricity needs, and smaller solar photovoltaic modules for homes. <http://projects.worldbank.org/P159712?lang=en>

piecemeal adaptation measures tend to fail, for the simple reason they may overlook ancillary events or didn't factor the proper time horizon.

In the past decade, with the involvement of government agencies and outside donor assistance, Pakistan has embarked on a number of climate change adaptation initiatives and disaster management programs (for a *partial listing*, see **Annex III**). Pakistan's heightened vulnerability to severe impacts of climate change makes it even more imperative to develop an adaptation and resilience strategy at the earliest possible date. Below is a set of *core principles and specific programs* in developing a comprehensive adaptation plan to address climate change and global warming. It is presented within a larger context of sustainable economic development and the building of societal resilience, one in which all members of the community can meaningfully participate and have specific roles to play.

(1) **Blueprint for Sustainable Infrastructures**: Here the key terms of the sustainability blueprint are; *robust, durable and long lasting*. At its foundation, both conventional and innovative forms of physical barriers, transportation routes and adequate drainage systems must be erected. At the same time, preventative policies should be adopted and implemented without much delay. They are:

- Immediate steps should be taken to *relocate populations* living in low coastal areas and flood plain zones to higher grounds, along with issuing new regulatory restrictions and structural guidelines on building constructions and public roadways.
- Special provisions and allocated funds should be made available for *low-income families*, to assist them in obtaining transportation, shelter, food, healthcare and other social services during the relocation process.
- Electric power is another service provided by large network grid system that is often disrupted by extreme weather events. Hence, building *small-scale, micro-grid systems*, derived from local solar and wind power, should be considered as an alternate means to meet this energy need, especially in small towns and villages.
- Similarly, *agricultural irrigation and drinking water* delivery system will need to be re-examined to upgrade them optimally and cost-effectively, while distributing them sustainably and efficiently to meet the long-term needs of the community.

(2) **Building Long-Term Resilience**: Since resilience is a newly introduced concept among policy makers, it may be defined as: "*the capacity of a community to withstand external stress by adapting and evolving to a more stable and sustainable state*". In other words, resilience connotes fortitude, improvisation and innovation in the face of challenges posed by climate change and global warming, and not necessarily making affected parts whole again or returning back to its status quo.

- One form of long-term resilience is to marshal natural ecosystems to combat sea level rise, coastal erosions and storm surges by restoring *mangrove forests and coral reefs* along marine coastlines and estuaries of the Indus River delta region in Pakistan.
- Similarly, planting *non-invasive trees and indigenous shrubberies* in semi-arid areas and on timbered mountain slopes would have beneficial effects in reducing land erosion,

provide cooling shades, increase scenic beauty, and act as catchment basins for groundwater recharge.

- The Pakistan government recently announced an ambitious plan of planting some *10 billion tree seedlings* around the country to restore its depleted forest lands and to prevent further soil erosion.[§] If implemented with sound horticultural practices and selection of appropriate plant species, this tree planting program would not only replenish forest resources, but restore badly damaged landscapes and eroded river basin areas.
- In the agricultural sector, development of *heat and drought-resistant crops* are a necessity, as well as the employment of *integrated pest management (IPM)* techniques to reduce the use of hazardous chemical agents to control insects and weeds.

(3) Mobilizing Social Capital and Expertise: An important adjunct to various activities related to adaptation and resilience to climate change is the need to engage the larger community in implementing programs in preparedness planning and disaster management response. Nothing can replace the expertise and bravery of first responders in times of natural disaster or human-made crisis, who selflessly risks their lives for the safety of others. Nevertheless, the participation of the whole community in disaster response has become a necessity in order for adaptation and resilience programs in Pakistan to succeed.

- In light of the inevitability of climate change's impact in Pakistan, mobilizing the social capital of experienced professionals to train and deploy *a dedicated core of citizen-volunteers* to participate in disaster response activities should be given a high priority. Such a program should be organized and managed by dedicated government funding donated to community organizations and NGOs well equipped carry out such activities.
- A widespread *public education program* on adaptation and building resilience to climate change should be developed and put into place at the earliest possible time in Pakistan. Such an effort should be carried out at all educational levels – from elementary and secondary schools through colleges, universities and other trade and professional learning and training centers.
- Regional planning bodies should develop a comprehensive *inventory list* of well-built shelters, food centers, health clinics, and drinking water sources, to be distributed to the general public and relief organizations during extreme weather events and other unforeseen natural disasters.
- Every attempt should be made to create a *network of community leaders and volunteers* to participate in ongoing preparedness training and engage them in *post-disaster* resettlement/recovery activities and trauma counseling services This should be done in cooperation with government agencies, local and regional NGOs, and national and international relief organizations.
- The role of the *faith community and civic institutions* should not be overlooked in Pakistan. Here these organizations can help mobilize citizens to assist in providing shelter, food, clothing and medical aid to victims of disasters, while soliciting monetary

[§] The 10 billion tree planting program – designated the *GreenPakistan drive* – was launched on September 2, 2018 by Prime Minister, Imran Khan, at a ceremonial event in Haripur, Khyber Pukhtunkhwa Province. On this occasion, the Prime Minister, who had strongly championed the initiative, stated, “This campaign will go on for five years and we will make all of Pakistan green.” <https://www.dawn.com/news/1430547>

donations, obtaining material supplies, and organizing in-kind assistance from the community.

III. Governance Structure and Financing Mechanisms: Lastly, it would be useful to briefly examine what governance structures and financing mechanisms exist in Pakistan, both in the past and the present that addressed issues related to climate change and global warming.

(A) Governance: Currently, at the national level, the *Ministry of Climate Change*, first established in 2012, appears to have the lead role on policy matters related to climate change. However, this Ministry has had a strangely checkered history, which is outlined below (along with highlights of other policy-relevant events and achievements):

Governance before 2012:

- Cabinet Committee on Climate Change is established (1995)
- Pakistan’s “*National Environmental Protection Act*” (NEPA) is enacted (1997)
- Global Change Impact Studies Centre (GCISC) is established (2002)
- National Communication on Climate Change (NCCC) is established (2003)
- Prime Minister’s Committee on Climate Change is established (2004 – 2005)
- Clean Development Mechanism (CDM), National Operational Strategy is developed (2006)
- Task Force on Climate Change (TFCC) is established (2008)
- *Ministry of Environment* is abolished; devolution of regulatory powers to the Provinces (2011)

Governance since 2012:

- *Ministry of Climate Change* is established, renamed from the *Ministry of National Disaster Management* (2012)
- National Climate Change Policy (NCCP) is approved (2012)
- National Disaster Management (NDM) plan is approved (2012)
- *Ministry of Climate Change* is downgraded to *Division of Climate Change* (2013)
- National Disaster Risk Reduction (NDRR) policy is approved (2013)
- Framework for Implementation of Climate Change policy is approved (2014)
- *Ministry of Climate Change* is reinstated; upgraded from its Division status (2015)
- “*Pakistan Climate Change Act*” is enacted, which establishes the *Climate Change Council* (Prime Minister as chair) and the *Climate Change Fund* (2017)

Institutional Changes and Uncertainties:

- As can be seen above, the *Ministry of Climate Change* was established, downgraded and then reinstated, all within a three to four year period (2012 – 2015).
- There is reason to believe that the reinstatement of the Ministry of Climate Change in 2015 was to provide a higher standing to Pakistan’s representation at the Paris Climate Change Conference (COP21, November/December, 2015), where the *Paris Agreement* on global climate change was adopted.
- At best, the Ministry of Climate has undergone a shaky and uncertain existence, with no clear reason to believe that its cabinet-level, ministerial status may not be changed again.

- What is equally distressing is that the *Ministry of Environment* was entirely abolished in 2011, with most regulatory duties and obligations transferred over to provincial governments. This devolution plan for the ministry was implemented under the 18th Amendment to the Constitution of Pakistan that was adopted by the National Assembly in April, 2010.
- Under the former Ministry of Environment, the *Pakistan Environmental Protection Agency* (EPA) carried out the statutory provisions of the 1997 NEPA legislation, along with regulating air pollution and radioactive wastes. The current mission of Pakistan EPA, housed under the Ministry of Climate Change, mainly relates to environmental impact assessments, laboratory certifications and other ancillary activities.
- Currently, the Ministry of Climate Change, with its limited budget and internal resources, functions as an instrument to oversee the implementation of Clean Development Mechanism (CDM) projects around the country, manages other international financial assistance and provides policy guidance on deforestation issues.
- Since the creation of the *Climate Change Council* in 2017 – a high level decision-making body, chaired by the Prime Minister, with membership of provincial Chief Ministers – it is not entirely clear what governance role the Ministry of Climate Change may continue to play in the future.
- In reviewing these constantly shifting institutional changes and division of responsibilities at the national and provincial level over a short span of time, the Asian Development Bank’s *Climate Change Profile* report (August, 2017) had this to say:

“[I]t reflects a rather reactive and bifurcated approach toward managing issues of the environment and climate change, without a concrete course of action. This causes confusion among key policy makers when it comes to linking and decoupling the two issues which can be traced, again, through the key policy document.”

Conclusion: At present, *there is no overall coherent administrative or regulatory body* related to environmental protection and climate change at the national level in Pakistan. This is indeed a remarkably odd and untenable situation, for it places the entire onus of policy-related environmental issues, including climate change and global warming, in the hands of a recently established junior federal Ministry, with poorly defined responsibilities and regulatory powers. In the final analysis, nothing is gained with frequent reshuffling of institutional governance structure, nor is it in the country’s best interest to have such a state of confusion in policy making prevail at the national level.

Recommendation: As a matter of some urgency, *it is recommended that the Prime Minister’s office, in consultation with the National Assembly, revisit these institutional problems with the view to remedy the current disjointed governance structure related to environmental protection and climate change at the earliest possible date.*

(B) Financing: Pakistan funding requirements to address the severe impacts of climate change in the next few decades are simply enormous. It is estimated by United Nations Development Programme (UNDP) that *\$6 billion to \$14 billion annually* will be needed to meet adaptation expenditures alone. At the 2015 Paris Climate Conference, Pakistan pledged to reduce by 20%

its estimated 2030 carbon emissions. This requires *another \$40 billion* for mitigation and adaptation related funds. Yet, only a trickle of such financing has been secured thus far.

In 2017, with the assistance of the UNDP, the Ministry of Finance and the Ministry of Climate Change jointly launched a new financing mechanism called the *Climate Change Financing Framework* (CCFF). Its goal is to serve as a road map to bring about institutional reforms and transparency in order to secure funding from a variety of sources, both public and private. Recognizing its limited budgetary resources to allocate funds for climate change mitigation and adaptation, Pakistan would require substantial multilateral and bilateral donor financing in near term. In its report, it states:

“To attract international funding, government must demonstrate the transparency and effectiveness of its budgetary systems. Development and implementation of the CCFF will provide a necessary leverage in establishing a credible PFM [Public Finance Management] system, and hence, enhance the confidence of international partners and funders.”

Below is an outline of financial mechanisms and institutional initiatives that help to administer and allocate funds on climate change mitigation and adaptation activities over the past decade:

- Global Expenditures: In 2013, the *Climate Policy Initiative* (CPI), an international NGO, reported that about \$331 billion annually was globally expended on climate change, of which only \$34 billion (10%) was transferred from developed to developing countries.
- Pakistan’s Expenditures: UNDP’s most recent *2017-Climate Public Expenditure and Institutional Review* (CPEIR) estimated that between 5.8% and 8.1% of total federal expenditures were directed to climate change during 2011 – 2016, with energy (57%) and transportation (19%) using most of the funds. That is not an inconsequential amount of funds derived from the federal budget, but not nearly enough to what is needed in the near term on climate change (for further information, *see below*).
- Disbursement of Funds: While the Planning Commission (Ministry of Planning, Development and Reforms) and the Ministry of Finance are responsible for fiscal allocation and distribution of funds, there is still *no direct budgetary entry point* for disbursing funds to implement the *National Climate Change Policy (NCCP)* proposals. It is hoped that under the new CCFF, this long neglected problem will finally be solved.
- Management of Funds: Currently, management of climate change related funds are carried out through a web of different federal agencies and institutions:
 - *Ministry of Climate Change* – administers the Clean Development Mechanism (CDM) program
 - *Ministry of Finance* – coordinates financing from donor agencies and provides legal services through its Economic Affairs Division (EAD)
 - *National Economic Council* (NEC) – provides interprovincial oversight; reports directly to the National Assembly

- *Council on Common Interest* – which is chaired by the Prime Minister; it works in conjunction with provincial ministries.
- **International Funding**: International investments and donor funding for climate change activities in Pakistan is currently quite meager. About 62% of the funding comes from private sources, while 38% are derived from public institutions and donors. The major multilateral and bilateral funds received from donor sources are as follows:
 - *Asian Development Bank*: \$389.8 million, 2011 – 2015, of which 96% was allocated for mitigation
 - *Global Environmental Facility (GEF)*: \$12.5 million
 - *Adaptation Fund*: \$3.9 million
 - *Fast Start Initiative (Japan)*: \$31.7 million, allocated for adaptation
- **Green Climate Fund**: A word or two should be mentioned of the newly established *Green Climate Fund (GCF)*, which is an operating arm of UNFCCC. It was established at the Climate Change Conference in Cancun, Mexico in 2010 (COP16). Currently based in Incheon, South Korea, GCF is mandated to mobilize \$100 billion from private and public sources by 2020. To date, it has raised \$10.3 billion from 43 countries. Hopefully, under the newly launched CCF mechanism in place, Pakistan will be eligible to receive substantial funds from this multilateral donor source. In January 2017, Pakistan received its first grant of \$36 million from GCF for a *Climate Adaptation Project* that addressed the serious glacier lake outburst situation in Northern Pakistan.
- **Pakistan’s Financing Need**: According to *2017-Climate Public Expenditure and Institutional Review (CPEIR)*, the average funds disbursed domestically on climate-related activities was about 6.6% of the total federal expenditures over a 5 year period. Using this average percentage figure against a federal 2017/2018 budget of Rs 4.7 trillion (or \$35 billion), we arrive at about *\$2.3 billion annually* being spent domestically on climate programs in Pakistan in recent years. While this compares well with the limited funds received from international donors at the present time, *it falls far short of \$10 - \$20 billion per year* (based on UNDP’s estimates discussed above) that will be needed in the next few decades on climate change mitigation and adaptation.

Concluding Remarks

Today, Pakistan is faced with a national crisis of unprecedented proportions. The reality of climate change is no longer a tedious scientific tale told to busy policy makers, whose priorities seemed to lie elsewhere, whether domestic or foreign. Above all, the country was awakened from its prolonged slumber on issues related to global climate change, when a devastating series of Indus River basin floods occurred that inundated the country at the beginning of this decade.

Millions of people were displaced. Many lost their lives, their homes, their belongings, and their livelihoods. This was followed by a series of unrelenting heat waves that broke all global temperature records. Like other victims of extreme weather events, or out of control forest fires, or long-lasting droughts, they have felt helpless, while some lost their most precious gift: hope.

At the same time, the national government found itself in an awkward political bind. While gaining greater democratic governance by undergoing devolution of its federal ministries to the provinces, it lost much of its central administrative capacity to manage and coordinate activities that spanned across many sectors at the national level.

Institutions that once played an important decision making role, such as the *Ministry of Environment*, were disbanded and their functions swiftly handed over to provincial governments. It seems that the best intentions of policy makers had unanticipated consequences that has now placed difficulties in responding to a national crisis. Once again, it appears that decisions must be taken to correct these institutional shortcomings.

What is still not clear is the role of the newly created *Climate Change Council*, which is chaired by the Prime Minister. Once this high-level Council becomes a properly functioning body, will the *Ministry of Climate Change* be downgraded again or sent away into permanent exile? These pending questions must be resolved at once.

In the end, three important items stand out: *lack of funds, lack of coordination, and lack of a sense of urgency among policy makers*. Since the very existence of the nation is at stake, it is well past time that climate change be placed at the top of the agenda of Pakistan's policy makers. Anything less than paying strict attention to this mounting national crises will not be viewed kindly by future generations who come after us.

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Annex I **Black Carbon / Asian Brown Cloud**

Black carbon soot are airborne particulate matter that is formed by the combination of three causative agents: (1) daily burning of firewood and other biomass materials in inefficient, smoky stoves (*chulas*) in many rural areas, (2) air pollution from industrial factories, brick kilns, power plants and motor vehicles, and (3) massive crop burning at the end of the harvesting season. Together, they form a dangerously harmful atmospheric formation called “brown cloud”, which not only affects human health, but deposits the long-range heat-absorbing particulate matter on mountain glaciers and snow-packed regions of Southern Asia and other parts of the globe. In fact, reducing the emissions of black carbon has multiple environmental and human health benefits. This was clearly stated in the 2015 *Global Environmental Facility (GEF)* report on black carbon (BC) mitigation:

Reducing BC emissions can help slow the rate of climate change, reduce local air pollution, improve human health and security of food and water supplies, and support achieving the Sustainable Development Goals (SDGs)”

At present, the three most prominent atmospheric components that cause climate change globally are (radiative forcing units in parenthesis): (1) carbon dioxide (1.7 W/m^2), (2) methane (0.9 W/m^2), and (3) black carbon (0.6 W/m^2). Estimated sources of airborne black carbon are: (a) open biomass burning (36%), (b) residential cooking and heating (25%), (c) transportation (19%), and (d) industry (19%). Hence, *high priority* should be paid on this mitigation option, since controlling of black carbon emissions from these sources would significantly lower the impact of global warming, especially on the Indo-Pakistan sub-continent.

In Pakistan, special attention should be given to the estimated *20,000 brick kilns* that serve as cottage industries to low-income families in many urban areas (Punjab Province has nearly 8,000 brick kilns alone). Using traditional technology, these brick kilns use coal and other locally available fuel materials (plastic, waste oil, tires) to produce some *45 billion bricks per year*. Not only they produce visually apparent air pollution to nearby inhabitants, they are considered to be *one of the largest sources of black carbon* in the region. Hence, every attempt should be made to regulate this industry, along with seeking more efficient and less polluting brick-producing technologies as viable substitutes.

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Annex II

Climate Change and Human Health: Specific Impacts in Pakistan

Global Outlook:

While pictorial images of intense cyclonic activity, large-scale flooding, torrential rains, forest fires and desertification provide graphic evidence of the destructive force of an increasing climate change, its impacts on human health has received much less public attention. Yet, climate change’s toll on the health and well-being of communities affected by global warming is equally, if not more, insidious and long-lasting. At times, it is difficult to identify causes of injuries and diseases from non-climate related events. Nevertheless, public health officials have lately studied links between human health and climate change in much finer detail in order to respond to them more effectively and in a timely manner. Both mitigation and adaptation approaches are now deemed necessary. Therefore, climate-related impacts on human health may be categorized as follows:

- a) Extreme weather events – This involves deaths, serious injuries and mental trauma following highly damaging cyclones, hurricanes and superstorms, with additional health impacts from storm surges, excessive precipitation, widespread flooding, drainage breakdowns and landslides. These weather-related events include intense forest and brush fires that accompany hot, dry winds (*Santa Ana, Leveche, Sirocco*), periods of water scarcity and prolonged droughts.
- b) Heat and cold waves – In tropical, sub-tropical and mid-latitude regions, extensive periods of high daytime temperatures cause heat strokes, muscle cramps, physical exhaustion, dehydration, loss of productivity, disorientation, mental distress and death. In northern latitudes and mountainous areas, severe cold-related episodes can cause hypothermia, frostbites, trench foot, chilblains, and accidental bone and muscular injuries.
- c) Vector-borne diseases – In recent years, with increasing global warming, many tropical and sub-tropical vector-borne diseases have migrated to mid-latitude regions. Caused by insects and ticks, these illnesses in Africa, Asia, Europe, North and South America include *malaria, dengue fever, leishmaniasis, schistosomiasis, onchocerciasis, trypanosomiasis, piroplasmiasis, rickettsiosis, spirochetosis, Rift Valley fever, yellow fever, tick-borne haemorrhagic fever, Lyme disease, tick-borne encephalitis, Chagas disease, West Nile encephalitis, hantavirus disease, etc.*
- d) Environmental pollution – Increasingly environmental factors related to climate change cause both acute and chronic diseases in many regions of the globe. While air pollution from particulate matter and brown clouds enhance impacts of global warming (from loss of glaciers and snow/ice cover, *see Annex I*), it also causes severe cases of respiratory illnesses in children and adults. Similarly, during severe flooding episodes, contaminated water from sewage outflow has been linked to outbreaks of typhoid fever, cholera and other intestinal diseases, while water streams carrying hazardous chemical wastes cause a variety of short and long-term debilitating illnesses.
- e) Food and water security – Climate change has a direct impact on food and water security, especially in agricultural regions linked to stream-fed irrigation systems. With loss of glaciers and mountain snow/ice to replenish rivers and streams, food and water security becomes a serious national and regional problem. This, in turn, will cause hunger, acute malnutrition, stunted child growth, immunodeficiency, and a variety of chronic illnesses to spread among rural and urban populations in these regions. A similar problem in rain-fed/groundwater agricultural belt will arise in periods of prolonged drought and water scarcity.

Viewing it from a global perspective, the leading British medical journal, *The Lancet* (online issue, November 28, 2018), presented the findings of 27 academic institutions and UN agencies on the human health risks that the world faces from climate change in the following summary statement:

1. Present day changes in *heat waves, labour capacity, vector-borne disease, and food security* provide early warning of the compounded and overwhelming impact on public health that are expected if temperatures continue to rise. Trends in climate change

impacts, exposures, and vulnerabilities show an *unacceptably high level of risk* for the current and future health of populations across the world.

2. A lack of progress in *reducing emissions and building adaptive capacity* threatens both human lives and the viability of the national health systems they depend on, with the potential to disrupt core public health infrastructure and overwhelm health services.

3. Despite these delays, a number of sectors have seen the beginning of a *low-carbon transition*, and it is clear that the nature and scale of the response to climate change will be the determining factor in shaping the health of nations for centuries to come.

4. Ensuring a *widespread understanding of climate change* as a central public health issue will be crucial in delivering an accelerated response, with the health profession beginning to rise to this challenge.

Climate Change Impacts on Human Health in Pakistan:

During the past decade, Pakistan has experienced the entire gamut of climate-related health impacts. To begin with, the *superfloods in the Indus River basin in July 2010*, due to torrential monsoon rains, resulted in widespread structural damages and thousands of human casualties, including severe injuries, chronic illnesses and deaths (based on semi-official and official figures – *National Disaster Management Authority, World Health Organization*):

- Geographical Areas: *Khyber Pakhtunkhwa* (Kohistan, Swat, Shangla, Upper/Lower Dir); *Punjab* (Mianwali, Bhakkar, Layyah, Muzaffargarh, D.G.Khan, Rajanpur, Rahim Yar Khan); *Sindh* (Kashmore, Ghotki, Jabobabad, Shikarpur, Qambar Shahdadkot, Dadu, Larkana, Jamshoro, Thatta); *Balochistan* (Nasirabad, Jaffarabad).
- Number of Districts affected: 78
- Number of people affected: 18 to 20 million (estimated)
- Number of deaths: 1,984
- Number of injuries: 2,946
- Number of people needing urgent care: 150,000
- Number of people living in camps: 350,000 (in 2011)
- Types of illnesses reported: skin infections, water-borne diseases
- Homes destroyed/damaged: 1,744,471
- Infrastructure destroyed: dikes, embankments, water channels, roads, schools, health facilities, safe drinking water sources, sewage disposal units
- Estimated cost for recovery and reconstruction: \$8.8 billion – \$10.9 billion

In 2015, 2017 and 2018, *intense heat waves* affected Sindh province and its capital city Karachi, with a population of 16 million. An estimated 1,500 to 2,000 people died in June 2015 when daytime temperatures hovered well above 40°C (104°F) in the city and its surrounding area for several days. In addition, some 65,000 people were admitted into local hospitals for heat-related ailments. It was reported that many of the deceased suffered heat strokes, dehydration and physical exhaustion, working as outdoor laborers or tending steam boilers at industrial factories. In May 2018, another major heat wave struck Karachi in the fasting month of Ramadan, when 65 people died during power outages, leaving many without cooling relief. In neighboring India, its

government recently estimated that more than 22,000 people died in heat waves between 1992 and 2005.

In terms of vector-borne diseases, *malaria* is endemic in Pakistan, with 1 million estimated and 300,000 confirmed cases reported annually in the country. With global warming, it is feared that unless well-designed mosquito control programs are initiated, the country will face higher morbidity and mortality cases from malarial infections. This is especially likely among rural farming communities where the disease is highly endemic and knowledge about its prevention is quite low. At present, the two prevalent mosquito-carrying parasites in Pakistan are *Plasmodium vivax* and *Plasmodium falciparum*, with the former accounting for nearly two-thirds of the infections. However, chloroquine-resistant *P. falciparum* infections have recently risen, mainly along the Afghanistan border areas, presumably being imported across the country line.

One of the most challenging public health problems facing Pakistan today is the recent introduction of *dengue fever*, in a region where this vector-borne disease was almost unknown. The first case of dengue fever was reported in Karachi in 1994, although it is possible that the disease remained unknown in the population for a while. In the fall months of 2011, the first major outbreak of the disease occurred, when over 15,000 dengue fever cases were diagnosed in Lahore, with lower incidences reported in other regions of the country. It is likely that the Indus River basin floods during the preceding two years provided breeding grounds for the disease mosquito vectors, *Aedes aegypti* and *Aedes albopictus*. Currently, control measures are employed to contain this disease – from pesticide treatment and stagnant water removal to carrying out a public education program

Like other developing countries, Pakistan suffers from excessive *air pollution* from greatly increased use of motor vehicles in its cities and towns. These urban hazards are often combined with regional emissions of sulfur oxides, nitrogen oxides, photochemical ozone and particulate matter from industrial plants, brick kilns and power generation sources. Air pollution during high temperature episodes can elevate health risks, especially in individuals with chronic disorders. Recent studies have shown that high ambient temperatures with atmospheric ozone exposure can affect cardiovascular function. Similarly, exposure to fine particulate matter (PM_{2.5}) and high temperatures are associated with acute lung edema in kidney patients. In addition, adverse health outcomes, such as intestinal diseases and skin infections, have been linked to *contaminated water sources* resulting from widespread flooding and other extreme weather events in Pakistan.

According to the World Food Programme, *Pakistan ranks 77th out of 109 countries in the Global Food Security Index*, with 60% of its population being food insecure and nearly half of its women and children below five years are malnourished. A recent study has shown that with global warming and rapid population growth, a drastic loss of food security, such as per capita wheat availability, will occur by mid-century in Pakistan. Without the development of new, high yield wheat crop and better management practices, the situation of food security in the country looks very grave. Moreover, *food security in the country is tightly bound to water security*, since 90% of arable agricultural land lies within the Indus River basin and its vast irrigation system. Any interruption of water flow to this stream-fed agricultural region from loss of glacier and snow/ice melt in the Hindu Kush-Karakoram-Himalayan ranges would be disastrous. While such drastic loss of water flow may not occur in the near term, there is reason to believe the declining

agricultural productivity will occur with many cash crops, such as wheat, rice, sugarcane, cotton, and maize. In the final analysis, the impact of water and food security on human health and well-being will be critical for the future prosperity and welfare of the country.

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Annex III
Pakistan's Climate Adaptation & Disaster Management Initiatives

The following is a *partial listing* of climate change adaptation and disaster management projects that are ongoing or about to be launched in Pakistan (in some cases, where available, the amount of funding approved or being allocated to the projects are indicated):

- World Wildlife Fund (with funding from European Commission) – *Building Capacity on Climate Change Adaptation in Coastal Areas of Pakistan*
<http://www.wwfpak.org/ccap/>
- United Nations Development Programme (UNDP) – *Climate Adaptation Projects*, which includes: (a) Scaling-up Glacial Lake Outburst Flood (GLOF); (b) Disaster Risk Management Support; (c) Strengthening Governance of Climate Change Financing; (d) Energy Efficiency Standard and Labeling
http://www.pk.undp.org/content/pakistan/en/home/operations/projects/environment_and_energy.html
- World Bank (Approved May, 2018) – Funding for *Climate Resilience, Water, Environment and Cities* that includes four projects/programs: (a) “Hydromet” and Disaster Risk Services project (\$188 million); (b) Sindh Barrage Improvement project (\$140 million); (c) Punjab Green Development program (\$200 million); (d) Punjab Cities program (\$4.1 million).
<https://www.worldbank.org/en/news/press-release/2018/05/25/pakistan-climate-resilience-receives-boost-world-bank-support-water-environment-cities>
- World Bank (Approved June, 2018) – Funding for *Sindh Solar Energy Project*, which includes designing and implementing large-scale solar power plants and small-scale photovoltaic (PV) units in the rural sector (\$100 million).
<http://projects.worldbank.org/P159712?lang=en>
- Green Climate Fund (GCF) (Approved January 2017) – Funding for *Climate Change Adaptation Project related to Glacial Outburst in Northern Pakistan* (\$36 million)
<http://www.asiapacificadapt.net/news/pakistan-climate-change-adaptation-project-benefit-185-million-population>
- Leadership in Environment and Development (LEAD) Pakistan – *Climate Action Programme*, with ongoing initiatives: (a) Agriculture Disaster Risk Management Plans and Implementation Guidelines; (b) Monitoring, Evaluation and Learning (UK Government International Climate Fund); (c) Partnership with Himalayan Adaptation, Water and Resilience; (d) Policy Development in Climate Change.
<http://www.lead.org.pk/lead/Pages/climatechange.aspx>
- Oxfam International – Project of *Community-Based Adaptation and Advocacy in Coastal Pakistan*.

<https://www.oxfam.org/sites/www.oxfam.org/files/pakistan-climate-adaptation.pdf>

- *Agence Francaise de Developpement (AFD) – Project on Rural Development and Climate Change*, in partnership with Aga Khan Agency for Habitat and Renewable Energy, Environment and Solidarity Group (GERES).
<http://www.afd.fr/en/rural-development-and-climate-change-adaptation-project-pdra-cc>

Annex IV **Climate Change, Environment and Development Links**

Pakistan Ministries:

- Ministry of Climate Change, Islamabad, Pakistan
<http://www.mocc.gov.pk/>
- Ministry of Finance, Islamabad, Pakistan
<http://www.finance.gov.pk/>
- Ministry of Energy (Power Division), Islamabad, Pakistan
<http://www.mowp.gov.pk/>
- Ministry of Water Resources, Islamabad, Pakistan
<http://mowr.gov.pk/>
- Ministry of Food Security and Research, Islamabad, Pakistan
<http://www.mnfsr.gov.pk/>
- Ministry of National Health Services, Regulation and Coordination, Islamabad, Pakistan
<http://www.nhsr.gov.pk/>
- Ministry of Planning, Development and Reform, Islamabad, Pakistan
<https://www.pc.gov.pk/>
- Ministry of Science and Technology, Islamabad, Pakistan
<http://www.most.gov.pk/>

Pakistan Government Agencies and NGOs:

- National Disaster Management Authority (NDMA), Islamabad, Pakistan
<http://www.ndma.gov.pk/>
- Water and Power Development Authority (WAPDA), Lahore, Pakistan
<http://www.wapda.gov.pk/>
- Pakistan Environmental Protection Agency (EPA), Islamabad, Pakistan
<http://www.environment.gov.pk/>
- Global Change Impact Studies Centre (GCISC), Islamabad, Pakistan
<http://www.gcisc.org.pk/>
- Leadership in Environment and Development (LEAD), Islamabad, Pakistan
<http://www.lead.org.pk/lead/home.aspx>
- Aga Khan Development Network (AKDN), Karachi, Pakistan
<https://www.akdn.org/where-we-work/south-asia/pakistan>

United Nations and International Organizations:

- UN Framework Convention on Climate Change (UNFCCC), Bonn, Germany

- <https://unfccc.int/>
- Intergovernmental Panel on Climate Change (IPCC), IPCC Secretariat, World Meteorological Organisation (WMO), Geneva, Switzerland, <http://www.ipcc.ch/>
 - United Nations Development Programme, Pakistan (UNDP-Pak), Islamabad, Pakistan <http://www.pk.undp.org/>
 - United Nations Environment Programme (UN Environment), Nairobi, Kenya <https://www.unenvironment.org/>
 - Climate and Clean Air Coalition, UN Environment, Paris, France <http://ccacoalition.org/en>
 - World Health Organization (WHO), Geneva, Switzerland <http://www.who.int/>
 - United Nations Children’s Fund (UNICEF), New York, NY <https://www.unicef.org/>
 - United Nations – Climate Change: List of NGOs with Observer Status with UNFCCC <https://unfccc.int/process-and-meetings/parties-non-party-stakeholders/non-party-stakeholders/admitted-ngos>
 - Asian Development Bank (ADB), Madaluyong (Metro Manila), Philippines <https://www.adb.org/>
 - World Bank – Environment, Washington, DC <https://www.worldbank.org/en/topic/environment>
 - Global Environment Facility (GEF), Washington, DC <https://www.thegef.org/>
 - Clean Development Mechanism (CDM) (under Kyoto Protocol), Bonn, Germany <https://cdm.unfccc.int/>
 - Green Climate Fund (GCF), Incheon, South Korea <https://www.greenclimate.fund/home>
 - Agence Francaise de Developpement (AFD), Paris, France <https://www.afd.fr/fr>

Non-Governmental Organizations (NGOs):

- International Centre for Integrated Mountain Development (ICIMOD), Katmandu, Nepal <http://www.icimod.org/>
- Climate Policy Initiative (CPI), San Francisco, CA <https://climatepolicyinitiative.org/>
- World Resources Institute (WRI), Washington, DC <https://www.wri.org/>
- Climate Leadership Council (CLC) (Online, no address) <https://www.clcouncil.org/>
- World Wildlife Fund (WWF), Washington, DC <https://www.worldwildlife.org/>
- National Council for Science and the Environment (NCSE), Washington, DC <https://www.ncseglobal.org/>
- Natural Resources Defense Council (NRDC), New York, NY <https://www.nrdc.org/>

- Environmental Defense Fund (EDF), Washington, DC
<https://www.edf.org/>
- Union of Concerned Scientists (UCS), Washington, DC
<https://www.ucsusa.org/>
- Citizens Climate Lobby (CCL), Coronado, CO
<https://citizensclimatelobby.org/>
- 350.org, Brooklyn, NY
<https://350.org/>
- Food and Water Watch, Washington, DC
<https://www.foodandwaterwatch.org/>
- International Development Research Centre (IDRC), Ottawa, Canada
<https://www.idrc.ca/>
- International Institute for Sustainable Development (IISD), Winnipeg, Canada
<https://www.iisd.org/>
- Oxfam International, Oxford, United Kingdom (Pakistan portal)
<https://www.oxfam.org/en/countries/pakistan>
- International Food Policy Research Institute (IFPRI) Washington, DC
<http://www.ifpri.org/>