EUROPEAN UNION

CSCCC

STAKEHOLDER RECOMMENDATIONS FOR CLIMATE CHANGE IMPLEMENTATION FRAMEWORK, SINDH

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EXECUTIVE SUMMARY

Pakistan is a textbook case of a country that contributes little to global GHG emissions, but faces atypical impacts. Pakistan accounts for only 0.8% of total global emissions[1], while the impacts of climate change have cost the country in terms of lives and the economy: Climate induced disasters between 1994 and 2013 resulted in an average economic loss of US$ 3.99 billion per annum. Between 2010-2014, flood events alone have led to losses of over US$ 18 billion, with 38.12 million people affected, 3.45 million houses damaged and 10.63 million acres of crops destroyed. Similarly the unprecedented heat wave in Karachi in 2015 resulted in the deaths of over 1200 people[2].

At the same time, Pakistan's emissions show a trend of increase, as its investments in economic growth bear fruit. Over the past 2 decades, the emissions grew 123%[3]. In a recent statement, Pakistan's minister for climate change stated that given the projected economic growth trajectory, emissions in Pakistan were expected to increase from 405 metric tons carbon dioxide to more than 1,603 metric tons of CO2 in the next 15 years - that means increasing by almost four times[4].

As Pakistan faces the dual pronged challenge of adapting to climate change while managing its carbon footprint, the government has upped its approach through a number of international, national and provincial measures to tackle the climate challenge. As well as being signatory to the Paris Climate Change Agreement 2015, Pakistan submitted a 'Nationally Determined Contribution' in 2015 to the UNFCCC secretariat, that commits a reduction in its carbon emissions by 20% by 2030, subject to financial support[5].

At the national level, the National Climate Change Policy (2012), its associated Implementation Framework (2014-2030), the Pakistan Climate Change Bill (2016) set out Pakistan's direction in tackling the climate challenge. At the same time, the provinces are steadily taking up the reins in through the development of policies and strategies to address the localized impacts of climate change.

In recognition of the increasingly important role played by the provinces in action on climate change at the local level, the Civil Society Coalition for Climate Change[6] in collaboration with the Ministry of Climate Change and Environment Protection Agency (EPA) Sindh, conducted a consultative workshop for developing recommendations for an institutional framework for achieving the objectives of climate change policies and frameworks at the provincial level. The workshop, titled 'Framing the Agenda for Climate Change: Consultative Dialogue,Sindh' was conducted at Committee Room, Sindh Secretariat, Karachi, on the 21st of December 2017.

The event featured robust participation from government, civil society, academia and the media. Following welcome remarks by Aisha Khan, C.E, Civil Society Coalition for Climate Change, the opening address was delivered by Mr. Baqaullah Unar, Secretary Environment, Sindh. Special remarks were delivered by Saadullah Ayaz, Ministry of Climate Change and Mr. Rizwan Memon, Chief Secretary, Sindh. The keynote address was delivered by Senator Sherry Rahman, Government of Sindh.

[1] Pakistan Nationally Determined Contribution to the UNFCCC, 2015
[2] ibid
[3] Pakistan National Environment and Economic Development Study (NEEDS), Ministry of Environment, 2010-2011
[4] http://www.theecologist.org/News/news_analysis/2989149/pakistan_to_quadruple_carbon_emissions_despite_feeling_pain_of_climate_change.html
[5] http://www4.unfccc.int/Submissions/INDC/Published%20Documents/Pakistan/1/Pak-INDC.pdf
[6] CSCCC is a licensed coalition (registered under Section 42 of the Companies Ordinance, 1984) dedicated to highlighting the subject of climate change in Pakistan and promoting informed climate action at the regional, national and subnational levels through research, knowledge-sharing, and advocacy.

The workshop was designed to strengthen capacity for planning, budgeting, implementation and monitoring of climate policies with timelines and benchmarks. The primary objective of the workshop was to improve civil society's capacity to work constructively with public authorities', building trust for partnership opportunities, and creating space for civil society to participate in policy dialogues that lead to inclusive, accountable and transparent approaches for effective governance that meet people's needs and boost free flow of information at the local and national level.

The workshop followed a whole of government approach and brought stakeholders from government, civil society, media and academia together to identify threats and opportunities and make recommendations on the way forward for developing an effective national response to climate action. This report presents a background of climate issues in Sindh, and documents the recommendations put forward by participants at the consultative dialogue on developing a Provincial Climate Change Implementation Framework in line with the National Climate Change Policy.

LIST OF ACRONYMS

ADB	Asian Development Bank
AEDB	Alternate Energy Development Board
ADBP	Agricultural Development Bank of Pakistan
AJK	Azad Jammu & Kashmir
AR	Annual Report
CADD	Capital Administration & Dev. Division
CBOs	Community Based Organizations
CC	Climate Change
CCI	Council of Common Interests
CDA	Capital Development Authority
CDG	City District Government
CETPs	Combined Effluent Treatment Plants
CO2	Carbon Dioxide
CSCCC	Civil Society Coalition for Climate Change
CSD	Conference on Sustainable Development
CSR	Corporate Social Responsibility
DDMAs	District Disaster Management Authorities
DMC	Domestic Material Consumption
DRR	Disaster Risk Reduction
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
EPD	Environmental Protection Department
EU	European Union
FAO	Food and Agriculture Organization
FATA	Federally Administered Tribal Areas
FC	Forman Christian
FDI	Foreign Direct Investment
FFC	Federal Flood Commission
Fig.	Figure
FI	Financial Institution
FPCCI	Federation of Pakistan Chambers of Commerce & Industry
GB	Gilgit Baltistan
GCISC	Global Change Impact Studies Centre
GDP	Gross Domestic Product
GHGs	Greenhouse gases
GHI	Global Hunger Index
GIS	Geographical Information System
GJ	Giga Joule
GLOF	Glacial Lake Outburst Floods
GoKP	Government of Khyber Pakhtunkhwa
GOP	Government of Pakistan
GPS	Global Positioning System
HDIP	Hydro Carbon Development Institute of Pakistan
HEC	Higher Education Commission
HPP	Hydropower potential
HTV	Heavy Transport Vehicle
ICM	Integrated Coastal Management
ICTs	Information and Communication Technologies
IEE	Initial Environmental Examination
IPCC	Inter-provincial Coordination Committee

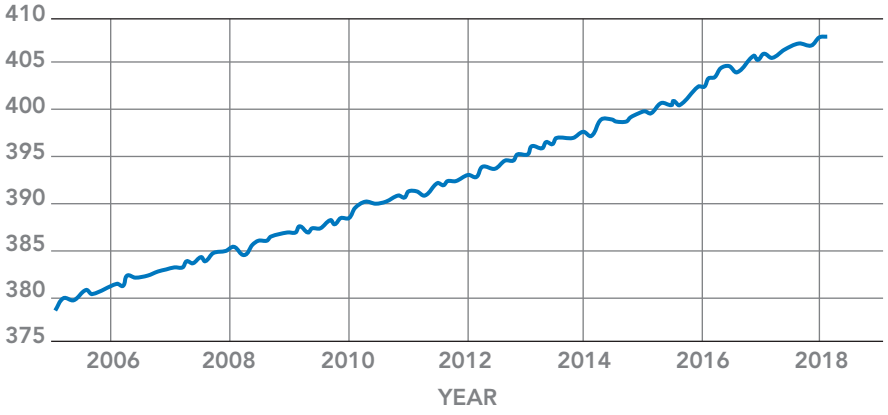
IPM	Integrated Pest Management
IRSA	Indus River System Authority
IUCN	International Union for Conservation of Nature and Natural Resources
IWMI	International Water Management Institute
IWRM	Integrated Water Resource Management
Kg	Kilogram
kl	kilo liters (1000 liters)
Km	Kilo-meter
KPK	Khyber Pakhtunkhwa
LG	Local Governments
LGRDD	Local Government, Elections and Rural Development Department
LPG	Liquefied Petroleum Gas
LTV	Light Transport Vehicle M/o Ministry of
MAF	Million Acre Foot
MDGs	Millennium Development Goals
MF	Material Footprint
MOCC	Ministry of Climate Change
MPCD	Marine Pollution Control Department
MRV	Measuring, Reporting, and Verification
MW	Mega Watt
NAP	National Action Plan
NARC	National Agricultural Research Council
NCCF	National Climate Change Fund
NCCP	National Climate Change Policy
NCPC	National Cleaner Production Center
NCS	National Conservation Strategy
NDMA	National Disaster Management Authority
NEECA	National Energy Efficiency and Conservation Authority
NEPRA	National Electric Power Regulatory Authority
NEQS	National Environmental Quality Standards
NGOs	Non-Governmental Organizations
NHA	National Highways Authority
NIE	National Implementing Entity
NIO	National Institute of Oceanography
NSDS	National Sustainable Development Strategy
OGP	Open Government Partnership
OECD	Organization for Economic Co-operation and Development
OGRA	Oil and Gas Regulatory Authority
PAEC	Pakistan Atomic Energy Commission
P&D	Planning and Development
Pak EPA	Pakistan Environmental Protection Agency
Pak-INDC	Pakistan's Intended Nationally Determined Contribution
PARC	Pakistan Agricultural Research Council
PC	Planning Commission
PCRET	Pakistan Council of Renewable Energy Technologies
PCRWR	Pakistan Council of Research in Water Resources
PCSIR	Pakistan Council of Scientific and Industrial Research
PDMAs	Provincial Disaster Management Authorities
PITB	Punjab Information Technology Board
PMD/MET	Pakistan Meteorological Department
PPP	Public Private Partnership
PPPA	Public Private Partnership Authority
PPRA	Public Procurement Regulatory Authority
Prov.	Province, including AJK, GB & FATA
PRSP	Poverty Reduction Strategy Paper

PSDP	Public Sector Development Program
PSLM	Pakistan Social and Living Standards Measurement
PSQCA	Pakistan Standards & Quality Control Authority
PTA	Pakistan Telecommunication Authority
R&D	Research and Development
REDD+	Reduction of Emissions from Deforestation and Forest degradation
Rs.	Rupees
SCP	Sustainable Consumption and Production
BCDA	Balochistan Coastal Development Authority
SDGs	Sustainable Development Goals
SEA	Strategic Environment Assessment
SERRA	State Earthquake Rehabilitation and Reconstruction Authority, AJK
SLM	Sustainable Land Management
SMEDA	Small and Medium Enterprise Development Authority
SMEs	Small and Medium Enterprises
SUPARCO	Space and Upper Atmosphere Research Commission
UN	United Nations
UNCSD	United Nation Conference on Sustainable Development
UN Environment	United Nations Environment Programme
UNESCO	United Nation Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
WAPDA	Water and Power Development Authority
WASA	Water and Sanitation Authority
WSSD	World Summit on Sustainable Development
WWF	World Wildlife Fund
ZTBL	Zarai Taraqiati Bank Limited

INTRODUCTION

Global research going back to 1824 in fields ranging through physics, oceanography, biology and geology have confirmed that human activity—mainly burning fossil fuels, raising livestock and destroying carbon sinks like forests and wetlands—is increasing greenhouse gas emissions and causing global temperatures to rise rapidly, putting humanity at risk. Every legitimate scientific academy and institution agrees that time is running out and urgent action is needed to keep temperature increase below 2 degrees Celsius.

However despite scientific evidence there is a disconnect between the reality of climate change and the priority given to it by the governments around the world in taking measures that are critical for keeping PPM rate below 3%. The Atmospheric CO2 is rising at an unprecedented rate. The consequences of this rapid increase are profound for earth's temperatures, climates, ecosystems and species, both on land and in the oceans.



Source: climate.nasa.gov

There is need for recognition from all stakeholders that overexploitation of natural resources and following unsustainable pathways to development that irrevocably disturb the balance between nature and human activity will put the planet at risk. While we need economic development there is an equal and urgent need to protect the environment, and develop pathways to resilience that allow both to thrive in tandem. It is possible to change the current economic but the finite resources of the planet cannot be enhanced to meet the needs of a human population that has increased to seven billion and rising in little more than a century. Scientific studies are unanimous in their conclusion that if use of fossil fuel is not reduced then it will be impossible to meet the Paris ambition of keeping global warming below 2 degrees Celsius.

Pakistan is among several countries whose carbon footprint is a fraction of global GHG emissions, but where the magnitude of climate induced stress has created disproportionate vulnerability on ground. As far as numbers go, Pakistan accounts for a mere 0.8% of total global emissions even as its carbon footprint has grown by 123 per cent over the last two decades against an average industrial growth rate of 5.33 per cent per annum between 1990-2017 .

Pakistan's industrial base and population have considerably expanded between 1990 and 2018, and correspondingly, the target increase of greenhouse gas emissions can be traced to the energy sector which accounts for 46 per cent of the national carbon count, followed by agriculture with 41 per cent and thereafter other sectors . Power generation for Pakistan's ever increasing energy consumption needs, and expanding transportation are expected to further drive up energy-based emissions. Meanwhile, there is a high dependency on agriculture that employs roughly half the national workforce and provides food security and bolsters GDP and export revenues.

Even greater is Pakistan's reliance on the Indus river system that supports agriculture, and provides water to meet the industrial and domestic needs of the country. Between 2010-2014, repeated megaflooding across the Indus rivers cost a staggering US$ 18 billion in damages, affecting 38.12 million people, destroying 3.45 million houses and 10.63 million acres of crop. Climate related losses averaged US$ 3.99 billion each year between 1994 and 2013 rolling back what modest economic gains were made during the 1990s.

The stresses of climate change are all too evident in Pakistan and the region at large. Accelerated melting of glaciers, erratic monsoons, frequency of extreme weather events such as flash floods and heat waves have a massive cumulative impact on Pakistan's poor climate resilience and governance mechanisms. In 2015, Pakistan requisitioned US$ 40 billion abatement cost in mitigation and 7- 14 million USD to meet adaptation needs as part of it its Nationally Determined Contribution, projecting an increase from 405 metric tons carbon dioxide to more than 1,603 metric tons of CO2 in the next 15 years.

Rational

Recognizing the crucial mandate available to provinces to implement climate action, the Civil Society Coalition for Climate Change (CSCCC) collaborated with the Ministry of Climate Change (MoCC) and the Environmental Protection Agency Sindh(EPA) to conduct a consultative workshop to formulate policy recommendations that help construct an institutional framework for achieving the objectives of climate change policies at the state level.

In order to develop a framework that feeds into existing policies and also reflects Sindh's specific short and long term concerns, the approach was aligned with the National Climate Change Policy to construct sector specific templates for developing a sub-national framework of activities that dovetail with the National Climate Change Policy and Implementation Framework. A template for Monitoring, Reporting and Verification Framework was also developed to facilitate measuring progress on indicators. The templates were shared with Sindh government for review and comments before circulation to all the participants ahead of the workshop to help stakeholders make a more meaningful contribution to the process (templates in annexure).The workshop format was designed for co creation of policy and engaged all key stakeholders from public sector and civil society to provide consensus based recommendations on sector specific thematic areas.

DEMOGRAPHIC PROFILE SINDH

The third largest province of Pakistan by area, and the second largest by population, Sindh is home to Pakistan's largest city, with Karachi, with the third highest population in the world. The population of Sindh was recorded at around 47 million, and occupies a land area of 14.091 million ha (34.81 million acres), with a population density of around 340/km2. The province forms the 'lower indus basin' and covers 1,40,915 square kilometres.

The province is divided into 'Divisions', namely Karachi, Hyderabad, Sukkur, Mirpurkhas and Larkana with their respective districts, while two new divisions namely Banbore and Nawab Shah/Shaheed Benazirabad. These are then further divided into 29 districts, 6 of which are Karachi.

In terms of the GDP and economy, Sindh is the second largest economy in Pakistan, and its coastal ports play a large role in this, as well as its manufacturing industry and agriculture. The province has 2 sea ports, both located in Karachi, and contribute to its economic activity.

	Urban	Rural	Total
Population	24910458	22975593	47886051
Male	13007937	11919109	24927046
Female	11900295	11056183	22956478
Transgender	2226	301	2527
Household	4185828	4399782	8585610

Employed 10+		2007-2008	2010-2011	Change 2007-2008 to 2010-2011 (percentage points)
Agriculture				
	Both Sexes	46.13	45.74	-0.39
	Males	39.45	39.19	-0.26
	Females	84.53	79.92	-4.61
	Urban	5.46	3.6	-1.86
	Rural	75.47	75.37	-0.1
Industry				0
	Both Sexes	12.23	12.64	0.41
	Males	13.5	14.18	0.68
	Females	4.95	4.64	-0.31
	Urban	24.55	25.49	0.94
	Rural	3.34	3.61	0.27
Services				0
	Both Sexes	41.54	41.62	0.08
	Males	46.95	46.64	-0.31
	Females	10.48	15.44	4.96
	Urban	69.77	70.91	1.14
	Rural	21.18	21.02	-0.16
All Sectors				
	Both Sexes	100	100	
	Males	100	100	
	Females	100	100	
	Urban	100	100	
	Rural	100	100	

Figure 1: Pakistan Labour Force Survey 2010-2011

Literacy Ratio	1981	1998	2014-2015
Sindh	31.45	45.29	63.0
Male	39.74	54.50	73.9
Female	21.64	34.78	50.7
Urban	50.77	63.72	79.6
Rural	15.56	25.73	45.0

Literacy rates in Sindh, while improving are still low, with the difference between male and female literacy at 13%. 8% of the total area of the province is under the control of the Sindh Forest Department, which makes up 2.782 acres of the total land area, which includes the protected areas of mangroves and rangelands, which are an important ecological resource.

As the province relies heavily on the development of industries, as well as facing a rapid population increase, the electricity demand in the province is extremely high, and relies almost solely on fossil fuel energy to meet its demand.

The long term average precipitation, recorded over a period of 50 years from 1960 to 2010 was noted at 160 mm (Pakistan Meteorological department). The province is a drought prone area with occasional surplus extremes that result in floods. The province lies between two monsoons- the southwest monsoon from the Indian Ocean and the northeast or 'retreating monsoon' deflected toward it by the Himalayan mountains. Sindh is in a subtropical region, meaning it is hot in the summer and cold in the winter, with temperatures frequently rising above 46 degrees between May and August, while a minimum of 2 degrees occurs during December and January.

The Indus is an important source of water for the province- of the total length of 2880 km of the Indus river, one third (about 944 ms) transverses the province. Agriculture in the province, given the meagre rainfall, relies heavily on the indus for its sustenance. Cotton, rice, wheat and sugarcane are some of the major crops cultivated in the province.

Other than the seaports, the waters around Karachi are highly productive with rich marine biodiversity that contribute to the ocean economy.

PROVINCIAL CLIMATE PROFILE

The province of Sindh can be divided into 3 regions

i. The central alluvial region- this area has a number of water sources, making the area fertile and largely irrigated. The region is home to the riverine forests of Sindh.

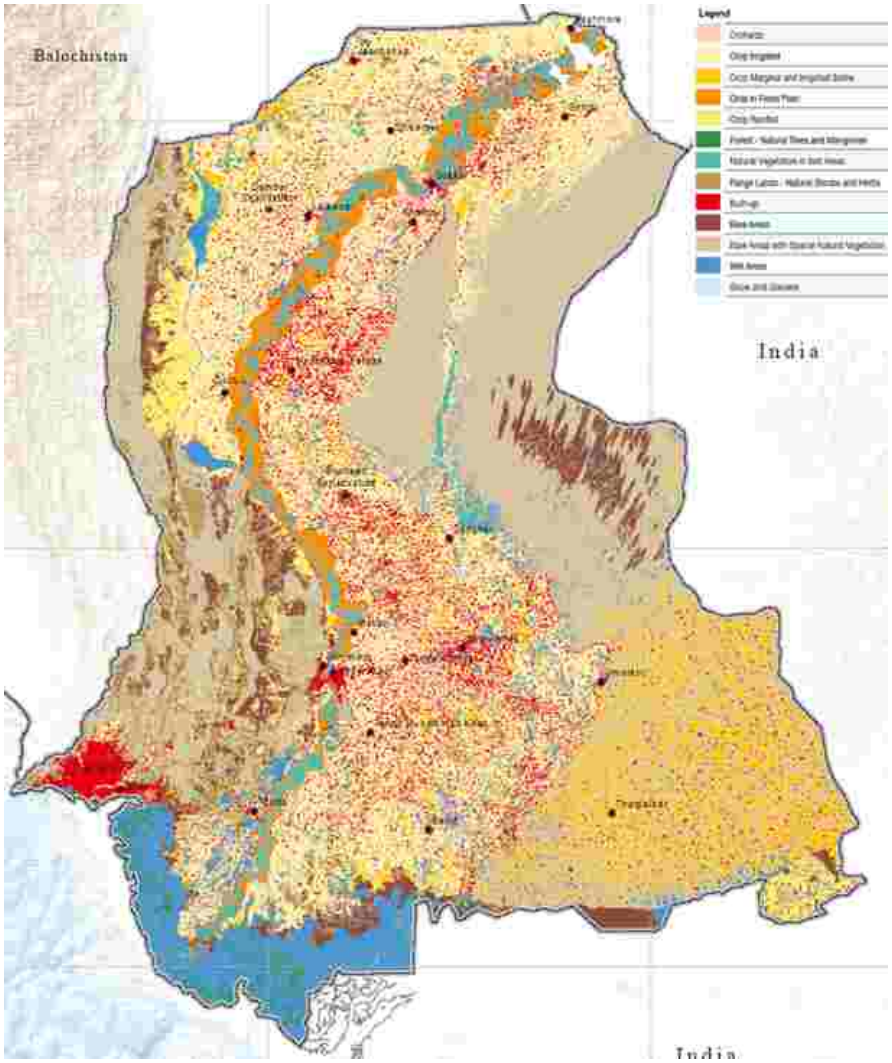
ii. Eastern Sandy Region- this region is home to the Thar Desert, in the eastern part of the province.

iii. Western Rocky Region- Home to the Kirthar Range, the area is mostly rocky and barren due to the lack of a water source.

The diverse topography of the province, including its coastline, make it vulnerable to a wide range of climate change impacts. In 2016 alone, the Pakistan Meteorological Department reported that rainfall was 82.76% below normal in the already dry province. At the same time, the frequency of extreme maximum temperature events is increasing in Sindh. A study of the mean temperatures in Pakistan between 1960-2007 showed a warming trend of 0.09 degrees in Sindh over the period (PMD). At the same time, Sindh is vulnerable to Sea Level Rise (SLR) due to its tidal flat topography and higher population concentration in the coastal areas, particularly those where industrial activities are concentrated. A 2 metre SLR is expected to submerge 7500 sq km in the Indus Delta (ADB 2017).

Impact of Climate Change in Sindh

Sindh is already experiencing both the fast and slow onset manifestations of climate change, in the form of sea level rise, extreme weather events, and variations in temperature and rainfall patterns. These changes are likely to impact some of its most vital sectors, and due to its high population, particularly in the mega city of Karachi, as well as uneven human development across the province, its vulnerability to climate change is high.
Agriculture and Livestock



Close to half of Sindh's population is involved in the agriculture sector for its subsistence and livelihood. 14% of the province relies on irrigation for its water needs, while the remainder rely on rainfall (Government of Pakistan, Bureau of Statistics, Agricultural Statistics of Pakistan 2010-2011). 0.551 Mha of the land relies on spate irrigation. Crops in both irrigated areas and those under spate farming systems are sensitive to variations in water and temperature. An estimated rise of temperature between 0.5 degrees and 2 degrees will cause agricultural productivity to decrease by around 8 to 10% by 2040 (ADB, 2017).

Similarly, a large proportion of Sindh's population is involved in the livestock sector, with estimated 60% of land used as rangeland throughout Pakistan. Studies suggest that climate change will degrade grazing systems such as pastures and grazing lands due to drought, floods, decrease in fodder quality and quantity, and increase in disease epidemics.

Energy

Sindh has enormous potential for renewable energy due to the high number of sunlight days leading to potential for solar energy, as well utilizing wind corridors for power generation. Through the China Pakistan Economic Corridor (CPEC), A 50 mw wind farm is being developed in Gharo, Thatta, as well as a 100 MW wind farm in Jhimpir, Thatta, and another in the same area worth 50 MW. At the same time, investments in coal based energy include the 1320 MW coal fired power plant in Thar, and three more worth 660, 330 and 330 MW Coal and Lignite fired power plant projects in the same area, and 2* 660 MW coal fired power plant at Port Qasim, Karachi.

The energy mix in Sindh consists entirely of fossil fuel for power generation, to meet the demands of a growing population and industrial sector, the energy demand is expected to rise. While the investments in alternative energy are encouraging, there is a need to pursue these more aggressively rather than the heavy investments in dirty energy.

Health

Climate change will exacerbate existing inequalities and impact safe drinking water, clean air, sufficient food and secure shelter, the environmental and social determinants of health (ADB 2017). This will play out through extreme heat events, natural disasters and variable rainfall patterns.

Sindh's health sector has already experienced some of these manifestations of climate change. The heat wave in Karachi in June 2015 reportedly lead to a death toll of 1200 persons in the city, as well as taking the lives of approximately 200 people in the rest of the province. The total number of primary healthcare facilities in Sindh was noted as being less than 2000, more than 1400 of which are BHUs and dispensaries. Secondary health care facilities are noted as being 90 for serving the entire province.

As the province continues to grow in population, and extreme weather events increase in frequency and intensity the corresponding risks to health and capacity to respond to climate change will be challenged.

Water

Sindh's climate is generally arid, receiving only 6-7 inches of rainfall per year, with occasional pockets of heavy rainfall that lead to flooding and disasters. The province relies heavily on the monsoon rainfall as a contribution to its hydrology, making it prone to drought with serious implications for its agricultural sector. Water scarcity is already a very real problem in Sindh, with more than 30% of households accessing water from potentially unsafe sources on average, and high drought and extremely water scarce areas, this number goes up to 42% and 41% respectively. As groundwater in downstream Sindh is mostly saline, there is a heavy reliance upon surface water for irrigation and domestic use.

With increasing stresses upon its water sector, which is crucial to the population and economy of the province, water availability per capita in the province is low, and with its growing urban population, this is predicted to increase. All these factors are indicative of a serious situation that can result in a humanitarian crisis and requires urgent planning to meet the immediate and long term needs of a megapolis.

Forests and Environment

Of a total 34.81 million acres of Sindh's land area, 8% (2.782 million acres) is controlled by the Sindh Forest Department. Forests are divided into

productive and protected categories- with riverine forests and irrigated plantations making up the former and covering only 2.29% of the area. The protected forests, which consists of mangrove forests and rangelands, are threatened not only by deforestation, but also by the environmental stressors such as variations in freshwater availability and environmental flows, sea level rise etc.

The Indus Delta alone supports 97% of Pakistans total mangrove forests, and is home to over one million people, 135000 of which depend on mangroves for their livelihoods (ADB 2017). In addition to the direct impacts on those reliant on mangroves and other forests for their livelihood, forests are an important ecological resource, and biome, housing much of the provinces biodiversity, and serving as a carbon sink. The rapid depletion of forests in Sindh will contribute to ecological degradation and associates goods and services that contribute to social and economic wellbeing of communities and ecosystems.

Coastal Areas

Sindh is vulnerable to Sea Level Rise (SLR) due to its tidal flat topography and higher population concentration in the coastal areas, particularly those where industrial activities are concentrated. A 2 metre SLR is expected to submerge 7500 sq km in the Indus Delta (ADB 2017). Population concentrations in these areas are high due to the industrial activity in the area, and many of the communities rely on the rich aquaculture for their livelihood through fishing and related services.

At the same time, the coastal areas are home to the mangrove forests, an important ecological resource that is threatened by deforestation and SLR, as well as changes in temperature and rainfall. Cyclones and Typhoons are already threatening the coastal belt of Pakistan, and increasing vulnerability.

ARCHITECTURE OF POLICIES GOVERNING CLIMATE CHANGE

The Sindh province is particularly vulnerable to the impacts of climate change, particularly given its varied topographical features ranging from coastal areas to deserts, and its high concentration of urban areas, contrasted with rural communities. The province is home to Karachi, one of the largest megacities in the world, with high numbers living on the coastline. Sindh is faced with a unique set of climate related challenges due to these factors, and is taking steps to strengthen its ability to respond to these challenges.

For this purpose, the Government of Sindh established an Environment, Climate Change and Coastal Development Department, which is dedicated to tackling and implementing policies relating to climate and environment. This department is housed within the Environment Protection Agency, and in February 2014, the legislative assembly of Sindh passed a bill to enact the Sindh Environment Protection Act, which 'envisages protection, improvement, conservation and rehabilitation of environment of Sindh with the help of legal action against polluters and green awakening of communities. It equally lays emphasis for the preservation of the natural resources of Sindh and to adopt ways and means for restoring the balance in its eco-system by avoiding all types of environmental hazards'. At the same time, the EPA is in the process of developing its provincial climate change policy.

PROCESS OF PREPARATION OF IMPLEMENTATION FRAMEWORK

The CSCCC secretariat engaged in a pre-workshop consultation with the EPA on the 22nd of November 2017. In this consultation, CSCCC met with key personnel from the EPA department to narrow down the scope of the Consultation, refine its objectives, identify key themes for discussion. In order to ensure a participatory and inclusive approach for the co creation of this document, EPA was requested to nominate officials from government departments linked to climate and environment, while CSCCC would be responsible for the participation of key stakeholders from civil society, academia and private sector.

The inception dialogue was conducted at two levels to develop a broad based constituency of support for the workshop objectives. The CSCCC delegation called on the Secretary, Environment, Climate Change and Coastal Development, Mr. Baqaullah Unar, in Karachi, along with related line departments, to apprise them about the purpose of organizing the workshop and the expected outcome of the session. A meeting was also held at the EPA and FC College with participation from relevant line departments to share proposed agenda and receive input from department representatives. CSCCC followed a 'Whole of Government Approach' to build consensus on objectives, identify thematic areas and share program methodology. Focal persons from both sides were nominated and roles and responsibilities were distributed with mutual consent to streamline activities.

Concurrently, following a review of the National Climate Change Policy, the National Implementation Framework for the Implementation of the Climate Change Policy, CSCCC developed a set of tools to be implemented during the workshop, i.e. Implementation Framework tool to identify quantifiable actions in line with existing policies, and an MRV Framework to match the identified actions with measurable monitoring indicators. These tools were reviewed by the Sindh government as well as CSCCC's roster of experts before finalization. CSCCC then developed a set of reference materials for each group in the consultative workshop, drawing from the existing policies and SDGs, to ensure that the consultative dialogues were in line with national policies

Workshop methodology

The structure and design of the workshop was built on the concepts of the Lima-Paris Action Agenda and anchored in the principles of the Open Government Partnership (OGP) that highlight the importance of civil society and emphasizes the need for engagement with policy makers in framing policies that are representative, participatory and inclusive. The workshop brought together policy makers and relevant stakeholders from the government, civil society, academia, private sector and the media to set the climate change agenda for Sindh contextualised in its adaptation and mitigation needs. The inaugural plenary speakers focused on challenges and policy priorities taking into account shared sector specific constraints peculiar to the local geography and topographical range. The threats and opportunities were shared with the audience/participants to amplify concerns and suggest solutions on way forward.

The workshop session was divided into six working groups and tasked with the development of an Implementation and Monitoring, Reporting and Verification Framework aligned with the goals of the National Climate Change Policy and Framework. Effort was also made to identify compatible activities that dovetail seamlessly with the SDGs and help in building complementary synergies. Each working group comprised of representatives from the government and civil society and was gender balanced to make it participatory and inclusive. The six thematic area for the working groups were based on the key areas of focus in the National Climate Change Policy.

i) Agriculture and Livestock
ii) Disaster Risk Reduction
iii) Health
iv) Water
v) Energy
vi) Environments and Biodiversity.

The recommendations of each table were captured in writing and documented for an accurate compilation of ideas to develop a roadmap for future action. The deliberative exercise and interactive session was successful in preparing a list of suggested activities with timelines to prioritise needs (longterm -short term-high-low) and identifying potential sources of finance and implementing partners. The collaborative strategy was designed to foster collective ownership and responsibility for planning, implementing and monitoring policies to strengthen climate governance. Existing sources of information and data were used to establish baseline and make future projections.

Impacts of climate change on water availability

In terms of drinking water, overall 30% of the households across Sindh access water from potentially unsafe and 70% from potentially safe water sources. The proportion of households accessing water from potentially unsafe sources is the highest in Tharparkar (68%) followed by 52% in Mirpurkhas and 44% in Thatta[1].

There are also issues in the water infrastructure in the province that exacerbate the water scarcity in the province. Reportedly, a makority of households (81.1%) are not connected to a drainage system whereas 11% and 8% are connected to underground/covered drains and open drains respectively. Existing inequalities are exacerbated as minority communities are not connected to sanitation systems. The lack of drainage system contributes to the spread of diseases such as diarrhea, especially among children.

Figure 3: Distribution of Surveyed Households by Water Scarcity

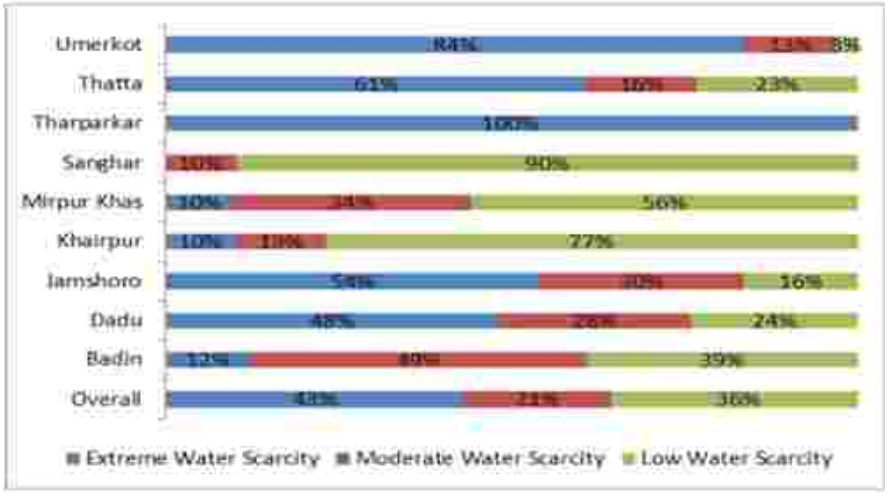


Table B12: Main drinking water source by district

	Overall	Badin	Dadu	Jamshoro	Khairpur	Mirpurkhas	Sanghar	Tharparkar	Thatta	Umerkot
Potentially safe	70%	87%	92%	63%	94%	48%	84%	32%	56%	72%
Potentially unsafe	30%	13%	8%	37%	7%	52%	16%	68%	44%	28%

[1]https://reliefweb.int/sites/reliefweb.int/files/resources/sdna_final_report_august_2016.pdf

Implementation Framework

Strategy 1: Develop and strengthen relevant institutions, policies and frameworks to promote integrated water resource management with special focus on implementation of rules and regulations, financial mechanisms and capacity building

Actions	Target	Priority	Potential/ Sources of Financing	Implementation Institutions Partners	Indicative Timeline	Estimated Budget (USD-Million)
Initiate development of Sindh Water Policy on integrated water resource management (IWRM) approach	To develop a special unit for the development of policy.	High/Short-term	Sindh Planning and Development (P&D)'	Sindh Planning and Development) P&D)	1 YEAR	1
Launch awareness program for implementation of National Drinking Water Policy and National standards for drinking water at all levels.	Awareness through media, community engagement, civil society support, sensitization of the business community.	High/Short-term	Sindh Planning and Development)P&D)	Local Government Elections and Rural Development Department (LGRDD)	1 YEAR	1
Invest in use and manufacture of water efficiency equipment's (fixtures and appliances).	Setting minimum standards for using water efficient equipment	Medium-term	LGRDD. Sindh Technical Education and Vocational Training Authority (TEVTA), National Vocational & Technical Training Commission (NAVTTC)	LGRDD. Sindh Technical Education and Vocational Training Authority(TEVTA), National Vocational & Technical Training Commission (NAVTTC)	3 YEARS	1
Minimizing system losses by improving operational management of canal system for wet, average, and dry season scenarios and by monitoring of water discharges at mogaaz	Measuring and monitoring the losses and developing innovative methods to minimize it.	Medium-term	Sindh LG (Local Government) & RDD (Rural Development Department)	Sindh LG (Local Government) & RDD (Rural Development Department)	2 YEARS	10

Legislate and enforce principle "polluter pays" for water polluting industries.		High/Medium-term	Sindh Planning and Development, Sindh Industries and Commerce Department, Ministry of Water and Power, Planning and Development, EPA	Sindh Planning and Development, Sindh Industries and Commerce Department, Ministry of Water and Power, Planning and Development, EPA	2 YEARS	10
Encourage water metering and effective control over wastage of municipal water.		Medium-term	LGRDD, WASA	LGRDD, WASA	3 YEARS	5
Strategy 2: Develop and strengthen relevant institutions, policies and frameworks to promote integrated water resource management with special focus on implementation of rules and regulations, financial mechanisms and capacity building						
Encourage the recycling and reuse of agricultural, industrial and domestic wastewater through efficient and cost-effective scientific techniques such as bio-remediation, sand filtration, reverse osmosis, etc.	Increase the water availability	High/short-term	Sindh LG & RDD, Ministry of Water and Power, Planning and Development Department, PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES (PCRWR), Public Health Engineering Department PHED	Sindh LG & RDD, Ministry of Water and Power, Planning and Development Department, PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES (PCRWR), Public Health Engineering Department	1 YEAR	12
Initiate Programs for monitoring of groundwater, including its quality, quantity, withdrawal, and recharge potential	Initiate groundwater policies.	High/medium-term	Sindh EPA, PCRWR	PHEDSindh EPA, PCRWR	2 YEARS	10
Adoption of high-efficiency irrigation system techniques, e.g. sprinkle and drip irrigation		High/medium-term	Agricultural Department		3 YEARS	10

MRV Framework

Actions	**Indicators**	**Baseline** *(What is the current value?)*	**Target** *(What is the target value?)*	**Means of** *Verification (How will it be measured?)*	**Frequency** *(How often will it be measured?)*	**Responsibility (Who will measurer?)**	**Reporting** *(Where will it be reported?)*
Initiate development of Sindh Water Policy on integrated water resource management (IWRM) approach	To create a special unit for the development of policy.	0	1 Provincial Policy	Implementation of Policy	Annually	Sindh Planning and Development (P&D)	Annual provincial development report.
Launch awareness program for implementation of National Drinking Water Policy and National standards for drinking water at all levels.	Awareness campaign after every month in different districts on Sindh	15 awareness campaign	30	Measure the outcomes and benefits of these campaigns. Initiatives after the campaign	Quarterly	Local Government Elections and Rural Development Department (LGRDD).	Annual provincial development report.
Invest in use and manufacture of water efficiency equipment's (fixtures and appliances).	Number of equipment installed.	0	100	How much water is saved by using this equipment. Baseline survey and survey after	Annually	LGRDD. Sindh Technical Education and Vocational Training Authority (TEVTA), National Vocational & Technical Training Commission (NAVTTC)	Annual report.
Minimizing system losses by improving perational management of canal system for wet, average, and dry season scenarios and by monitoring of water discharges at mogaaz Legislate and enforce principle "polluter pays" for water polluting industries.	Methods to improve operational management canal system.			How many systems have been improved	Annually	Sindh LG (Local Government) & RDD (Rural Development Department)	Annual report

Actions	Indicators	Baseline *(What is the current value?)*	Target *(What is the target value?)*	Means of *Verification (How will it be measured?)*	Frequency *(How often will it be measured?)*	Responsibility **(Who will measurer?)**	Reporting *(Where will it be reported?)*
	Minimum 100 polluters should be identified.	0	100	Check if the identified polluters paying or not	Quarterly	Sindh Planning and Development, Sindh Industries and Commerce Department, Ministry of Water and Power, Planning and Development, EPA	Annual Report
Encourage water metering and effective control over wastage of municipal water.	Measure volume of water used by residential and commercial buildings that are supplied with water by a public water supply system	0		Annually analysis of which sector use the most water and how can it be reduced.	Annually	LGRDD, WASA	Annual Report
Encourage the recycling and reuse of agricultural, industrial and domestic wastewater through efficient and cost-effective scientific techniques such as bio-remediation, sand filtration, reverse osmosis, etc.	How much water is recycled				Annually	Sindh LG & RDD, Ministry of Water and Power, Planning and Development Department, PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES (PCRWR), Public Health Engineering Department PHED	Annual Report
Initiate Programs for monitoring of ground water, including its quality, quantity, withdrawal, and recharge potential	One program in each district		29		Annually	Sindh EPA, PCRWR	Annually

DRR and Climate Change

Sindh is vulnerable to a number of climate related extreme events, most notably, the 2011 floods in the province, originating due to the monsoon rainfall, with an estimated loss of 434 human lives, and 5.3 million people affected and impacted 1,524,773 homes, and inundated 1.7 million acres of arable land, causing extensive damages to the economy and infrastructure. Health issues arising from this disaster included gastroenteritis and malaria. Similarly, the heatwave in Karachi in 2015 caused up to 1500 recorded deaths in the city, and 200 in other citiesin Sindh. As temperature and precipitation continue to vary in the province, these disasters are expected to increase.
The notable climate extremes in Sindh include floods, droughts, heat waves and cyclones. Floods in Sindh can be linked to erratic rainfall patterns, rapid glacier melting due to temperature rise which impacts the flow of water in the rivers downstream. In addition, cyclones and storms that bring moisture inland from the oceans also cause flooding, as well as hurricanes. One of the predominant factors however is the monsoon rainfall that is becoming increasingly intense, leading to flash flooding. Because the River Indus runs through the province with waters from the 5 rivers, the canal irrigation network and interrupted drainage systems contribute to the flooding in the province.

Floods, Flash Floods :

Frontal storms form at the front of large, moist air masses moving across the country and can cause floods. Hurricanes are intense tropical storms that can cause floods. Heavy rains the monsoon season every year originated flash floods and drainage usually over spills during the season, causing havoc to people, livelihoods and property downstream.

The confluence of River Indus after receiving water from 5 rivers' system, the Canal Irrigation Network and Interrupted Drainage System are some of the major reasons of flooding in Sindh province. The upper regions of the Sindh Province constitute the Districts of Kashmore, Shikarpur and Larkana on the right bank of River Indus and Ghotki, Sukkur, Khairpur, Naushahro feroze and Shaheed Benazirabad on the left bank of River Indus. These Districts on the right and left of River Indus face a severe threat due to their proximity to the inner bank. owing to passage of River Indus. The districts in the lower Sindh, prone to Riverine flooding includes Dadu, Jamshoro and Thatta on the right bank of River Indus and Tando Muhammad Khan, Matiari, Hyderabad and Sujawal. The length of River Indus through the province is 750 kms. Districts of Jacobabad, Kambar Shahdadkot, Larkana, Dadu, Jamshoro and Karachi East District, are also vulnerable to hill torrents which cause flash flooding, the early warning possibility for which is very minimal. According their intensity and causes the floods in Sindh can by classifies in to different categories like

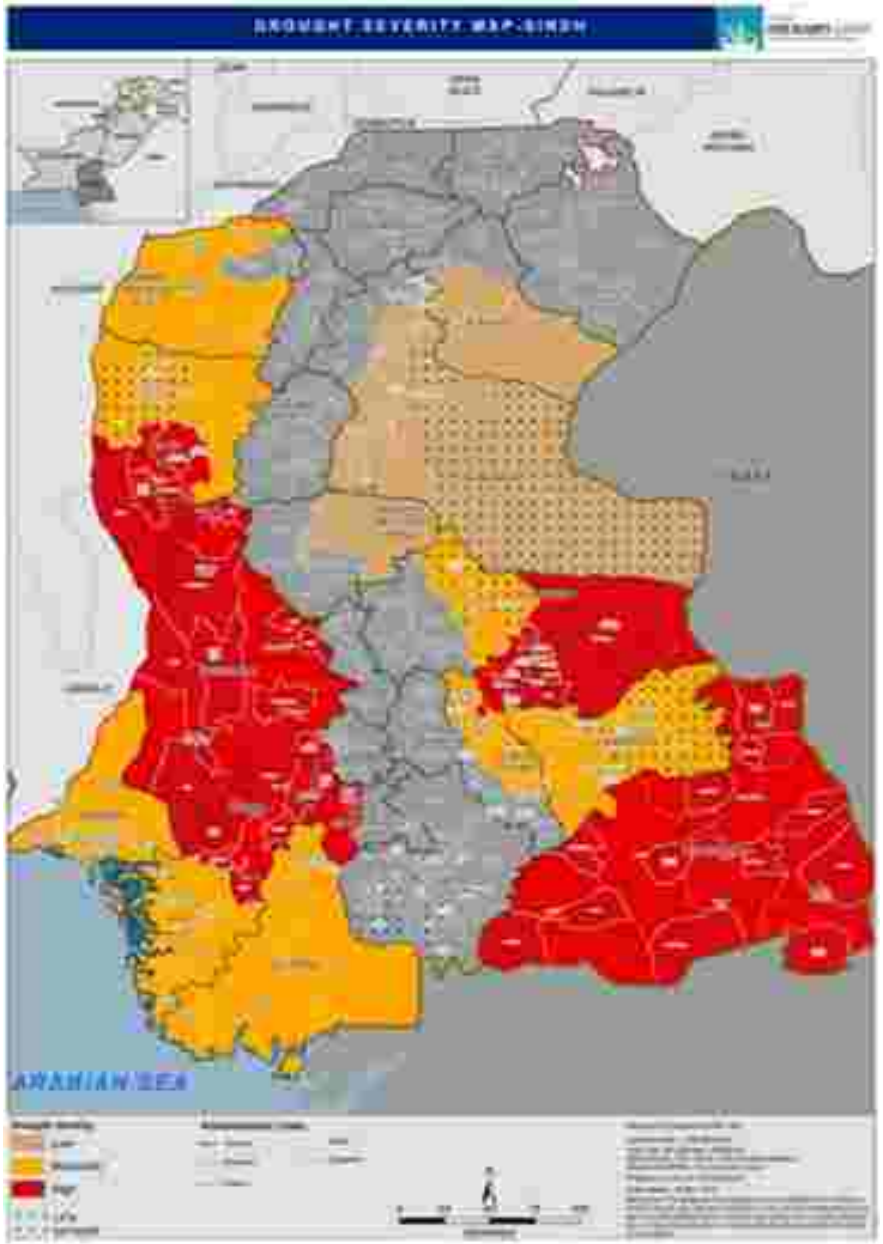
- Monsoon Floods
- Flash Floods
- Urban Floods
- Coastal Floods

History of Past Flood Events

Year	Deaths	Injured	Houses Destroyed	Houses Damaged	People Affected	Cattle Lost	Villages Affected
2013	47	43	14095	21400	534834	88	3068
2012	280	3687	116849	247851	3088970	849	12915
2011	462	756	608579	694519	8634995	104277	36008
2010	475	837	372089	245872	8065846	398769	13649
2008	40	29	3583	13026	0	219	0
2006	162	0	0	113475	1570881	5	95
2003	407	235	0	246464	831157	3618	3243
1995	114	0	21189	0	504455	1397	823
1994	264	0	129387	35554	690035	6090	7894
1992	232	0	239238	269085	0	66512	0
1988	8	0	0	16445	175000	25	1

Sindh is also prone to drought due to its arid landscape. Notably, the drought from 2007-2014 in Tharparkar and its adjoining districts took a heavy toll on the lives and livelihood of the affected population. Additionally, malnutrition and the outbreak of waterborne diseases affected the health and reduced productivity.

Heat wave incidents are also on the rise in the province as studies show the increase in incidents of warmer days. Due to a 45 degree temperature in Sindh, coupled with zero wind activity, high humidity, poor infrastructure and power outages in 2015, Karachi faced a heatwave that led to 1500 deaths and 70,000 people hospitalized. The Pakistan met department suggests that this is a trend that is likely to continue throughout Pakistan as temperatures in the Arabian Sea are showing gradual rising trends.[1]



Implementation Framework

Actions	Target	Priority	Potential/ Sources of Financing	Implementation Institutions Partners	Indicative Timeline	Estimated Budget (USD-Million)
Strategy 1: Incorporate hazard mitigation policies						
Prepare an integrated natural hazard zoning map	All Province	High	PDMA	PDMA P&D Department	2 Year	5
Identify low floods risk areas for future land use planning.	All Province	High	PDMA Irrigation Departments Ministry of Water & Power	PDMA P&D Department Irrigation Departments	1 Year	1
Identify safe areas for evacuation of people and livestock in each vulnerable locality	All Province	High	PDMA	PDMA P&D Department	1 Year	1
Update river laws to protect Streams, rivers banks and its flood plain areas from encroachments	All Province	Medium	PDMA Communication, works, Physical Planning and housing department	Communication, works, Physical Planning and housing department	5 Year	1
Strategy 2: Public Awareness And Media Contribution						
Develop a Provincial Media Strategy on DRR	All Province	High	PDMA	Information Department, PDMA, Media Houses, Community	3 Year	5
Conduct special emergency handling situation training programs for NGOs and volunteer organizations	50 NGOs	Medium	National and International Donors PDMA	PDMA	3 Year	5

Conduct special awareness campaigns for different segments of society and particularly for those communities living in vulnerable areas, through radio, TV, print media and participatory workshops	25 Districts of Sindh	Medium	Information Department, PDMA, Media Houses, Community	Information Department, PDMA, Media Houses, Community	4 Year	3
Develop climate change curricula with particular emphasis on Disaster Risk Reduction (DRR) and introduce it into formal education system at all levels.	All Province	High	Education Department Local and international Donors P&D Department PDMA	Education Department PDMA	3 Year	2
Strategy 3: Strengthening the Early warning system						
Improvement in real-time meteorological and hydrological data collection and processing for understanding natural processes and evolving disasters.	All Province	High	PDMA Science & Information Technology, PAK-MET GCISC	PDMA PAK-MET	2 Year	10
Development of SOPs for line department for DRR	All line departments	High	Line departments	PDMA P&D	3 Year	0.5
Upgrade and expand weather monitoring station network in the Province	All province	High	PDMA PAK MET	PAK MET	5 Years	20

Actions	Target	Priority	Potential/ Sources of Financing	Implementation Institutions Partners	Indicative Timeline	Estimated Budget (USD-Million)
Establish regional flood forecasting and warning centres at divisional Level	All province	High	PAK MET Irrigation	PAK MET	5 Years	5
Strategy 4: Reduction in the disastrous impacts of cyclones and tsunamis.						
Get local community organizations involved in building and maintaining vegetative barriers in the coastal areas	25 CSO	Medium	National and international Donors	PDMA Forest	5 Years	3
Initiate campaigns to plant mangroves, coastal palm and other trees suitable for coastal areas to control sand and soil erosion	15 Campaigns/ Year	Medium	National and international Donors	PDMA Academia Forest P&D	5 Years	12
Redesign and construct cyclone shelters in vulnerable coastal areas using bioengineering techniques	25 cyclone Salters on Sindh Costal line	Medium	PDMA Works & Services Department P&D Department National and international Donors	PDMA	5 Years	10
Strategy 5: Invest in disaster resilient infrastructure						
Plan, design, construct and strengthen appropriate flood embankments, dykes, protective bunds to protect flood plains	Construct flood embankments, dykes, protective bunds to protect flood plains at 80% flood vulnerable spots.	High	PDMA Irrigation Department P&D Department National and international Donors	Irrigation	5 Years	20
Construction of Resilient multipurpose school Building	10 per district	High	Education P&D	Education	3 Years	25

MRV Framework

Strategy #1	Actions	Indicators	Baseline	Target	Data Source	Frequency	Responsibility	Reporting
Incorporate hazard mitigation policies	Prepare an integrated natural hazard zoning map	# of Natural hazard maps prepared by each district	No hazard Mapping available	All districts	DDMA	Every Six Month	PDMA PAK MET P&D	Province Natural Hazard Mapping Report
	Identify low floods risk areas for future land use planning.	# of areas flood risk areas for future land use planning	No hazard Mapping available	All landslide vulnerable areas	DDMA	Every Year	DDMA	Health disaster management report.
	Identify safe areas for evacuation of people and livestock in each vulnerable locality	# of safe areas for evacuation of people and livestock in each vulnerable district	No baseline available	All districts of province	DDMA	Every six month	DDMA	District disaster risk reduction plan
	Update river laws to protect Streams, rivers banks and its flood plain areas from encroachments	# of updated laws	No baseline available	All districts of province	PDMA Irrigation department	Every six month	DDMA	Province Natural Hazard Mapping Report
Strategy #2	**Actions**	**Indicators**	**Baseline**	**Target**	**Data Source**	**Frequency**	**Responsibility**	**Reporting**
Public Awareness And Media Contribution	Develop a Provincial Media Strategy on DRR	Media strategy on DRR	There is media strategy for DRR	Develop a comprehensive media strategy to address the DRR challenges in Baloshistan	PDMA Media Houses Information department	Onec	Information department	Media Strategy
	Conduct special emergency handling situation training programs for NGOs and volunteer organizations	# of training organized # of NGOs and Volunteer participated in trainings	20% NGOS and Volunteer organization currently involve in DRR trainings	50 organizations will participate in emergency trainings	NGOs Volunteer organizations PDMA	Quarterly	P&D PDMA	Activity Reports

Strategy #2	Actions	Indicators	Baseline	Target	Data Source	Frequency	Responsibility	Reporting
Incorporate hazard mitigation policies	Conduct special awareness campaigns for different segments of society and particularly for those communities living in vulnerable areas, through radio, TV, print media and participatory workshops	# of awareness session organized in different communities related to DRR and Climate change	No specific data available in this regard	Awareness session will be organized in 25 most disaster vulnerable districts of Sindh	NGOs,INGOs Volunteer organizations PDMA	Quarterly	P&D PDMA	Activity Reports
	Develop climate change curricula with particular emphasis on Disaster Risk Reduction (DRR) and introduce it into formal education system at all levels.	Media strategy on DRR	Not available	This curriculum will serve for whole province	Education Department	Every six Month	Education department	Year education index
Strategy #3	**Actions**	**Indicators**	**Baseline**	**Target**	**Data Source**	**Frequency**	**Responsibility**	**Reporting**
Strengthening the Early warning system	Improvement in real-time meteorological and hydrological data collection and processing for understanding natural processes and evolving disasters.	# of districts from where in real-time meteorological and hydrological data collected for monitoring, Prediction and timely early warning of the aforementioned extreme events	Data is not available on districts level	All districts of Sindh province	PAK MET	Every SIX month	PDMA	Early warning system annual report

Strategy #3	Actions	Indicators	Baseline	Target	Data Source	Frequency	Responsibility	Reporting
	Development of SOPs for line department for DRR	# of departments develop their SOPS with regard to DRR and Climate change	4-5 department have their SOPS for DRR	All government department will prepare their SOPS with regard to DRR	All line department	Every six Month	PDMA	Departments DRR SOPs
	Upgrade and expand weather monitoring station network in the Province	# or Weather monitoring station upgraded # of new weather monitoring stations		Expand the updated weather monitoring station all over Sindh	PAK-MET	Every six Month	PAK-MET	Department Annual Report
	Establish regional flood forecasting and warning centres at divisional Level	# of flood forecasting and warning center established and regional and divisional level		7 divisions of Sindh	Irrigation Department PDMA	Every six Month	PAK-MET Irrigation	Department Annual Report
Strategy #4	**Actions**	**Indicators**	**Baseline**	**Target**	**Data Source**	**Frequency**	**Responsibility**	**Reporting**
Plantation barriers along coastal areas to control sand and soil erosion and to reduce the disastrous impacts of cyclones and tsunamis.	Get local community organizations involved in building and maintaining vegetative barriers in the coastal areas	# of vegetative barriers in the coastal areas build and maintained by LSOs		80-90% disaster prone costal area will be secure by vegetative barriers build and maintained by LSOs	LSOs	Every six Month	PDMA, Local Government and rural development authority	PDMA annual reports
	Initiate campaigns to plant mangroves, coastal palm and other trees suitable for coastal areas to control sand and soil erosion	# Campaigns for Mangroves plantations # of Acers covered will mangroves though these campaigns		1 campaigns quarterly.	PDMA, EPA LSOs	Quarterly	PDMA EPA	PDMA Annual reports

Strategy #4	Actions	Indicators	Baseline	Target	Data Source	Frequency	Responsibility	Reporting
	Redesign and construct cyclone shelters in vulnerable coastal areas using bioengineering techniques	# of cyclone shelters constructed		25	PDMA	Yearly	PDMA	PDMA Annual reports
Strategy #5	**Actions**	**Indicators**	**Baseline**	**Target**	**Data Source**	**Frequency**	**Responsibility**	**Reporting**
Disaster resilient Infrastructure	Plan, design, construct and strengthen appropriate flood embankments, dykes, protective bunds to protect flood plains	# of flood embankments, dykes, protective bunds constructed to protect flood plains		80 %	Irrigation	5 Year	PDMA	PDMA Annual reports
	Construction of Resilient multipurpose school Building				Education	3 Years	Education	Education department annual reports

Energy and climate change mitigation

The energy demand for Sindh is increasing rapidly due to increases in population and economic development. However, the supply of electricity in Sindh relies solely on non renewable resources, 70% coming from natural gas and 28% from oil, while coal and nuclear make up 2%.

There is enormous potential for renewable energy in Sindh due to the presence of considerable number of sunlight days for the generation of solar energy, as well as the discovery of substantial wind corridors with the possibility of the generation of wind power plants. Through the China Pakistan Economic Corridor (CPEC), A 50 mw wind farm is under development in Gharo, Thatta, as well as a 100 MW wind farm in Jhimpir, Thatta, and another in the same area worth 50 MW.

Sectoral electricity consumption for the province Sinsh (2008-14) in GWh

Year	Domestic	Commercial	Industrial	Agriculture	Others	Total
2008-09	7,505	1,575	4,012	690	736	14,518
2009-10	7,902	1,659	4,229	726	777	15,293
2010-11	8,211	1,722	4,387	750	806	15,876
2011-12	8,442	1,773	4,511	772	827	16,325
2012-13	8,687	1,911	4,804	858	932	17,193
2013-14	9,213	1,938	4,938	849	902	17,839

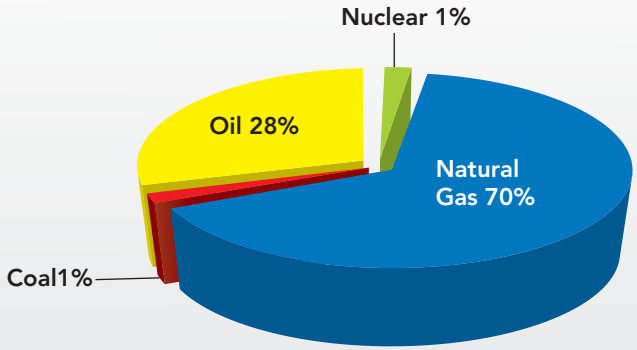


Fig. 2 (a) Fuel used for power generation

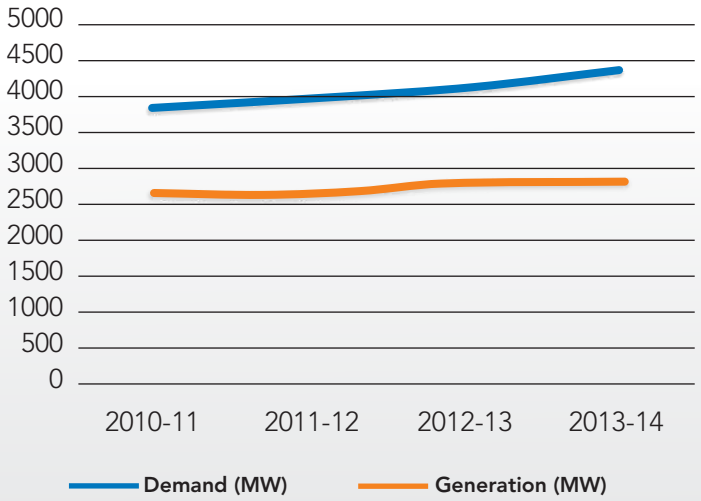


Fig. 2 (b) Electricity demand vs generation

Implementation Framework

Strategy 1: Strengthening of relevant institutions, policies, rules and regulations, financial mechanisms, innovative and accessible resources for energy efficiency

Actions	Target	Priority	Potential/ Sources of Financing	Implementation Institutions Partners	Indicative Timeline	Estimated Budget (USD-Million)
Enhance Public private partnership and investment for energy efficiency.	Agro sector, household utilization appliances, transport sector, NEGs.	High/long	Federal govt., provincial govt., private sector, foreign funding, NEECA, energy dept., govt. of Sindh.	Energy efficiency, energy dept., local govt., rural development.	3-5 years	15
Create awareness regarding advantage of solar PV systems for ensuring undisrupted supply of energy for domestic and commercial use	Awareness through media, community engagement, civil society support, sensitisation of business community.	High	Govt. of Sindh, donor agencies, private investors, micro finance banks, banking institutions.	Energy efficiency, energy dept., local govt., rural development, NGOs, social welfare private investors,	3-5 years	15
Attract foreign direct investment, FDI in energy rector in order to meet up the resource gap in public sector.	Improvement in energy infrastructure. Creation of employment. Development of local industry. Improvement of invested polices. Access of affordable energy to the community.	High	Federal, govt., provincial govt., PPP, private investors.	PND, ED, EAD, GP, PPP unit, FD, federal agencies, federal ministry of finance.	5-10 years	16

Strategy 2: Promote R and D for clean energy technology, and tap Pakistan's huge potential for indigenous and renewable resources and technologies such as micro-hydel, bio fuel, solar, wind, geothermal and hydrogen energy						
Actions	**Target**	**Priority**	**Potential/ Sources of Financing**	**Implementation Institutions Partners**	**Indicative Timeline**	**Estimated Budget (USD-Million)**
Establish centre of excellence to explore possibilities and option for proper generation through innovative and energy clean.	Research centre at division level. Research action at engineering universities. Research related motivational approach among students. Engagement of private sector, engagement of foreign certified labs for bringing knowledge.	High	Govt. of Pakistan, provincial govt., donor agencies.	Universities, provincial dept., NGOs, private universities, research and training institutes.	3-5 years	10
Install plants to generate power from municipal waste.	Select one at each administrative division at potential sites.	High	Govt. of Sindh, local govt. corporations, local and foreign inventors.	ED, PPP FD, LG, MC, federal govt.	3-5 years	50
Prepare baseline primary data on solar, biogas, wind and hydrogen energy potential	Baseline of renewable energy potential in Sindh	High	As above	As above	2 years	2

MRV Framework

Actions	Indicators	Baseline *(What is the current value?)*	Target *(What is the target value?)*	Means of *Verification (How will it be measured?)*	Frequency *(How often will it be measured?)*	Responsibility **(Who will measurer?)**	Reporting *(Where will it be reported?)*
Enhance PPP investment for energy efficiency.	Replacement and installation of efficient energy appliances at micro or macro level.	Saving of up to 500 MW.	Saving up to 1000 MW.	DISCOS, power development cell, ED, electricity dept., evaluation cell, GOS.		Ministry of power and provincial energy depts...	Annual energy Report
Create awareness regarding advantage of solar PV system.	Monthly media campaign Awareness program Quarterly meeting with business authority.	15 awareness campaign	30	Federal Moe, provincial dept.		Federal MoE, ED, local govt., rural development, social welfare.	Annual provincial development report.
Attract foreign direct investment, FDI in energy rector in order to meet up the resource gap in public sector.		USD 200M.	USD 500 M.	MoE, MoF, EAD.		MoF, Gop, provincial, ebergy dept., FD, PND.	Annual energy and finance report.
Establish center of excellence to explore possibilities and option for proper generation through innovative and energy clean.	Establishment of state of the art research at engineering universities.	USD 50 M.	USD 100 M.	Provincial higher education commission, STEVTA.		Provincial higher education commission. ED	Provincial higher education commission.
Install plants to generate power from municipal waste	6 MSW power generation power plants.	USD 100 M	USD 150 M.	MOE, GOP		MOE, GOP, GOS, ED MSW, local govt.,	Annual energy report.

FORESTS AND BIODIVERSITY

Climate change impacts on forests and biodiversity

The total area of Sindh is 34.81 million acres, of which an area of 2.782 million acres is under the control of the Sindh Forest Department. This makes up roughly 8% of the total area of the province. However, riverine forests and irrigated plantations, known as 'productive forests' make up only 2.29% of the total forest area, while the remainder, consisting of mangrove forests and rangelands, is considered as protective forests. This means that the province is deficient in forest resources.

The province is home to a number of animals, including the rare leopard, Pirrang or large tiger cat, wild bear, Ibex, blackbuck, wild sheep, the rare houbara bustard, crocodiles etc. Despite being home to a number of important species, the province is home to only one National Park in Kirthar. The Kirthar National Park is spread over 3000 km2 of desert, stunted tree forests and a lake.

Type	Area (Million ha.)	% of total land area of Sindh
Riverine Forests	0.241	1.71
Irrigated Plantations	0.082	0.58
Mangroves	0.345	2.45
Rangelands	0.457	3.25
Grand Total	1.125	8.00

Implementation Framework

Strategy 1: Sustainably manage forests, combat desertification, halt desertification and reverse land and forest degradation and biodiversity loss

Actions	Outcomes	Priority	Potential/ Innovative Sources of Financing	Lead Implementation Institutions Partners	Partner Institutions	Indicative Timeline	Estimated Budget (USD-Million)
Mobilize and significantly increase financial resources to conserve and sustainably use biodiversity	Finances available for conservation and biodiversity conservation	High/short term	WWF, UN agencies, GCF	Forest Departments, P and DD department, Provincial Agricultural departments	Academia, Finance departments	2 years	0.5

Actions	Outcomes	Priority	Potential/ Innovative Sources of Financing	Lead Implementation Institutions Partners	Partner Institutions	Indicative Timeline	Estimated Budget (USD-Million)
Mobilize and significantly increase financial resources to conserve and sustainably use biodiversity	Finances available for conservation and biodiversity conservation	High/short term	WWF, UN agencies, GCF	Forest Departments, P and DD department, Provincial Agricultural departments	Academia, Finance departments	2 years	0.5
Set biodiversity indicators and tap financial resources for implementation of Biodiversity Action Plan	Implementation of biodiversity action plan resulting in measurable progress in conservation	High/short term	As above	As above	As above	2 years	2
Encourage empirical research on flora and fauna in the context of their responses to current and historical climatic changes and ecosystem conservation	Evidence generated to support conservation of ecosystems against climate change impacts	High/short term	IFAD, FAO	As above	As above	2-3 years	2
Process, approve and implement the draft National Forest Policy and carry out intensive institutional and legal reforms both at the federal and provincial levels to promote good forest ecosystem management	Policy frameworks supporting protection of forests	High/ medium term	As above	Forest Department, Ministry of Climate Change	Forest departments at district level, agriculture departments, EPA	3-5 years	1 million

Actions	Outcomes	Priority	Potential/ Innovative Sources of Financing	Lead Implementation Institutions Partners	Partner Institutions	Indicative Timeline	Estimated Budget (USD-Million)
Promote sustainable forest management of all types of forests to halt deforestation and restore degraded forests by developing and implementing sustainable forest management plans	Reduction in deforestation	High/ medium term	IFAD, FAO	Ministry of climate change, Forest Departments, WWF, IUCN	Line departments	3-5 years	10
Promotion of REDD+ program in Sindh	Reduction in emissions from deforestation, measureable	High/ medium	REDD+, GCF, GEF	As above	Forestry departments	3-5 years	10
Protection and preservation of watersheds, catchment areas for aquifers, national wetlands	Conservation of water	High/long term	Adaptation Fund, UN agencies, WWF	As above	Irrigation departments, WASA, PHED departments, forest departments	5-10 years	10

MRV Framework

Strategy #1	Actions	Indicators	Baseline	Target	Data Source	Frequency	Responsibility	Reporting
Sustainably manage forests, combat desertification, halt desertification and reverse land and forest degradation and biodiversity loss	**Mobilize and significantly increase financial resources to conserve and sustainably use biodiversity**	Amount of finance available and sources	Limited data available	Increase mobilization of finance by at least 70% from current sources	Reciepts/ budgets	Quarterly	Environment Department, Forest Departments	Annual Reports for Forest, Annual Budget
	Set biodiversity indicators and tap financial resources for implementation of Biodiversity Action Plan	Biodiversity action plan developed and financed	Draft action plan	Complete action plan with financial / budgets	Consultation reports/final plan	Quarterly	Environment Department, Forest Departments, EPA	As above
	Encourage empirical research on flora and fauna in the context of their responses to current and historical climatic changes and ecosystem conservation	Research papers with evidence of climate change impacts	Limited research available	Comprehensive data on climate impacts on ecosystems	Final research papers	Quarterly	As above	As above
	Process, approve and implement the draft National Forest Policy and carry out intensive institutional and legal reforms both at the federal and provincial levels to promote good forest ecosystem management	Institutional and legal reforms in place regarding forest management	No policy	Policy in place with reforms and institutional mechanisms in place	Final policy. legal reforms, consultative workshop reports	Quarterly	Forest Department, Ministry of Climate change, EPA	Annual reports by department

Strategy #1	Actions	Indicators	Baseline	Target	Data Source	Frequency	Responsibility	Reporting
	Promote sustainable forest management of all types of forests to halt deforestation and restore degraded forests by developing and implementing sustainable forest management plans	Reduction in deforestation rates	Unreliable data	At least 10% reduction in deforestation	GIS data, forest records	Quarterly	Ministry of climate change, Forest Departments, EPD	Annual Reports Forest Department
	Promotion of REDD+ program in Sindh	Reduction in emissions from deforestation	Limited data	10% reduction against current	Emissions profile of Pakistan, Forest cover data	Ministry of climate change, Forest Department	Quarterly	REDD plus reports, Forest Department reports
	Protection and preservation of watersheds, catchment areas for aquifers, national wetlands	Reduction in degradation of inland water, wetlands etc		Reduction in degradation by over 20%	WWF data on wetlands and catchments	WWF, IUCN	Quarterly	EPA annual report

HEALTH

Climate Change impacts on health

Rising temperatures, shifting rainfall patterns, flash floods, droughts, water insecurity and inaccessibility of food are contributing to the already weak health situation in Sindh. Infectious diseases, vector borne diseases, environmental inequalities, temperature related drought and mortalities, malnutrition and massive urbanization make Sindh water and food insecure, leading to a number of health issues. This is coupled with relatively low education rates, especially among women, who are main care takers of households contribute to the health impact of climate change in Sindh.

This is coupled with inadequate health facilities, poverty, low budget allocation towards health are identified as the cause of poor health standards in the province (Sindh Health Department).

Primary Healthcare Facilities in Sindh

No.	Category	Total No. of Health Facilities	No. of HFs with PPP Node	No. HFs with PPHI	No. HFs with Health Dept.
1	Rural Health Centers	125	114	1	10
2	Basic Health Units	757	0	648	109
3	Dispensaries	792	0	326	466
4	Mother & Child Health Centre (MCH Centers)	67	0	27	40
5	Sub Health Centers/ Clinics	3	0	2	1
6	Homeopathic Dispensaries	1	0	0	1
7	Urban Health Centers	1	0	0	1
8	Unani Shifa Khana	36	0	9	27
	TOTAL	1782	114	1013	655

Primary Healthcare Facilities in Sindh

No.	Category	Total No. of Health Facilities	No. of HFs with PPP Node	No. HFs with Health Department
1	DHQ Hospitals	14	1	13
2	THQ Hospitals	49	6	43
3	Major/Other/Speclizied Hospitals Secondary	27	0	27
4	Total	90	7	83

Implementation Framework

Actions	Outcomes	Priority	Potential/ Innovative Sources of Financing	Lead Implementation Institutions Partners	Partner Institutions	Indicative Timeline	Estimated Budget (USD-Million)
Strategy 1: Draft, prioritize and implement district wise health, heat and disaster management plans which help to reduce risk to human health from climate induced disaster and disease.							
Risk Assessment	District wise data base.	High/Short-term	WHO, Global fund, Health department, CSO's.	Health department Sindh.	Public health department, Academia, think tanks.	3 months	1 million p/ district.
Devise health management action plan	Health specific framework.	High/ medium term	WHO, Global fund, Health department, CSOS.	Health department Sindh, Public Health specialist.	WHO, Civil Society organizations, Ministry of health, private practitioners.	3 months	2 million
Relevant Legislative Changes	Reduction in factors that cause health risks.	High/long term	WHO, Global fund, Health department, CSOS.	Advocacy groups, CSO's, Environmental lawyers, provincial govt.	WHO, Civil Society organizations, Ministry of health, private practitioners.	1 year	2 million
Relevant Legislative Changes	Reduction in factors that cause health risks.	High/long term	WHO, Global fund, Health department, CSOS.	Advocacy groups, CSO's, Environmental lawyers, provincial govt.	WHO, Civil Society organizations, Ministry of health, private practitioners.	1 year	2 million
***Priority : ranking (high, medium and low) and (short-term, medium-term and long term)**							
Strategy 2: Conduct needs assessment of the health sector, identifying infrastructure, human resource and financial human resource required by sub urban and rural health facilities to equip them to handle climate induced disease and disaster.							
Assessment of health infrastructure and human capital.	Capacity assessment of the infrastructure and Human capital in Health	High/short term	International organization, health dept.	Health officials, think tanks, academia.	Health officials, think tanks, academia.	6 months	0.2 Million / p district.

Strategy 3: Take measures to reduce waterborne diseases and insure access to safe clean drinking water							
Actions	**Outcomes**	**Priority**	**Potential/ Innovative Sources of Financing**	**Lead Implementation Institutions Partners**	**Partner Institutions**	**Indicative Timeline**	**Estimated Budget (USD-Million)**
Conduct assessments on the impacts of climate change on vector/ waterborne and nutritional diseases.	Impact Assessment Report of multiple domains	High	Health, Sindh Saaf Pani Company Department, P&D Department, National and international Donors	Health Department	Health, CSOs,INGOs Health	1 Year	50 Million
Use media and civil society organizations to educate and sensitize public as well as health personal to the climate change related health issues particularly	Reduction water borne diseases.	High	Health, Sindh Saaf Pani Company Department, P&D Department, National and international Donors	Sindh Saaf Paani Company Information and Culture	Health, CSOs, INGOs Health	2 Years	20Million
Strategy 4: Educating and sensitizing health personnel and the public about climate change related health issues.							
Design communication strategies to inform the general public of climate change related health hazard and its geographical span, particularly, alerting health personnel in the vicinity.	Public Awareness and capacity building regarding Heath and Climate change	High	Health, P&D Department, National and international Donors	Health Department	Health, P&D Department, National and international Donors	2 years	20 Million

MRV Framework

Strategy #1	Actions	Indicators	Baseline	Target	Data Source	Frequency	Responsibility	Reporting
Draft, prioritize and implement district wise health, heat and disaster management plans which help to reduce risk to human health from climate induced disaster and disease.	Risk assessment	Public health data base/ data of Sindh's districts.	There is no climate change related baseline available in Sindh.	36 districts	General populations, health institutions, CSO's.	Annual	Health department Sindh.	Annual health risk assessment report.
	Devise health disaster management action plan.	END epidemic/ climate change disease, expand/ build capacity 60-70 % health service providers.	No disaster management plan available for health.	Substantially reduce the number of death due to climate change and disaster.	District wise disease incidence report.	Plan reviewed every year.	Health department.	Health disaster management report.
	Relevant legislative changes regarding health.	Number of legislative changes for health.	Environmental laws	Reduction of carbon emission and other factors resulting environmental degradation.	PA	Continuous review	Law makers, CSO, Academia	Passage of law.
Strategy #2	**Actions**	**Indicators**	**Baseline**	**Target**	**Data Source**	**Frequency**	**Responsibility**	**Reporting**
Conduct needs assessment of the health sector, identifying infrastructure, human resource and financial human resource required by sub urban and rural health facilities to equip them to handle climate induced disease and disaster	Assessment of health infrastructure and human capital.	# of Health and climate change related Assessment survey conducted	h	All Sindh	District Health authorities' record. District Disease surveillance record.	Quarterly	Health Department	District Health Information System (DHIS). Reports

MRV Framework

Strategy #3	Actions	Indicators	Baseline	Target	Data Source	Frequency	Responsibility	Reporting
Take measures to reduce waterborne diseases and insure access to safe clean drinking water	Conduct assessments on the impacts of climate change on vector/ waterborne and nutritional diseases.	# or reports prepared		80% reduction in the cases of waterborne diseases	District Health Information System (DHIS).	Every Six Month	Health Department	DISEASE SURVEILLANCE SYSTEM
	Use media and civil society organizations to educate and sensitize public as well as health personal to the climate change related health issues particularly	# of awareness program arranged by Media # or awareness session organized for community by civil society.	No data available currently on this indicator	70-80 % Public and health personals will be aware of the health issues related to climate change	Knowledge assessment studies	Every Six Month	Health Department	Annual health risk assessment report.
Strategy #3	**Actions**	**Indicators**	**Baseline**	**Target**	**Data Source**	**Frequency**	**Responsibility**	**Reporting**
Educating and sensitizing health personnel and the public about climate change related health issues.	Design communication strategies to inform the general public of climate change related health hazard and its geographical span, particularly, alerting health personnel in the vicinity.	# of Communication Strategies develop	No communication strategy available at provincial level	1 communication strategy for general Pubic and 1 communication strategy health personal	Health Department P&D Department	Quarterly	P&D Department	Final Communication Strategies

Climate change impacts on food security, agriculture and livestock

Sindh's diversified economy comprises a well-developed agricultural base supported by an effective irrigation network on the Indus. Sindh's agri-economy contributes 23% to the country's total agricultural GDP. Around 14% wheat, 30% rice, 30% sugar cane, 25% cotton and 30% vegetable crops grown in Pakistan are from Sindh (Sindh Board of Investments, Govt. of Sindh).

Sindh province is mainly a dry region and is relatively more arid than the upcountry areas. The agriculture is mainly sustained through a network of barrages and canals on river Indus. The province also has a number of lakes and water bodies. The terrain of the province is almost flat and drainage of water is a serious problem whenever there are floods or heavy rains. Two spinal drainage systems have been devised on the left and right bank of Indus to address this impediment. The sub surface water outside the river bed is generally brackish and unfit for agriculture purposes.

The province has four distinct ecological/cropping regions. The Indus delta in the extreme south is fertile and famous for growing rice and sugarcane crops. The Tharparkar in the south east of the province is a desert area and has sustained livestock, wildlife and limited cropping. The region has witnessed massive migration of human and livestock during years of drought. The Kirthar range in the west of the province consists of a series of analogue rocky hillocks, with more or less barren land surface features. It supports wild life. The remaining area in Sindh is irrigated and can be categorized into three sub regions viz. right bank with rice and the left bank with cotton crops (Crop Reporting Services, Govt. of Sindh 2015).

The proliferated river bed is called "katcho area" covering almost 0.6 million ha. This is a fertile land but is also prone to intermittent flooding. The large consumption markets of Karachi and Hyderabad have played their part in shaping cropping pattern of the province. The focus is to grow horticultural crops to meet human requirements and fodders to feed the animals in addition to wheat, cotton, rice and sugarcane. Being a frost free zone onion, chillies, tomatoes and other crops are also cultivated. Farmers generate good cash flows on account of these crops.

AGRICULTURE

CROPS	AREA "000" HECTARES		PRODUCTION "000 M. TONS	
MAJOR CROPS	2013-14	2014-15	2013-14	2014-15
Wheat	1,121.6	1,106.9	4,002.1	3,672.2
Rice	745.5	781.7	2,617.3	2,652.6
Sugarcane	297.6	316.7	8,362.5	16,613.8
Cotton ("000" Bales)	568.0	596.2	3,523.4	3,572.5
Jowar	12.8	12.2	12.0	11.6
Bajra	44.8	44.9	23.3	23.1
Maize	3.5	3.2	3.5	3.4
Rape Seed & Mustard	48.3	49.1	51.4	51.4
Gram	15.9	14.8	15.5	14.4
TRACTORS (Nos)		1984	1994	2004
TRACTORS		16,542	23,182	36,245
Tube Wells (Nos)		2012-13	2013-14	2014-15
Tube Wells (Installed)		246	257	357*
Land Utilization ("000" Hectares)		2012-13	2013-14	2014-15
i Geographical Area (Sq. K.m)		14,091	14,091	14,091
ii Total Area Reported (iii+iv+v+vi)		14,091	14,091	14,091
iii Forest Area		1,034	1,032	1,032
iv Not Available for Cultivation		6,287	6,244	6,275
v Cultureable Waste		1,595	1,603	1,607
vi Cultivated Area (vii+viii)		5,175	5,212	5,175
vii Current Fallows		2,799	2,667	2,514
viii Net Area Sown		2,375	2,545	2,661
ix Area Sown more than once		843	943	980
x Total Cropped Area (viii+ix)		3,218	3,488	3,641

Figure 2: Sindh Agriculture Statistics (Source: Sindh Board of Statistics)

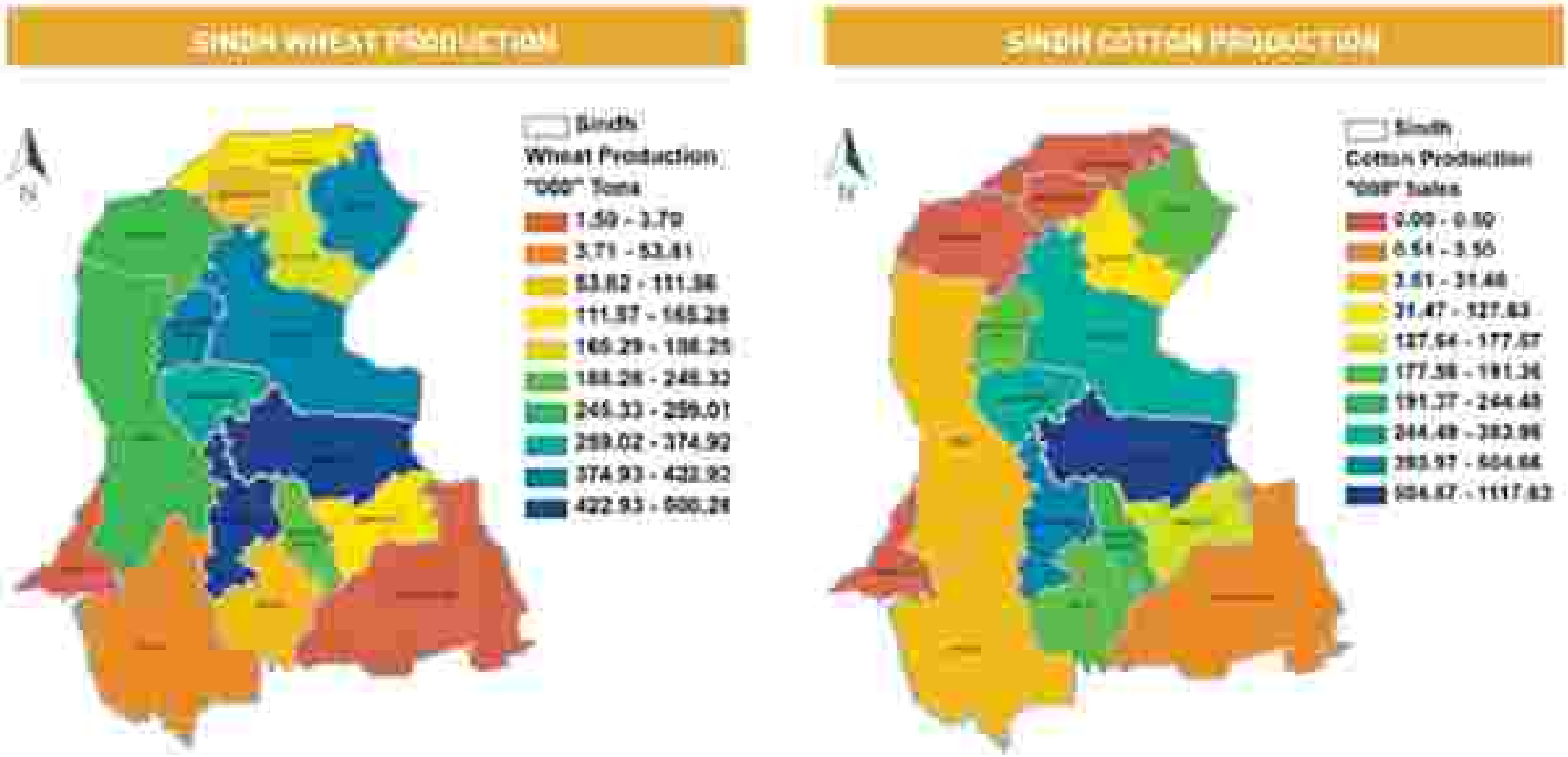


Figure 3: Districtwise Production of Two Major Crops (wheat and cotton) in Sindh (Source: Crop Reporting Services, Government of Sindh)

Changing climatic conditions and its associated negative repercussions, thus, have far-reaching negative impacts on not only the agriculture and livestock sector of Sindh but the overall food security of the country owing to reduced crop yields, adverse effects on livestock health, productivity and reproduction, as well as from losses due to water scarcity and extreme weather events[2].

Major horticulture crops are mangoes, bananas and chilies. Of the total output, Sindh produces 88% of chilies, 73% of bananas, and 34% of the mangoes. Sindh also has cultivable land under usage for fodder, pulses, condiments, oilseeds, fruits and vegetables.

Rice is the leading kharif crop. Rice production offers an important source of employment and income in rural areas. In Sindh the IRRI type long grain heat tolerant tropical rice is grown. Rice is grown mostly on the west bank of the Indus. Extreme weather in the summers is well suited to this type of rice.

[2]Final Report of Task Force on Climate Change, 2010

Cotton is the leading cash crop of Sindh. In fact, cotton cultivation in Sindh dates as far back as 5,000 years ago to the Indus Valley Civilization. At Mohenjo-daro the world's oldest cotton cloth was discovered which lends evidence to the suggestion that Sindh is the birthplace of cotton. Additionally, Sindhu was the word used by Babylonians for cotton and Sindon by the early Greeks. Today, Pakistan is the fourth largest producer of cotton. Cotton adds a value of 2% to the GDP of Pakistan.

Major Crops of Sindh Province by Cropping Season	
Kharif season (Sowing : *April/May* Harvesting: *October/December*)	**Rabi season** (Sowing: *October/December* Harvesting: *April/May*)
Rice	Wheat
Cotton	Tobacco
Sugarcane	Sunflower/Safflower
Maize	Gram
Millet	Barley
	Mustard
	Vegetables

Table 1: Major Crops of Sindh Province by cropping season
(Source: Board of Statistics, Govt. of Sindh)

Climate change and natural hazards have the potential to alter all segments making up, as well as, inputs and outputs of pastoral and aquatic systems. Livestock represents an important component of the agricultural sector in Pakistan especially Sindh. Indeed, crop and livestock activities are, to a great extent, interdependent upon each other, for their functioning within the farm sector. The latter provides inputs like farm yard manure (FYM) and draught power for the crop sector and, in turn uses fodder, crop products and residues.

Extreme weather conditions exacerbated by climate change have far-reaching consequences for livestock and fisheries production. For example, heat stress and prolonged periods of droughts can reduce the rate of animal feed intake (mainly by impacting rangeland productivity) or affect the fish stock. This, in turn, results in heightened food security among households that are largely dependent on livestock and fisheries for their dietary intake and livelihoods.

Increasingly, impacts of climate change are expected to result in intense and frequent disasters that have implications for livestock production systems. The direct effects of climate change on livestock will include, for example, extreme weather events (such as floods, droughts), higher temperatures and reduced rainfall leading to heat and water stresses. These factors could translate into increased spread of existing vector-borne diseases and macroparasites, with the possibility of emergence of new diseases in livestock.

For rural communities, this means losing livestock assets that can push livestock dependent households into chronic poverty and have a prolonged effect on their livelihoods.

The table below lists down the factors that impact livestock and livestock production systems:

Factors	Impacts	Linkages
Temperature Changes	**Vector borne disease**	**Enhanced heat and water stressed conditions result in loss of adapted animal genetic resources that leads to increased incidence of vector borne disease in animals**
Extreme weather event	**Morbidity (in surviving animals and mortality)**	**Increased rate of extreme weather events directly affect fodder production and subsequently, livestock productivity.**
Precipitation changes	**Feed and clean animal drinking water**	**Reduced precipitation in rain-fed areas lead to shortage of feed and clean drinking water for animals.**

Table 2: Effects of Climate Change of Livestock (Source: WWF)

Implementation Framework

Actions	Target	Priority	Potential/ Sources of Financing	Implementation Institutions Partners	Indicative Timeline	Estimated Budget (USD-Million)
Strategy 1: Adopt sustainable agriculture practices, technologies for sustainable production systems and to meet food security						
Focus on improving water use efficiency for irrigation through using sprinkler and trickle irrigation etc	25 UC	High/short term	UN, World Bank	PAD, agriculture dept.	3 years	20
Introduce training programs for exposing farmers to international successful farming practices	Whole province	High/short term	IFAD, WFP	PAD, agriculture dept. PP	3 years	10
Formulate Sindh Food Security Policy followed by strategic action plan	Policy for all districts	High/ medium term	FAO	Govt. of Sindh, donors	2 years	1
Encourage agro forestry, floriculture and social forestry	All districts	medium	IFAD, WFP, FAO	P and D department, Forestry Department, Agriculture Department	3 years	10
Encourage access to export markets by facilitating packaging and eco labeling of agriculture products	60%	High/long term	Private sector	Seed sector, research extensions, P& D, donors, Export regulatory authorities	5-10 years.	10
Strategy 2: Reduce food loss and waste and ensure quality nutrition						
Enhancing capacity building of PPD.	30%	High	PT, donors	**PPD, Agriculture Departments**	3 years	4
Environment friendly pesticides.	5-10%	High	Pro, F, donors	**Irrigation and agriculture departments**	5 years	7

Actions	Target	Priority	Potential/ Sources of Financing	Implementation Institutions Partners	Indicative Timeline	Estimated Budget (USD-Million)
Strategy 2: Reduce food loss and waste and ensure quality nutrition						
Legislation on food standards	Legislation passed	Medium	Donors	**Agriculture, irrigation, PHE departments**	3 years	1
Strategy 3: Increase and ensure protection and preservation of prime agricultural land and combat desertification and drought						
Develop Sindh Land Use Policies to protect land use planning and zoning of agricultural land	Policy covering all districts	High/Short Term	IFAD, FAO, Other donors	**EPA Sindh, Forestry Department, Agriculture Departments**	1 Year	2
Employ Environmentally sound multi cropping and crop management practices from traditional to high value economic crops	Area specific	High/short term	As above	**As above**	5-10 years	2
Control soil problems such as water logging, salinity, sodicity and soil structure deterorioration	10 districts	High/medium term	As above	**As above**	3-5 years	10
Develop capacity of institutions on remote sensing and GIS techniques to assess temporal changes in land cover of different agro ecological zones	Relevant institutions in all districts	High/long term	As above	**As above**	5-10 years	25

MRV Framework

Actions	Indicators	Baseline *(What is the current value?)*	Target *(What is the target value?)*	Means of *Verification (How will it be measured?)*	Frequency *(How often will it be measured?)*	Responsibility (Who will measurer?)	Reporting *(Where will it be reported?)*
Focus on improving water use efficiency for irrigation through using sprinkler and trickle irrigation etc	Number of landholders with improved water efficiency	Current area (unknown)	+-20%	Reports /data, pictures	Annually	Agriculture Department, water department, PHED department, irrigation departments	Agriculture statistics books.
Introduce training programs for exposing farmers to international successful farming practices	Farmers with improved cropping patterns	<1%	+- 5%	Field survey pictures/numeric data.	Quarterly	As above	Agriculture statistics books.
Formulate Sindh Food Security Policy followed by strategic action plan	Food security plans in place	None	Policy developed for all districts	Policy	Quarterly	Ministry of Food Security, EPA, Agriculture departments, irrigation departments	Food security policy
Encourage agro forestry, floriculture and social forestry	Area under cultivation yield and water table.	50-60% acres	100 area distribution	Survey area data	Bi-annually	CRS	Annual report
Encourage access to export markets by facilitating packaging and eco labeling of agriculture products	Export of sustainable produce	15-20%	60%	Export data	Quarterly	CRS	Annual report
Enhancing capacity building of PPD.	Trained staff	No baseline available	At least 60% of staff trained	Attendance sheets, training reports, evaluations	Bi annually	Agriculture, irrigation and PPD departments	Annual report

Actions	Indicators	Baseline *(What is the current value?)*	Target *(What is the target value?)*	Means of *Verification (How will it be measured?)*	Frequency *(How often will it be measured?)*	Responsibility **(Who will measurer?)**	Reporting *(Where will it be reported?)*
Environment friendly pesticides.	Agric. Bank Uptake Data Fertilizer company	Unknown >2%	50% farmers	Third part evaluation	Monthly	Agric. bank and agric. Dept.	Annual report
Legislation on food standards	Legislation passed on food standards	No data	Legislation passed	Reports from legislative sessions	Quarterly	Agriculture department, irrigation departments	Annual Reports
Develop Sindh Land Use Policies to protect land use planning and zoning of agricultural land	Zoning of land carried out	Data not available	Zoning carried out for all land	Zoning maps	Quarterly	EPA, Forest Department	Annual Report
Employ Environmentally sound multi cropping and crop management practices from traditional to high value economic crops	Number of farmers converting to high value crops	Limited data	40% increase	Reports from agriculture departments	Quarterly	Agriculture, irrigation departments	Agriculture statistics reports
Control soil problems such as water logging, salinity, sodicity and soil structure deterorioration	Quality of soil	Limited data (district level)	Improvement in soil quality in target districts	Reports from departments	Quarterly	As above	As above
Develop capacity of institutions on remote sensing and GIS techniques to assess temporal changes in land cover of different agro ecological zones	Uptake of GIS techniques in institutions	Limited data	Increased use of GIS in relevant departments across districts	GIS data reports, training reports	Quarterly	As above	As above