EUROPEAN UNION

CSCCC

STAKEHOLDER RECOMMENDATIONS FOR CLIMATE CHANGE IMPLEMENTATION FRAMEWORK, PUNJAB

TABLE OF CONTENTS

EXECUTIVE SUMMARY 01

INTRODUCTION 03

DEMOGRAPHIC PROFILE OF PUNJAB 05

CLIMATE PROFILE OF PUNJAB 06

ARCHITECTURE OF POLICIES GOVERNING CLIMATE CHANGE 08

PROCESS OF PREPARATION OF IMPLEMENTATION FRAMEWORK 09

WATER 11

- Impacts of climate change on water availability 11
- Implementation Framework 11
- MRV Framework 14

DRR 16

- DRR and Climate Change 16
- Implementation Framework 17
- MRV Framework 20

ENERGY 23

- Energy and climate change mitigation 23
- Implementation Framework 24
- MRV Framework 26

FOREST AND BIODIVERSITY 27

- Climate change impacts on forest and biodiversity 27
- Implementation framework 28
- MRV Framework

HEALTH 30

- Climate Change impacts on health 30
- Implementation Framework 30
- MRV Framework 32

FOOD SECURITY, AGRICULTURE AND LIVE STOCK 35

- Climate change impacts on food security, agriculture and livestock 35
- Implementation Framework 36
- MRV Framework 38

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 Forman Christian College, 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, Punjab' was conducted at Forman Christian College, Lahore, on the 31st of October 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 and Dr. Saeed Shafqat, Professor and Director of Centre for Public Policy and Governance at Forman Christian University, the opening address was delivered by Syed Abu Ahmad Akif, Federal Secretary, Ministry of Climate Change, with special remarks by Dr. Tariq Banuri, ED GCISC, Captain Saif Anjum, Provincial Secretary EPA, Mr. Shahid Javed Burki, Former President of the World Bank, Mr. Iftikhar Chaudhry, Former UN Representative, and Mr. Ahmad Rafay Alam,

[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.

Environmental Lawyer. The keynote address was delivered by Ms. Zakia Shahnawaz, Provincial Minister for Environmental Protection.

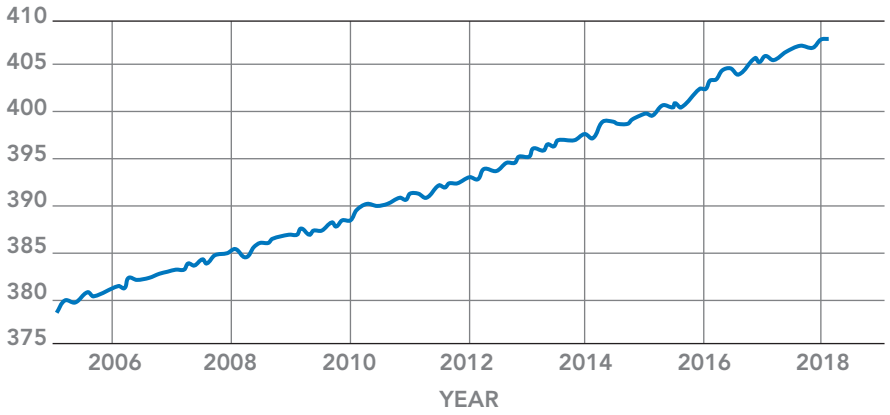
The workshop was designed to strengthen capacity for planning, budgeting, implementation and monitoring of climate policies with timelines and benchmarks. The primary objective of the workshop was to improve civil society's capacity to work constructively with public authorities', building trust for 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 Punjab, 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.

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 to remember that the two are not equal considerations. The current economic model can be changed but the finite resources of the planet cannot be enhanced to meet the needs of a human population that has more than quadrupled to seven billion and rising in little more than a century. All studies are unanimous in their conclusion that we must refrain from burning fossil fuel to avoid catastrophic warming.

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[1] even as its carbon footprint has grown by 123 per cent over the last two decades[2] against an average industrial growth rate of 5.33 per cent per annum between 1990-2017[3].

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[4]. 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 for employing roughly half the national workforce, providing food security and bolstering GDP and export revenues.

[1]Pakistan Nationally Determined Contribution to the UNFCCC, 2015
[2]Pakistan National Environment and Economic Development Study (NEEDS), Ministry of Environment, 2010-2011
[3]https://tradingeconomics.com/pakistan/industrial-production
[4]USAID (2016) Greenhouse Gas Emissions in Pakistan available at https://www.climatelinks.org/sites/default/files/asset/document/GHG%20Emissions%20Fact%20Sheet%20Pakistan_6-3-2016_edited_rev%2008-18-2016.pdf

Even greater is Pakistan's reliance on the Indus river system to feed agriculture, other industrial usages and domestic consumption. 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[5].

Rationale

Recognizing the crucial mandate available to provinces to implement climate action, the Civil Society Coalition for Climate Change (CSCCC)[6] collaborated with the Ministry of Climate Change (MoCC) and the Environmental Protection Agency Punjab(EPA) and the Forman Christian College (FC College) Punjab, 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 Punjab's specific short and long term concerns, CSCCC used the Punjab Climate Change Policy as the building block, and aligned it with the National Climate Change Policy to construct sector specific templates for developing a sub-national framework of activities that dovetail with the national policy and framework. A template for Monitoring, Reporting and Verification Framework was also developed to help with measuring progress on indicators. The templates were shared with Punjab government for review and comments before circulation to all the participants ahead of the workshop date to help them 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 make consensus based recommendations on sector specific thematic areas.

[5]http://www.theecologist.org/News/news_analysis/2989149/pakistan_to_quadruple_carbon_emissions_despite_feeling_pain_of_climate_change.html
[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.

DEMOGRAPHIC PROFILE OF PUNJAB

The Punjab is Pakistan's second largest province by area after Balochistan, and with a population of 110,012,442 in 2017, is its most populous province. The capital city of Punjab is Lahore. The province is divided into 9 divisions, with a total of 36 districts. These are further divided into 145 Tehsils. The population of Punjab increased 5 times in the last 60 years, and may reach an estimated 188 million by 2050. A majority of the population of Punjab is under 30 years of age, corresponding with the rest of country.

Of Punjab's 110 million inhabitants, 40 million are classified 'urban' while 70 million are classified 'rural'. The average population density is recorded at 536 persons per sq. km, making Punjab one of South Asia's most urbanized regions where approximately 40% of the populace resides in urban areas.
Agriculture is the basis of economic growth and development in Punjab, as the sector (including livestock) contributes a quarter of Punjab's GDP, while employing a large portion of its workforce, and contributing a large share to national export earnings and food security. This has been due to the world's largest integrated gravity flow irrigation system being in Punjab, along with climate conditions that are conducive to agricultural production. However, according to the Punjab Growth Strategy (2018), the last twenty years have seen a declining share of agriculture in provincial growth from 31% to 20%, while the manufacturing sector contribution increased from 20 to 24%. Overall, the services sector has taken the lead by contributing almost 56% to provincial output.

Punjab's landscape is characterized by fertile alluvial plains, owing to the Indus river and its four major tributaries – Jhelum, Chenab, Ravi and Sutlej, which traverse the province from north to south. The province also includes mountainous regions, including the Sulaiman Mountains, Margalla Hills and the Salt Range. Deserts can be found in southern Punjab near the border with Rajasthan and near the Sulaiman range, as well as parts of the Thal and Cholistan region. The Pakistan Agricultural Research Council divides the province into 4 agro ecological zones, as can be seen in Fig.1: Irrigated Plains, Barani Region, Thal Region and Marginal Land.

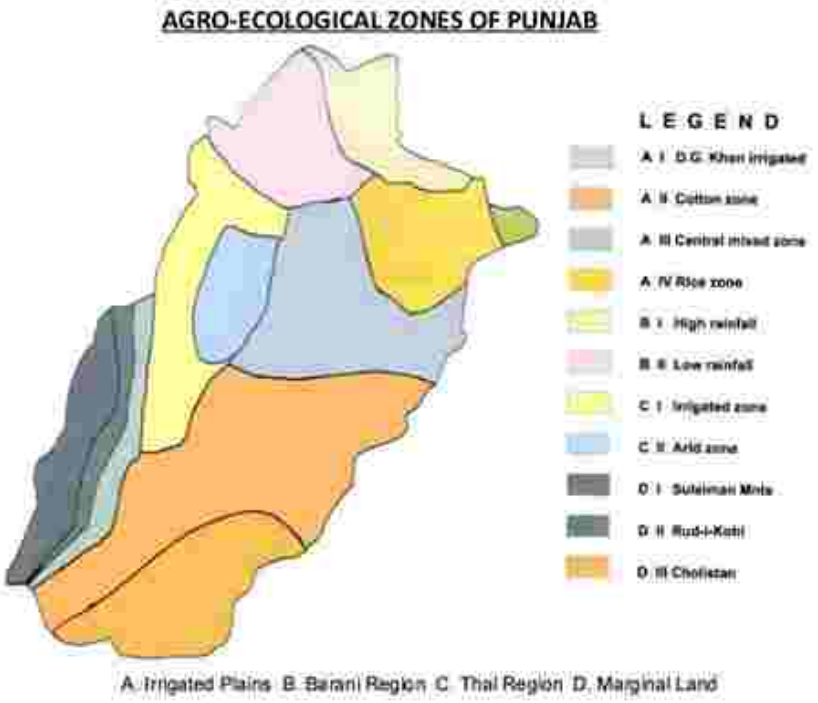


Figure 1: Source: P.A.R.C

CLIMATE PROFILE OF PUNJAB

As the second most urbanized province of Pakistan, with the second largest land mass and the highest population, as well as a varied topography, Punjab is particularly vulnerable to climate change. It retains the status of the 'breadbasket of Pakistan', whereby it contributes 56.1% to 61.5% to the country's agriculture sector, and as much as 76% to annual food grain production, with wheat and cotton as its largest crops. In the last 50 years, the annual mean temperature in Pakistan has increased by roughly 0.5 degrees C, and by the end of the century the annual mean temperature is expected to rise from anywhere between 3 to 5 degrees for a central global emissions scenario (ADB, 2017).

Between 1960 and 2007, there has been an increase of 0.97% in winter temperatures, 0.22% of summer temperatures, and an overall increase of 0.54% in annual mean temperatures[7]. Similarly, central and southern Punjab have experienced a 0.63% mean annual precipitation change between 1951-2000. Studies indicate that there is some precipitation increase in the summer, and decrease in the winter over most of southern Pakistan, including Punjab. However, the province is experiencing increasingly erratic monsoon rainfall patterns, which have led to flooding throughout its many districts. At the same time, irregular rainfall patterns have led to acute water shortages in desert areas, making it particularly dire for communities to rely on rainfed agriculture for their subsistence.

Impact of Climate Change in Punjab

With an economy as heavily reliant on natural resources, climate change will impact all productive sectors of the economy and all social strata in Punjab. Some adverse impacts are already being felt, and have the potential to deter the developmental objectives of Punjab in key priority areas, as listed below.

Agriculture and Livestock

According to Pakistan Bureau of Statistics, 7,27,404.7 acres or 80.7% of the total land cover of Punjab is under agriculture. While most of the agriculture land is irrigated, variability of precipitation patterns has implications for the flow of water in the main rivers of the province, which feed the canals for agriculture and irrigation purposes. In some pockets of the province, increasingly variability in rainfall will have implications for crop yields and overall productivity.

Livestock plays an important role in the rural economy, contributing about 11.5% to national GDP and 55% to the agriculture sector's share of GDP. Almost 75% of Punjab's rural population is involved in the livestock sector, which buffers crop failure and is more easily saleable. Natural disasters have led to large losses or disease in livestock; droughts in particular have severely reduced grazing zones of the livestock. Increasing temperatures have spawned diseases that break out as epidemics.

Agriculture, land area under cultivation, cropping patterns11 (Punjab) 2013-2014

Trade and Industry

The industrial sector in Punjab contributes 24% to the provincial GDP coming out of 48,000 industrial units which employ 23% of the province's labour force. Many of the industries are linked directly or indirectly to agriculture. As climate change wears away physical infrastructure including electricity transmission lines and road networks, and disrupting economic supply chains, the resilience of the industry is put under strain. One of the biggest challenges faced by industry is inadequate energy and power supply.

[7]Q. Z. Chaudhry et al. 2009. Climate Change Indicators of Pakistan. Technical Report. No. 22. Islamabad: Pakistan Meteorological Department.

Environment, Water Resources and Forestry

As Pakistan races towards the water-stressed status, there has not been any corresponding improvement in water usage practices. Studies have repeatedly suggested that the irrigation system in Punjab is severely inefficient and yields large losses at every stage of the delivery system (Ahmed and Gautam, 2013) and the associated menaces of water logging, salinity, nutrient mining and soil erosion result. In addition, access to tap water for domestic usage and drinking is very low in rural areas – 13% as compared to 43% in urban areas. The quality of water is substandard, and requires billions to be spent in mitigating waterborne diseases in the province (Punjab Saaf Paani Project, GoP).

In addition, the rapidly urbanizing province faces environmental degradation as a result of the unsustainable use of its natural resources for economic growth and development. Air quality deterioration, surface and ground water quality degradation and improper disposal of municipal and industrial waste contribute to this problem. While Punjab has over 12 national parks and 37 wildlife sanctuaries, it is pertinent to note that the rate of deforestation is high, as urban sprawl goes unchecked.

Physical Infrastructure

Changes in temperature, heavy rainfall, floods, frequent and intense storms have a collective bearing on physical infrastructure, particularly which is located in areas exposed to climate sensitive features, such as rivers. In 2001, heavy rainfall in Nullah Lai, a rain fed natural stream flowing through Rawalpindi city inundated nearby houses, bridges and roads, and led to 61 deaths and destruction of 800 houses. As extreme events are expected to rise throughout Punjab, damages to physical infrastructure and the associated disruptions in production, connectivity and access will also rise.

Energy

Punjab consumes 62% of Pakistan's electricity, at an estimated 47,000 GWh in 2010-11, compared to the total national consumption of 76,000 GWh. The majority of this is used at the domestic level, followed by commercial, industrial and agricultural usage. With the largest population base and relatively high industrial output, the province relies heavily on the national power grid. Despite this, Punjab's industrial sector and domestic consumption face severe energy shortfalls that impact productivity and welfare. The province has struggled to reconcile its growth and associated energy needs with climate compatible development, and energy is likely to will remain long term challenge for Punjab vis a vis climate challenge.

Health

Climate change becomes obvious in extreme weather events, natural disasters and erratic rainfall patterns in Punjab, with manifest impact on safe drinking water, clean air, sufficient food and secure shelter (ADB, 2017). The rise in temperature also leads to the risk of water borne and vector borne diseases, such as dengue and malaria which have periodic outbreaks every year. Given some of Punjab's precarious health indicators, including four million malnourished children; a third of pregnant women estimated to have iron deficiency; and only 58% of the population having access to sanitation services, the vulnerability of the province's health sector is very high when confronted with climate change.

ARCHITECTURE OF POLICIES GOVERNING CLIMATE CHANGE

Climate Change in Punjab is viewed through the lens of development planning which has a robust agenda on economic growth and climate compatible development. As one of the largest provinces in Pakistan whose contribution to the national GDP is significant, Punjab's growth and development is critical. However, unsustainable development practices over the past few decades have created vulnerability at multiple levels. The need for coherent and coordinated regulatory frameworks is paramount, and should guide all efforts in tackling climate degradation and build the resilience of communities and essential systems.

In this respect, the Punjab government has taken strides to incorporate and mainstream climate change into its policies and growth strategies. The Punjab growth strategy 2018, which aims to resolve Punjabs growth challenges and accomplish economic growth of 8% by 2018, while achieving all the SDGs. The strategy takes into account key climate relavant sectors such as industrial development, cities and urban development, agriculture, livestock, and health. The strategy features sustainability as a key component throughout the policy measures and target interventions.

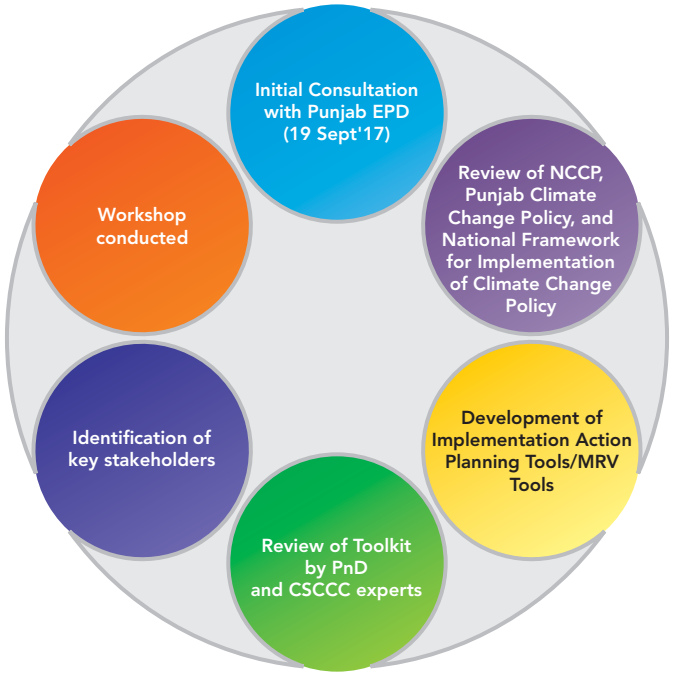
At the same time, the Punjab government is working on developing the Provincial Climate Change Policy, rooted in the National Climate Change Policy of Pakistan, and the Framework for Implementation. The policy focuses on ensuring 'that climate action is mainstreamed in the development planning, and especially in the economically and socially vulnerable sectors of the economy; and to steer Punjab towards economic growth and climate compatible development'.

PROCESS OF PREPARATION OF IMPLEMENTATION FRAMEWORK

The CSCCC secretariat engaged in a pre-workshop consultation with the EPA on the 19th of September 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 Provincial Minister for Environment, Begum Zakia Shahnawaz and the EPA in Lahore, 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, and the Punjab 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 Punjab government and FC college 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 Punjab 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 Punjab Climate Change Policy and in consonance with 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 identify 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.

THEMATIC DIVISION OF CLIMATE INDUCED CHALLENGES

WATER

Impacts of climate change on water availability

Punjab has the worlds largest contiguous irrigation canal networks, 2,3712 miles long. The five rivers of the Punjab and Indus Basin yield an average of 145 MAF per year. However, with the largest population in Pakistan, as well as water intensive agriculture and industrial sectors, the already stressed water profile of Punjab is set to become water scarce, as the river hydrology is impacted by rapidly melting glaciers, erratic rainfall patterns and higher temperatures, leading to evaporation. These are coupled with issues in water quality, particularly in the rural areas.

In Punjab, 7% of the rural population depends on dug wells and rivers for water supply. 79% of the province has access to fresh groundwater, while saline waters are mostly encountered in the central Doab areas. Irrigation systems in place are currently insufficient, and there is much loss of water and an overall lack of storage capacity, that will add to the already dwindling water supply in Punjab. Groundwater now supplements canal irrigation across virtually all canal command areas in Punjab and accounts for 29 percent (52 km^3) of the total average annual water withdrawals in all of Pakistan (180 km^3), compared to surface water withdrawals, which amount to 71 percent (128 km^3).

Studies also indicate the presence of high fluoride content and arsenic, which are well above WHO guideline values for safe drinking water, which further exacerbate the issue.

Implementation Framework

Strategy Assess and address the need for additional water storage.

Actions	Outcomes	Priority	Potential/ Innovative Sources of Financing	Lead Implementation Institutions	Partner Institutions	Indicative Timeline	Estimated Budget
Proposal development, inventory feasibility analysis.	Gaps, Decision making.	High Short term	Donors, academia.	SPARCO, LUMS, Irrigation Dept.	SPARCO, LUMS, Irrigation Dept.	1-3 years	Budget approve process
Actions plans for different topographic scaling.		medium term	BOS, POS coverage, WB		Environment Dept., irrigation dept.	1 years	
Integrated strategy formulation record.		High term	Rural survey, WB	Environment Dept., irrigation dept.		1 years	
Leakages/ extraction analysis, benefits actions.		Medium/high term	BOS, POS coverage, WB			1 years	

Proposal development, inventory feasibility analysis.	Gaps, Decision making.	High Short term	Donors, academia.	SPARCO, LUMS, Irrigation Dept.	SPARCO, LUMS, Irrigation Dept.	1-3 years	Budget approve process
Actions plans for different topographic scaling.		medium term	BOS, POS coverage, WB		Environment Dept., irrigation dept.	1 years	
Integrated strategy formulation record.		High term	Rural survey, WB	Environment Dept., irrigation dept.		1 years	
Leakages/ extraction analysis, benefits actions.		Medium/high term	BOS, POS coverage, WB			1 years	
***Priority: ranking (high, medium and low) and (short-term, medium-term and long term)**							
Strategy: Water pricing process.							
Awareness Raising program for implementation of sustainable	Efficient and more sustainable use of water	High Short term	Donors of political clash.	PC, PCRWR, irrigation dept., WAPDA	SPARCO, Irrigation Dept., WAPDA	2 years	5 Million
Encourage water metering and effective control over wastage of municipal water.	Efficient use of water	high medium term	Provincial Government	PC, PCRWR, irrigation dept., WAPDA		1 years	
Adopt participatory approach in water management that will engage all stakeholders, particularly marginal groups like women and poor	Capacity building	High Medium term	International Donors, Provincial Government	Environment Dept., irrigation dept.	PC, PCRWR, irrigation dept., WAPDA	5 years	
Legislate and enforce principle "polluter pays" for water polluting industries	Efficient and sustainable use of water	high Short Term		ABAD, PCRWR, irrigation dept., WAPDA, CPA	Punjab Planning and Development Department, Punjab Industries and commerece department, Ministry of Water and Power ,EPA	2 years	

Actions	Outcomes	Priority	Potential/ Innovative Sources of Financing	Lead Implementation Institutions	Partner Institutions	Indicative Timeline	Estimated Budget
***Priority : ranking (high, medium and low) and (short-term, medium-term and long term)**							
Strategy: Water pricing process.							
Enforce industrial and domestic wastewater treatment and management practices to protect environment, in particular water resources from degradation	Clean water and less pollution	High Medium Term	International Donors (Water Aid etc.) Government of Pakistan	Punjab LG & RDD, Ministry of water and power, Planning and development department, Punjab EPA	Punjab LG & RDD, Ministry of water and power, Planning and development department , Punjab EPA	3 years	20 Million
Carry out periodic scientific monitoring of water aquifers and fresh water bodies and identify hot spot area of contamination and their resources.	Identification of hot spot area of contamination and solution for how to deal with it.	High Long Term	International Donors (Water Aid etc.) Government of Pakistan		LGRDD WASA	2 years	20 Million
Encourage the recycling and ruse of agriculture industrial and domestic wastewater through efficient and cost effective scientific techniques such as bio remediation sand filtration, reserve osmosis	identifying and designing innovative solutions fordomestic and/or industrial sectors with appropriate use of decentralized and/or centralized options	High Medium Term	International Donors (Water Aid etc.) Government of Pakistan	Punjab LG & RDD, Ministry of water and power, Planning and development department, Punjab EPA	Punjab LG & RDD, Ministry of water and power, Planning and development department , EPA,PCRWR, PHED	4 years	100 Million
***Priority : ranking (high, medium and low) and (short-term, medium-term and long term)**							
Strategy: Water pricing process.							
Initiate development of Punjab Water Policy on integrated water resource management (IWRM) approach.	Road map for sustainable water usage	High Priority Short-term	Provincial Dept	Punjab Planning and Development Department (P&D)	Punjab Planning and Development Department (P&D)	6 Months	

MRV Framework

Strategy	Actions	Indicators	Baseline	Target	Data Source	Frequency	Responsibility	Reporting
Inventory/ feasibility assessment	PC- II Prep. & approval Hiring modalities	Report publish	Tube wells 50 5 available (1.1 million total), geo location, water table, operation power.	Entire resource base information 100%., water provisions to farmers, soil outlets, fertility, nutrition chemicals.	Agriculture crops production, Irrigated data.			
Areas specific actions plans potwar, cholistan, thal, irrigated area.	Inventory gaps, coordination.	Number of actions plans development, improvement in soil conditions, number of notification issued.	Sectorial plans	Climatic water resources, soil, water policy measures integrated.	PND, IRSA, PWD, agriculture staff.		PND, soil fertility research institute.	Medium term framework, annual report, PND AR.
Integrated policy formulation. (water & storage)	Notification advocacy public interest.	Punjab water policy approved.	National Punjab water policy, 2014 not approved, review and approved.	Approval by CCI, Develop implementation framework.			Irrigation dept.	
Leakage/ extraction analysis.	Sectors need assessment.	Report published.	93 % agriculture 1-3 % domestic 2-3 % industry population census.	85 5 agri water required, sustainable ground water use.	Population, food data, water use.	3-5 years	Agriculture and irrigation	Report census, irrigation dept., government monitoring unit.
Awareness Raising program for implementation of sustainable	Campaigns.	Number of farmers informed about water pricing, number of proposal demand.	Current Campaign beneficiaries vs the target	50 % of farms	Farmer extension services.	Yearly.	Agriculture and irrigation, local government.	Annual report

Strategy	Actions	Indicators	Baseline	Target	Data Source	Frequency	Responsibility	Reporting
Enforce industrial and domestic wastewater treatment and management practices to protect environment, in particular water resources from degradation	Advocacy com, treatment management methods,	How much water is treated and in how many areas the treatment management plan was introduced	No. of plans already in practice and how many is the target	3 waste water treatment and management plans especially in industrial cities e.g. Sialkot, Faisalabad, Lahore	EPA, WASA, PCRWR	After every 3 months	Planning and Development Department	Water quality reports
Carry out periodic scientific monitoring of water aquifers and fresh water bodies and identify hot spot area of contamination and their resources.	Tools and techniques for monitoring of water aquifers and fresh water bodies	Identification of hot spots and actions to reduce the contamination of those spots		All the major contamination hot spots identified.	EPA, WASA, PCRWR	Yearly	Planning and Development Department	Annual reports
Encourage the recycling and ruse of agriculture industrial and domestic wastewater through efficient and cost effective scientific techniques such as bio remediation sand	Machine for treatment of water	How much water will be treated	0	At least 20 %	EPA, WASA, PCRWR	After every 3 months	Planning and Development Department	
Initiate development of Punjab Water Policy on integrated water resource management (IWRM) approach.	Preparation of Punjab water policy	Policy targets	Federal Water Policy	Develop and passed in tear 2018	EPA, WASA, PCRWR	Review and amend after 5 years	Planning and Development Department	

DRR and Climate Change

Changes in the frequency and intensity of rainfall events, as well as increasingly erratic temperature patterns, add to the vulnerability of the Punjab province to a number of disasters. River flood and hill torrents have notably been frequently occurring since 2010, in varying degrees of intensity almost every year (PDMA 2017). Punjab's geographic location, and the rivers transversing through it, make it vulnerable to monsoon flooding. Particularly since the climate change associated variability in the monsoon means that the occurrence and intensity of floods have significantly increased. The unexpected floods in the summer of 2010 along the Indus River Plain affected 21 million out of which 8.6 million were children. 2 million homes and 8.4 million acres of crop were damaged due to the flood. (Punjab Climate Change Policy, 2016).

Drought is also identified as a threat to Punjab, particularly in the desert range of Cholistan, which comprises of parts of Rahim Yar Khan, Bahawalnagar and Bahawalpur districts. The area has sandy soil with meager annual precipitation, and as rainfall patterns become more erratic due to climate change, the variability of water availability in indigenous water systems will be felt in the form of drought conditions. Drought durations in Punjab are long, are have impacted children the most, as well as women and girls who have to travel longer distances to collect water for their families and livestock.

Flood and drought events are increasingly felt in the Punjab, as well as incidents of heat waves, tornadoes, epidemics etc. These events will cause food security issues in the province.
While the Punjab has policies in place to tackle these disasters, such as the Provincial Disaster Response Management Plan (2017) and associated district disaster management plans, in light of the impacts of climate change, the approach must shift from reactive to proactive- focusing on building the resilience of systems and communities to these disasters, rather than responding to the damages caused.

Years	2010 (July)	2011 (Sep)	2012 (Sep)	2013 (Aug)	2014 (Sep)	2015 (July)	2016
Cause of flooding	Indus, Chenab/Jehlum	Sutlej & Hill Torrents	Hill Torrents Rains in South	Chenab & Sutlej Nullahs	Jehlum/Chenab Nullahs	Jehlum/Chenab Nullahs	Jehlum/Chenab Nullahs
No of Districts affected	11	12	3	9	16	16	-
No of Villages affected	1810	335	110	1628	3484	3484	189*
Population affected	6.2 m	0.26 m	0.389 m	0.120 m	2.47 m	2.47 m	-
No of Deaths	262	4	60	109	286	286	29**
Household damage	353,141	1284	25,556	3,378	83,593	83,593	287***
Area affected	5.23 MA	0.270 MA	1.96 MA	0.195 MA	2.41 MA	2.41 MA	-
Livestock perished	3572	59	898	81	737	737	-

Implementation Framework

Actions	Outcomes	Priority	Potential/ Innovative Sources of Financing	Lead Implementation Institutions	Partner Institutions	Indicative Timeline	Estimated Budget
Strategy 1: Reorientation of the flood embankment expenditure pattern in Punjab.							
Revision of the policy focus to prevent only the irrigation infrastructure, focus should include life and property of common people.	Reduction in damages to life and property.	High/long term		Irrigation dept., agriculture dept., PDMA.	Federal ministry	6 months	Proper allocation
Revision of embankment design.	Reduction in damages.	High/long term	PDMA, finance ministry of Punjab.	Punjab govt., PDMA, P & D, Nespak.	Federal ministry, universities.	2 year	100 million
Strategy 2: Better communication of risk vulnerable reduction.							
R and D on international best practices of communication of risk and reduction target community.	R and D on international best practices of communication of risk and reduction target community.	High/long term	Effective pathway of resilience.	Irrigation dept., Union council, DDMA, Education institutions and PDMA.	Federal ministry, universities and colleges.	1 years	500 million.
Development of mobile apps for DDR messages.	Development of mobile apps for DDR messages.	High/short term	Risk awareness.	PTTB, P & D Punjab.	Universities, IT institutions, Telecom companies.	6 Months	5 million
Integration of awareness raising and evacuation training in local mechanisms.	Integration of awareness raising and evacuation training in local mechanisms.	High/short term.	Risk awareness.	PDMA, district govt., media.	Federal govt., local govt.	1 year	10 million.

Strategy 3: Improving awareness of issues related to mitigation of climate change induced disasters through public participation.							
Actions	**Outcomes**	**Priority**	**Potential/ Innovative Sources of Financing**	**Lead Implementation Institutions**	**Partner Institutions**	**Indicative Timeline**	**Estimated Budget**
Make the decision makers aware of the likely increase in the frequency and intensity of natural disasters due to climate change and the proposed mitigation strategy	Effective Risk Assessment thorough available data	High	PDMA, P&D Department Punjab. International Donors	PDMA	P&D Department. District DRR Units	2 year	50 Million
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;	Capacity Building of the Masses with Regard to Climate Change and DRR	High	PDMA, P&D Department	PDMA	Education Dep. Print and Electronic Media	3 year	10 Million
Develop flood adaptability of the communities' living in riverine flood plains	Community DRR and Disaster adaptability	High	PDMA P&D Dep International and national Donor	PDMA	Irrigation Education	2 year	25 Million
Enhance the institutional capacities of all agencies involved in disaster management related activities (PDMA, Provincial Irrigation Departments, PMD, WAPDA and Emergency Relief Cells Civil Defence, Health Deptt, Education Dept, Hydel Board, Highways Deptt, CBO, Academia)	Capacity Building	High	PDMA Dep. National and International Donor CSR programs etc	P&D Department	All relevant stake holders	3 year	100 Million

Actions	Outcomes	Priority	Potential/ Innovative Sources of Financing	Lead Implementation Institutions	Partner Institutions	Indicative Timeline	Estimated Budget
Strategy 4: Developing and strengthening natural hazard early warning system for providing the reliable warnings to the users.							
Strengthen natural disaster's early warning system for making it more efficient and linked it with improved mitigation measures and actions.	Improved Early Warning system and preparedness	High	PDMA Dep. National and International Donor CSR programs etc	PDMA MET	Irrigation Local Government and Community Development	1 year	100 Million
Develop improved early warning dissemination system using radio, TV, SMS, and mosque loudspeakers etc	Decrease local vulnerability from Disasters	High	PDMA, P&D Department	PDMA	Education Dep. Print and Electronic Media. Auqaf and Religious Affairs	2 year	20 Million
Strengthen linkages with media, particularly with electronic media, for timely dissemination of early warning in easy to understand local languages	Enhancement of Public awareness	High	P&D National and International Donor CSR programs etc	Information and cultural department	Information and cultural department, PDMA Academia	1 year	10 Million
Strategy 5: Develop climate change resilient Infrastructure							
Developing and strengthening the infrastructure which is resilient to climate change, particularly to the extreme weather events.	Less disaster causalities and damages	High	Relevant departments, Housing, Urban Development and Public Health Engineering	Housing, Urban Development and Public Health Engineering	Labour and Human Resource, Local Government and Community Development, Planning and Development	5 year	100 Million

MRV Framework

Strategy	Actions	Indicators	Baseline	Target	Data Source	Frequency	Responsibility	Reporting
Reorientation of the flood embankment expenditure pattern in Punjab.	Revision of policy forces to prevent irrigation, infrastructure and focus on loss of life and people.	Reduced damages.	70 % of embankments do not support the life and property.	10 % reduction in 6 months to a year.	PDMA,FFC	yearly	P & D Dept. Punjab.	Punjab developments statistics, PDMA & WAPDA annual flood report,
		Reduced number of embankment braches.		Revision of around 20 % embankments in 2 years.	Irrigation dept., Punjab	Yearly.	FFC ministry of water and power, irrigation dept. Punjab.	Annual report of irrigation dept., FFC
Better communication of risk vulnerable reduction.	R & D on international best practices of communication to target communities.	Effective evacuation.	Almost 10 % of population is not evacuating.	Improve the evacuation by further 5 %.	PDMA,DDMA	yearly	PDMA, DDMA	PDMA, DDMA
	Development of mobile app for messages.	No of active users or downloads.	No current use of mobile app.	At least 50 % of vulnerable communities should use the app.	PTTB	monthly	PTTB	PTTB
Improving awareness of issues related to mitigation of climate change induced disasters through public participation.	Make the decision makers aware of the likely increase in the frequency and intensity of natural disasters due to climate change and the proposed mitigation strategy	# of trainings/ workshops conducted. # of professionals attended capacity building and awareness trainings	Almost 10% professional aware of the effects of climate make on their relevant sector	80% decision makers will be aware of the effects of climate change on their specific sector	Relevant department	Every six month	PDMA,EPA Monitoring Unit P&D department	PDMA, EPA

Strategy	Actions	Indicators	Baseline	Target	Data Source	Frequency	Responsibility	Reporting
	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 TV shows, participatory Workshops and radio program organized. # of IEC material printed in print media	10-15 % print and electronic media disseminating climate and DRR related information.	5% of time and space on print and electronic media will be utilized for DRR and climate chnage dissemination. Participatory workshop for DRR and climate awareness will be organize quarterly	Print and electronic Media,	Every six month	PDMA, Information and Culture	Information and Culture P&D Department
	Develop flood adaptability of the communities' living in riverine flood plains	# of DRR awareness workshop and training organized in communities' living in riverine flood plains	10 -20 % communities' living in riverine flood plains are adoptive to floods	80-90 % communities' living in riverine flood plains will be adoptive to floods	PDMA DDMAPDMA	Quarterly	PDMA DDMA CSOs INGOS	PDMA
	Enhance the institutional capacities of all agencies involved in disaster management related activities (PDMA, Provincial Irrigation Departments, PMD, WAPDA and Emergency Relief Cells Civil Defence, Health Deptt, Education Dept, Hydel Board, Highways Deptt, CBO, Academia)	# of DRR awareness workshop and training organized in each department at district and provincial level	No baseline available	Capacity building of 70-80% departmental professional involved in disaster management activities	All relevant department	Every Six Month	Monitoring Unit P&D department	PDMA, P&D

Strategy	Actions	Indicators	Baseline	Target	Data Source	Frequency	Responsibility	Reporting
Developing and strengthening natural hazard early warning system for providing the reliable warnings to the users.	Strengthen natural disaster's early warning system for making it more efficient and linked it with improved mitigation measures and actions.	# of Early warning system stations established and strengthen with modern technologies	No data available on this action	Establishment of early warning system in and divisional level and capacity enhancement of 100% existing RWS	PDMA MET department	Yearly	P&D and Met Department	MET Department and PDMA department
	Develop improved early warning dissemination system using radio, TV, SMS, and mosque loudspeakers etc	# of Early warning massages prepared and disseminate by Print and electronic media ,cellular companies and religious institutions	No data available	5% time and space on print and electronic media dedicated for EWS and involvement all district Auquaf department in EWS	PDMA, AUQUAF department Cultural and information department	Every six month	PDMA, AUQUAF department Cultural and information department	PDMA
	Strengthen linkages with media, particularly with electronic media, for timely dissemination of early warning in easy to understand local languages	# of Early warning massages prepared and disseminate by Print and electronic media in local language	No data available	80-90 % Early warning massages will be prepared and disseminate by Print and electronic media in local language	PDMA, AUQUAF department Cultural and information department	Every six month	PDMA, AUQUAF department Cultural and information department	PDMA
Develop climate change resilient infrastructure	Developing and strengthening the infrastructure which is resilient to climate change, particularly to the extreme weather events.	# of disaster resilient building or infrastructure build in each district	Currently no specified data available on this indicator	80-90% building or infrastructure will be builed according to the SOPs of DRR	Housing, Urban Development and Public Health Engineering, Services and General Administration	Every six month	Housing, Urban Development and Public Health Engineering. Monitoring unit P&D department	Housing, Urban Development and Public Health Engineering.

Energy and climate change mitigation

The Punjab Growth Strategy (2018) sets out an agenda to achieve economic growth of 8% by 2018. Much of this is to be done through its industrial sector. While pursuing climate compatible development, this means that the emissions from the Punjab will rise, particularly if unsustainable sources are used. Punjab consumes 68% of generated national power, growing at 6-8% annually. However, the province faces a shortfall from 3000 to 5000 MW, out of the current energy mix.

At present, 33% of the energy in Punjab is hydro, while 67% is thermal. The installed electricity generation capacity is approximately 21000MW, of which 6599MW comes from hydropower[8]. The power and gas gap leads to loadhsedding that has adverse social and economic consequences.

While the Government of Punjab is investing in solar and wind power projects, such as the Quaid e Azam solar park, and small projects under the 'Access to Clean Energy Investment Project', the province is heading towards a reduction in reliance on coal.

The Punjab climate change policy proposes to tackle energy through improved Efficiency and Conservation methods, as well as focusing on means for more sustainable generation and distribution of energy. While Pakistan as a country ranks low in terms of GHG emissions, not only are these expected to rise as growth in the energy, agriculture, industrial processes, LULUCF and wastes sector increases, the country has also committed to reducing its emissions by 20% by 2030, in its NDC submitted to the UNFCCCC. For energy intensive Punjab, this is particularly relevant, as it is responsible for much of the consumption of the countrys energy, as well as emissions from these key sectors. The importance of clean energy mechanisms to fulfil the demand-supply gap while limiting contributions to GHG emissions is crucial.

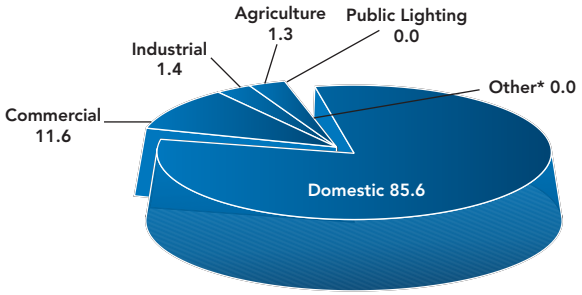


Figure3: Percentage of Punjab's Electricity Consumption in 2012, by Sector

[8]Qhttp://www.energy.punjab.gov.pk/_pages/oppinPunjab_Hydro.html

Implementation Framework

Strategy 1: Reorientation of the flood embankment expenditure pattern in Punjab.

Actions	Outcomes	Priority	Potential/ Innovative Sources of Financing	Lead Implementation Institutions	Partner Institutions	Indicative Timeline	Estimated Budget
Introduce Energy performance labelling.	Efficient use of energy.	High/ short term	Dept. of Punjab environment /energy.	Dept. of Punjab environment /energy, PSQCA,PNAC	Public and private partnership NGO,s	3-5 years	70/80 sq. feet details of million housing unit. (300, 00) unit gap.
Promotion of energy efficiency devices.	Efficient use of energy.	High/short term	Dept. of Punjab environment /energy.	Public and private partnership NGO,s		1 year	
Formulate set of rules to improve construction quality and product use in the building to make it more energy efficient.	Energy efficiency.	High/short term	Dept. of Punjab environment /energy.	Public and private partnership NGO,s		3 years	
Building heat insulation.	Energy use.	High/short term	Dept. of Punjab environment /energy.	Public and private partnership NGO,s		1 years	
Implementation framework of ECBC.	Better understanding.	High/short term	Dept. of Punjab environment /energy.	Public and private partnership NGO,s		3 months	
Awareness raising for the masses. Documents and videos should be developed in Urdu and Punjabi for better understanding.	More understanding.	High/short term	Dept. of Punjab environment /energy.	Public and private partnership NGO,s		1 year	

*Priority : ranking (high, medium and low) and (short-term, medium-term and long term)							
Strategy: Punjab (C policy-5) develop GHG inventory.							
Actions	**Outcomes**	**Priority**	**Potential/ Innovative Sources of Financing**	**Lead Implementation Institutions**	**Partner Institutions**	**Indicative Timeline**	**Estimated Budget**
Collect data from agriculture, transport, energy, construction, industry.	GHG, efficient energy.	High/ medium term	International funding, EPA, GCF independent body, Climate change, IFC.	EPA.	EPA	2 years	
Tabulation of data.	Better understanding	High/short term	Environment dept.			6 months	
Awareness of that data collected.	Better understanding	High/short term	NGO's			On doing	
Build capacity of farmers for upgrading livestock farms to produce biogas.	Increase in energy production	High/MED IUM term	Government	LGRDD	LGRDD	3 years	$50 million
Strategy: Punjab (C policy-5) develop GHG inventory.							
Create awareness regarding advantages of installing solar PV systems for ensuring undisrupted supply of energy for domestic and commercial use.	Increase in use of solar panels for energy and reduction in GHG emissions.	High/medium term	World bank, CPEC , Government of Punjab .	Punjab Energy Department, PCRET, AEDB, PPIB	Punjab Energy Department, PCRET, AEDB, PPIB	1 year	$20 million
Minimize line losses by upgrading the transmission lines	Efficient use of energy and reduction in losses.	High/medium term	Government of Punjab	Punjab Energy Department, WAPDA	Punjab Energy Department, WAPDA	4 years	$40 million

MRV Framework

Actions	Indicators	Baseline	Target	Data Source	Frequency	Responsibility	Reporting
Introduce Energy performance labelling.	Increase in the use of energy efficient products	0	30%	Dept. of Punjab environment /energy, PSQCA,PNAC	yearly	Dept. of Punjab environment / energy, PSQCA, PNAC	Annual Report
Formulate set of rules to improve construction quality and product use in the building to make it more energy efficient.	Energy efficient products and electricity goods use to make it more efficient and sustainable	0		Dept. of Punjab environment /energy.			
Building heat insulation.	100 building installing heating insulation			Dept. of Punjab environment /energy.			
Awareness raising for the masses. Documents and videos should be developed in Urdu and Punjabi for better understanding.	Increase awareness of GHG emissions and promote the use of more energy efficient methods and habits			Dept. of Punjab environment /energy.			
Collect data from agriculture, transport, energy, construction, industry.				EPA.			
Build capacity of farmers for upgrading livestock farms to produce biogas.				LGRDD			
Create awareness regarding advantages of installing solar PV systems for ensuring undisrupted supply of energy for domestic and commercial use.				Punjab Energy Department , PCRET, AEDB, PPIB			
Minimize line losses by upgrading the transmission lines				Punjab Energy Department, WAPDA			

FORESTS AND BIODIVERSITY

Climate change impacts on forests and biodiversity

Out of the total area of 50.95 million acres of Punjab, recorded forest area is 1.66 million acres (excluding linear plantations) which constitutes 3.26% of the geographic area of the Punjab. Of this area, Irrigated plantations comprise 25.6%, Riverine forests 10.6%, scrub forest 40.7%, rangle lands 12.2%, desert 2.3% , coniferous forests 6.8% and mix forests 1.8%[9]. These numbers are well below the recommended forest cover, and continuing deforestation in order to convert land use to economic practices has had impacts on the ability of Punjab's forests to act as carbon sinks, as well as impacting pastoralist communities and increasing the vulnerability to landsliding, floods etc.\

In Punjab, there are 11 wildlife parks, 37 sanctuaries and 24 game reserves.

1. Lal Suhanra National Park
2. Changa Manga Forest and Wildlife Park
3. Jallo Forest and Wildlife Park
4. Gatwala Forest and Wildlife Park
5. Bansra Gali Wildlife Park
6. Bahawalnagar Wildlife Park
7. Bhagat Wildlife Park
8. Kamalia Wildlife Park
9. Lohi Bher Wildlife Park
10. Pirowal Wildlife Park
11. Rahim Yar Khan Wildlife Park

It is predicted that most of the impacts of climate change such as changes in temperature and precipitation, increasing frequency and intensity of extreme events will impact forests severely, threatening the soil quality and biodiversity (ADB 2017). While the GoP has taken initiatives to improve forest cover, such as the Green Pakistan Programme, which aims to plant 10000 acres of forest over the next five years, and the Punjab Forest Department program for planting private farmlands by trees over an area of 3000 acres with 70% subsidy, there is still a need to improve the Punjab land use planning and ensure that biodiversity is conserved, protected against the adverse impact of climate change.

[9]QPunjab Forest Department, 2016

Implementation Framework

*Priority : ranking (high, medium and low) and (short-term, medium-term and long term)							
Strategy 1: Reorientation of the flood embankment expenditure pattern in Punjab.							
Actions	**Outcomes**	**Priority**	**Potential/ Innovative Sources of Financing**	**Lead Implementation Institutions**	**Partner Institutions**	**Indicative Timeline**	**Estimated Budget**
Make green roof on each and every building.	Increase green cover & its impact to control temperature, pollution, carbon emission and water run-off.	High term	Gef, small grant program, provincial government, private sector as CSR.	LDA, PHA, housing societies, EPA/Ds	Restore, Pakistan GBC, Govt. Punjab.	1 year	1 million
Localize forest patches.	Same as above	High term	Same as above	LDA, PHA, housing societies, EPA/Ds	Restore, Pakistan GBC, Govt. Punjab.	1 year	1 million
Provide green belts with covers.	Same as above	High term	Same as above	LDA, PHA, housing societies, EPA/Ds	Restore, Pakistan GBC, Govt. Punjab.	1 year	1 million
Institutional framework for implementation.	Same as above	Medium term	Same as above	LDA, PHA, housing societies, EPA/Ds	Restore, Pakistan GBC, Govt. Punjab.	1 year	1 million
Encourage community plantation drives.	Same as above	Medium term	Same as above	LDA, PHA, housing societies, EPA/Ds	Restore, Pakistan GBC, Govt. Punjab.	1 year	1 million
***Priority : ranking (high, medium and low) and (short-term, medium-term and long term)**							
Strategy: Awareness about Native tree species among stakeholders to promote afforestation.							
Mobilize local communities.	Increase biodiversity, retention and quality of ground water, lower cost, and better pest control.	High term	Local Punjab, international donors, private sector.	Forest dept., PHA,	Academia, public or private.	6 months-1 year	1 million

Actions	Outcomes	Priority	Potential/ Innovative Sources of Financing	Lead Implementation Institutions	Partner Institutions	Indicative Timeline	Estimated Budget
Capacity building of stakeholders.	Increase biodiversity, retention and quality of ground water, lower cost, and better pest control.	High term	Local Punjab, international donors, private sector.	Forest dept., PHA,	Academia, public or private	6 months-1 year	1 million
Promote tourism by arranging school trips etc.	Same as above	High term	Same as above	Forest dept., PHA,	Academia, public or private	6 months-1 year	1 million
Create native plant/tree nurseries.	Same as above	Medium term	Same as above	Forest dept., PHA,	Academia, public or private	6 months-1 year	1 million
Wildlife/fisheries (parks).	Same as above	Medium term	Same as above	Forest dept., PHA,	Academia, public or private	16 months-year	1 million
***Priority : ranking (high, medium and low) and (short-term, medium-term and long term)**							
Strategy: Awareness about Native tree species among stakeholders to promote afforestation.							
Engage academia/ researcher for data collection & dissemination.	Base line data to define terms of reference/ engagement.	High term	WWF, GEF, GIT	Academia, EPA/ EPD, forest, WWF.	SDPI	1-2 year	10 million
ATL/BTL campaigns	Same as above	High term	WWF, GEF, GIT	Academia, EPA/ EPD, forest, WWF.	SDPI	1-2 year	10 million

HEALTH

Climate Change impacts on health

Climate change is likely to impact both the environmental and social determinants of health, i.e. safe drinking water, clean air, sufficient food and secure shelter. All of these are impacted by extreme heat events, natural disasters and variable rainfall patterns (ADB 2017). At the same time, the spread of infectious diseases and and food security implications are also correlated to the increase in temperature variability and rainfall patterns. In addition, extreme events were correlated with the mental health of the impacted population.

The current health status of the Punjab is likely to contribute to, and exacerbate existing vulnerabilities in the province. The poor health status is explaned in part by poverty, low levels of education particularly for women, exclusion of women from decision making, inadequate sanitation and potable water facilities, low spending and expenditure on health, as well as serious deficiencies in health services. For the entire 110 million population of the Punjab, there are 151 hospitals, 194 dispensaries, 293 RHC's, 2461 BHUs- and only 37,272 hospital beds.

This is reflected in the low health status. Infant mortality in Punjab is 77 per 1000 live births, while under 5 mortality rate is 112 per 1000 live births. There are currently around 4 million malnourished children in Punjab, and 1/3 of all pregnant women are estimated to have iron deficiency anemia[10].

Frequent and intense disasters will not only damage critical health infrastructures, but the weak health systems may impair the ability to provide medical relief to those impacted by disasters, as well as tackling post disaster health issues such as mental distress, water borne diseases and injuries. At the same time, dwindling water resources in Punjab will contribute to food insecurity, and as malnutrition is one of the biggest problems in the Punjab, tackling the issue will become even more difficult if investment in critical infrastructure related to health is not in place in a timely manner.

Implementation Framework

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.

Actions	Outcomes	Priority	Potential/ Innovative Sources of Financing	Lead Implementation Institutions	Partner Institutions	Indicative Timeline	Estimated Budget
Risk Assessment	District wise data base.	High/Short-term	WHO, Global fund, Health department, CSO's	Health department Punjab.	Public health department, Academia, think tanks.	3 months	1 million p/ district.

[10]Punjab Health Profile, Government of Punjab, 2015

Actions	Outcomes	Priority	Potential/ Innovative Sources of Financing	Lead Implementation Institutions	Partner Institutions	Indicative Timeline	Estimated Budget
Devise health management action plan	Health specific framework.	High/medium-term	WHO, Global fund, Health department, CSO's	Health department Punjab, 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
***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							
Conduct assessments on the impacts of climate change on vector/ waterborne and nutritional diseases.	Impact Assessment Report of multiple domains	High	Health, Punjab Saaf Pani Company Department, P&D Department, National and international Donors	Health Department	Health, CSOs, INGOs Health	1 year	50 million

Actions	Outcomes	Priority	Potential/ Innovative Sources of Financing	Lead Implementation Institutions	Partner Institutions	Indicative Timeline	Estimated Budget
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, Punjab Saaf Pani Company Department, P&D Department, National and international Donors	Punjab Saaf Paani Company Information and Culture	Health, CSOs, INGOs Health	2 years	20 million
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	Risk assessment	Public health data base/ data of Punjab's districts.	There is no climate change related baseline available in Punjab.	36 districts	General populations, health institutions, CSO's.	Annual	Health department Punjab.	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.

Strategy	Actions	Indicators	Baseline	Target	Data Source	Frequency	Responsibility	Reporting
human health from climate induced disaster and disease.	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.
	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.
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	http://health.punjab.gov.pk/system/files/Division_and_district_wise_facilities.pdf	All Punjab	District Health authorities' record. District Disease surveillance record.	Quarterly	Health Department	District Health Information System (DHIS). Reports

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# of awareness program arranged by Media	https://www.pitb.gov.pk/system/files/Disease%20Calendar.png	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	# 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 # 4	**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

AGRICULTURE AND LIVESTOCK

Climate change impacts on agriculture and livestock

Agriculture & Livestock is one of the largest and most important sectors of Punjab's economy making up around 57.2% of the total cultivated land in Pakistan and a 53% contribution to the total agricultural GDP of the country[11]. It is also one of the most vulnerable sectors to the impacts of climate change due to its dependence on—and sensitivity to—precise precipitation and temperature conditions, patterns, and magnitudes.

Changing climatic conditions and its associated negative repercussions, thus, have far-reaching negative impacts on not only the agriculture and livestock sector of Punjab 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[12].

A changing climate affects agricultural production in different ways, and the effect on crops is also different as various crops react differently to changing variables of temperature and rainfall. However, research has shown that overall, a rising temperature and decreasing precipitation negatively affects the productivity of almost all major crops in the long term. Climate change does not only affect the production of agriculture commodities, but also disturbs economic steadiness affecting the supply and demand balance of agriculture commodities, profitability, trade and prices of these products.

As per 2006 Livestock Census, Punjab dominates Pakistan's livestock sector. Livestock in Punjab contributes to two third of the milk production in the country. Pakistan has an estimated livestock population of 125 million, as reported in 2006, a large portion of this population is in Punjab. It is also a large source of livelihood for 75% of the rural population (Planning and Development Department, 2015).

[11]Punjab Development Statistics, 2014
[12]Final Report of Task Force on Climate Change, 2010

The province has 49% of all cattle, 65% of buffaloes, 24% of sheep, and 37% of the goats of the total livestock in the country. In value of product, it is reportedly producing 62% of milk, 43% of beef, 32% of mutton and 75% of poultry of Pakistan. However, livestock productivity and standards of preventive health are far below world benchmarks and under threat from the impacts of climate change.

PRODUCTION OF MAJOR CROPS, PAKISTAN & PUNJAB 2014-2015

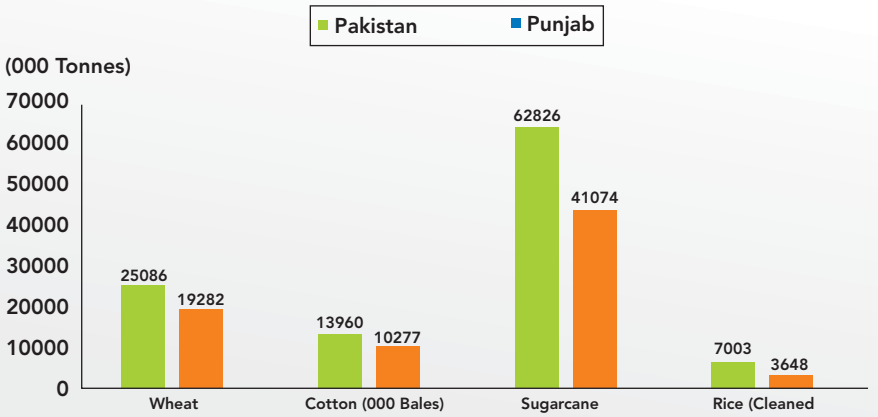
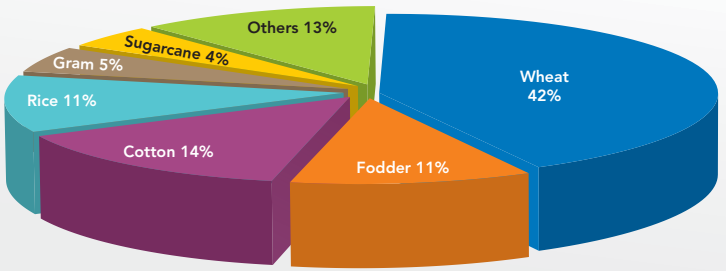


Figure 3: Source: Punjab Development Statistics 2016

CROPPED AREA BY CROP THE PUNJAB 2014-2015
TOTAL CROPPED AREA 16585 (000 HECTARES)



Implementation Framework

Actions	Outcomes	Priority	Potential/ Innovative Sources of Financing	Lead Implementation Institutions	Partner Institutions	Indicative Timeline	Estimated Budget
Strategy 1: Develop digital stimulation models for assessment of climate change impact on agriculture systems.							
Implement capacity building initiatives for research institutions on digital stimulation, modelling and forecasting.	Better trained staff and professionals.	High/Short-term	Punjab govt., and internationals funding.	Agriculture department.	Academia, CSO's, GCISC, PMD	6 months	3 million
Carry out climate impact stimulation and modelling & publicise results.	Better understanding of climate impacts on agriculture	High/long-term	Province govt.	Agriculture department.	GCISC, PMD	8 months	2 million
***Priority : ranking (high, medium and low) and (short-term, medium-term and long term)**							
Strategy: Develop new varieties of crops that are drought resistant, high yielding and more resilient. / promote organic farming and reduce pesticides based farming.							
Conduct research and promote the use of organic pesticides.	Environmentally friendly pesticide use adopted	High/long-term	Private Sector, UNDP, FAO	Agriculture Department, EPA	Academia, local government department	2 years	5 million
Research & adoption of new Superior varieties of crops.	Identification and feasibility of climate resilient crop varieties	High/long-term	Private Sector, UNDP, FAO	Agriculture Department, EPA	Academia, local government department	1 year	2 million
Training of farmers in improved methods and farming including organic practices. E.g. Composting.	Resilience of farmers and crops to climate change	Medium term		Agriculture Department, EPA	Local NGOs, irrigation department etc	1 year (rolling)	1 million/ annum

Actions	Outcomes	Priority	Potential/ Innovative Sources of Financing	Lead Implementation Institutions	Partner Institutions	Indicative Timeline	Estimated Budget
***Priority: ranking (high, medium and low) and (short-term, medium-term and long term)**							
Strategy: Develop and introduce better breeds of livestock.							
Research & appropriate cross breeding, acclimatization, spoilage nutritional fodder.	Climate resilient livestock	High/long term	Food and Agriculture Organization, IFAD	Agriculture Department	Academia, Local NGOs, animal husbandry department	3 years	15 million
***Priority: ranking (high, medium and low) and (short-term, medium-term and long term)**							
Strategy: Enabling financial environment for farmers and risk management systems/insurance.							
Pilot for farm insurance implemented.	Crops and livestock insured against disasters	High/short term	Private sector	Private-public partnership	Local NGOs and Local government	1 year	12 million
Improved breeding species for farming introduced.	Climate resilient livestock	High/medium term	IFAD, FAO, WFP, BISP, PPAF	Livestock Department		1 year	20 million
***Priority: ranking (high, medium and low) and (short-term, medium-term and long term)**							
Strategy: Develop and promote best management practices for methane and nitrogen management in livestock.							
Research best practices and Implement them at form level for nitrogen/ methane.	Identification and implementation of emissions reduction from agriculture	High/medium term	World Bank	Agriculture Department, Academia	Livestock Department	2 year	2 million
***Priority: ranking (high, medium and low) and (short-term, medium-term and long term)**							

MRV Framework

Strategy # 1	Actions	Indicators	Baseline	Target	Data Source	Frequency	Responsibility	Reporting
Inventory/ feasibility assessment	PC- II Prep. & approval Hiring modalities	Report publish	Tube wells 50 5 available (1.1 million total), geo location, water table, operation power.	Entire resource base information 100 %., water provisions to farmers, soil outlets, fertility, nutrition chemicals.	Agriculture crops production, Irrigated data.			
Areas specific actions plans potwar, cholistan, thal, irrigated area.	Inventory gaps, coordination.	Number of actions plans development, improvement in soil conditions, number of notification issued.	Sectorial plans	Climatic water resources, soil, water policy measures integrated.	PND, IRSA, PWD, agriculture staff.		PND, soil fertility research institute.	Medium term framework, annual report, PND AR.
Integrated policy formulation.(wate r & storage)	Notification advocacy public interest.	Punjab water policy approved.	National Punjab water policy, 2014 not approved, review and approved.	Approval by CCI, Develop implementation framework.			Irrigation dept.	
Leakage/ extraction analysis.	Sectors need assessment.	Report published.	93 % agriculture 1-3 % dometic 2-3 % industry population census.	85 5 agri water required, sustainable ground water use.	Population, food data, water use.	3-5 years	Agriculture and irrigation, local government.	Report census, irrigation dept., government monitoring unit.
Awareness rising.	Campaigns.	Number of farmers informed about water pricing, number of proposal demand.		50 % of farms	Farmer extension services.	Yearly.	Agriculture and irrigation	Annual report
Pricing study, staket 5holder's consultation.	Pilot study, urban meeting farmers.		pro	2019 study				
Proposal development.			Knowledge capacity are limited					