




LIVING INDUS

Investing in Ecological Restoration

The logo represents the Indus as being inextricably linked with the identity of the natural and human environments it flows through. The green represents the life-giving properties of the river and its Basin; blue, the importance of sustaining the aquatic bounties of the Indus; and brown, the lands from the mighty mountains, to the prosperous plains, to the dynamic Delta that are nurtured by the Indus. The Living Indus logo positions the well-being of the river as a life force intertwined with the well-being of the people and their living environment. A life-line from the mountains to the sea and everything in between.





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The idea of a Living Indus prospectus for the Basin's ecological restoration (within the boundaries of Pakistan) was developed jointly by the Ministry of Climate Change and United Nations in Pakistan under a directive of the Prime Minister's Committee on Climate Change for the Government of Pakistan. The scope was refined and developed through a series of consultations with senior policy makers and experts in all the provinces (mostly at the Chief Minister level) and in Azad Jammu and Kashmir (Prime Minister's office); meetings of our research team with provincial policymakers in key ministries and departments; and a series of expert consultations with academic, civil society, business and area specialists. We are grateful to all who provided comments and ideas during the consultation process. We are also grateful for the care with which reviewers in government departments at the Federal and Provincial levels read the document and provided feedback that has greatly improved this version. We hope that a number of comments that were beyond the scope of the current exercise in proposing useful next steps and expansion of ideas will be taken up in subsequent work.

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“ The Indus River has served as the vibrant core of the social, cultural, and economic life of what is today called Pakistan for well over a documented 5,000 years. But, today, one is forced to wonder if it will be able to do so even for another 100 years? ”





What is the Indus telling us?

The Indus Valley stretches from the Tibetan Plateau of the Himalayan mountains to the Arabian sea, through a landscape rich in beauty, culture, and contrast. The Indus River has served as the vibrant core of the social, cultural, and economic life of what is today called Pakistan for well over a documented 5,000 years. But, today, one is forced to wonder if it will be able to do so even for another 100 years?



No danger is more existential to today's Pakistan than the perils of unabated climate change and the havoc it could play with the Indus Basin

We have written the story of Indus over the millennia, exalting its might, the vibrance of its civilisations, the richness of its ancient folklore and epic love stories, and the history that these waters have witnessed - and made. The legends of Sohni-Mahiwal, Sassi-Punno and Heer-Ranjha played out along its banks. Harappa and Mohenjo-Daro were nurtured by its bounty and the most ancient of civilizations took on its name. Its geography defined untold battles of conquest, including that of Alexander. And, from the mountains of the Himalayas to the shores of the Arabian Sea, its ecosystems realized an abundance that defined every aspect of the people that call its Basin, home.

What might the Indus say, if it could speak to us today. Most likely, it will be preoccupied not by the glories of its past, but by the grave challenges to its future.

Quite likely, it will remind us that its future will define our own and that no danger is more existential to today's Pakistan than the perils of unabated climate change and the havoc it could play with the Indus Basin.

The year 2022 marks the centenary of the modern rediscovery of the Harappan civilization which thrived in the Indus Basin. This rediscovery brought to light the first urban civilization of South Asia, contemporaneous with the civilizations of Mesopotamia and Egypt. We have, since, lived off the bounty of this Basin. Maybe this is a good time to begin listening to the Indus which has been shouting a perilous warning to us: "If you will not protect me, I may no longer be able to provide for you."

This report builds on the many conversations that are already going on in Pakistan on the type of things we can do today to sustain a healthy Indus and to address the likely impacts of climate change along its Basin. It is also a call to action and a collation of ideas crying out to be elevated to action. This brief document is not a litany of the challenges faced by the Indus, nor a chronicle of its centrality to Pakistan's future. Both are well documented elsewhere, and forever discussed everywhere. We focus, instead, on collecting and presenting a preliminary set of investments that advance us towards a healthier Indus and ready us to address the challenges of climate change across its Basin, from the mountains to the seas.

Ours is not meant to be an exhaustive

discussion. It is, instead, a preliminary contribution to what we hope will be an evolving and continuing conversation amongst policymakers as well and citizens on how we might respond if the Indus were to speak to us and ask what we are doing to safeguard its – and our own – health in this 'Age of Adaptation'¹ to global climate change.

Our first steps may be modest, but our eventual goal cannot be so. The vision of this initiative is inspired by the immensity of the challenge and by the reassurance we would need to offer to the Indus if it were to speak to us.

“We aspire to an Indus Basin that can sustain a thriving civilization from its sources to the ocean - a Basin whose natural resources and ecosystems have been repaired and restored, and are resilient in the face of climate change.”

Indus and climate change in the age of adaptation

It is true that the Indus Basin clearly transcends the boundaries of any one country. But much of Pakistan is sustained and defined by this Basin. Some 90% of Pakistan's people and more than three-quarters of its economy resides in this Basin. More than 80% of Pakistan's arable land is irrigated by its waters.² Nine out of the ten largest cities in Pakistan – and all nine of the top nine – are situated within 50km or less of the waters of the Indus; the one exception being Quetta, the tenth largest city in Pakistan (Figure 1). The river system is home to at least 668 bird species,³ and more than 150 fish species of

which at least 22 are not found anywhere else in the world,⁴ including the unique and still endangered Indus Blind Dolphin, one of the world's rarest mammals.



Some 90% of Pakistan's people and more than three-quarters of its economy resides in this Basin

The Living Indus Initiative flows from two sources: first, it springs from a sober assessment of the present situation. The Indus and its ecosystems are under pressure from the seemingly inexorable changing climate, temperature fluctuations, disruption of rainfall patterns, and we are still only at an early stage of efforts to adapt to and mitigate these effects. As important and as sobering as the degraded state of Indus ecosystems may be, there is a second source for the Initiative, and that is the growing demand of the nation and its population and communities for action to ensure a healthy future rooted in a resilient ecosystem, in the steady building of human, social and natural capital, and in a shared vision for a more equitable and stable future.



“If you will not protect me, I may no longer be able to provide for you”

Even without accounting for climate change, the economic cost to Pakistan of poor water resource management is estimated to be USD 12 billion per annum (4% of GDP), and of that degradation of the Indus Delta another USD 2 billion.⁵ Both numbers may be underestimates given the unavailability of robust ecological and social costs. A healthy Indus would need to address the balance between



the sometimes-competing needs for water quality, water quantity and Basin ecology. All evidence suggests that global climate change will exacerbate stresses on all three and the reports of the Intergovernmental Panel on Climate Change (IPCC) and other

Nine out of the ten largest cities in Pakistan - and situated within 50km or less of the waters of the Indus

scientific studies have consistently ranked the Indus as amongst the natural systems most vulnerable to global climate change.

Pakistan is consistently ranked as amongst the ten most vulnerable countries to the

effects of global climate change, mostly of the impacts on the Indus system. Having already seen an average temperature increase of 1 degree Celsius over the last century (Chart 1)⁶ and witnessing highly erratic and extreme weather events over the last decade, Pakistan's vulnerability to the climate challenge is expected to become more severe in the future both in absolute and (globally) comparative terms. Climate warming is also expected to increase heat stress and water demand across Pakistan.

For Pakistan, the impacts of climate change are already evident everywhere and at all points in the calendar. It is already entrenched in the 'Age of Adaptation'⁷

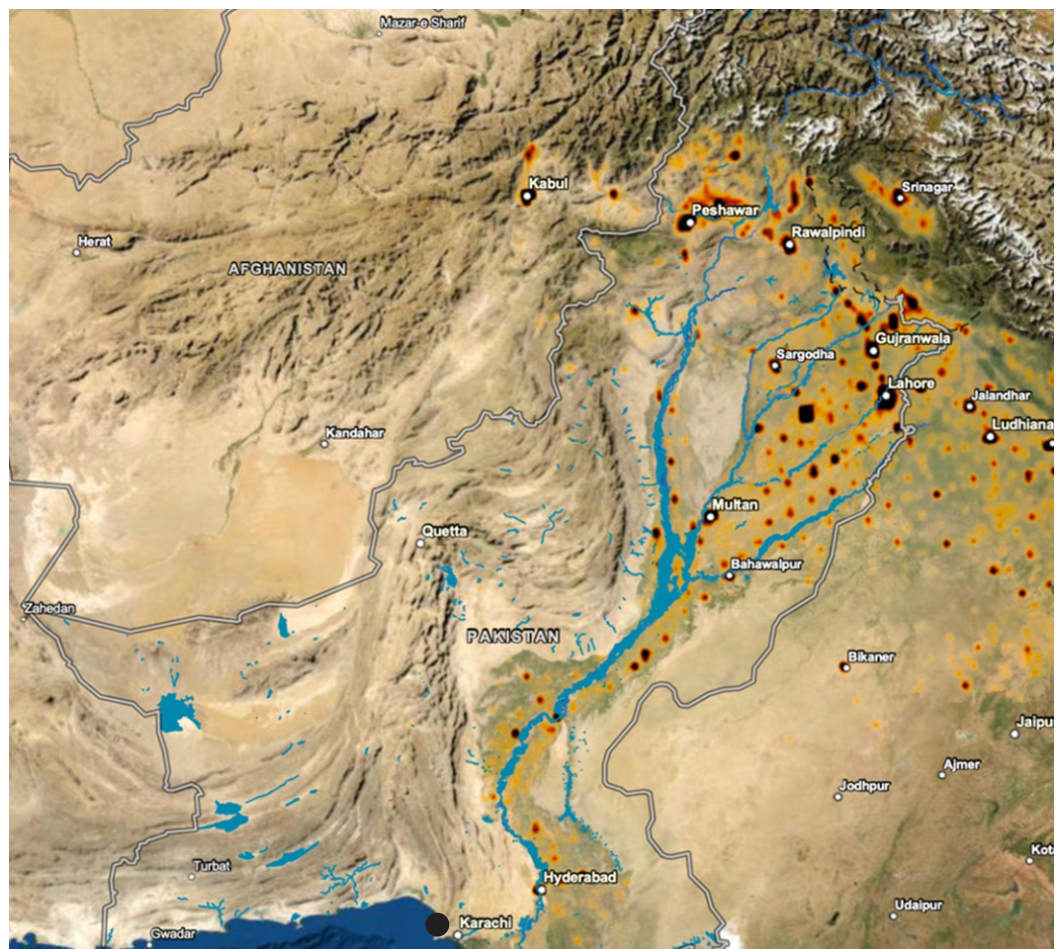


Figure 1 - Population Density along the Indus Basin (Source: Arc-GIS)

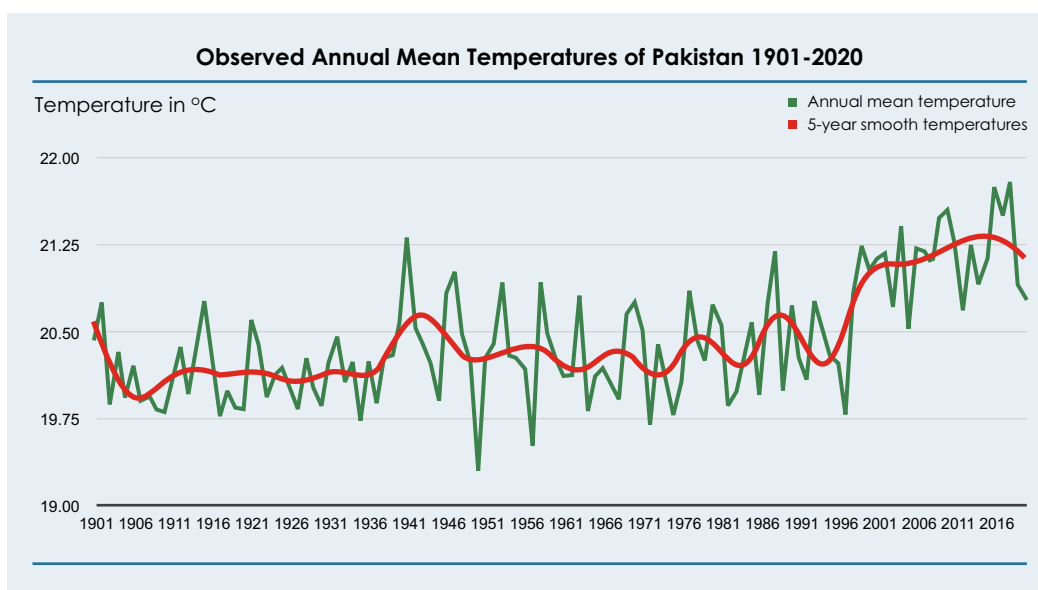


Chart 1 – Increase in average temperature in Pakistan 1901-2020

where it has to be dealing with and preparing for climate impacts even as it continues to contribute to global emissions mitigation. Climate change, for Pakistan, is therefore primarily a water challenge.

Climate change is the biggest longer-term and currently unmitigated external risk to Pakistan's water endowment.⁸ Though climate change is not expected to greatly alter average water availability over coming decades, it is however expected to bring about an increase in the frequency and intensity of extreme weather events, coupled with erratic monsoon rains causing frequent and intense floods and drought.⁹ The climate change induced increase in annual and seasonal precipitation in recent decades, has resulted in an increase in river flows during the high flow season. The increase in variability of South Asia Summer Monsoon (SASM) is likely to increase further in the twenty-first century leading to a rise in intensity of floods and droughts.

A large part of the impact of climate change on Pakistan happens through its impact on

the Indus River system.¹⁰ In the upper Indus Basin, accelerated glacial melting will increase the risks of dangerous glacial lake outburst floods. The twin pressures of global warming and environmental degradation threaten glaciers as the critical



The required annual investment for climate change adaption has been estimated to be US\$7 billion to US\$14 billion

source of inflows into the Indus River System. As a result, flows are likely to first increase to a certain point known as 'peak water', a level at which glacier meltwater flow would reach its maximum. After that, flows are likely to decline. According to an estimate, the 'peak water' of the Indus could be reached as early as in three decades.

In the lower Indus Basin, global warming and associated sea level rise threaten the livelihoods of people living in coastal cities, as well as the sustainability of coastal ecosystems. Over the last two centuries, the Indus Delta has shrunk by an alarming 92%. It is estimated that by 2050, a further 2.73% of the Delta will be lost due

to sea water intrusion, affecting about 1% of the population.¹² According to some models, Karachi could witness a sea level rise of as much as 15cm in only the next twenty years putting large tracts of populated land and millions of inhabitants in peril.¹³ Sea level rise and increases in the frequency and severity of coastal storms are also expected to exacerbate seawater intrusion into the Delta and into coastal groundwater.

OVER 60%

of annual flow in the Upper Indus Basin comes from snow and glacier melt.

pastures and grazing lands owing to drought, floods, and a rise in temperature and, ultimately, loss of land productivity, decrease in fodder quality and quantity, and increase in disease epidemics. The required annual investment for climate change adaptation has been estimated to be US\$7 billion to US\$14 billion, including US\$2.0 billion to US\$3.8 billion to reduce just flood vulnerability.¹⁸

ABOUT 60%

of the glacier mass of the Hindukush-Karakoram-Himalaya (HKH) glaciers is projected to be lost by the end of the century

Source: Ghulam Rasool, Q D. (2008). Global Warming and Melting Glaciers Along Southern Slopes of HKH Ranges.⁹

The Indus is the backbone of Pakistan's agricultural economy.¹⁴ Pakistan already loses an average of 4% of GDP¹⁵ due to water-related economic impacts – inadequate water supply and sanitation, flood damages and water scarcity in agriculture. This estimate does not include the indirect cost of loss of ecosystem services. Degradation of the Indus Delta has been estimated to cost over US\$2 billion¹⁶ annually because of foregone ecosystem services. Around half is agricultural loss caused by waterlogging and salinity, and half is loss of Delta ecosystem services (including from mangrove forests and fisheries).

It is estimated that with the rise of average temperature (0.5 to 2 degree celsius), agricultural productivity could decrease by around 8%–10% by 2040.¹⁷ Climate change is expected to cause degradation of

The implications of these changes will be felt across key sectors of Pakistan's economy: agriculture, livestock, energy, forests, fisheries and health, and will be further exacerbated through the effect of climate change on water.¹⁹ In many of these contexts, women are more vulnerable to the effects of climate change than men, as they are more dependent on natural resources for their livelihood, often bearing the responsibilities for securing water, food and fuel for cooking and heating for their families. In Pakistan's context, existing inequities in access to resources and decision making, as well as socio-economic barriers limit women's coping capacity in the face of climate change.²⁰

This alarming snapshot of climatic vulnerability indicators only just begins to alert us to even more insidious societal and ecological implications – many, non-

reversible – that expected climate change could bring about. But even if some climate impacts are now inevitable, their magnitude can (and must) be mitigated

A call to action

Realizing the vision of the Living Indus Initiative will require using all the tools in the toolbox, bringing to bear a wider and deeper mobilization than has been tried in the past, and deploying innovation and creativity that will draw from the deep pool of energy and imagination available in Pakistan – especially amongst the passions of its young. The goal should be to mobilize a movement of ideas and action at every level of state and society that aspires to repair and restore a thriving and healthy Indus for today and into tomorrow.

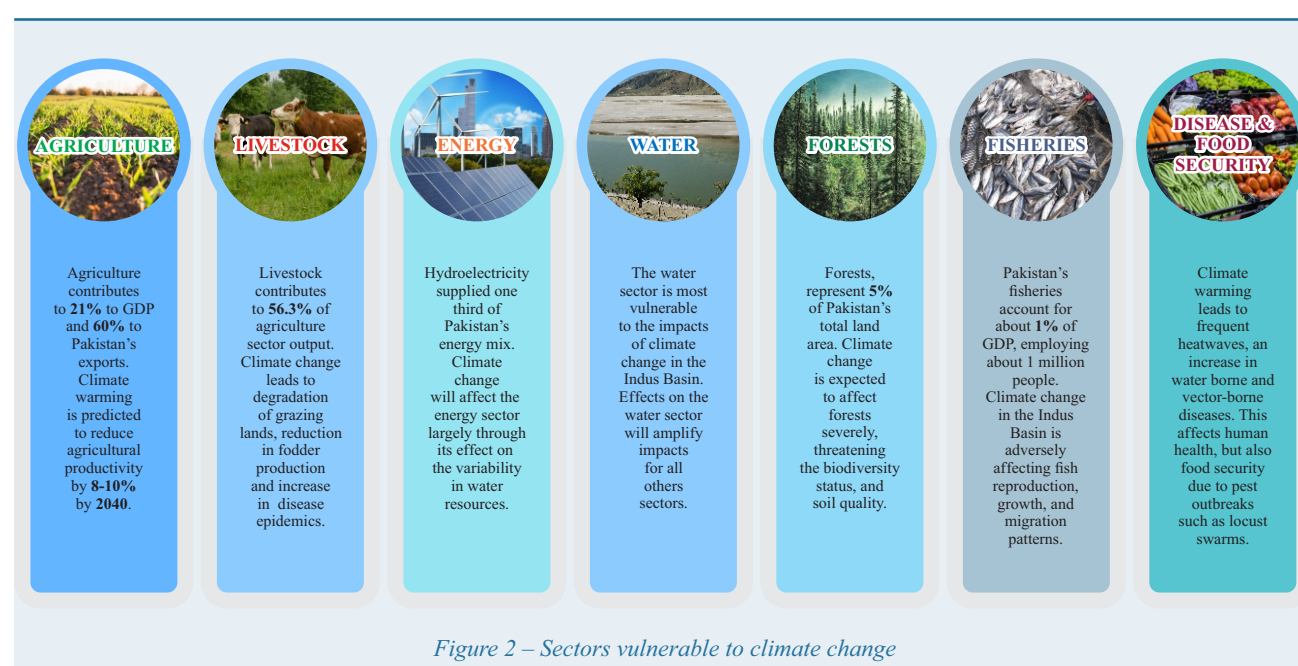
This document is a call to action initiated by the Prime Minister's Committee on Climate Change directing the Ministry of Climate Change (MoCC) to investigate programs and policies that are ripe for

implementation to restore the health of the Indus Basin. It builds on prior ideas and initiatives while also inviting new, bold and innovative thinking for the future. With assistance from the United Nations in Pakistan and MoCC, a rapid but intense set of consultations were initiated, beginning at the highest provincial levels with Chief Ministers and senior policymakers in each province and region, moving to surveying existing initiatives and plans at relevant Federal and Provincial ministries and agencies, and a subsequent set of expert and civil society consultations in Karachi, Lahore and Islamabad.



Women are more vulnerable to the effects of climate change than men, as they are more dependent on natural resources for their livelihood

The goal was to learn from existing and planned initiatives, policies and programmes and to identify pathways to enhancing the health of the Indus Basin at a





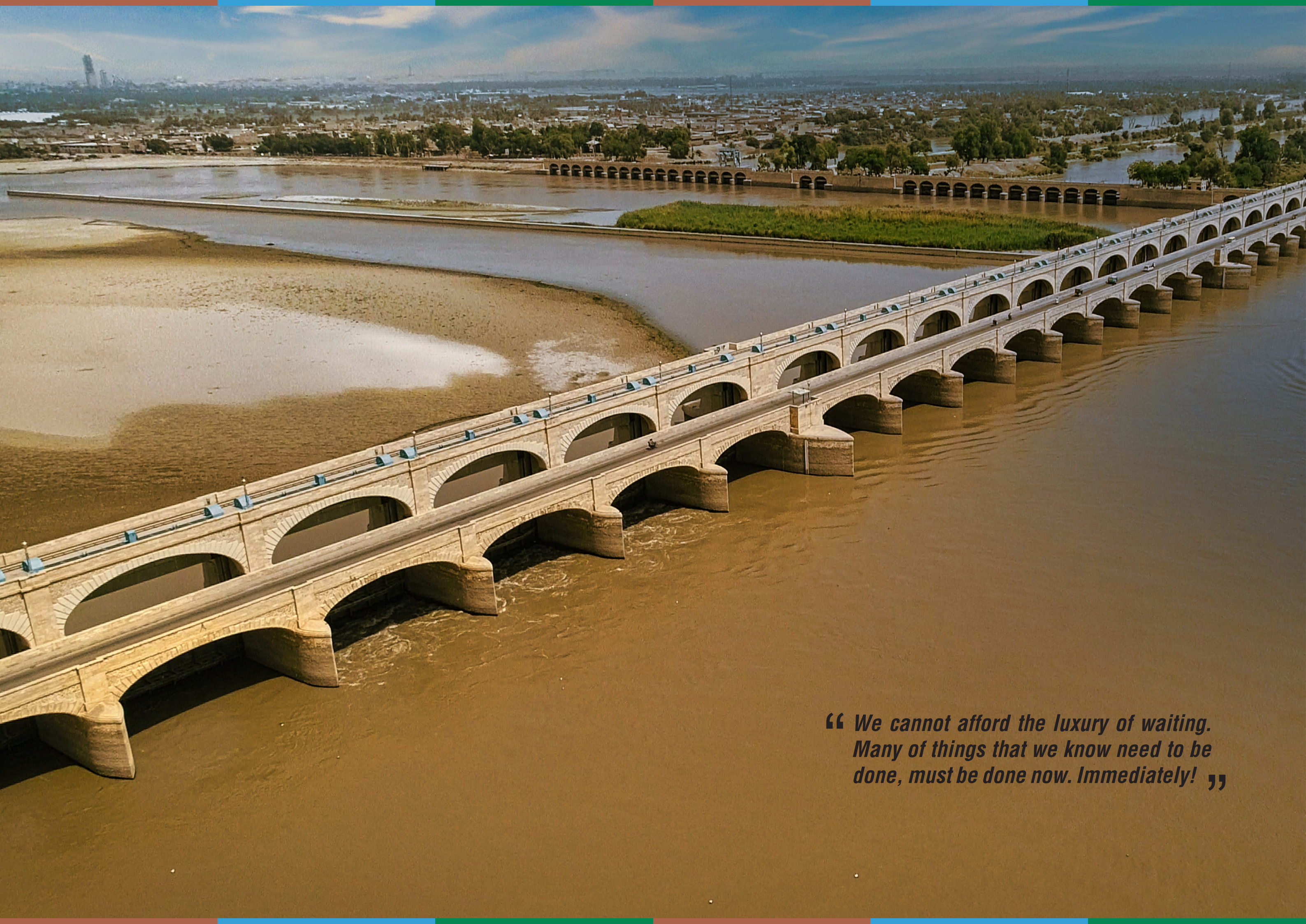
higher level of urgency and ambition, through the scaling up of existing initiatives, implementation of new and innovative interventions in the short term, and the identification and deployment of

The goal should be to mobilize a movement of ideas and action at every level of state and society that aspires to repair and restore a thriving and healthy Indus for today and into tomorrow

as-yet-untried approaches drawn from global best practice. This process has led to the identification of a preliminary and indicative list of 25 initiatives that are

discussed in the next chapter as an suggestive sampling of the type of 'bold', 'doable' and 'worth doing' initiatives that would put us on the road to a revitalized and restored Indus.

Chapter 3 then concludes this document by identifying some of the pathways to next steps, including the innovative structural and systemic policy directions that Pakistan not only learns from global best practices but can, hopefully, contribute to it by placing the country at the cutting edge of meaningful climate action in this Age of Adaptation.



***“ We cannot afford the luxury of waiting.
Many of things that we know need to be
done, must be done now. Immediately! ”***



Towards a healthy Indus

This chapter introduces an indicative menu of 25 high-impact interventions for policy makers, practitioners, and civil society to lead and support the ecological restoration of the Indus Basin. These interventions have emerged from the process of



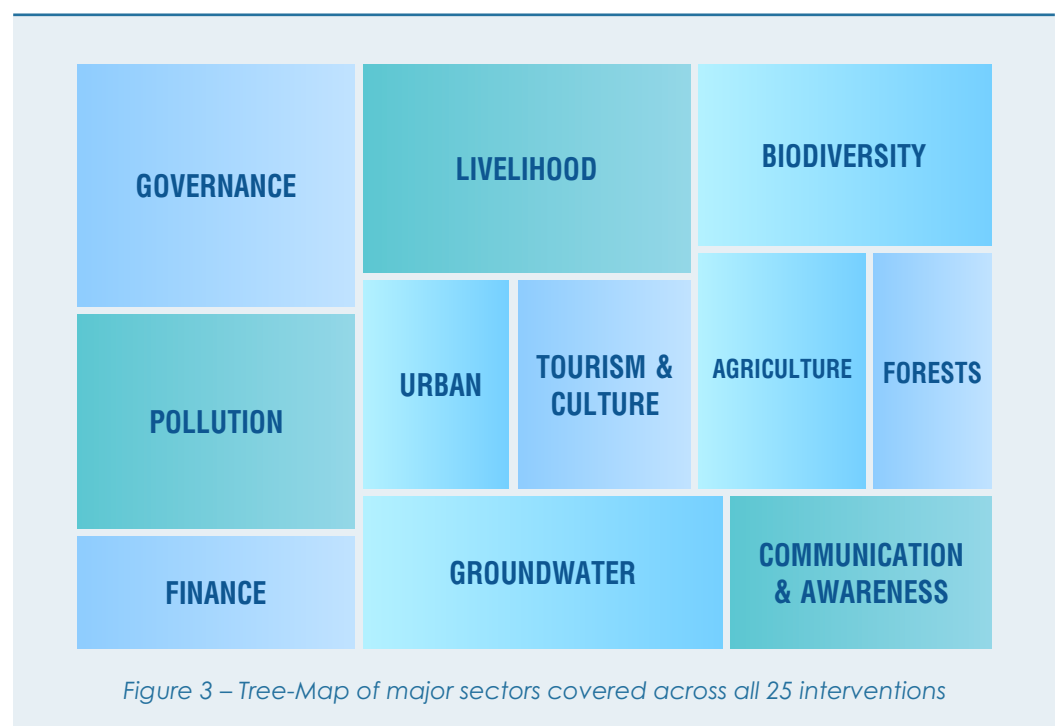
This preliminary list of initiatives is designed to be a living list that will evolve, refine and grow in detail

consultation with national and provincial policymakers, experts and civil society by organizing many of the shared ideas and initiatives.

We recognize that this list of possible interventions presented is preliminary and potentially incomplete. It is designed to be

a living list that will evolve, refine and grow with more contributions and addition of nuance and priority as this conversation continues. But it is offered as a sense of priority and urgency and in the belief that we cannot afford the luxury of waiting. Many of the actions that we know need to be taken, must be taken now. Immediately. This is our contribution to what some of these actions could be.

The interventions identified here cover a variety of sectors which are critical to a healthy Indus Basin, as illustrated in the Tree-Map (Figure 3). Within the Tree-Map, the area covered indicates the degree of focus across all interventions on each sector, for example, from the figure we can deduce that governance, biodiversity, pollution, livelihood, and groundwater



represent the bulk of the focus across all 25 interventions. Without going into a detailed analysis of the list of interventions as a set (since it is meant to be an evolving list), the point to underscore is that there is no single silver bullet solution, and we will need to work along many dimensions of action, each reinforcing the other in the quest for a sustainable and healthy Indus Basin.

What follows in this section is a brief 'pitch' for each intervention, making a case for 'why do this', 'what is required', and 'what can be done' with a focus on innovation, nature-based solutions, and community engagement. The interventions are designed to be in line with global best practices for ecological restoration of river basins and have focused on green infrastructure and nature-based approaches wherever possible. In line with the vision statement set out for Living Indus each intervention has been assessed on the criterion of whether it can bolster the Indus Basin for climate change in the future, restore the Basin's health and improve sustainable management of the Basin's precious natural resources to sustain the livelihood of communities that depend on it. The interventions are designed to be community focused, and citizen led, with a specific focus on gender inclusivity and centred around women's full and effective participation in decision making around natural use and resource conservation. The descriptions here are necessarily brief and will require more detailed analysis for implementation, but the menu of interventions (as a whole) should give policymakers an indicative sense of the range of possible interventions, along different 'price points,'

and in different impact areas that all lead towards the larger goal of a healthy and living Indus Basin.



The interventions are designed to be in line with global best practices for ecological restoration of river basins and have focused on green infrastructure and nature-based approaches wherever possible

All interventions put together seek to advance a holistic approach. Some interventions may be more urgent than others, but all are important. Though there is some inter-dependence amongst interventions from an implementation standpoint, but work can be kicked-off or scaled-up individually, and anywhere on this menu. We can start with any, or all; but start, we must.

Furthermore, the brief pitch also classifies each intervention across multiple parameters such as its connection to meeting Sustainable Development Goals (SDGs) and Pakistan's Nationally Determined Contributions (NDCs), an indicative cost estimate (rough and ready sense of the 'ballpark' cost), whether a Public - Private Partnership implementation mode is needed, level of community engagement required for implementation etc., complete details of which are explained in Table 1 (below). Table 2 (below), then, provides a snapshot of the 25 indicative interventions together, as a handy and ready reference to compare them across multiple dimensions. Following this, we will go directly in the modular description of the 25 interventions, presented here in no particular order.

Table 1: List of parameters with descriptions used to explain interventions

Parameter	Description
Title	Elaborates the key impact areas of the intervention
Location 	Geographical boundary to which the interventions implementation is limited too, i.e. Upper, Plains and Delta (Lower Region) or all along the Indus Basin . Further the term 'all along the Indus Basin' has also been used for interventions that may be physically located at one location, however impact on all regions of Indus (within the boundaries of Pakistan).
SDG Goals 	Specifies which of the 17 SDGs the intervention meets e.g. Gender Equality, Climate Action and Life Below Water to achieve the Sustainable Development 2030 Agenda
Priority 	In the domain of Business Analysis, the term MoSCoW is generally used to identify Prioritization. The acronym MoSCoW represents four categories of initiatives: must-have, should-have, could-have, and won't-have, or will not have right now. On the similar lines each intervention has been classified as either; Must Have - Critical for the success Should Have - Important for the cause but not necessary Could Have - Interventions that are nice to have but initiative will still be successful if they are not adapted
Timeframe 	Implementation timeframe to ensure adequate impact and show results Short Term: Less than 5 years Medium Term: Between 5 to 10 years Long Term: Beyond 10 years
Flood Resilience 	Specifies if the intervention will create significant resilience to floods
Status 	New: Proposed as part of the Living Indus Initiative Ongoing: Currently being executed and requires scale-up / continuity Piloted: Being experimented at a smaller scale and should be scaled-up based on findings
NDC 	Specifies if the intervention contributes directly, indirectly or acts as an enabler to achieve binding Nationally Determined Contributions targets agreed by Pakistan as per Paris Agreement
Community Meter 	Levels of community engagement required to implement the intervention High: Fully dependent on the community Medium: Not dependent but requires partial community involvement Low: Does not require community involvement
Public Private Partnership 	Specifies whether Public-Private Partnership is necessary for successful implementation
Cost 	Indicative cost range based on a top-down / back-of-the-envelope calculations with a cost horizon, specifying the spending period

A LIVING INDUS KNOWLEDGE PLATFORM: CROWD SOURCING KNOWLEDGE



Indicative Cost
\$20-25 mn



Time Frame
SHORT



Location
ALL



Priority
MUST HAVE

Information Technology is a key pillar of modern human society. Decision support systems based on geo-spatial data are now central to environment and water management, such as Very Early Warning Systems for natural hazards. While some regional and thematic knowledge platforms are now in place, an easily accessible one-stop Digital Knowledge Platform that could facilitate research and analysis on the health of the Indus Basin does not yet exist.

We propose that a common source of information should be created for policy makers and researchers to underpin informed decision making. We propose to develop an interactive platform, with information structured and analysed, so to understand what the Indus is telling us and how our actions are impacting the Basin's health. We believe, success is contingent on community engagement and we propose to establish the Living Indus Digital Knowledge Portal by crowdsourcing data from individuals and organisations to develop a powerful database and interface which measures the Basin's health. An example of crowdsourcing data is to distribute Water Quality Testing strips amongst the youth to check water quality across the Basin, which is both cost effective and accurate, and will create the change agents we need to demand timely action.

Indicative cost: USD 20 million to USD 25 million (Establishing a state of the art, advanced centre would similar to operating a medium sized IT company – an estimated one-time investment of USD 10 million, followed by USD 2 to 3 million per year for 5 years to run the portal). Cost horizon: 5 years

INDUS TRUST FUND



Indicative Cost
\$125-150 mn



Time Frame
SHORT



Location
ALL



Priority
MUST HAVE

Establishing a Trust Fund for the Indus Basin to pool, manage and deploy finance resources in support of activities under the Living Indus Initiative. The Government of Pakistan might formally establish such a fund, hosted in the Ministry of Climate Change, which can expend financial resources through provincial governments, businesses, and civil society.

The objective of the Trust Fund is to provide a central repository of funds dedicated exclusively to the implementation of agreed activities under the Living Indus Initiative. The Trust Fund would receive funding from both domestic and international sources which are allocated across activity areas and geographies through a transparent, accountable system. Given the ambition, generating the initial endowment will require an innovative approach, especially as we propose to kick-off the fund with as aspirational PKR 22 billion, symbolizing a contribution of PKR 100 per capita. This will require an endowment built from the civil society, public and private sector, and international development community; and serve as the main vehicle to contribute to saving the Indus Basin, which is the backbone of Pakistan's civilization. It will also require innovative financing vehicles such as Climate and Nature Performance Bonds.

Indicative cost: USD 125 million to USD 150 million (Establishing the fund would require an initial endowment of approx. USD 110 million (for 5 years) and a running expenditure of USD 2 million to USD 4 million per annum). Cost horizon: 5 years.



SDGs
5, 6, 7, 8, 11, 12,
13, 14, 15, 17



Status
NEW



Public Private Partnership



NDC



Flood Resilience

COMMUNITY METER



SDGs
5, 8, 11, 13, 17



Status
NEW



Public Private Partnerships



NDC



Flood Resilience

COMMUNITY METER



CLIMATE AND NATURE PERFORMANCE BONDS FOR A LIVING INDUS



Indicative Cost
 < \$10 mn



Time Frame
 SHORT



Location
 ALL



Priority
 MUST HAVE

The many activities proposed under the Living Indus Initiative will require funding beyond what will realistically be available from national and provincial budgets or even donor support. Funds will need to be raised from the private sector and full use will have to be made of new and innovative financial instruments - including green bonds and debt-for-nature swaps.

A new class of financial instruments is emerging that holds particular promise - variously known as SDG-linked bonds, KPI bonds or Performance bonds. They are particularly attractive in that they raise money for SDG-linked action while improving the debtor country's risk profile - and therefore the cost of the capital it raises on international markets. Such bonds fix performance indicators (e.g, ecological restoration of 1000 sq.km of degraded land). As milestones are achieved, the bond value is released. The investment in natural capital improves Pakistan's risk profile in international capital markets and thereby lowers the cost of capital. The performance indicators need only absorb a low percentage of the bond value, so that the rest may be deployed on other urgent development priorities.

The Living Indus Initiative, in close cooperation with the Ministry of Finance and the Debt Management Office, should pilot one or several sovereign performance bonds linked to activities identified in the initiative. Once a market has been established, it is highly probable that private capital markets will move in behind it, greatly augmenting the funds that can be raised for this purpose.

Indicative cost: Less than USD 10 million (This is an estimate, given it only requires technical assistance). Cost horizon: 5 years.

SOCIAL ENTREPRENEURSHIP FOR A CLIMATE RESILIENT INDUS



Indicative Cost
 < \$10 mn



Time Frame
 SHORT



Location
 ALL



Priority
 SHOULD HAVE

Social entrepreneurs are integral for a sustainable reversal of the Basin's deteriorating health by solving social, economic, and environmental problems, while also creating livelihood opportunities, particularly for youth and women. As per the British Council, in Pakistan, 53% of social enterprises operates in the Education sector, whereas Agriculture/Fisheries and Green Energy make up for 11% and 9%.²² With agriculture and energy sectors being major drivers of the Basin's economy, there is a strong need to promote social entrepreneurship in these two sectors with a salient objective to restore the Basins health.

The Indus Trust Fund is one proposed approach to facilitate social entrepreneurs (through financial support) to address these challenges. However, for the trust fund to be successful, accelerator programs to raise awareness, provide training and further nourish ideas are necessary, especially for 'must address' challenges such as waste management, environmental restoration, sustainable agriculture or other more radical concepts such as "alternative protein". These accelerator programs can be initiated in partnership with organizations already promoting entrepreneurship, such as the National Incubation Centres.

Indicative cost: Less than USD 10 million (This is an estimate, given it only requires technical assistance). Cost horizon: 5 years.



SDGs
 13, 14, 15, 17



Status
 NEW



Public Private Partnerships



NDC



Flood Resilience

COMMUNITY METER



SDGs
 1, 2, 5, 6, 8, 9,
 10, 13, 17



Status
 NEW



Public Private Partnerships



NDC



Flood Resilience

COMMUNITY METER



COMMUNITY ACCESS TO CLEAN ENERGY



Indicative Cost
\$200-250 mn



Time Frame
SHORT



Location
ALL



Priority
MUST HAVE

Clean energy is central for sustainable economic development. It is an established fact that Pakistan possesses immense wind and solar energy potential. According to the World Bank, utilising only 0.071% of the country's area²³ for solar photovoltaic (solar PV) power generation would meet Pakistan's current electricity demand.

This makes for a strong case to scale up existing projects and leverage on innovative approaches to harness Pakistan's clean energy potential. Under this intervention, we propose a combination of small-scale clean energy solutions across the Basin such as mini turbines, solar panels and wind power masts. But more important is how clean energy solutions are packaged, e.g. covering water canals for irrigation with solar panels and providing clean energy to neighboring communities is a win-win approach. Innovative initiatives can also be designed by packaging clean energy solutions. We propose, as a starting point, that 250 MW of clean energy be installed for vulnerable communities across the Basin over the next 5 years.

Indicative cost: USD 200 million to USD 250 million (Estimated cost to install 1 MW clean energy is between USD 750,000 to USD 1 million – Hence to install 250 MW, the estimated range is USD 200 million to USD 250 million). Cost horizon: 5 years.



SDGs
5, 6, 7, 8, 11,
12, 13, 17



Status
PILOTED



Public Private Partnerships



NDC

COMMUNITY METER



ZERO PLASTIC WASTE CITIES ALONG THE INDUS



Indicative Cost
\$1.5-2 bn



Time Frame
MEDIUM



Location
ALL



Priority
MUST HAVE

Indus River is the second most plastics-polluted river in the world, being located alongside a large human population of over 220 million. Pakistan generates 3.9 million tonnes of plastic waste in a year, of which only about 25% to 30% is managed.²⁴ The rest ends up on land or in water bodies. Annually 164,332 tonnes²⁵ of plastic waste is carried by the Indus River system to the sea, negatively affecting marine life and posing a threat to climate due to release of green-house gases as the plastic breaks down. Plastic waste has adversely impacted coastal areas in Sindh, such as the mangrove forests which have suffered from waste accumulation in natural habitats.²⁶

Pakistan has recently become a signatory to the Global Plastic Action Plan that aims to create a circular economy for plastics. In line with this commitment, we propose to establish “zero plastic waste cities” starting with the largest cities in the Indus Basin of Pakistan - Karachi, Lahore, Faisalabad, Rawalpindi, Hyderabad, Multan, Islamabad, Peshawar, Quetta, and others. This can be done effectively by leveraging the private sector and scaling up existing initiatives. For example, the partnership between Unilever and UNDP to create a circular economy system for plastics waste management aims to make Rahim Yar Khan a zero-waste city by 2025.²⁷

Indicative cost: USD 1.5 billion to USD 2 billion (Net cost of environmentally friendly plastic waste management projects is estimated to be between USD 100 and USD 2,000 per tonne of plastic waste. Since the Indus River System carries 164,332 tonnes, and we assume that per tonne of plastic waste will cost between USD 1,000 to USD 1,250 per tonne. Then the estimated cost range comes to between USD 150 to USD 200 million per annum). Cost horizon: 10 years.



SDGs
6, 11, 12, 13,
14, 15, 17



Status
PILOTED



Public Private Partnerships



NDC

COMMUNITY METER



URBAN FORESTS ALONG THE INDUS²⁸



Indicative Cost
\$100-150 mn



Time Frame
SHORT



Location
ALL



Priority
MUST HAVE

Pakistan's forest cover has shrunk to amongst the lowest in the world, at 5.1%, in comparison to 31% across the globe.²⁹ Human activities are the primary cause of deforestation in Pakistan which has contributed to rising temperatures, pollution, and environmental damage. The Pakistan government has already set itself the target to plant and regenerate 10 billion trees which will help restore the Basin's health. Supplementing the 10 billion tree program with an ambitious urban forestation program is now proposed. A large-scale program of urban forestation would mitigate urban challenges such as the deteriorating air quality, rising temperatures, insufficient carbon sequestration and depleting urban wildlife habitats. Existing urban plantation initiatives such as the Clifton Urban Forest in Karachi, the Miyawaki forest in Lahore (part of the 10 billion tree program) and the 1 million tree drive in Cantonment Boards are already showing promising results.

We propose to develop urban forests by planting 200 million trees over the next two years in all cities of Pakistan along the Indus. This initiative could be expanded on the model of China's sponge cities, where in addition to urban forests, there are complementing initiatives such as green roofs, creating urban wetlands and trenches to filter run-off water that can be used to replenish aquifers, irrigate gardens and urban farms, flush toilets and clean homes.

Indicative cost: USD 100 million to 150 million (Average cost per tree is assumed to be USD 0.5 to USD 0.75). Cost horizon: 5 years.



SDGs
11, 13, 14, 15



Status
PILOTED



Public Private Partnerships



NDC



Flood Resilience

COMMUNITY METER



100,000 COMMUNITY PONDS



Indicative Cost
\$1-1.5 bn



Time Frame
LONG



Location
ALL



Priority
MUST HAVE

Pakistan is now a water-stressed country, with per capita water availability of 1090m.^{30,31} Pakistan's growing population is expected to reach 225 million by 2025, which will only add pressure on water security. Groundwater supplies 90% of domestic water in rural Pakistan, 70% of domestic water nationally, and over 50% of agricultural water. Despite the dependence on groundwater and with approximately 80% of Pakistan's citizens living in the Indus Basin,³² there is no sustainable groundwater management program to take mitigation measures in time. Only 20% of the population has access to safe drinking water, the remainder relying on water which is contaminated by increasing salinity, untreated wastewater, pesticide and fertiliser residue from agricultural runoff, and geogenic (natural) contaminants.

Artificial recharge is the one of the oldest activities undertaken in South Asia to conserve rainwater both above ground and underground. The activity dates back to 600 AD when communities built ponds which effectively recharged the local wells. We propose to revitalize and establish 100,000 ponds across the Indus Basin, especially in water scarce regions. Although any such program will have to be designed with technical care and to avoid unintended negative consequences, it could, if properly designed, enhance artificial ground water recharge and help desalinate the groundwater, while serving also to improve waterlogged lands.

Indicative cost: USD 1 billion to USD 1.5 billion (Assuming the cost per pond to be between USD 10,000 to USD 15,000, based on earthwork, basic infrastructure, plantations etc). Cost horizon: 10 years.



SDGs
5, 6, 7, 8, 11, 12,
13, 14, 15, 17



Status
NEW



Public Private Partnerships



NDC



Flood Resilience

COMMUNITY METER



GREEN INFRASTRUCTURE FOR FLOOD CONTROL AND GROUNDWATER RECHARGE



Indicative Cost
\$30-35 mn



Time Frame
SHORT



Location
ALL



Priority
MUST HAVE

Groundwater serves as an important buffer against the variability of monsoon rains as well as surface water flows. Groundwater supplies 90% of domestic water in rural areas of Pakistan, 70% of domestic water nationally, and over 50% of agricultural water.³³ Despite Pakistan's dependence on groundwater, a large-scale systematic approach towards sustainable groundwater management is lacking.

Various ecosystem-based adaptation approaches and green infrastructure measures can be implemented to secure groundwater resources and ecosystem services, for example by using floodwater to restore wetland ecosystems. Techniques such as riverbank filtration, underground dams, recharge area protection and enclosures offer more sustainable and cost-effective storage as compared to grey infrastructure solutions such as dams. Switzerland for example use riverbank filtration to recharge, treat, and supply up to 80% of the drinking water requirements. This could be done under the umbrella of existing programs such as the GoP's Recharge Pakistan Program. Such programs have promised benefits of reduced flood risks, increased water security, enhanced agricultural productivity and food security (both through crops and fisheries), improved community-based disaster risk management, and provision of climate-resilient livelihood options. Investment can be sought from MDBs, GCF, and private sector.

Indicative cost: USD 30 million to USD 35 million (At 135 litres / day / capita, total clean water required is ~25 billion litres of day. One Riverbed Filtration Site (RBS), with a conservative capacity of 20 mn litres / day is estimated to be between USD 100,000 to 120,000. If we target to recharge and clean 25% of daily requirement, we will need 310 sites. The indicative cost is then estimated to be between USD 30 million to USD 35 million excluding operational costs) Cost horizon: 5 years.

SUSTAINABLE GROUNDWATER GOVERNANCE THROUGH PROVINCIAL WATER ACTS



Indicative Cost
< \$10 mn



Time Frame
MEDIUM



Location
ALL



Priority
MUST HAVE

Pakistan is the fourth largest groundwater abstractor in the world, and the Indus Basin Aquifer is the second most overstressed aquifer globally. Pakistan is also the world's largest exporter of groundwater, reflecting the volume of groundwater used in the country's export products such as rice, leather, and textiles. Groundwater provides more than 50% of the agricultural water requirement for Punjab, and at least 20% for Sindh and 50% for Balochistan.³⁴ In addition, groundwater serves more than 70% of Pakistan's drinking water requirement.

Groundwater is the main buffer against the unpredictability of climate change and irregularity of surface water flows,³⁵ but is suffering from unsustainable over-abstraction and pollution – in large part due to poor governance. Pakistan's commitment to sustainable governance of its groundwater resources is reflected in recent legal and institutional changes. At the federal level, the National Water Policy of 2018 has called for the creation of a Groundwater Authority in Islamabad. At the provincial level, the Punjab Water Act of 2019 and the Khyber Pakhtunkhwa Water Act of 2020 empowers the newly formed provincial water resource commissions to issue licenses for abstraction and disposal of groundwater. However, implementation is lacking. We propose to enact water acts in remaining provinces, Balochistan and Sindh, and build capacity to implement all groundwater legislations across Pakistan.

Indicative cost: Less than USD 10 million (This is an estimate, given it only requires technical assistance). Cost horizon: 5 years.



SDGs
6, 11, 12, 13



Status
PILOTED



NDC



Flood Resilience

COMMUNITY METER



SDGs
6, 11, 12, 13,
14, 15, 17



Status
ONGOING



NDC

COMMUNITY METER



INDUS PROTECTION ACT AND INDUS COUNCIL



Indicative Cost
< \$10 mn



Time Frame
SHORT



Location
ALL



Priority
MUST HAVE

The ecological protection of the Indus River System needs a new national legal and institutional framework to achieve the twin goals of ecological protection and green development in the Indus Basin. The Indus Protection Act, inspired by other initiatives aimed at ecological protection of rivers such as Yangtze River Protection Law, Yellow River Protection Law and National Ganga River Basin Authority, would govern the Indus Basin's overall planning of land resources and water resources, pollution management, rehabilitation of ecology, and issues of institutional coordination.

Recognizing the Indus as the lifeline of Pakistan's socio-cultural and economic activity, we propose that it should confer the rights of legal personhood to the river. This has already been done in countries such as New Zealand, India, Colombia, Ecuador and Canada. The Indus Protection Action should be accompanied by the formation of an 'Indus Council', a high-level political authority, chaired by the Prime Minister, with an interprovincial structure spanning multiple sectors - environment, urban development, water resources, agriculture, industries, energy and tourism, etc. - which works across ministerial and provincial boundaries. The Indus Council should have a clear mandate to address the critical gaps in sustainable development of the Indus by enhancing the capacity of existing governing institutions such as Indus River System Authority and Council of Common Interests, and with provincial governments, implementing agencies, civil society and the private sector to achieve the goals of the Living Indus Initiative and also serve as a platform for improving interstate cooperation for the health of the Indus Basin.

Indicative cost: Less than USD 10 million (This is an estimate, given it only requires technical assistance). Cost horizon: 5 years.



SDGs
5, 6, 11, 12,
13, 14, 15



Status
NEW



NDC



Flood Resilience

COMMUNITY METER



INDUS PROTECTED AREAS³⁶



Indicative Cost
\$2-3 bn



Time Frame
2030
MEDIUM



Location
ALL



Priority
MUST HAVE

The Indus flows for 3180 km before emptying into the Arabian Sea and supports 97% of the total mangrove forests in the Delta.³⁷ However, a myriad of challenges threatens the health of the Basin, such as grey infrastructure encroachments in the shape of urban sprawl, extensive use of outdated agriculture techniques and increasing pollution. These now represent existential threats to both the flora and fauna of the Basin.

Establishing Protected Areas is a tried and tested approach to protect biodiversity and restore ecosystems. At the global level, there are an estimated 269,840³⁸ protected areas across 245 countries and territories. This averages to approximately 1,100 protected areas per country, whereas Pakistan has only around 400 protected areas recognized by IUCN. We propose establishing 500 new protected areas and uplifting 50 existing protected areas to Zero Carbon status through local community engagement and by incentivizing the private sector to adopt and establish protected areas. As a first step, a comprehensive master plan must be developed for the restoration and rehabilitation of the protected areas, which will feed into community driven management plans, specific to each protected areas ecological and biodiversity needs.

Indicative cost: USD 2 billion to 3 billion (Assuming USD 4 to 6 million per establishment and management of protected area over 5 years). Cost horizon: 10 years.



SDGs
5, 13, 14, 15, 17



Status
ONGOING



Public Private Partnerships



NDC



Flood Resilience

COMMUNITY METER



BUILD BACK BIODIVERSITY IN THE INDUS BASIN



Indicative Cost
\$200-250 mn



Time Frame
2030
MEDIUM



Location
ALL



Priority
MUST HAVE

Pakistan consists of various ecological regions with diverse biological life on land and in the water. There are about 668 bird species, 195 mammals, 22 amphibians, 198 freshwater fish, 800 marine fish, more than 5,000 invertebrates and 5,700 flowering plants in Pakistan.³⁹ Approximately 63% of Pakistan's population lives in rural areas and is primarily dependent on the Basin's ecosystems for their livelihoods.⁴⁰ Pressure from the increasing population on the ecosystem has resulted in forest degradation, depleted rangelands, over-grazing of pastures, illegal hunting, and pollution of wetlands. These factors are major threats to the biodiversity of Pakistan.

Ecosystem-based forest management and designating specific sites for Biodiversity Reserves is key to restoring forest biological diversity. We propose to establish 50 new biodiversity reserves along the Indus Basin in the first phase, along with supporting existing national parks and protected areas to restore biodiversity. Nature-based activities and infrastructure can be implemented to support aquaculture and bird life, such as fish hatcheries in the Basin to promote rewilding of aquatic life and promoting pollen rich plant species that bring back bees and birds. These initiatives have to be in tandem with biodiversity-friendly policies for agriculture, forestry, livestock and fisheries and hinge upon the successful engagement of and ownership by local communities.

Indicative cost: USD 200 million to 250 million (Assuming the cost per biodiversity reserve to be USD 1 million to establish and an additional USD 200,000 to USD 300,000 per annum to run operations). Cost horizon: 10 years.



SDGs
1, 8, 11, 12,
13, 14, 15



Status
ONGOING



Public Private Partnerships



NDC



Flood Resilience

COMMUNITY METER



COMMUNITY BASED ECOTOURISM



Indicative Cost
\$350-400 mn



Time Frame
SHORT



Location
ALL



Priority
MUST HAVE

In 2018, 6.6 million tourists visited Pakistan,⁴¹ generating USD 765 million for Pakistan's economy. The Indus Basin makes up 80% of Pakistan's land mass and presents tremendous tourism potential, with over 29 notified national parks and more than 400 protected areas.⁴² However, there is a need to improve management of existing wildlife parks and national parks through upgrading the national and provincial tourism policies, and by envisioning a greater role of local communities in promoting sustainable eco-tourism.

A new and improved governance for eco-tourism must envision a key role for local communities and the private sector to support implementation and management of sustainable ecotourism initiatives in national and wildlife parks. Wildlife tourism and ecotourism represent interesting opportunities for local communities to boost their income-generating potential whilst also safeguarding the conservation of species. Empowering local communities through education, social entrepreneurship and cultural preservation programs coupled with an incentive scheme for recognizing the best managed parks will be instrumental in developing sustainable community led ecotourism and can generate significant livelihood opportunities. Studies show that for every dollar governments invest in protected areas and support for nature-based tourism, the economic rate of return is at least six-times the original investment. Similarly, experiences from Brazil, Fiji, Nepal and Zambia also show that for every additional dollar spent by a tourist, local incomes increase by more than a dollar, making investments to improve eco-tourism governance a viable option to restore the Basins health and also increase income of local communities.

Indicative cost: USD 350 million to 400 million (contribution of travel and tourism to Pakistan's gross domestic product (GDP) was 5.7%; i.e. ~USD 15 billion. We assume to spend 0.5% of tourism GDP on improving eco-tourism governance; i.e. USD 75 million per annum, which equals to between USD 350 million to 400 million). Cost horizon: 5 years.



SDGs
1, 2, 5, 6, 8, 10,
12, 13, 15



Status
ONGOING



Public Private Partnerships



Flood Resilience

COMMUNITY METER



INDUS HERITAGE SITES



Indicative Cost
\$25-50 mn



Time Frame
SHORT



Location
ALL



Priority
SHOULD HAVE

Heritage sites such as the archaeological ruins of Mohenjo-Daro, the Buddhist ruins of Takht-i-Bahi, Stupas in Swat, or the Pir Patho watchtower are undoubtedly a living testament to the richness of the Indus civilization. Some, like the restored historical fort in Sehwan city (dating back to the era of Alexander the Great), are extremely well managed, but many heritage sites are not. Additional measures and resources are required to reverse the heritage decay, not only to uplift tourism and create economic activity but to ensure that these heritage sites play their part to educate citizens and be part of the “Story of the Indus”.

We propose that the Living Indus Initiative adopts 10 heritage sites along the Basin and empowers the local community through financial and technical facilitation. Today, technological advancements (such as 3D models) along with innovations in materials and techniques have made it possible to resurrect and safeguard heritage sites. These efforts will aim to reverse the deterioration of heritage sites through a sustainable and eco-friendly approach and bring these historical symbols into the broader public's consciousness under the “Indus Heritage Ecotourism Initiative”.

Indicative cost: USD 25 million to USD 50 million (Assuming a cost of ~USD 5 million per major site and ~USD 2.5 million per minor sites, if we establish 10 sites, this translates to a range of USD 25 to USD 50 million). Cost horizon: 5 years.



SDGs
5, 6, 10, 11,
12, 13



Status
ONGOING



Public Private Partnerships

COMMUNITY METER



NATURE-BASED WATERSHED MANAGEMENT



Indicative Cost
\$500 mn-1 bn



Time Frame
MEDIUM



Location
ALL



Priority
MUST HAVE

Over the last century, climate change-induced flooding, large scale degradation of forests, alpine and sub-alpine pastures and glaciated lands as well as heavy grazing and unregulated tourism have all contributed to rapid deterioration of the Indus Watershed. These cumulative climate induced changes have led to challenges in sustaining the Indus flows. For example, large-scale siltation of the Indus River to the tune of 221 million tons per year has been recorded at Dattu Kohistan.⁴³ It has been projected that due to soil erosion, siltation of main reservoirs will reduce up to 30% surface water storage capacity by 2025.⁴⁴ This water shortage could result in food shortage of 70 million metric tons.⁴⁵

There is an urgent need for conservation of soil, plant and water resources of the Indus Watershed in line with the principles of integrated watershed management. The Indus Watershed comprises 1,091 sub-watersheds spread throughout Pakistan, with 609 in KP, 352 in AJK, 75 in GB, 20 in Punjab and 35 in Balochistan.⁴⁶ We propose a detailed analysis of the 1,091 watersheds to identify gaps in existing efforts and identify solutions to implement as part of a granular integrated watershed management plan, which prioritizes local community participation for sustainability.

Indicative cost: USD 500 million to USD 1 billion (Assume USD 500,000 to USD 1 million per sub-watershed over a 10-year period). Cost horizon: 5 years.



SDGs
1, 2, 6, 8,
12, 13, 15



Status
ONGOING



NDC



Flood Resilience

COMMUNITY METER



EXPANDED GLOF II



Indicative Cost
\$50-100 mn



Time Frame
LONG



Location
UPPER



Priority
MUST HAVE

The upper Indus catchment has more than 16,400 hectares under glaciers which contribute about 80% of the water in the Indus River System.⁴⁷ The increased frequency of climate change induced GLOF (Glacial Lake Outburst Floods) events has made over 7.1 million people vulnerable to climate disasters in Gilgit Baltistan and Khyber Pakhtunkhwa.⁴⁸

In order to improve the response to climate disasters and protect vulnerable populations in these areas, a Very Early Warning System is needed. An effective Early Warning System saves human lives and assets and reduces rehabilitation costs through integrated communications to help vulnerable segments of the community prepare in time and avoid conversion of risk into disasters. For every rupee spent on a Very Early Warning System, it has been estimated that damage worth more than PKR 56 can be averted. The Ministry of Climate Change, with the technical and financial assistance of UNDP and GCF, is already implementing the GLOF-II project in 10 districts of GB and KP. Building on the promising results from GLOF II, we propose to expand geographical coverage of GLOF II to all vulnerable districts in the catchment area and address gaps in the existing areas. This program would aim to improve the response capacity to GLOF events and climate disasters through an improvement in risk knowledge, monitoring, and warning services as well as dissemination and communication.

Indicative cost: USD 50 million to USD 100 million (GLOF II cost is USD 37.5 million, hence the expansion is assumed to be more). Cost horizon: 15 years



SDGs
1, 2, 11,
13, 15



Status
ONGOING



NDC



Flood Resilience

COMMUNITY METER



NATURE-BASED RESILIENT AGRICULTURE



Indicative Cost
\$500-750 mn



Time Frame
SHORT



Location
ALL



Priority
MUST HAVE

Pakistan consists of arid to semi-arid regions with vast variability in climatic parameters. Monsoon rains are the dominant water resource which contributes to 59% of annual rainfall. Global Climate Risk Index (GCRI) ranks Pakistan at 8th position⁴⁹ among the most affected countries due to climate change. According to the GCRI annual report for 2020, Pakistan has suffered economic losses worth US\$ 3.8 billion and witnessed 152 extreme weather events from 1999 to 2018.⁵⁰ As per Pakistan Meteorological Department (PMD), the country received below normal (-41.5%) rainfall between (Oct-20 to Mar-21) with Balochistan and Sindh among the main impacted areas. The drought conditions along with changing Monsoon patterns have already severely impacted food security.

Significant investment has already gone into making more water available for agriculture such as the Kachhi Canal in Balochistan and Thar Canal in Sindh. But now is the time to supplement grey infrastructure solutions with nature-based solutions whilst improving water distribution in water stressed areas. We propose to revise the existing institutional framework on these lines, and aggressively promote practices such as on-farm rain harvesting systems like conservation tillage, bed-sowing for more crop per drop, advanced soil moisture measurement techniques to improve irrigation schedule and even the more radical, nano-technology driven efficient water application technologies.

Indicative cost: USD 500 million to USD 750 million (To make one-million acre-feet of water available through grey infrastructure costs roughly USD 200 to USD 250 million (which is estimated from the national watercourse phase 2 program). As nature-based infrastructure is more complex and diverse, we have assumed that nature-based infrastructure will cost an additional 25%. If we set an ambitious target to make 2 MAF available through nature-based infrastructure, the indicative cost estimates to be between USD 500 million to USD 750 million). Cost horizon: 5 years.



SDGs
1, 2, 11,
13, 15



Status
NEW



Public Private Partnerships



NDC

COMMUNITY METER



PROMOTING PERMACULTURE



Indicative Cost
\$5 mn



Time Frame
SHORT



Location
ALL



Priority
SHOULD HAVE

Pressures to nourish growing population has led to increased agriculture productivity through mechanization and chemicals but in the process has also degraded soils and nutritional value of agricultural products, leading to deleterious health effects. Throughout the world, there is a strong focus on new approaches to improve soil fertility and increase yields without compromising ecosystems health. A return to pesticide free, organic agriculture is one such movement that has gained focus in recent years.

The promotion of Permaculture - abbreviated from Permanent Agriculture - is of interest in this context and is now practiced in more than 140 countries. Permaculture focuses on development of an ecosystem that is self-sustaining and self-sufficient. The inspiration is to develop farming systems that are based on crop diversity, resilience, and natural productivity. Such systems generally are based on rainwater harvesting along with the division of cultivable lands into various zones. Each zone is utilised to grow multiple crops at a time. Permaculture can be practiced in small areas (such as 1 hectare only) and could yield 3 to 4 times as much as conventional agriculture.⁵¹ Pakistan could learn from successful examples from countries such as Japan, India and Australia where permaculture has flourished. We propose to promote this concept in Pakistan by creating model permaculture farms in at least 20 districts. These farms will be used by the community for learning new and innovative techniques in agriculture to improve soil fertility and productivity.

Indicative cost: ~USD 5 million (As this is a pilot initiative, it will not require a large investment at the outset. Assuming permaculture will be piloted at an existing farm, the average per annum cost is expected to not exceed USD 50K per annum per site. The 5 year budget per site is estimated to be USD 250K per pilot. This equates to USD 5 million across 20 sites – each site represents multiple areas with various zones). Cost horizon: 5 years.



SDGs
6, 7, 8, 11,
12, 13



Status
NEW



Public Private Partnerships



NDC



Flood Resilience

COMMUNITY METER



MANAGING AGRICULTURAL WASTE WATER



Indicative Cost
\$1.5-2 bn



Time Frame
2030
MEDIUM



Location
ALL



Priority
SHOULD HAVE

Agriculture is recognized as one of the major sources of surface and groundwater pollution in Pakistan. The unqualified use of nitrogen and phosphorus-based fertilisers and pesticides are amongst the most harmful sources of water pollution in the Indus Basin, threatening ecosystems and biodiversity. Modern mechanical farming techniques such as the removal of vegetation and intensified ploughing degrades the soil layer ecosystem and reduces its ability to deliver several ecosystem services that are important to maintain water quality. High levels of nitrogen and phosphorus in water bodies can cause eutrophication of water bodies with severe consequences for aquatic and marine life and biodiversity.

The use of nature-based solutions hold great promise for diffusing non-point source pollution by using integrated pest management and plant nutrition management as ways of managing agricultural runoff and drainage water. We propose to construct wetlands or vegetated buffer strips, as have been used in countries such as Germany, England, Denmark, United States and Taiwan which demonstrated considerable success at removing ammonia, nitrate, phosphorus and phosphate from agricultural runoff. In addition, water and sediment control basins are earthen embankments that can effectively trap sediment and manage onsite and downstream runoff.⁵²

Indicative cost: USD 1.5 to USD 2 billion (Agriculture in the Indus Basin (plain and lower region) spans across 150,000 Km2 and assuming these nature-based solutions are put in place for every 1,000 Km2 – this will require 150 such sites. Each site is assumed to be a minimum of 1 million cubic yards, and the cost per basin of 235 cubic yards is between USD 2000-5000. The guesti-bounded indicative cost comes to between USD 1.5 to USD 2 billion) Cost horizon: 10 years.



SDGs
1, 11, 12,
13, 14, 15



Status
NEW



Public Private Partnerships



NDC

COMMUNITY METER



INDUS CLEAN-UP: INDUSTRIAL AND URBAN EFFLUENT TREATMENT



Indicative Cost
\$3-4 bn



Time Frame
MEDIUM



Location
ALL



Priority
MUST HAVE

Pakistan treats less than 1% of wastewater in the Indus Basin,⁵³ very far from the SDG goal of being able to treat 50% of the wastewater generated. Despite existing legal provisions, 99% wastewater is discharged untreated in open drains which eventually enters the Indus River System, and of the 99% about 75% comes from untreated urban and rural residential wastewater. This directly affects the health, environmental flow and sustainability of the Indus River system, and the human, terrestrial and aquatic life it supports. Untreated wastewater further contributes to climate change with a GHG footprint three times that of the same wastewater treated in a traditional wastewater treatment plant.

Of the 388 cities in Pakistan, only 8 cities have wastewater treatment facilities,⁵⁴ with some only partially functioning. The establishment and strict implementation of adequate effluent treatment facilities for industries and municipalities along the Indus is critical. This should be supplemented by the use of nature-based solutions (water based or substrate based) for wastewater treatment. However, given the cost-intensive nature of this intervention, we propose building Public-Private Partnerships across the Basin to treat wastewater through a combination of grey and green infrastructure, which is supported by an incentive program for the local community, municipalities and businesses.

Indicative cost: USD 3 billion to 4 billion (Assuming we need to install 200 systems each in top 5 major cities, 50 systems in top 50 cities, 5 systems in remaining of 388 cities – this comes to an approx. 5,300 systems. If on average a system costs between USD 500,000 to USD 1 million, the guesstimate-bounded cost estimated range would be USD 3 billion to 4 billion). Cost horizon: 10 years..

SALINITY CONTROL IN THE LOWER INDUS



Indicative Cost
\$200-350 mn



Time Frame
MEDIUM



Location
LOWER



Priority
MUST HAVE

Approximately 50% of land in Lower Indus region is affected by salinity, presenting a significant threat to agricultural productivity, food security and hence, livelihoods in this region. While construction of Left Bank Outfall Drain (LBOD) in 1997 attempted to relieve the issue by removing saline drainage from affected districts into the Arabian Sea, but also resulted in ecological deterioration of the region due to design and management flaws. LBOD not only drains saline wastewater, but also untreated effluent and municipal wastewater along with flood water into the Indus Delta, further adding to the delta's ecological deterioration.

There is a need to restructure and redesign the governance of Left Bank Outfall Drain. This could include a range of interventions such as restoring natural waterways (Dhoras) to recharge creeks, treatment of wastewater before release, installation of water quality metres for improved monitoring, desilting of drains to manage flooding, and bio-saline agriculture. These interventions will complement and build on the success of other interventions under the Living Indus such as wastewater treatment, reducing water pollution from agriculture sources, and mangrove afforestation and rehabilitation. A governance overhaul and improved management of LBOD and upcoming Right Bank Outfall Drain can be pivotal in reducing the estimated economic loss of USD 2 billion per annum incurred in the Indus Delta due to ecological degradation.

Indicative cost: USD 200-350 million (LBOD construction was estimated to cost USD 844 million - if we assume to spend 20% of original cost to improve management, it comes to approx. 200 million. RBOD on the other hand is also estimated to cost approx. USD 750 million, which may also require an additional 20% of original cost for improvement in management). Cost horizon: 10 years.



SDGs
3, 6, 11, 12, 13,
14, 15, 17



Status
ONGOING



Public Private
Partnerships



NDC

COMMUNITY METER



SDGs
6, 13, 14



Status
ONGOING



Flood Resilience

COMMUNITY METER



SUSTAINABLE AQUACULTURE AND FISHERIES MANAGEMENT



Indicative Cost
\$125-250 mn



Time Frame
SHORT



Location
ALL



Priority
MUST HAVE

Pakistan's fisheries account for about 1% of the GDP, employing about 400,000 fisherfolk and another 600,000 in ancillary industries.⁵⁸ Increasingly, ecosystem degradation and climate change has threatened the sustainability of the fisheries sector, including through temperature, rainfall and hydrological changes in the Indus Basin are adversely affecting fish reproduction, growth, and migration patterns. Despite the importance and potential of fisheries for the economy, policy linkages with other sectors (including water management and agriculture) are underdeveloped and institutional capacity is limited. There is a critical need to improve fisheries governance, starting with a national policy framework to improve coordination across the fisheries sector, and a shift from fisheries as a commercial activity towards conservation and protection of aquatic life for ecologically balanced development of the fisheries sector.

We propose a move towards climate-smart and sustainable aquaculture through an integrated approach for inland and marine fisheries. This includes, but may not be limited to, curtailing harmful and illegal fishing practices such as drag net fishing and overnight fishing, improving biosecurity and sanitary conditions for post-harvest landing facilities, and preventing degradation of freshwater resources for sustainable management of inland fisheries. In this regard, it is proposed that 20 additional fish sanctuaries along the Indus Basin are established to ensure sustainability of the sector and to safeguard its potential for economic growth.

Indicative cost: USD 125 million to USD 250 million (Agriculture GDP is 18.9% of GDP, which equals to ~USD 50 billion. Fisheries is 4% of Agriculture GDP, which makes it a USD 2 billion market. If we assume that approx. 1% to 2% equivalent of fisheries market is invested to improve the sectors governance, this translates to a range of USD 25 to USD 50 million per annum). Cost horizon: 5 years.



SDGs
2, 5, 8, 12,
14, 17



Status
NEW



Public Private Partnerships



NDC

COMMUNITY METER



TELLING THE LIVING INDUS STORY



Indicative Cost
\$15-25 mn



Time Frame
SHORT



Location
ALL



Priority
MUST HAVE

Water sustains life and the story of the Indus Basin is no different. Ancient folklore attests to the enduring legacy of the Indus and its presence in Pakistani literature, mysticism, and culture. To reignite the traditional reverence reserved for the Indus, we must change how we think about the Basin and what it means for us.

A narrative is built on and populated by a thousand stories. A stronger narrative is built around stronger stories. We propose the communications strategy to be centred around building on citizen narratives, advocacy, educational curricula, and arts and culture interventions all aimed to cultivate awareness about the importance of a healthy Indus. The objective of the communications program is to encapsulate what the Indus is telling us, by building on examples of initiative and success, which gradually replace a sense that the problems of the Indus are intractable. A deliberate building of an inspiring Living Indus narrative is a precondition of success and will be built into the design of the initiative from the beginning. We need to build champions for the Indus Basin, as part of a movement, for which we propose a program for civil society, media houses, businesses, educational and government institutions to build a strong foundation of shared values that can serve as the basis for Indus Basin repair and rehabilitation, and especially inspire the youth to be mascots for a Living Indus.

Indicative cost: USD 15-25 million (Assuming between USD 3 million to USD 5 million per year as the seed investment required to mobilize stakeholders for a period of 5 years). Cost horizon: 5 years.



SDGs
5, 13, 16



Status
NEW



Public Private Partnerships

COMMUNITY METER



CLIMATE RESILIENCE ON THE INDUS DELTA



Indicative Cost
\$100-150 mn



Time Frame
SHORT



Location
LOWER



Priority
MUST HAVE

Pakistan boasts 1046 km of coastline, bordering Iran in the west and India in the east. Climate change has resulted in rising temperatures from 0.6 to 1 degree Celsius, thereby reducing precipitation in the coastal belt.⁵⁵ The country has lost 2.2 million hectares of land due to sea intrusion⁵⁶, creating a vulnerability for the entire coastal ecosystems and for the communities dependent on them. Entire fishing communities in the Indus Delta region are forced to migrate due to sea intrusion. Small villages like Sokhi Bander and Kharo Chan face extinction in this situation.

A key factor that aggravates the problem is loss of the mangroves forests, which are the first line of defence against coastal flooding and serve as a highly effective carbon sink to combat rising CO₂ levels. Approximately 500,000 citizens benefit from the 600,000 hectares of mangrove protected area in the Indus Delta,⁵⁷ making it one of the most productive ecosystems in Pakistan. Yet the mangrove forests face serious threat due to extensive cutting for commercial and domestic use, increasing pollution, low regeneration, and a poor growing environment due to rising salinity and decrease in nutrient replenishment through siltation because of reduction in water flows.

We propose that an integrated coastal zone management plan for the entire coastal belt of Pakistan be developed for Sindh and Balochistan provinces, including nature-based strategies for each coastal zone. The integrated plan would include steps to protect biodiversity, revive mangrove forests, uplift fishing communities and manage urban sprawl, and must be supported by a high-powered body to monitor progress and coordinate between levels of governments and civil society, including businesses.

Indicative cost: USD 100 million to 150 million (Assuming the cost to restore mangrove forest in Pakistan is USD 750 to 1,000 per hectare and with 600,000 hectares in total, if the Living Indus Initiative targets to restore an additional 25% of mangrove forests over the next 5 years – the cost comes to between USD 100 million to 150 million. As for the coastal zone management plan, it only requires technical assistance which is assumed to cost less than USD 10 million). Cost horizon: 5 years.



SDGs
1, 11, 12, 13,
14, 15, 17



Status
ONGOING



Public Private Partnerships

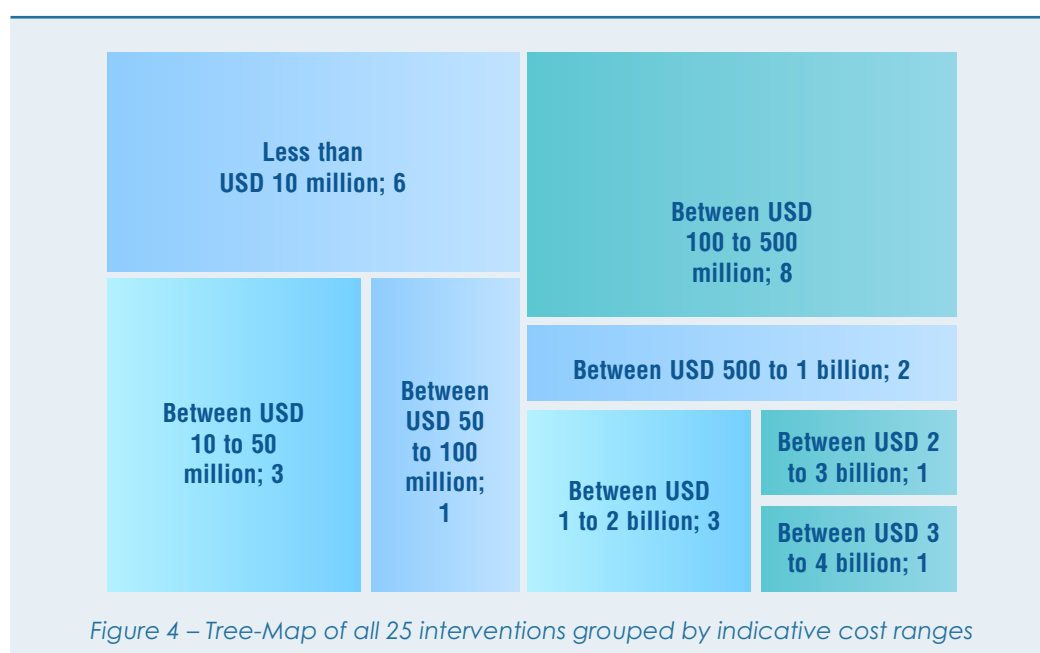


NDC



Flood Resilience

COMMUNITY METER



A time to act

The time to act is now. We have presented here an early collation of a living list – a menu, if you will – of interventions that are diverse and build upon each other with important cross synergies. These interventions draw on an axis of action and five focus areas that Chapter 3 will discuss to bring in dimensions of governance, technology, community led natural resource governance and conservation,



Let us begin with what can be done immediately and seek support nationally and internationally on the more ambitious interventions But, please, let us not delay action

innovative forms of climate finance as partnership with civil society and the private sector. The purpose here, is to suggest that there is a variety of important interventions that can be made immediately. The Indus clearly needs all this and more but let us not delay action and start wherever we can, building on what we can do now and creating a momentum of action. This is not a 'program' that must necessarily be funded fully for anything to happen, it can start at any point and build upwards and outwards.

A rough and ready sense of the 'ballpark' cost of each intervention has been included – ranging from as little as USD 5 million to as much as USD 4 billion for some long-term interventions – to highlight that financing too should not be a barrier to immediate action. Let us begin with what can be done immediately and seek support nationally and internationally on the more ambitious interventions. But, please, let us not delay action.

Ours are necessarily broad estimates and the accompanying Tree-Map (Figure 4) present a visual description of the diversity in indicative cost ranges that the Living Indus intervention list encapsulates. However, all said, there is no need to wait to raise a minimum threshold of finance to be able to start. First, because the cost of inaction is far more and second, the list of interventions provides opportunities at every level of investment suitable to a range of budgetary constraints. For example, six of our 25 indicative interventions each require less than USD 10 million, mainly for technical assistance. And even for the larger and cost-intensive interventions, work can begin now, sometimes modularly, especially as different interventions complement and build platforms for other's success.

The next, and final, chapter will take an even broader view of how to advance the agenda for a Living Indus. In doing so, it will define an 'axis of action' that builds on global best practice and, if implemented properly, could potentially make the Living Indus become the global best practice. That, in fact, should be our ambition.

Table 2: Snapshot of proposed interventions under Living Indus Initiative characterized by parameters

Proposed Interventions	Priority	Status	Location	Indicative Cost	Time Frame	SDGs	NDC	Flood Resilience	Community Engagement	PPP
A Living Indus Knowledge Platform: Crowd sourcing knowledge	Must Have	New	All Along the Indus Basin	Between USD 10 to 50 million	Short	5,6,7,8, 11,12,13, 14,15,17	Yes	Yes	High	Yes
Indus Trust Fund	Must Have	New	All Along the Indus Basin	Between USD 100 to 500 million	Short	5,8,11, 13,17	Yes	Yes	Low	Yes
Climate and Nature Performance Bonds for a Living Indus	Must Have	New	All Along the Indus Basin	Less than USD 10 million	Short	13,14, 15,17	Yes	Yes	Low	Yes
Social Entrepreneurship for a Climate Resilient Indus	Should Have	New	All Along the Indus Basin	Less than USD 10 million	Short	1,2,5,6, 8,9,10, 13,17	Yes	Yes	High	Yes
Community Access to Clean Energy	Must Have	Piloted	All Along the Indus Basin	Between USD 100 to 500 million	Short	5,6,7,8, 11,12,13, 17	Yes	No	Medium	Yes
Zero Plastic Waste Cities Among the Indus	Must Have	Piloted	All Along the Indus Basin	Between USD 1 to 2 billion	Medium	6,11,12, 13,14,15, 17	Yes	No	High	Yes
Urban Forests along the Indus	Must Have	Piloted	All Along the Indus Basin	Between USD 100 to 500 million	Short	11,13, 14,15	Yes	Yes	High	Yes
100,000 Community Ponds	Must Have	New	All Along the Indus Basin	Between USD 1 to 2 billion	Long	5,6,7,8, 11,12,13, 14,15,17	No	Yes	High	Yes
Green Infrastructure for Flood Control and Groundwater Recharge	Must Have	Piloted	All Along the Indus Basin	Between USD 10 to 50 million	Short	6,11, 12,13	Yes	Yes	High	No
Sustainable Groundwater Governance through Provincial Water Acts	Must Have	Ongoing	All Along the Indus Basin	Less than USD 10 million	Medium	6,11,12, 13,14,15, 17	Yes	No	High	No
Indus Protection Act	Must Have	New	All Along the Indus Basin	Less than USD 10 million	Short	5,6,11, 12,13,14, 15	Yes	Yes	High	No
Indus Protected Area	Must Have	Ongoing	All Along the Indus Basin	Between USD 2 billion to 3 billion	Medium	5,13,14, 15,17	Yes	Yes	High	Yes
Build Back Biodiversity in the Indus Basin	Must Have	Ongoing	All Along the Indus Basin	Between USD 100 to 500 million	Medium	1,8,11,12 13,14,15	Yes	Yes	High	Yes
Community Based Ecotourism	Must Have	Ongoing	All Along the Indus Basin	Between USD 100 to 500 million	Short	1,2,5,6, 8,10,12, 13,15	Yes	Yes	High	Yes
Indus Heritage Sites	Should Have	Ongoing	All Along the Indus Basin	Between USD 10 to 50 million	Short	5,6,10, 11,12,13	No	No	High	Yes
Nature-Based Watershed Management	Must Have	Ongoing	All Along the Indus Basin	Between USD 500 to million to 1 billion	Short	1,2,5,6, 8,10,12, 13,15	Yes	Yes	High	No

Table 2: Snapshot of proposed interventions under Living Indus Initiative characterized by parameters

Proposed Interventions	Priority	Status	Location	Indicative Cost	Time Frame	SDGs	NDC	Flood Resilience	Community Engagement	PPP
Expanded GLOF II	Must Have	Ongoing	Upper	Between USD 50 to 100 million	Long	1,2,11, 12,15	Yes	Yes	High	No
Nature-Based Resilient Agriculture	Must Have	New	All Along the Indus Basin	Between USD 500 million to 1 billion	Short	1,2,11, 13,15	Yes	No	High	Yes
Promoting Permaculture	Should Have	New	All Along the Indus Basin	Less than USD 10 million	Short	6,7,8, 11,12,13	Yes	Yes	High	Yes
Managing Agricultural Waste Water	Should Have	New	All Along the Indus Basin	Between USD 1 to 2 billion	Medium	1,11,12, 13,14,15	Yes	No	High	Yes
Indus Clean-up: Industrial and Urban Effluent Treatment	Must Have	Ongoing	All Along the Indus Basin	Between USD 3 to 4 billion	Medium	3,6,11, 12,13,14, 15,17	No	No	Medium	Yes
Salinity Control in the Lower Indus	Must Have	Ongoing	Lower	Between USD 100 to 500 million	Medium	6,13,14	No	Yes	Medium	No
Sustainable Aquaculture and Fisheries Management	Must Have	New	All Along the Indus Basin	Between USD 100 to 500 million	Short	2,5,8, 12,14,17	Yes	No	High	Yes
Telling The Living Indus Story	Must Have	New	All Along the Indus Basin	Less than USD 10 million	Short	5, 13, 16	No	No	High	Yes
Climate Resilience on the Indus Delta	Must Have	Ongoing	Lower	Between USD 100 to 500 million	Short	1,11,12, 13,14,15, 17	Yes	Yes	High	Yes

“ At the heart of the Initiative is the wish not only to protect the Indus as the essential lifeblood of the nation, but to restore it to the health it once enjoyed ”





Moving forward

Discussions of climate change and environmental degradation are characteristically accompanied by urgent calls for action. The time for discussion is over, we are told, and the time to act is now!

In the design of the Living Indus Initiative, we have heeded this call. The bulk of this presentation is focused on action that can be initiated immediately; existing action that can be reinforced, taken to scale or extended geographically beginning now; and action that builds on best practice in Pakistan or elsewhere that can be adapted and implemented in the short term.

This is deliberate. The Living Indus Initiative flows from two sources: first, it

springs from a sober assessment of the present situation. The Indus and its ecosystems are under pressure both from the seemingly inexorable changing climate, temperature fluctuations, disruption of rainfall patterns, and early stage of efforts to adapt to and mitigate these effects. A resilient Indus will be one that seeks to build resilience in the face of changes already underway or whose advent is highly probable given the state of science. At the heart of the Initiative is the wish not only to protect the Indus as the essential lifeblood of the nation, but to restore it to the health it once enjoyed, thus rendering it capable of offering a life of prosperity and dignity to all Pakistanis.



As important and as sobering as the degraded state of Indus ecosystems may be, there is a second source for this initiative, and that is the growing demand of the nation and its population and communities for action to ensure a healthy future rooted in healthy and resilient ecosystems, in the steady building of human, social and natural capital, and in a shared vision for a more equitable and stable future.

The 2017 Pakistan Human Development Report focusing on youth in Pakistan⁵⁹ painted a picture of a generation full of energy and determination to construct a new and different nation, driven by a clear vision of the Pakistan they wish to see emerge, and brimming with innovative ideas across a very wide spectrum of fields, from governance, finance, and economic organization right across to social dynamics, the role of communities, applications of technology and many others. If ever there was doubt about the human capital to build a resilient and dynamic Pakistan, this report will have put them to rest.

Indeed, the energy, vision and commitment of Pakistan's youth is the single greatest reason for hope that the goal of the Living Indus Initiative is within reach. Harnessing it will, however, require more than the actions spelt out in the previous section. These immediately actionable areas, important and urgent as each one is, should not mislead us into thinking that a set of on-the-ground and policy shifts will, on their own and in the near-term, restore the Indus to health and resilience. Longer-term, truly to place Pakistan on a path to sustainable development will require calling into question present assumptions, approaches, and practices.

As important as engaging the youth, a strong and systematic effort must be made to ensure that implementation of the Living Indus Initiative systematically improves the opportunities for women, women's organizations and women-led enterprises to participate openly and equally with their counterparts in crafting a new future for Pakistan. Achieving the goal of the mission will be impossible unless gender balance and equity are built into the DNA of the endeavour.



Longer-term, truly to place Pakistan on a path to sustainable development will require calling into question present assumptions, approaches, and practices

At the heart of this challenge is the often-unspoken belief that the accumulation of incremental improvements, the phasing out of practices that damage the climate and the natural environment, and an increase in investment in promising new approaches will shift the present trends to the point where they are effectively reversed. While a great deal of progress can be made in this way, rising to the challenge posed by climate change and degradation of nature and ecosystems will require a more fundamental questioning of systems of economic and social organization and an openness to change that goes beyond the engrained habits and practices of political life.

In the early 1990s, Mahbub ul Haq and Amartya Sen rethought both the purpose of development and ways in which genuine development might best be achieved. They upturned traditional notions of progress based on GDP growth and proposed an approach that placed human well-being at the heart of development

purpose. This notion of Human Development measures development progress against the extent to which it contributes to improvement of human well-being. Well-being is measured not simply against indicators relating to health, education, employment, housing, etc. but against the expansion of “agency”, namely the capacity of human beings, families and communities to participate in the decisions that most affect their prospects for improved well-being. The growth of agency is, in turn, equated with the growth in freedom – from want, from exclusion, and from insecurity.

Implementing the set of activities set out in this last chapter of this document will bring about an enormous improvement in the well-being of Pakistan's citizens, principally those who live in the Indus Basin but, more broadly, the whole country will benefit from this investment in human,



It is important to understand that the greatest dividend for both climate and nature lies in the recovery and restoration of degraded lands, waters and ecosystems

social and natural capital. Pakistan will be better equipped to address the climate change that is already underway and whose negative impact will, if science is right, otherwise continue to grow.

Yet a truly resilient Indus Basin will require both the reform and abandonment of practices that are currently exacerbating the impact of climate change and placing undue pressure on natural resources and ecosystems, and the introduction of new approaches that favour both climate and nature resilience.

So, beyond the full and timely implementation of the type of programmes set out in Chapter 2, we should begin already now to think what the next phase may look like. The rest of this chapter addresses some of the opportunities that might be more fully elaborated in the next stage of the Living Indus Initiative. All are reflected to some extent in the activities for immediate deployment; their full elaboration and implementation would, however, genuinely begin to reverse trends and accelerate the transition to the Indus Basin spelled out in the vision for the Living Indus Initiative.

An axis of action

The key elements of this second - more ambitious - phase of the initiative are addressed through one axis of action, and five areas of focus. These are briefly spelled out below.

The axis of action proposed is that of repair and restoration. Too often, nature-based climate solutions and nature conservation interventions focus on identifying and protecting the remaining wild and intact sites, often by seeking to set them aside from human use. While protection and conservation of ecosystems and natural resources will always be – and must resolutely remain – a part of any sustainable development strategy, it is important to understand that the greatest dividend for both climate and nature lies in the recovery and restoration of degraded lands, waters and ecosystems. Pakistan has vast areas of land that is either damaged or producing well below its potential to deliver both production and ecological services.

The combination of conservation of wild areas, and the restoration of degraded land to both productivity and biodiversity, offers a real prospect at building both strong resilience to the impacts of a changing climate, protection from extreme weather events, and a robust biodiversity in Pakistan. The government is – at both federal and provincial levels – already committed to this approach, for example through the Ten Billion Tree Tsunami and Recharge Pakistan, to name just these, but the potential to expand and accelerate these and to design and launch similar programmes is very large and must be at the heart of both this first and any future phases of this initiative.

Further to this axis of action, five domains stand out as being particularly important to the achievement of the Living Indus Initiative's vision and potential and illustrative of the shape and character of the action to come in the second phase of the Living Indus Initiative. These are briefly set out below but must be further elaborated in the planning and design of the next phase of the initiative. They illustrate how a programme based on ambitious and robust action can move into one based on transformation, thus meeting the aspirations of hundreds of millions of citizens for a restored and sustainable Pakistan and offering the youth a genuine chance to move forward towards their dream of a secure, prosperous, and healthy future.

1. A new concept of legitimacy for government, civil society & private sector

In countries that move up the UNDP Human Development Index, a common feature is the improvement of mechanisms

that allow citizens to influence and shape their futures. Pakistan, too, has many successful mechanisms for citizen participation, including many that trace their origins to traditional societies prior to Pakistan becoming a State. In other parts of the world, increasing importance is given consulting citizens, giving them an increasing voice in decisions that affect them directly, seeking their views and ideas, and giving them an increasing role in



Citizen-led action will not only have to be enabled and welcomed to a greater extent, but it will also have to become a central feature of how development is planned and realized in the Indus Basin

implementation of development activities. These mechanisms are necessarily accompanied by measures that improve the transparency of and access to information relevant to taking judicious decisions, instilling a sense of mutual ownership of decisions, and breaking down the many ways in which citizens have, in the past, been or felt they have been marginalized and that they are left to accept decisions that they may not share and that do not improve their position.

Successful restoration of the Indus Basin to health and resilience requires an active citizenry. It requires not just the enabling policy and regulatory network that governments can put in place, but also the bottom-up energy, mobilization and creativity that comes from people determining their own futures.

The range of interventions proposed in Chapter 2, such as community-managed protected areas and ecosystem based forest management and biosphere reserves – lay a

foundation for a greater involvement of people and communities in taking charge of their future and channelling their energy into positive action. For the scale of action needed to realize the vision of the Living Indus Initiative, however, citizen-led action will not only have to be enabled and welcomed to a greater extent, but it will also have to become a central feature of how development is planned and realized in the Indus Basin and in Pakistan more generally. This in turn will require a deep reform of existing institutions, of the administrative culture and of the respective roles of the political class, civil service and the population at large.

Considerable experience exists in all parts of the world in how this can optimally be done. This best practice should be screened, and elements relevant to Pakistan should be identified, adapted, and implemented as a core part of the delivery mechanism for the Living Indus Initiative.

2. Standards, screens, and the “license to operate”

It is often said that, once an objective has been set, it is easier to plot the optimal pathway to it. Without a clear objective, many roads look attractive, even if they eventually lead to other destinations. The vision for the Living Indus Initiative is clear, and so it is necessary to plot the itinerary that will reach it, and the tools that will allow quick progress along that particular path.

A first tool would be the rapid adoption of a central set of standards that guide investment, corporate activity, political decision-making, and even personal behaviour. For example, in the climate space, the concept that all development,

investment and corporate activity must meet the Net Zero standard within a short and predictable time frame is rapidly gaining ground. Not far behind is the notion that all activity must be “Nature Positive”. In other words, all development activity must be planned and executed in a way that leaves nature, biodiversity, and ecosystems better off than they were before the development activity began – hence the notion of Nature Positive.

Increasingly, Net Zero and Nature Positive notions are converging around a common framework insisting that both standards be met. While the mechanisms to implement such standards are not fully developed, a strong signal must go out that development activity – whether by government, local authorities, private companies, or communities – must meet the Net Zero/Nature Positive standard and that activities that fail to will increasingly be regarded as pariah behaviour and lose legitimacy – or their moral “license to operate”.

Similar standards are emerging in the social sphere, with the notion of a Just Transition – a transition to a more sustainable state without sacrifice to social equity, employment, and preservation of livelihoods – gaining ground.

Accompanying all this is the growing notion that nature itself has rights, and that the rights of citizens to a healthy environment will increasingly be recognized. Initial activities in this direction such as the Indus Protection Act and the Indus Council have been spelled out in the previous chapter, building also on an increasing body of jurisprudence from around the world. Pakistan has been a pioneer in the recognition of

environmental rights and the active role played by the judiciary, including the Supreme Court, in advancing this expanded notion of rights and protections. Legal pathways are rapidly becoming important mechanisms for profound change. Litigation in defence of the right to health, security and protection from environmental damage is rapidly gaining a foothold in civil society action challenging, and often reversing, government decisions and giving ever more importance to climate and nature stability. Shareholder action is encountering increasing success. These pathways can accelerate the kind of evolution the Living Indus Initiative calls for and should be a strong part of the theory of change as the initiative evolves towards a second phase.

3. Finance, incentives and disincentives

There is no solid move towards sustainable development without the alignment of the financial sector behind development approaches that speed the transition to sustainability. Chapter 2, focuses on the development of new and innovative financial instruments – such as Nature and Climate Performance Bonds – that give value to natural capital in ways that reduce the country's credit risk and therefore its cost of capital. Increasing attention is being paid both to reforms of the rules governing the financial system and new ways to reflect nature capital in a country's balance sheet that hold out promise for solutions that benefit not only the country's financial actors but the environment too.

Digital Financial Technology opens doors to new ways to create value from nature's resources, to enable citizens to express and

act on their preference for environmentally aligned goods and services, or to create new markets for nature and natural products. This technology gives citizens – indeed anyone with access to a cell phone or to an internet connection – many ways to influence consumption and markets in ways that respect social and environmental preferences. It is a vast market only waiting to be developed in Pakistan.



Pakistan must develop a sustainable finance roadmap that spells out the pathways and milestones for a transition of its financial system to more environmentally friendly forms of investment

The financial system as it operates today contains many perverse incentives that reward environmentally destructive behaviour and discourage behaviour that aligns with nature's needs. This misalignment adds up to many billions of rupees – mostly of public money – being spent in ways that undermine nature and climate. Destroying the planet with taxpayer's money is notion that we must all find unacceptable.



The notion of a Just Transition - a transition to a more sustainable state without sacrifice to social equity, employment, and preservation of livelihoods - gaming ground

Pakistan must develop a sustainable finance roadmap that spells out the pathways and milestones for a transition of its financial system to more environmentally friendly forms of investment and expenditure in both the private and public sectors. This roadmap should spell out the reforms and innovations needed across the entire

spectrum represented by financial and capital markets – from transparency, disclosure, norms and standards, through the activities of the banking sector, insurances, pension funds, to stock markets and even the activities and policies of the State Bank.

4. Technology

When looking to the future, technology is characteristically pointed to as the source of solutions to present problems, and there is good reason to see it as a part – perhaps a big part – of the solution set that needs to be deployed in order to achieve the vision of the Living Indus Initiative. Some technology approaches are, of course, built into the immediate actions in the previous chapter, but there is scope for a great deal more.



Technology can break down the barriers that currently impede citizen action and is a powerful tool for greater transparency

Technology can break down the barriers that currently impede citizen action; it can offer real-time information and “crowd science” and is a powerful tool for greater transparency as the intervention on the Living Indus Digital Knowledge Platform proposes. Technology can “nudge” consumer choices into green channels. It can build the efficiency of water use in agriculture, industry and on the domestic front. It can be used to plant trees and to stock lakes with fish. The potential is almost limitless.

In preparation for a second phase of the Living Indus Initiative, a comprehensive survey of potential technology application should be commissioned, and a broad

debate engaged to identify the most promising. Technology can boost and accelerate movement towards the goals of the Initiative, in particular because it addresses the talents and interests of the generation just entering or about to enter the job market. It is a field resolutely turned towards the future.

5. International cooperation

The Indus arises on the Tibetan Plateau before flowing into Pakistan. Most of its major tributaries join the mainstream after crossing the international frontiers from Afghanistan and India. While the Indus is the backbone of Pakistan and while the greatest part of its Basin and its water flow is in Pakistan, the Indus is in every sense an international river Basin. It follows that, while a great deal can be done by Pakistan alone (such as the Indus Protection Act and Indus Council), a full recovery of the Indus Basin and the achievement of the vision for the Living Indus Initiative requires cooperation with Pakistan's neighbours – in particular, India.

International experience suggests that positive cooperation around shared water resources has been the norm rather than the exception with international river basins – the Senegal, the Mekong, the Paraná rivers come to mind, not to mention the international rivers in the richer countries such as the Rhine, the Danube and the St. Lawrence – and there is a great deal of highly inspiring best practice to draw upon.

Indeed, the Indus Waters Treaty has, for over six decades now, offered a platform for cooperation between Pakistan and India despite armed conflict breaking out on several occasions since its adoption in 1960. Perhaps, however, the time has come to reopen discussion among riparian

nations of the Indus to seek to spread the vision embedded in the Living Indus Initiative and to ensure coordinated action along the parts of the river not within Pakistan's borders.

Final Word

The journey to a truly “living” Indus Basin is a long one. It is also a necessary one. Immediate action has been identified and must be engaged. The longer-term pathways have also been proposed and set out. The energy, innovation and commitment lie in deep pools within Pakistan's communities and expert networks, and in government at all levels. The challenge now is to tap these pools and channel them not only into action, but into a movement that will sweep the country in its power and enthusiasm. The Living Indus must become a national movement that demands nothing less than the full achievement of the vision set out for it and that sets in place the foundation for a new Pakistan.

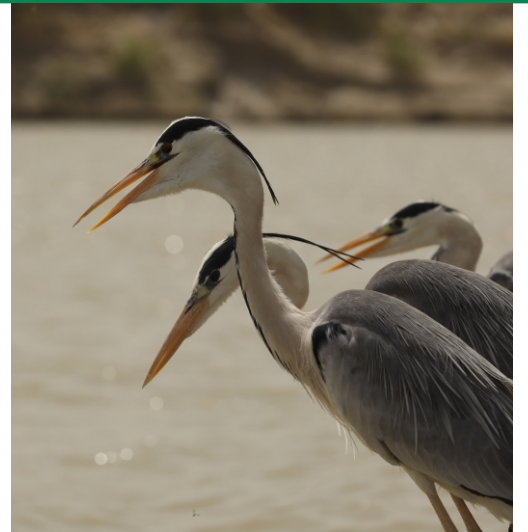
While this presentation suggests a phase of immediate action, it does not follow that the second phase should be put off until the first is fully engaged. Indeed, the first phase should be seen as a pump primer to engage the motor and ensure that the initiative moves forward with energy and confidence. It is, however, the second and subsequent phases that will determine whether the vision for a Living Indus reaches its goals and targets. Many of the actions set out in this chapter require preliminary work. That work should be engaged quickly so that the phases required after the initial one come on stream as soon as they can and overlap.

The Living Indus Initiative will reach its goals if it becomes a broad, popular and non-partisan movement. In turn, a movement implies the alignment of many elements that coalesce and begin to move in a particular direction. That movement must be channelled into the framework provided by the initiative itself, with the different actors, areas of action mutually stimulating the acceleration of the movement towards its goal. It must draw from – and in turn – feed a narrative that builds a strong sense of inevitability both in the direction of movement and in its certainty of success.



While the Indus is the backbone of Pakistan and while the greatest part of its Basin and its water flow is in Pakistan, the Indus is in every sense an international river Basin


Nothing less than this has a chance to transform Pakistan in the way this initiative holds the potential to do, nor will a growing, impatient population settle for a result that falls short of the initiative's goal.



Endnotes

- ¹Boston University Frederick S. Pardee School of Global Studies. (2015). Najam on Living in “The Age of Adaptation”. Retrieved from <https://www.bu.edu/pardeeschool/2015/11/12/najam-talks-about-living-in-the-age-of-adaptation/>
- ²William J. Young, A. A. (2019). Pakistan, Getting More from Water. World Bank Group.
- ³Biodiversity Action Plan, Pakistan Retrieved from <https://www.cbd.int/doc/world/pk/pk-nbsap-01-en.pdf>
- ⁴World Wide Fund for Nature. (n.d.). World's top10 rivers at risk.
- ⁵William J. Young, A. A. (2019). Pakistan, Getting More from Water. World Bank Group.
- ⁶Current Climate, Pakistan. (n.d.). Retrieved from Climate Change Knowledge Portal: <https://climateknowledgeportal.worldbank.org/country/pakistan/climate-data-historical>
- ⁷Boston University Frederick S. Pardee School of Global Studies. (2015). Najam on Living in “The Age of Adaptation”. Retrieved from <https://www.bu.edu/pardeeschool/2015/11/12/najam-talks-about-living-in-the-age-of-adaptation/>
- ⁸Hussain, Asghar; Abbas, Hassan. 2019. “Restore Pakistan's rivers, handle floods, droughts and climate change.” The Third Pole, July 12, 2019.
- ⁹Habib, Z., Wahaj, R. 2021. Water availability, use and challenges in Pakistan – Water sector challenges in the Indus Basin and impact of climate change. Islamabad. FAO. <https://doi.org/10.4060/cb0718en> (<https://www.fao.org/3/cb0718en/cb0718en.pdf>)
- ¹⁰Ghulam Rasul, Q. D. (2008). Global Warming and Melting Glaciers Along Southern Slopes of HKH Ranges. Pakistan Journal of Meteorology
- ¹¹Center of Advance Studies in Water, USAID: Retrieved from <https://water.muett.edu.pk/wp-content/uploads/2019/07/Report-on-Indus-Delta.pdf>
- ¹²Asian Development Bank. (n.d.). Climate Change Profile of Pakistan.
- ¹³GCISC estimate using the NASA's Sea Level Projection Tool. (n.d.). Sea Level Projection Tool. Retrieved from <https://sealevel.nasa.gov/ipcc-ar6-sea-level-projection-tool>
- ¹⁴Tahir, Zubair; Habib, Zaigham. (2000). Land and Water Productivity: Trends Across Punjab Canal Command. International Water Management Institute (IWMI), Working paper 35.
- ¹⁵William J. Young, A. A. (2019). Pakistan, Getting More from Water. World Bank Group.
- ¹⁶William J. Young, A. A. (2019). Pakistan, Getting More from Water. World Bank Group.
- ¹⁷Ali Dehlavi, A. G. (2015). Climate Change Adaptation in Indus Ecoregion: A Micro-Econometric Study of the Determinants, Impact and Cost Effectiveness of Adaptation Strategies. International Development Research Center, World Wide Fund for Nature-Pakistan, Lahore University of Management Science.
- ¹⁸William J. Young, A. A. (2019). Pakistan, Getting More from Water. World Bank Group/
- ¹⁹“Yu, Winston; Yang, Yi-Chen; Savitsky, Andre; Alford, Donald; Brown, Casey; Wescoat, James; Debowicz, Dario; Robinson, Sherman. 2013. Indus Basin of Pakistan : Impacts of Climate Risks on Water and Agriculture. Directions in development;countries and regions. Washington, DC: World Bank.
- ²⁰Global Gender Gap Report 2021. https://www3.weforum.org/docs/WEF_GGGR_2021.pdf.
- ²¹The interventions proposed have been shaped by our discussions with key water sector experts, academics and civil society members including (but not limited to): Simi Kamal (Hisaar Foundation), Hammad Naqi Khan (WWF), Dr. Muhammad Abu Bakr (LUMS), Dr. Fozia Perveen (LUMS), Dr. Uzma Khan (WWF), Dr. Mohsin Hafeez (IWMI), Dr. Masood Arshad (WWF), Mr. Rafay Alam (Environmental Lawyer), Ms. Imrana Tiwana (ITA), Dr. Zaighan Habib (FAO), Mr. Ali Tauqeer Sheikh (Climate and Water Consultant), Dr. Hassan Abbas (ZIZAK), Mr. Masood Lohar (Clifton Urban Forest), Ms. Afia Salam (Environmental Journalist) and Ms. Fatima Majeed (Pakistan Fishermen Forum).
- ²²British Council. (n.d.). The state of social enterprise in Bangladesh, Ghana, India and Pakistan. Retrieved from https://www.britishcouncil.org/sites/default/files/bc-report-ch5-pakistan-digital_0.pdf
- ²³The World Bank. (n.d.). Expanding Renewable Energy in Pakistan's Electricity Mix . Retrieved from The World Bank: <https://www.worldbank.org/en/news/feature/2020/11/09/a-renewable-energy-future-for-pakistans-power-system>
- ²⁴Khan, M. A. (n.d.). 4 ways Pakistan is tackling plastic waste and pollution . Retrieved from World Economic Forum: <https://www.weforum.org/agenda/2021/11/4-ways-pakistan-is-tackling-plastic-waste-and-pollution/>

- ²⁵An approach to the solution of plastic pollution. (2019). Office of Research, Innovation and Commercialization at Karachi University
- ²⁶Bhim Adhikari, S. P. (2010). The Use and Management of Mangrove Ecosystems in Pakistan. *The Journal of Environment & Development* Vol. 19, No. 4
- ²⁷Unilever Pakistan. (2021). Rahim Yar Khan - Zero Plastic Waste City by 2025 . Retrieved from Unilever Pakistan: <https://www.unilever.pk/news/2021/rahim-yar-khan-zero-plastic-waste-city-by-2025/>
- ²⁸We are grateful to Mr. Masood Lohar for elaborating this idea at the Living Indus Consultation Session in Karachi on February 9, 2022.
- ²⁹Food and Agriculture Organization of the United Nations. (2020). Forestry sector review: Pakistan. Islamabad.
- ³⁰This idea was articulated in particular detail by Ms. Simi Kamal at the Living Indus Consultation Session in Karachi on February 9, 2022.
- ³¹Water management in Pakistan's Indus Basin: challenges and opportunities, Shahmir Janjua; Ishtiaq Hassan; Shoaib Muhammad; Saira Ahmed; Afzal Ahmed Retrieved from <https://iwaponline.com/wp/article/23/6/1329/84494>
- ³²Managing Groundwater Resources in Pakistan's Indus basin retrieved from <https://www.worldbank.org/en/news/feature/2021/03/25/managing-groundwater-resources-in-pakistan-indus-basin>
- ³³World Bank. (n.d.). Managing Groundwater Resources in Pakistan's Indus Basin . Retrieved from The World Bank: <https://www.worldbank.org/en/news/feature/2021/03/25/managing-groundwater-resources-in-pakistan-indus-basin>
- ³⁴World Bank. (n.d.). Managing Groundwater Resources in Pakistan's Indus Basin . Retrieved from The World Bank: <https://www.worldbank.org/en/news/feature/2021/03/25/managing-groundwater-resources-in-pakistan-indus-basin>
- ³⁵Hussain, Asghar; Abbas, Hassan. 2019. "To Save Pakistan, look under its rivers." *The Third Pole*. September 27, 2019.
- ³⁶This intervention benefitted from inputs from Ms. Imrana Tiwana at the Living Indus Consultation Session in Lahore on February 10, 2022.
- ³⁷IUCN, Pakistan. (n.d.). Mangroves of Pakistan Status and Management.
- ³⁸IUCN, Protected Planet. (n.d.). Retrieved from IUCN, Protected Planet: <https://www.protectedplanet.net/en>
- ³⁹Government of Pakistan, Ministry of Climate Change. (2009). Pakistan Fourth National Report
- ⁴⁰Rural Population (% of total Population Pakistan). (2020). Retrieved from Data Repository, The World Bank: <https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS?locations=PK&view=chart>
- ⁴¹Junaidi, I. (n.d.). Tourist traffic witnesses sharp increase in five years. Retrieved from Dawn: <https://www.dawn.com/news/1508132/tourist-traffic-witnesses-sharp-increase-in-five-years>
- ⁴²IUCN, Protected Planet. (n.d.). Retrieved from IUCN, Protected Planet: <https://www.protectedplanet.net/en>
- ⁴³WAPDA. (n.d.). Dasu Hydropower Project Environment and Social Assessment
- ⁴⁴Qureshi, A. S. (n.d.). Water Management in the Indus Basin in Pakistan: Challenges and Opportunities. *Mountain Research and Development* , Aug 2011, Vol. 31, No. 3 (Aug 2011), pp. 252-260
- ⁴⁵Sana Arshad, A. S. (2012). Food Security Indicators, Distribution and Techniques for Agriculture Sustainability in Pakistan.
- ⁴⁶Government of Pakistan, Ministry of Water Resources. (2018). National Water Policy
- ⁴⁷R. Jilani, M. A. (n.d.). A Study of Glaciers in Northern Pakistan. Pakistan Space & Upper Atmosphere Research Commission (SUPARCO)
- ⁴⁸Ministry of Climate Change, Government of Pakistan. (n.d.). Scaling-up of Glacial Lake Outburst Flood (GLOF) risk reduction in Northern Pakistan . Retrieved from <http://mocc.gov.pk/Detail/ZmI3OWZlMzYtMTdkYy00ZGU5LTgyZjAtMzIxODdkMTBmMTEy>
- ⁴⁹David Eckstein, V. K. (n.d.). Global Climate Risk Index 2021. GermanWatch.
- ⁵⁰David Eckstein, V. K. (n.d.). Global Climate Risk Index 2021. GermanWatch.
- ⁵¹According to Professor Olivier de Schueter in the French documentary "the world of tomorrow" by Cyril Dion.
- ⁵²Water and sediment control basins are earth embankments generally constructed across the slope or at the base of the field to form a sediment trap and water detention basin.
- ⁵³Ghulam Murtaza, M. H. (n.d.). Wastewater Production, Treatment and Use in Pakistan.



⁵⁴Ghulam Murtaza, M. H. (n.d.). Wastewater Production, Treatment and Use in Pakistan.

⁵⁵Asian Development Bank. (n.d.). Climate Change Profile of Pakistan.

⁵⁶Khawaja, D. K. (2016). The Senate Standing Committee Report, Planning Commission, Government of Pakistan.

⁵⁷IUCN, Pakistan. (n.d.). Mangroves of Pakistan Status and Management.

⁵⁸Hayat, M. (n.d.). Fishing Capacity and Fisheries in Pakistan. Retrieved from Food and Agriculture Organization:
<https://www.fao.org/3/y4849e/y4849e0a.htm#fn81>

⁵⁹United Nations Development Program. (2017). Pakistan National Human Development Report Unleashing the Potential of a Young Pakistan.

“We aspire to an Indus Basin that can sustain a thriving civilization from its sources to the ocean - a Basin whose natural resources and ecosystems have been repaired and restored, and are resilient in the face of climate change”





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