

**Research & Training Wing
Planning & Development Department
Government of Sindh**



**RESEARCH HIGHLIGHTS
2020-21
'A Year in Review'**

FOREWORD

With the aim of creating a holistic amalgamation of its research portfolio after its revitalization and restructuring in 2018-19, the Research & Training Wing has initiated a series of 'Research Highlights'. This publication delineates the key research undertaken by the Wing during 2020-21.

The Research Highlights comprise the research that culminated in reports and was subsequently published on the Research & Training Wing's website. The Wing provided analytical support to the P&D Department on the 'M&E Cell Biennial Report 2018-2020', 'Five-Year Sindh Development Review', 'Karachi Development Review', and the Situational analysis of existing and proposed Quarantine, Isolation, and Critical-Care Facilities in all the districts of Sindh to cater to the emergent COVID-19 situation'.

The in-house research reports developed by the Wing during 2020-21 were the following:

- Financial & Economic Appraisal of PC-I Proposals: A Practical Guide
The Guide provides an in-depth description and analysis of the key concepts that are Critical to the appraisal like Net Present Value, Internal Rate of Return, Cost-Benefit Analysis, Cost-Effectiveness Analysis, and other important elements.
- Systematic Review of Global Health Response to COVID-19: Strategic Focus on Pakistan and Sindh in Specific
This research report focuses on taking stock of global health response to COVID-19 pandemic with a review of the initiatives undertaken by the Governments of Pakistan and Sindh.
- Collaboration with Cambridge University's Gates Scholar to Facilitate Research Study on "Zoonotic Diseases in Sindh" [along with its interplay with Climate Change & Displacement]
The collaboration with Ms. Dorien Braam (Gates Scholar) is encapsulated in the following:
 - Climate change displacement and local solutions in coastal communities in Sindh (IDMC)
 - Disaster displacement and zoonotic disease dynamics: The impact of structural and chronic drivers in Sindh, Pakistan (PLOS Global Public Health)

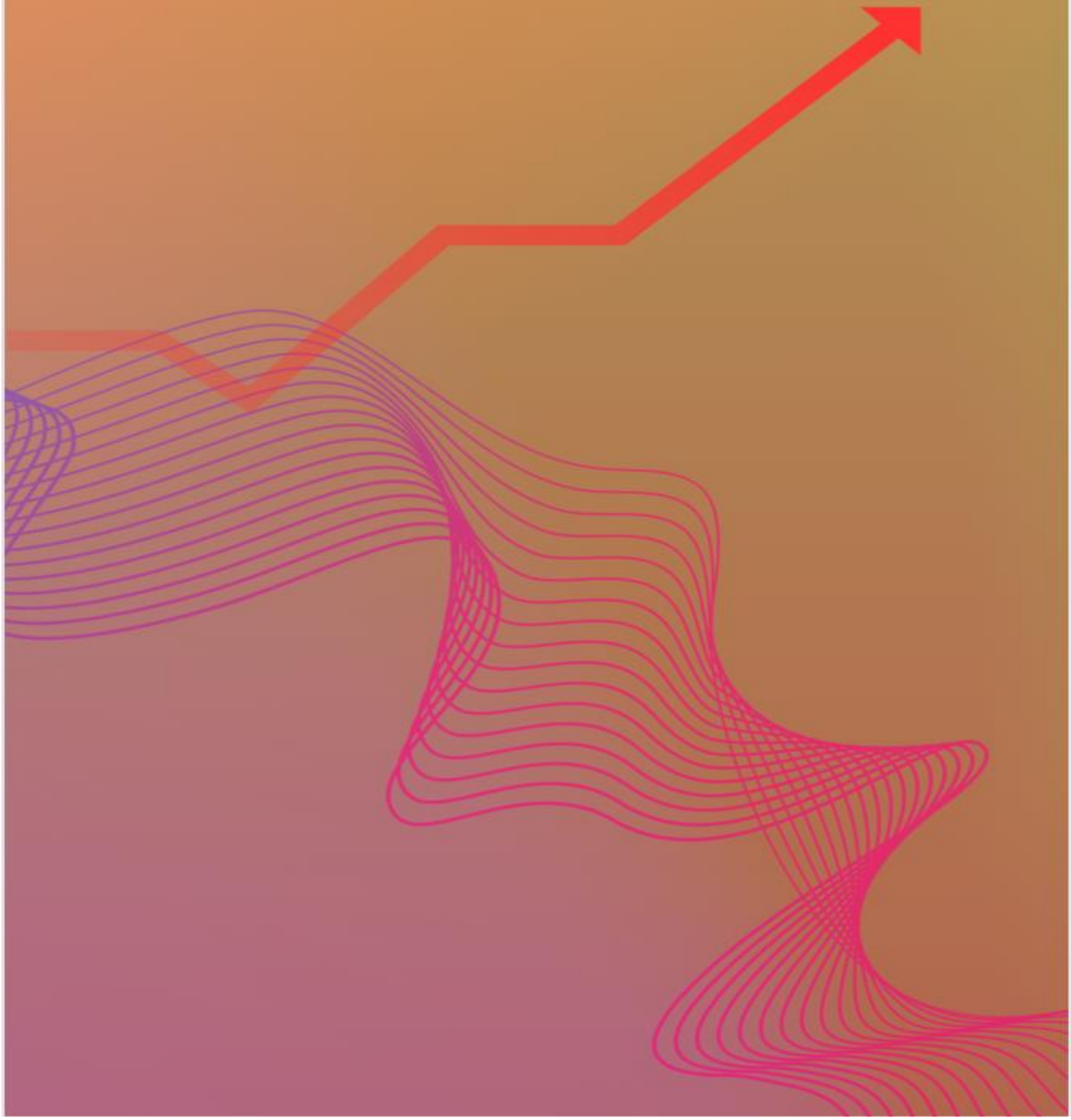
I would like to acknowledge the efforts of the research team of the Wing, especially Mr. Obaid Arshad Khan (Social Sector Advisor), who spearheaded the research initiatives under the strategic guidance of the Chairman P&D Board, Members of the P&D Board and Senior Management of P&D Department.

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**Financial & Economic
Appraisal of PC-I
Proposals:
A Practical Guide**



Acronyms

ADP	Annual Development Programme
AI	Artificial Insemination
BCR	Benefit–Cost Ratio
BEV	Break-Even Value
BEQ	Break-Even Quantity
CBA	Cost–Benefit Analysis
CEA	Cost-Effectiveness Analysis
DSS	Decision Support System
EU PFM-SPP	European Union Public Financial Management Support Program for Pakistan
EIA	Environmental Impact Assessment
FV	Future value
GoP	Government of Pakistan
GoS	Government of Sindh
IRR	Internal Rate of Return
NGO	Non-Governmental Organization
NPV	Net Present Value
OC	Opportunity Cost
O&M	Operation and Maintenance
P&D	Planning and Development
P&DD	Planning and Development Department
PC	Planning Commission
PDWP	Provincial Development Working Party
PKR	Pakistani Rupee
PSDP	Public Sector Development Programme
PV	Present Value
ROI	Returns on Investment
TC	Technical Committee
VFM	Value for Money
WB	World Bank

Glossary of Terms

<u>Benefit–Cost Ratio:</u>	Technique for the cost-benefit analysis to compute overall benefits relative to the costs associated with a project. $BCR > 1$ indicates that the benefits outweigh the costs
<u>Break-Even Point</u>	Calculated by dividing the fixed costs of production by the price per unit minus the variable costs of production. It is the level of production at which the costs of production equal the revenues for a product
<u>Cost Benefit Analysis:</u>	Analyzing comprehensive list of all the costs and benefits associated with the project or decision. Techniques like BCR are part of the analysis.
<u>Cost-Effectiveness Analysis:</u>	Alternative to Cost-Benefit Analysis that is centered on comparing relative costs to the outcomes (cannot be monetized) of two or more projects (e.g., deaths averted due to Project A vs Project B)
<u>Discount Rate</u>	Interest rate used in discounted cash flow (DCF) analysis to determine the present value of future cash flows (determined by the Budget Wing of Finance Division of GoP)
<u>Externality:</u>	Cost or benefit caused by the producer that is not financially incurred or received by the producer (e.g., industrial pollution causing widespread lung diseases in the society)
<u>Financial Sustainability:</u>	The assessment that a project would have sufficient funds to meet all its resources and financial obligations
<u>Future Value</u>	Value of an asset or investment at some point in the future based on assumed growth rate(s)
<u>Internal Rate of Return</u>	Discount rate that makes the net present value of all cash flows in a discounted cash flow analysis equal to zero. IRR is a metric to estimate the profitability of an investment (If $IRR > \text{Discount Rate}$, the project is considered profitable)
<u>Net-Present Value</u>	Capital budgeting technique that discounts projected cash flows to the present to determine if they are greater than zero or not ($NPV > 0$ means that project is feasible)
<u>Payback Period</u>	Amount of time it takes to recover the cost of an investment. Simply put, the payback period is the length of time an investment reaches a break-even point.
<u>Sustainability</u>	Meeting present needs without compromising the ability of future generations to meet their needs

Introduction

When discussing 'returns on investment' (RoI) indicators, one of the queries that may arise is that 'Why would the Government look at RoI indicators, given that its primary aims are grounded in equitable growth and inclusive development?' In other words, the assertion might be that RoI indicators are pertinent to businesses that have a sole profit maximization motive, but not particularly relevant for the Government. The simple answer to that question is that RoI estimations or projections are not reserved for profit-maximizing businesses because many non-governmental and non-profit organizations also incorporate such projections in their proposals to quantify the potential impact. The follow-up question can be: 'Why is computing RoI indicators important for non-profit entities, including the Government?' The answer to this question is also the underlying reason for developing this guide for financial and economic appraisal of project proposals. The confusion often stems from a narrow definition of the term 'returns'. More often than not, returns are assumed to be financial returns on investments/costs incurred. However, the expansive view of 'returns' is grounded in the concept of multiple dimensions of benefits that are yielded against the investments.

To illustrate the point of distinguishing between financial and other kind of returns to investment, let's distinguish the corresponding 'Returns on Investment' indicators between a stylized example of an 'Infrastructure' project & a 'Social Sector' project proposal. For example, a 'farm-to-market road' project has been proposed for Taluka Shah Bandar with an investment of Rs. 100 million that would yield financial benefits of Rs. 150 million within a span of two years. This project would be termed feasible as the financial benefits outweigh the costs by Rs. 50 million.

Now, let's consider a 'social sector' project that proposes rolling out a school deworming program for children under-five years with an investment of Rs. 40 million. The program is projected to avert 400,000 deaths that translate into 10 deaths averted per Rs. 1000 spent by the government. This would be termed as the 'social returns to investment' for the proposed deworming program. From an appraisal perspective, cost-effectiveness analysis can be conducted to quantify relative 'social returns' of the deworming program to those of a door-to-door measles vaccination program that projects 8 deaths averted per Rs. 1000 spent by the government. Cost-effectiveness analysis would tilt the resource-constrained government towards the deworming program (10 > 8 deaths averted per Rs. 1000 spent).

The aforementioned stylized examples are provided to stress on an important point: Project proposals need to quantify the potential benefits that are envisioned with the investments undertaken today. These 'returns' do not need to be confined to financial returns. If the appraiser has a holistic understanding of the 'returns on investment' indicators, then a better economic and financial appraisal can be undertaken. The systemic demand for projections of financial, economic, social and other benefits would help improve the quality of project proposals and overall quality of public sector investments.

It is worth mentioning that this guide is not a replacement for any facet of the technical appraisal of PC-I proposals. This guide is designed to delve into the economic and financial analysis contours of the appraisal to provide Planning & Development Department Officials with actionable knowledge and tools to effectively undertake financial and economic appraisal of the proposals. By the virtue of their respective functions, the technical sections of P&DD have adequate sectoral knowledge to effectively undertake technical appraisals of PC-I before these are presented to competent provincial forums of Technical Committee and Provincial Development Working Party. Incorporating financial and economic analytical techniques in the appraisal would improve the decision support system and also ensure value-for-money in terms of public sector development investments in the long-run.

Background

This guide has been developed in the contextual background of recently incorporated requirements to include potential impact (social, economic, environmental) of development schemes' proposals for Technical Committee (TC) and Provincial Development Working Party (PDWP). It is imperative to create and transmit meaningful knowledge for officials who appraise PC-I proposals and officials who prepare them on the essentials of key quantifiable impact indicators. The key indicators are now part of the updated working papers & proposals for Technical Committee Meeting and Provincial Development Working Party.

This development necessitates that both the Line Departments and Planning & Development Department (P&DD) officials are well aware of the key concepts to prepare and evaluate the computations on project's estimated returns on public sector development investments.

The 'RoI' indicators (not exhaustive) discussed in the guide and a few others are also available in the 'Appraisal Section (Chapter 7) of the Planning Commission's Manual for PSDP (Revised 2019). Incorporating such indicators would add rigor and robustness to project proposals as they would help in making informed and evidence-based decisions about the feasibility of development investments, based on potential quantifiable impact. The widespread adoption of such practices will help move the government(s) towards more fiscally responsible development initiatives that aim to avoid funds leakages/dissipation. Ultimately, evidence-based approaches would facilitate and catalyze amplified impact from the investments undertaken by the government.

Objective

This guide is developed with an overarching objective to equip technical sections with the knowledge and tools for effective project appraisal and analysis

The actualization of 'Evidence-Based Planning' can be ensured by effective Economic and Financial Appraisal Techniques that are aimed to ascertain whether the development investments are undertaken in projects with quantifiable returns and societal benefits. Before delving into the economic and financial appraisal techniques, the salient features of project appraisal are briefly discussed

Salient Features

Project appraisal is intended to:

- help develop and formulate potential projects precisely and concisely
- promote quantifying the effectiveness of projects with evidence of potential impact
- ensure returns on investment in projects with obvious societal benefits
- determine if project components are consistent with the project objectives & sectoral strategy
- assess sources and magnitude of the risks
- determine how to reduce, mitigate and share risks

Theory of Change

A **theory of change** is a diagrammatic delineation and illustration of how the intended change of a program/project would happen in a particular context with the stated assumptions. Theory of change can also be described as the detailed chain of causal links from the program intervention to its impact. It is an ongoing process of reflection on how change happens, and the role we can play:

- locates a programme or project within a wider analysis of how change comes about;
- draws on external learning about development.
- articulates our understanding of change - but also challenges us to explore it further.
- acknowledges the complexity of change: the wider systems and actors that influence it
- often presented in diagrammatic form with an accompanying narrative summary.

From a program/project perspective, the theory of change in a three-step process:

- identify the problem that the project aims to address
- diagnose the most pressing underlying cause/binding constraint for the identified problem
- design the appropriate intervention along with the 'theory of change' that unpacks how the proposed intervention leads to desired change along with the underpinning assumptions

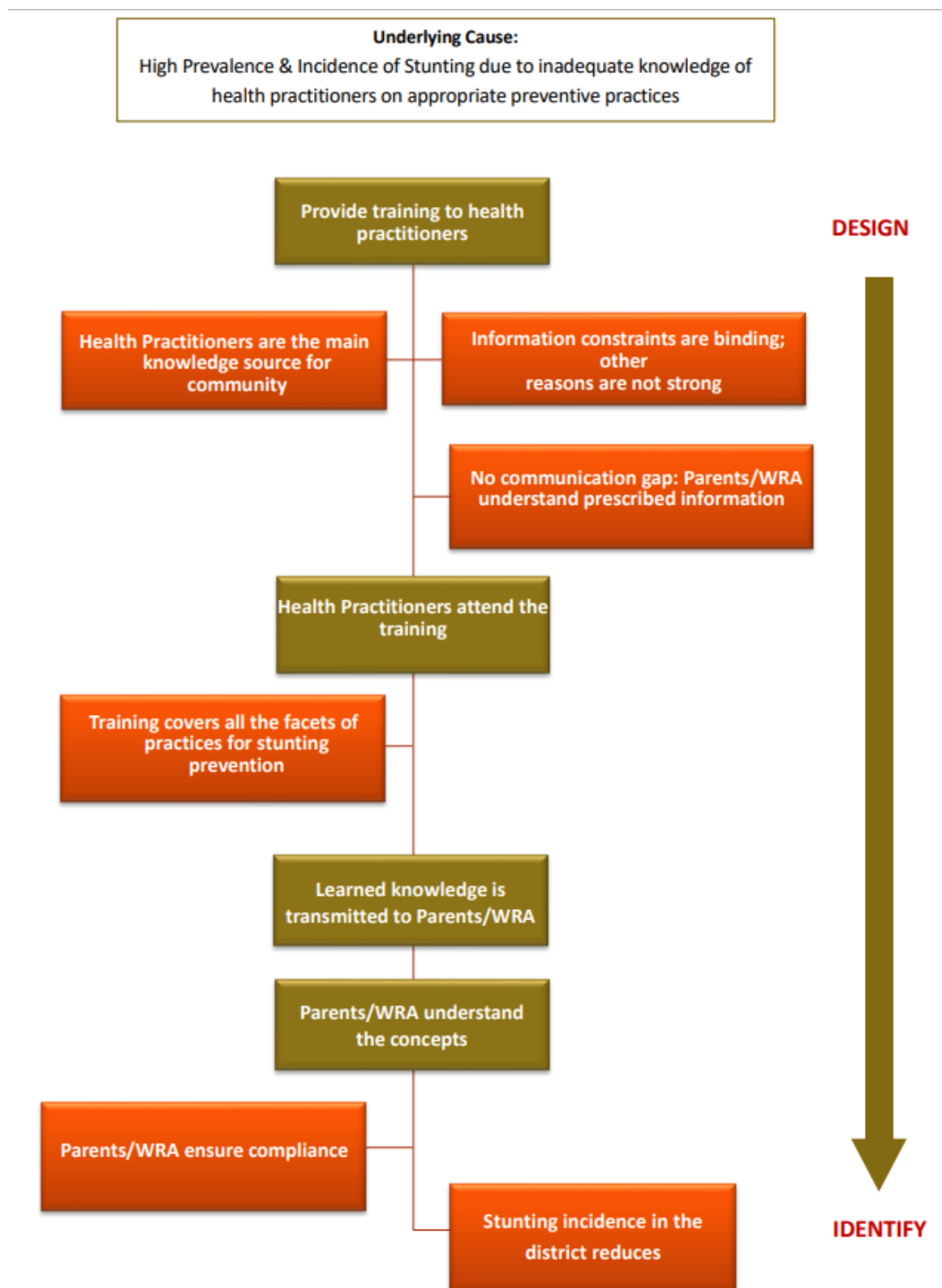
From the appraiser's perspective, it is essential to scrutinize the project proposal to ascertain if a clear theory of change is provided with evidence to substantiate how the proposed project would bring about the desired change in terms of the intended impact. A clearly delineated theory of change would help pre-emptively clarify a lot of confusion that may arise with regards to unpacking the causal chain from project intervention(s) to the desired change. Absence of a robust theory of change would mean that there is lack of clarity about what exactly the proposed project wants to achieve and the relevant evidence to back the assertions and assumptions.

The appraiser can analyze the theory of change through the three-step process highlighted above:

- Does the project proposal clearly identify the problem that it aims to address?
- Has ample evidence been provided to ascertain that the underlying cause of the identified problem the most important one?
- Is the proposed intervention clearly laid out to explain how it would lead to the intended impact or desired change along with implicit and explicit assumptions at every stage?

By analyzing the theory of change, the appraiser will have ample clarity to gauge whether other project indicators (e.g. milestones, deliverables, key performance indicators, etc.) are also aligned with the theory of change. The systemic demand for a well-articulated theory of change can go a long way in significantly improving the quality of proposals and the subsequent implementation of the project. Let's take a simple example to unpack the concept of theory of change pertaining to the problem of stunting in a particular district in Sindh. The first step is the 'identification of the problem' which in this case is the prevalence of stunting at 48% among under-5 years of age children in that district. To 'diagnose the most pressing problem or the binding constraint', the evidence of both demand-side and supply-side causes of stunting are analyzed to prioritize the most significant cause. Let's assume that the 'lack of awareness of health practitioners about stunting' is the most significant cause of the prevalence of stunting in the district as it perpetuates lack of community awareness about the stunting issue. To 'design the intervention', the diagnosis of inadequate information among health practitioners as the underlying cause is used.

The proposed intervention would be a ‘training program for health practitioners on stunting’ in which they will learn about the practices that may reduce the incidence of stunting in the district. A stylized diagram of the theory of change for the aforementioned example is provided below:



Financial & Economic Appraisal

Before delving into the financial and economic appraisal techniques, it is important to distinguish between the two concepts. Financial appraisal & analysis is primarily being centered on the private benefits and the financial returns on investment. Economic appraisal & analysis focuses on the economic returns on investment from the perspective of the societal benefits. Let's take an example of a 'farm-to-market connectivity road' to reduce the transportation costs and time for the farmers to bring their products to the market. From the financial standpoint, the analysis would focus on computing financial benefits in terms of quantifying the increase in the volume of trade due to the road and compare it to the costs to be incurred for building the road. From the economic appraisal standpoint, the economic costs & benefits of the road would be analyzed from societal perspective. The economic costs could include the displacement of population and cutting down trees to build the road in addition to the direct financial costs incurred. The economic benefits could include the access this road would provide to the population to education and health facilities, in addition to the increased commerce and trade activities that are captured in the financial analysis.

In the aforementioned example, the resettlement costs due to the displacement of population and the environmental costs due to cutting down of trees for the road construction can be termed as 'negative externalities'. Similarly, better access to education and health facilities that might result in improved human development outcomes can be termed as 'positive externalities'. Including the societal benefits, costs and externalities would be a part of economic analysis, but not the financial analysis.

Another key component of economic analysis is the concept of 'shadow price' which is assigning a price to that is not traditionally assigned a monetary value or market price using financial analysis. For example, the value of life is something that is difficult to monetize; however, to compute shadow price of the value of a life, 'willingness to pay' studies are conducted to estimate the value of a statistical life. An example of such a study would be to interview a representative sample of 50,000 people to ask how much they would be willing to pay to avoid or reduce the risk of dying of a disease with 1 per 100,000 mortality risk. If the average comes out to Rs. 1000, then the value of a statistical life is computed by multiplying the average 'willingness to pay' of Rs. 1000 by the inverse of mortality risk i.e. 100,000. This would translate into the value of statistical life for that population to be $100,000 \times 1000 = \text{Rs. } 100 \text{ million}$.

Again, it is worth reiterating that financial and economic appraisal comes after the technical appraisal of PC-I proposals that need to ascertain whether the proposed project meets a pressing need, is part of the sectoral strategy, and is technically sound and coherent. The scrutiny of financial and economic feasibility must follow after the aforementioned and other considerations are rigorously analyzed. Key distinctions between financial and economic appraisal are provided below.

Distinctions between Financial and Economic Appraisal

	Financial Appraisal	Economic Appraisal
Purview	Entity or Participants	Society/Country
Prices	Market	Economic (Shadow Prices)
Benefits	Private	Societal
Costs	Private	Societal
Externalities	Not accounted for	Accounted for

Financial Appraisal

The financial appraisal of a project helps determine the financial sustainability of the project and its overall success. It helps the Government to not only ensure the availability of funds to finance the project but also whether the project is financially feasible or not.

The appraisal is done for three primary reasons: 1) Funds Availability, 2) Determining Net Economic Benefits, and 3) Profitability

Financial Appraisal can be broadly categorized into 'discounting' and 'non-discounting techniques'. Simply put, the discount rate is provided to compute the 'time value of money'. A simplified example for time value of money can be that a person earning Rs. 30,000 today would have decreasing purchasing power/real income if he/she keeps earning Rs. 30,000 in the next five years. In other words, the person's purchasing power decreases because the earning was constant, but the inflation kept increasing over time.

Another example can be that if Country A borrows Rs. 100,000 from Country B for undertaking medium-term investment during December, 2020, then paying that money back after 5 years in December 2025 would entail computation of the value of money in that time. Assuming that the discount rate is 12%, Country A would have to payback Rs. 176,234 in December, 2025 using the following computation:

$$176,234 = 100,000 \times 1.12^5$$

The aforementioned computation was centered on calculating the 'future value' of money. However, when PC-I proposals are submitted, the appraiser's focus should be on computing/scrutinizing the present value of project benefits to ascertain if the proposed project is financially/economically feasible. The real rate of discount is usually computed by subtracting the inflation rate from long-term borrowing rate (or nominal rate); i.e., Real discount rate = Nominal Rate – Inflation Rate. However, there is a slightly more complex relation between the rates as conceptualized by the Fisher Equation below:

$$\text{Real Discount Rate} = \frac{(1 + R_N)}{(1 + R_I)} - 1$$

R_N = Nominal Rate

R_I = Inflation Rate

For financial analysis in Pakistan, the rate of mark-up is fixed by the Budget Wing of the Finance Division which has been fixed at 6.62% for 2017-18, 11.53% for 2018-19, and 12.20% for 2019-20. In theory, discount rate for financial analysis is the actual rate of interest on capital. For economic analysis, the discount rate is defined as the 'opportunity cost' of capital. Pakistan follows World Bank's discount rate of 12% for economic evaluation of the projects. It is worth mentioning that the '12% discount rate' might not be reflective of the opportunity cost of capital, but might be used for rationing of funds.

In essence, all the techniques for financial appraisal are applicable to economic appraisal too, but economic appraisal entails a holistic analysis of societal benefits, costs and externalities that are not captured in financial appraisal. Another key concept in economic analysis is that of 'opportunity cost' which essentially means the valuation of benefits foregone when undertaking a certain project. For example, in a resource-constrained setting, the opportunity cost of investing in a 'smoking cessation campaign project' would be investing the same money in a specialized healthcare institute for chest diseases. If the benefits of undertaking the 'smoking cessation project' outweighs the opportunity cost of foregone benefits of investing in an institute for chest diseases, then the project is deemed economically feasible.

The following table summarizes key 'discounting' and 'non-discounting' techniques for undertaking financial appraisal. As mentioned above, the discounting techniques that incorporate discount rate/time value of money are also applicable to economic appraisal that would incorporate the concepts of societal benefits & costs, externalities and opportunity costs to compute the returns on investment. For example, for the Net Present Value of a proposed 'smoking cessation campaign project', the financial analysis would compute the NPV using 12.20% as discount rate while the economic analysis would use 12% as discount rate and might also include monetized values of societal benefits & costs that are not captured in the financial analysis. Ultimately, the core idea of both financial and economic appraisal is to ascertain whether the quantifiable value of benefits outweighs the costs or not.

Techniques for Financial Appraisal

Discounting Techniques	Non-Discounting Techniques
Net Present Value (NPV) is the sum total of present values of the expected incremental positive and negative net cash flows over a project's proposed life. If $NPV > 0$, There is a gain on investment and the project is feasible	Payback Period: Under this technique, a project is accepted or rejected on the basis of years that a project requires to recover the money invested in it. It is mostly expressed in years. Unlike NPV payback period technique does not take into account the time value of money
Internal Rate of Return (IRR) is that discount rate which sets the NPV of a project to 0. IRR has to be thus compared with the opportunity cost of funds (prevailing discount rate) to find if the project is feasible or not	Breakeven Analysis allows you to know how much revenue is required to cover the costs associated with an investment. In effect, it allows one to set prices for products and services
Benefit Cost Ratio (BCR) also sometimes called the profitability index, the benefit-cost ratio, is the ratio of the NPV of the net cash inflows (or economic benefits) to the NPV of the net cash outflows (or economic costs)	

Economic Appraisal

The economic appraisal of a project helps analyze the costs and benefits of a project from the point of view of the entire economy, and takes into account the societal costs and benefits too.

The appraisal is important because the Government does not operate on profit motivation when considering projects. In fact, the impact of an investment is scrutinized from the perspective of the entire society and/or economy. As mentioned in the sections above, all the techniques for financial appraisal can be replicated for economic appraisal with incorporation of additional computations for societal costs & benefits, externalities, and opportunity cost.

One key addition for the economic appraisal is the concept of 'cost-effectiveness analysis' which helps in comparing projects that are geared towards same outcomes. For example, Project A is projected to improve full immunization coverage for under-2 years' children by 1% for every Rs. 100,000 spent compared to Project B which estimates improving immunization coverage by 0.5% for every Rs. 100,000 spent. Hence, Project A would be deemed more cost-effective relative to Project B.

One key consideration that must be looked at when considering economic/shadow prices is that of **standard conversion factor (SCF)** which is essentially the ratio of domestic prices of goods to the international prices of these goods. Simply put, if the average domestic prices are 10% more than the world prices, the standard conversion factor would be $1/1.1=0.91$. Hence, for all the financial costs and benefits would be multiplied by 0.91 to convert them into economic costs and benefits. SCF is mainly influenced by the trade policy of the government (e.g. tariff regime). It is estimated by the weighted average of import and export tariffs. The formula for computing SCF along with an example is provided below for further explanation of the concept.

$$\text{Standard Conversion Factor} = \frac{M + X}{(M + T_m) + (X - T_x)}$$

M= CIF Value of Imports

X= FOB Value of Exports

T_m = Net Value of Taxes on imports

T_x = Net value of Taxes on exports

Cost, Insurance and Freight (**CIF value**) is the actual **value** of the goods when they are shipped. The **FOB Value** (free on-board price) of **exports** and imports of goods is the market **value** of the goods at the point of uniform valuation, (the customs frontier of the economy from which they are **exported**).

An example is provided below to further elucidate the concept of SCF

	(Million Rs.)					
Description	2011-12	2012-13	2013-14	2014-15	2015-16	Average
Total Imports	4009093	4349880	4630521	4644152	4658749	4458479.0
Total Exports	2110605	2366478	2583463	2397513	2166846	2324981.0
Import Duties	219589	242989	244947	308950	410632	254120.7
Sales Tax on Imports	430399	429831	495330	553028	683518	477147.0
Subsidies on Imports	49198	10000	3000	23700	18625	26304.7
Export Duties	5762	6832	6595	6361	5933	6387.5
Export Rebates	8453	10362	8732	9091	11994	9726.4

$$SCF = \frac{4458479 + 2324981}{(4458479 + 254120.7 + 477147 - 26304.7) + (2324981 - 6387.5 + 9726.4)}$$

$$\text{Standard Conversion Factor} = \frac{6783460}{7491762}$$

Standard Conversion Factor = 0.905

The subsequent financial prices would then be converted into economic (shadow) prices by multiplying the financial prices with the aforementioned SCF for economic analysis.

Techniques for Economic Appraisal

Cost-Benefit Analysis (CBA)	Cost-Effectiveness Analysis (CEA)
<p>Through Cost-Benefit Analysis (CBA), different approaches to achieving the project's benefits are assessed and compared to determine which approach is the most beneficial.</p> <p>For different approaches, the stream of economic benefits are identified, quantified and monetized in net present value terms. These are then compared with the respective stream of economic costs (that include the accounting cost and the opportunity cost) in net present values.</p> <p>The net benefit is assessed and the option with the highest net benefit is selected as the approach to the project.</p>	<p>Cost effectiveness analysis (CEA) is an analysis of the operational efficiency of a project.</p> <p>It is to determine the least expensive approach to achieving a result, from two or more alternatives.</p> <p>This approach is most commonly used when it is difficult to monetize the economic benefits from a project, e.g. number of lives saved from polio vaccinations.</p>

Estimating Financial & Economic Benefits

When we discuss computing present and future values of costs or benefits, we are actually focusing on the computing the time value of money as we know that Rs. 100 today would be worth much less in the next year, and so on. From an appraiser's perspective, we are essentially looking at whether the net present value of cash inflows (benefits) outweigh the net present value of cash outflows (costs) to ascertain whether the project is feasible or not. For example, if the projected benefits for a Project are shown to be Rs. 120 in five years, but the investment required at present is Rs. 100. This would not mean that the benefits outweigh the costs by Rs. 20 because the benefits would be yielded after five years. The present value of the benefits at 12% discount rate would be $120 / (1.12)^5 = \text{Rs. } 68.1$. This would mean that the project is not financially feasible as the cost outweighs the benefit at present value.

In order to compute future values, compounding of cash flows is required. There are two main ways that interest can be included in future values (FV), **simple interest** and **compound interest**. The definition and formulas are provided below:

Compounding (Calculating Future Values)

	Simple Interest Rate	Compound Interest Rate
Definition	paid only on the principal amount that is invested	paid on both the principal and the interest as it accumulates
Formula	$FV = 100 * (1 + r)t$ <p>Where, FV = Future value, r = the interest rate and t = time period</p>	$Vt = V0 \times (1 + r)t,$ <p>where, Vt = value in year t, V0 = value in year 0, r = the interest rate and t = time period.</p>

Understanding the Discount Rate

The discount rate is generally determined by the prevailing interest rates in a country and is equal to the opportunity cost of funds.

The higher the discount rate, the lower present value of a future investment. Thus, higher discount rates increase the chances of the rejection of projects on the basis of NPV and IRR analysis and vice versa. The Federal Government uses the following discount rates in specific cases:

Financial appraisal:

For government-funded projects, provisional rate of mark-up is fixed by the Finance division of Pakistan. This was 12.20% for 2019-2020

In case of Foreign 'grants', the discount rate is taken as 0%.

Economic Appraisal:

A discount rate of 12% is taken.

Calculating Present Value

In the example below, at a 10% discount rate the present value of one rupee received after 10 years would be Rs. 0.386. If the discount rate is higher i.e., 15% this value would be Rs. 0.247.

Year	0	1	2	3	10
Discount Factor at 10% rate	$1/1.1^{(0)}$	$1/1.1^{(1)}$	$1/1.1^{(2)}$	$1/1.1^{(3)}$	$1/1.1^{(10)}$
	= 1	=0.909	= 0.826	=0.751	= 0.386
Discount Factor at 15% rate	$1/1.15^{(0)}$	$1/1.15^{(1)}$	$1/1.15^{(2)}$	$1/1.15^{(3)}$	$1/1.15^{(10)}$
	= 1	=0.870	= 0.756	=0.658	= 0.247

Net Present Value (NPV)

The net present value (NPV) is the sum total of present values of the expected incremental positive and negative net cash flows over a project's proposed life. Net Present Value is argued to be the best methodology for assessing government projects.

The net present value of a project is dependent upon

- The time frame of project
- The discount rate and
- The accuracy of the cash flow calculations

If NPV = 0, it means that there is no loss but also no benefit on investment.

If NPV < 0, There is a loss on investment and the project is not feasible

If NPV > 0, There is a gain on investment and the project is feasible

Scenario 1-NPV Method (Example)

The following example is a 'made-up' one to illustrate Net Present Value (NPV) computations:

Note:- In the examples below, Year 1 is synonymous with the initial Year of project which essentially means that discounting would start from Year 2 as $1/(1+r)^1$, and so on.

SCENARIO 1:

Artificial Insemination Project (Livestock)

Discount rate = 12%, Life

of Project = 10 years

Capital Cost =Rs.100 billion O&M

cost = Rs. 32 Billion Revenue =

Rs. 320 billion

In the example below, the net present value of the project at 12% discount rate is **Rs. 71.0 billion** which would make the project feasible.

Year	Capital Cost	O&M	Total Cost	Revenue	Net Benefit/Loss	PV of Net benefit/Loss
1	30.00	-	30.00	-	(30.00)	(30.00)
2	30.00	-	30.00	-	(30.00)	(26.80)
3	40.00	4.00	44.00	40.00	(4.00)	(3.20)
4		4.00	4.00	40.00	36.00	25.60
5		4.00	4.00	40.00	36.00	22.90
6		4.00	4.00	40.00	36.00	20.40
7		4.00	4.00	40.00	36.00	18.20
8		4.00	4.00	40.00	36.00	16.30
9		4.00	4.00	40.00	36.00	14.50
10		4.00	4.00	40.00	36.00	13.00
Total	100.00	32.00	132	320.00	188.00	71.00

Scenario 2-NPV Method (Example)

The following example is a ‘made-up’ one to illustrate Net Present Value (NPV) computations with a discount rate of 18% (compared to 12% in the original case):

SCENARIO 2:

Artificial Insemination Project (Livestock) Discount rate = **increased**

from 12% to 18%, Life of Project = 10 years

Capital Cost = Rs.100 billion O&M cost = Rs. 32 Billion

Revenue = Rs. 320 billion

Year	Capital Cost	O&M	Total Cost	Revenue	Net Benefit/Loss	PV of Net benefit/Loss
1	30.00	-	30.00	-	(30.00)	(30.00)
2	30.00	-	30.00	-	(30.00)	(25.40)
3	40.00	4.00	44.00	40.00	(4.00)	(2.90)
4		4.00	4.00	40.00	36.00	21.90
5		4.00	4.00	40.00	36.00	18.60
6		4.00	4.00	40.00	36.00	15.70
7		4.00	4.00	40.00	36.00	13.30
8		4.00	4.00	40.00	36.00	11.30
9		4.00	4.00	40.00	36.00	9.60
10		4.00	4.00	40.00	36.00	8.10
Total	100.00	32.00	132.00	320.00	188.00	40.20

If we increase the discount rate from 12% to 18%, the NPV of the project decreases, but still remains positive at **Rs. 40.2 billion**

Internal Rate of Return (IRR)

By definition, IRR is that discount rate which sets the NPV of a project to 0. IRR has to be thus compared with the opportunity cost of funds/capital (prevailing discount rate) to find if the project is feasible or not.

For example, if the discount rate is 12% and the IRR is greater than 12% the return on the project is more than the opportunity cost of funds making the project feasible. And IRR of 12% would mean that the project is breakeven and you are no better or worse off. If the IRR is less than the discount rate than the project is not feasible. The following formula denotes the formula for computing IRR which can easily be computed with the in-built function for IRR in Microsoft Excel using net cash flows

$$NPV = \frac{\sum_0^t C_t}{(1 + IRR)^t} - C_0 = 0$$

where:

C_t =Net cash inflow during the period t

C_0 =Total initial investment costs

IRR=The internal rate of return

t= The number of time period

If IRR = Discount Rate, it means that there is no loss but also no benefit on investment. If

IRR < Discount Rate, there is a loss on investment and the project is not feasible

If IRR > Discount Rate, there is a gain on investment and the project is feasible

Method (Artificial Insemination Project):

In the aforementioned scenario of AI Project, the IRR of 32.16% is greater than the discount rate applied (which is 12 % in this case), the project is feasible.

Year	Capital Cost	O&M	Total Cost	Revenue	Net Benefit/Loss	PV of Net benefit/Loss	PV at IRR
1	30.00	-		30.00	-	-30.00	-30.00
2	30.00	-		30.00	-	-30.00	-22.70
3	40.00	4.00		44.00	40.00	-4.00	-2.30
4		4.00		4.00	40.00	36.00	15.60
5		4.00		4.00	40.00	36.00	11.80
6		4.00		4.00	40.00	36.00	8.90
7		4.00		4.00	40.00	36.00	6.80
8		4.00		4.00	40.00	36.00	5.10
9		4.00		4.00	40.00	36.00	3.90
10		4.00		4.00	40.00	36.00	2.90
Total	100.00	32.00		132.00	320.00	188.00	0.00
						IRR	32.16%

Benefit Cost Ratio

Also sometimes called the profitability index, the benefit-cost ratio, is the ratio of the NPV of the net cash inflows (or economic benefits) to the NPV of the net cash outflows (or economic costs):

$$BCR = \frac{NPV \text{ of Net Cash Inflows}}{NPV \text{ of Net Cash Outflows}}$$

If the ratio is less than one, the project is not feasible
 If the ratio is greater than one, the project is feasible
 If the ratio is equal to 1, the project would breakeven

Sensitivity Analysis

Sensitivity-Original Case

Multiple scenarios can be tested to see the sensitivity of the project to survive such risks (e.g. cost escalation, decrease in revenue.)

Original case - Discount rate of 12%								
Year	Capital Cost	O&M	Total Cost	PV of Total cost	Revenues	PV of Total Revenues	Net Benefit/ Cost	PV of Net Benefit/cost
1	30		30	30		-	(30)	(30)
2		4	4	3.6		-	(4)	(3.6)
3		4	4	3.2	40	31.9	36	28.7
4		4	4	2.8	40	28.5	36	25.6
	30	12	42	39.6	80	60.4	38	20.8
							NPV	20.8
							IRR	37.47%
							BCR	1.52

Sensitivity-Cost-Over Run Case

A different scenario with a 20% increase in cost

Cost Over-run (20% increase) - Discount rate of 12%								
Year	Capital Cost	O&M	Total Cost	PV of Total cost	Revenues	PV of Total Revenues	Net Benefit/ Cost	PV of Net Benefit/cost
1	36		36	36		-	(36)	(36)
2		4.8	4.8	4.3		-	(4.8)	(4.3)
3		4.8	4.8	3.8	40	31.9	35.2	28.1
4		4.8	4.8	3.4	40	28.5	35.2	25.1
	36	14.4	50.4	47.5	80	60.4	29.6	12.8
							NPV	12.8
							IRR	25.94%
							BCR	1.27

Sensitivity-Revenue-Decrease Case

A different scenario with a revenue decreases of 20%.

Revenue Decrease of 20% - Discount rate of 12%								
Year	Capital Cost	O&M	Total Cost	PV of Total cost	Revenues	PV of Total Revenues	Net Benefit/ Cost	PV of Net Benefit/cost
1	30		30	30		-	(30)	(30)
2		4	4	3.6		-	(4)	(3.6)
3		4	4	3.2	32	25.5	28	22.3
4		4	4	2.8	32	22.8	28	19.9
	30	12	42	39.6	64	48.3	22	8.7
							NPV	8.7
							IRR	21.91%
							BCR	1.22

Sensitivity-Discount Rate Increase Case:

A different scenario with a discount rate increases from 12% to 15%

Discount rate increase from 12% to 15%								
Year	Capital Cost	O&M	Total Cost	PV of Total cost	Revenues	PV of Total Revenues	Net Benefit/ Cost	PV of Net Benefit/cost
1	30		30	30		-	(30)	(30)
2		4	4	3.5		-	(4)	(3.5)
3		4	4	3.0	40	30.2	36	27.2
4		4	4	2.6	40	26.3	36	23.7
	30	12	42	39.1	80	56.5	38	17.4
							NPV	17.4
							IRR	37.47%
							BCR	1.44

Sensitivity Analysis-Different Scenarios

Comparing different scenarios for sensitivity analysis for risk estimations.

	Original	20% Cost Increase	20% Revenue Decrease	Discount rate of 15%
NPV	20.80	12.80	8.70	17.40
IRR	37.47%	25.94%	21.91%	37.47%
BCR	1.58	1.27	1.22	1.44

As can be seen from the different scenarios constructed for sensitivity analysis, the NPV decreases relative to the original case for all 3 scenarios, but remains positive (i.e. 20% Cost Increase, 20% Revenue Decrease and Discount rate increasing to 15%). IRR also decreases for the 2 scenarios, but remains more than the 12% discount rate (i.e. 20% cost increase and 20% revenue decrease). However, IRR doesn't change when discount rate increases to 15% because IRR doesn't depend on the discount rate (it is a discount rate itself that makes NPV=0). BCR also decreases, relative to the original case, for the aforementioned scenarios, but remains more than 1 throughout.

In short, the anticipated risks might decrease the profitability of the project, but the project remains feasible across all scenarios (i.e. NPV>0, IRR>Discount Rate, BCR>1). The appraiser should take into account such risks, their implications and mitigation strategies when conducting/scrutinizing sensitivity analysis.

Payback Period

Under this technique, a project is accepted or rejected on the basis of years that a project requires to recover the money invested in it. It is mostly expressed in years. Unlike NPV payback period technique does not take into account the time value of money.

As per this technique the quicker the recovery of initial investment the more desirable a project. The formula of the Payback period is as follows

$$\text{Payback Period} = \frac{\text{Investment Required}}{\text{Net Annual Cash Flow}}$$

Example: The Government of Sindh is planning build a farm-to-market road. The road would cost Rs. 400 million and would have a useful life of 10 years. The expected annual net cash inflow from the road through the toll payments is Rs. 80 million per year.

The payback period would be calculated as follows:

$$\text{Payback Period} = \frac{\text{Rs. 400M}}{\text{Rs. 80M}} = 5 \text{ Years}$$

Thus, the road would cover its cost in 5 years.

Breakeven Analysis

Breakeven analysis allows you to know how much revenue is required to cover the costs associated with an investment. In effect, it allows one to set prices for products and services.

$$\text{BEV} = \frac{\text{Fixed Costs}}{\text{Revenue per Unit} - \text{Variable Cost per Unit}} = \frac{\text{Fixed Costs}}{\text{Unit Margin}}$$

Example: The Government of Sindh is planning build a financially sustainable Reverse Osmosis Plant with a revenue generating stream by selling six-liters water bottles. The fixed cost for the project is estimated at Rs. 1 million, the variable cost per water bottle would be Rs. 10. The water bottle is proposed to be sold at Rs. 20. Therefore, given the fixed cost, variable cost and selling price, the project would need to sell 100,000 bottles to breakeven.

The breakeven quantity would be calculated as follows:

$$\text{Breakeven Quantity} = \frac{\text{Rs. 1,000,000}}{\text{Rs. 20} - \text{Rs. 10}} = 100,000 \text{ Bottles}$$

Return on Investment

Return on Investment Ratio is another profitability ratio that computes net gains from a project compared to the net cost. In simple words, ROI computes how much the project will get back compared to the investments.

Usually, ROI between 5% and 12% is considered good while ROI above 12% is considered excellent. A negative ROI entails that the project is not worth considering.

$$\text{ROI} = \frac{\text{Net Present Value}}{\text{Present Value of Cumulative Cash Outflows}}$$

Example: The Government of Sindh is planning to invest in a technical skills program for the youth to generate employment and income opportunities. The net present value of the project is estimated at Rs. 250,000. The cumulative present value of cash outflows (costs) is estimated to be Rs. 1.5 million. Therefore, the ROI of the project is 16.7% which essentially means that the **net gain** on Rs. 1.5 million investments is 16.7%.

The return on investment (ROI) would be calculated as follows:

$$\text{ROI} = \frac{\text{Rs. 250,000}}{\text{Rs. 1,500,000}} \times 100 = 16.7\%$$

Cost-Benefit Analysis & Cost-Effective Analysis

Economic Appraisal:

The Government does not operate on profit motivation when considering projects. In fact, it wants to determine the effect of an investment proposal on the entire nation. Economic appraisal helps analyze the costs and benefits of a project from the point of view of the entire economy.

There are three main differences due to which economic analysis may give different results from financial analysis. These differences include

- a) Social benefit vs private benefit
- b) Social cost vs private cost and
- c) Market distortions

There are two basic techniques for economic appraisal i.e., **Cost Benefit Analysis (CBA)** and **Cost Effectiveness Analysis (CEA)**

Cost-Benefit Analysis

Through Cost-Benefit Analysis (CBA), different approaches to achieving the project's benefits are assessed and compared to determine which approach is the most beneficial

For different approaches, **the stream of economic benefits are identified, quantified and monetized in net present value terms. These are then compared with the respective stream of economic costs** (that include the accounting cost and the opportunity cost) **in net present values**. The net benefit is assessed and the option with the highest net benefit is selected as the approach to the project

Examples of Monetized Economic Benefits	Examples of Economic Costs
Current and future income generated	Actual financial costs of the project
Revenue collections	Foregone financial income from child labor, as a result of education projects
Value of increased economic activity, from a cash transfer programme	Foregone income of business along the existing roads, from a new road project
Higher life expectancy and therefore higher future incomes from a health project	Foregone tourism and cultural heritage, from infrastructure projects that impact heritage and nature sights.
Future income of students, from a technical education programme	
Low future financial outlays on flood cleanup, from a disaster risk management project	

Example: The Government of Sindh is planning to build a farm to market road. Two Proposals are received.

BCR for Proposal 1=1.5;
BCR for Proposal 2=1.8.

Financial CBA would dictate that the Government opts for Proposal 2

What if Proposal 2 has a negative 'externality' that displaces population and businesses along the route that would increase the cost to the society? Suppose **BCR for Proposal 2 now equals 1.2 (instead of 1.8).**

Economic CBA incorporates the societal cost which makes Proposal 1 the more feasible option now (i.e., 1.5>1.2)

Cost-Effectiveness Analysis

Cost effectiveness analysis is an analysis of the operational efficiency of a project. It is to determine the least expensive approach to achieving a result, from two or more alternatives. This approach is most commonly used when it is difficult to monetize the economic benefits from a project, e.g. number of lives saved from polio vaccinations.

For such projects, different approaches are evaluated by comparing the cost-effectiveness ratio:

$$\text{CE Ratio} = \frac{\text{Effectiveness of the Option}}{\text{Cost of the Option}}$$

The option with the highest CE ratio is the preferred option.

(Note: -sometimes, the formula is reversed in which case lowest CE ratio is the preferred option)

Example: The Government of Sindh is planning to invest in a project to reduce under-5 child mortality. Two Proposals are received.

CE ratio for Proposal 1= 2 deaths averted/Rs. 100 invested;CE

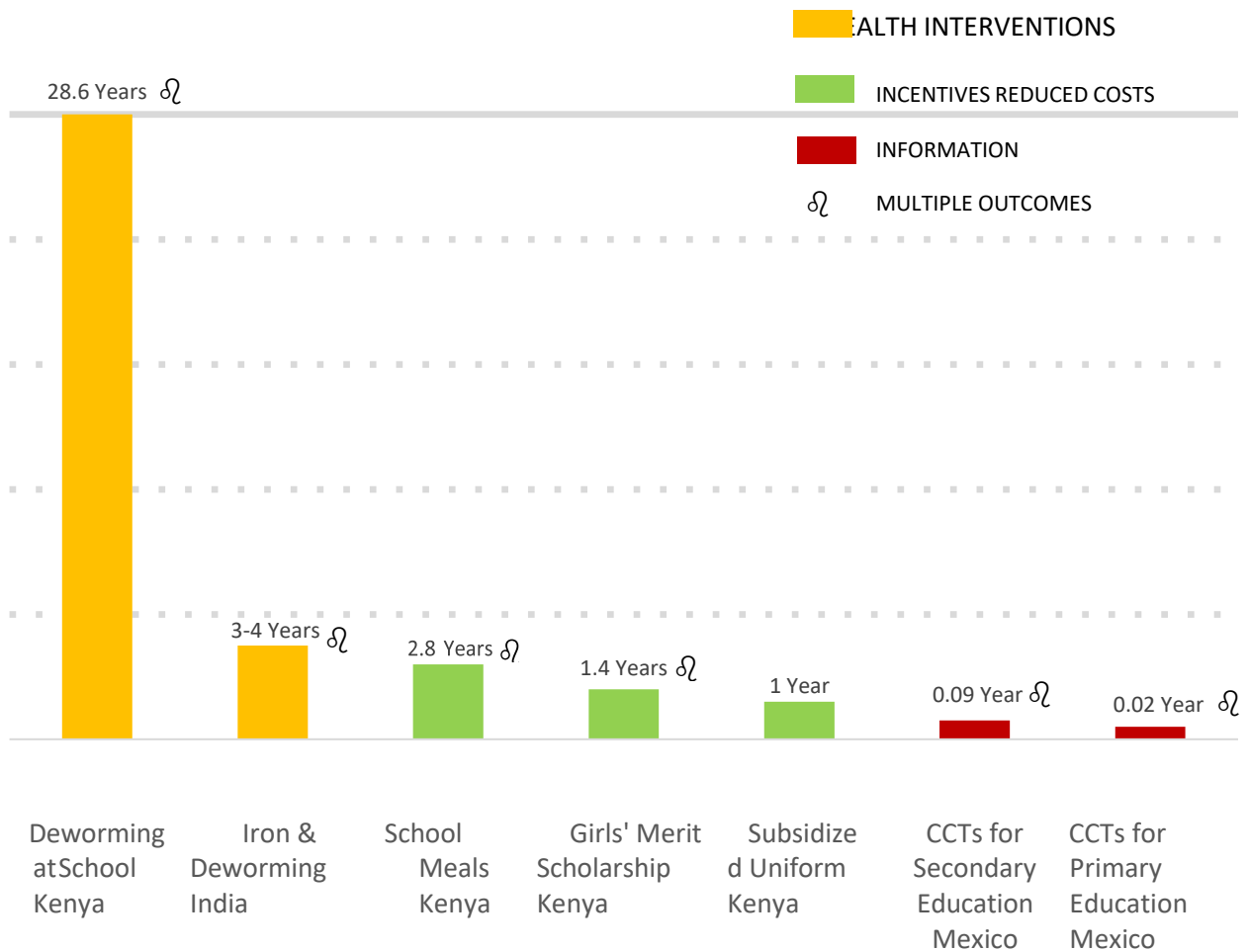
ratio for Proposal 2= 1 death averted/Rs. 100 invested.

CE analysis would dictate that the Government opts for Proposal 1

What if Proposal 2 has a positive 'externality'/'spill-over' effect that results in deaths averted in proximate households (e.g. herd immunity)? Suppose CE Ratio for Proposal 2 now equals 3 deaths averted/Rs. 100 invested (instead of 1).

Incorporating the positive spill-over effects makes Proposal 2 the more feasible option now (i.e. 3>2 deaths averted per Rs. 100 invested)

Cost-Effectiveness: Additional Years of Student Attendance per USD100 Spent



Source: J-PAL, MIT <www.povertyactionlab.org>

The concept of cost-effectiveness can be further crystallized by looking at multi-country studies undertaken by Massachusetts Institute of Technology's (MIT) Abdul Latif Jameel's Poverty Action Lab (J-PAL). The studies looked at the effect of various school-based interventions (e.g. deworming, school meals, merit scholarships, subsidized uniforms and conditional cash transfers) to gauge their impact on a common outcome, i.e. additional years of student attendance per USD 100 spent.

The figure below shows the relative cost-effectiveness of the interventions on the same outcome. This helps resource-constrained countries in making an evidence-based decision about which intervention to finance to achieve the highest value-for-money in terms of impact of spending.

Technical Appraisal

Technical appraisal helps in assessing the technical feasibility of a Project. Technical Appraisal provides a comprehensive review of all technical aspects of the project such as rendering judgment on merits of technical proposals and operating costs.

Technical appraisal may comprise of the following (not an exhaustive list):

- Confirmation of the source of the project proposal, including feasibility studies undertaken before the proposal, and the nature of decisions taken by all relevant authorities involved
- Has the problem to be resolved by the project been clearly stated? (Well-defined objectives)
- Has the project been clearly spelled out with the correct technical design details (such as size, location, timing, and technology)?
- Is there is a sound rationale for the selected technical design or approach?
- Has the proposed technology been proven or tested or has been in practice elsewhere? Can the technology be applied in the current context and conditions?
- Are the costs of the project clearly established, expected product prices projected, and payment modalities and schedules agreed to?

In addition to the aforementioned considerations, the overarching objectives of the project should be effectively scrutinized to ascertain whether the proposed project falls under the purview of the sectoral strategy. For example, a project proposed for health sector must contribute to the Sindh Health Sector Strategy 2012-20. However, there can be exceptions when a project might not be a part of the sectoral strategy per se, but there should be an effort to focus on the alignment of any proposed project with the provincial, national or global strategy/policy/goal. Similarly, a demand-supply analysis should be undertaken for every project proposal.

For example, if a project proposes to build a primary school in Taluka Shah Bandar of District Sujawal, then the demand should be ascertained by doing a survey of the area and the catchment population to gauge how many school-going children are present in the vicinity. From the supply side, the project should present the quantum of human, physical, technical and financial resources that would be expended to cater to the computed demand. Existing projects and initiatives in the area must also be surveyed to ensure that there is no duplication of efforts.

Another demand-and-supply analysis from a technical appraisal perspective can be a water supply project for Sindh with a water pricing component via water-meters for revenue generation and financial sustainability. The obvious question that the appraiser should ask is about the demand and supply of the project. The demand of the project must be ascertained by a geo-spatial analysis of the water consumption patterns in the province. Similarly, 'willingness-to-pay' studies must be conducted to ascertain the water price that can be paid by the catchment population. Additionally, such studies would help gauge peak demand period that may put additional burden on the water supply system. The studies can translate into a 'differential tariff strategy' such that the prices increase during the peak period and decrease during the off-peak period to balance production and consumption. The supply side of the project must be centered on the physical, human, technical and financial resources that

would be needed to effectively cater to the demand of the catchment population.

Creating an evidence-base with pertinent studies can help make informed decisions when analyzing and appraising proposals. Asking basic relevant questions can go a long way in effective appraisal of project proposals. This is true irrespective of how complex or intricate the project proposal is.

Social Appraisal

A social appraisal reviews the project design and the process of project identification through to implementation and monitoring, from a social perspective. Social Appraisal allows adjustments to the project goals so that they have more meaning for both the project population and the implementing agencies.

Social analysis focuses on four areas indicated below:

- The demographic and social-cultural characteristics of the project beneficiaries – its size and social structure, including ethnic, tribal and class composition
- How the project beneficiaries are organized to carry out productive activities, including the structure of households and families, availability of labor, ownership of land, and access to and control of resources.
- The project's beneficiary's cultural acceptability; i.e. its capacity both for adapting to and for bringing about desirable changes in stakeholders' behavior and in how they perceive their needs
- The strategy necessary to elicit commitment from the project beneficiaries and to ensure their sustained participation from design through to successful implementation, operation and maintenance.

Stakeholder Analysis

Stakeholder analysis as well as thorough poverty mapping are two good tools for analyzing the above. A robust stakeholder analysis can help in answering the above and provide detail on

- What are the different stakeholders?
- What are their interests?
- How will proposed project affect them?
- What are the project priorities between the different groups?
- What is their capacity to participate in the project?

Poverty Mapping

Similarly, a poverty mapping exercise can shed light on

- Who the poor are (at community, household and individual level)?
- What are the characteristics of their poverty (in terms of access to and control of resources and benefits, vulnerability and exclusion)?
- How can the issues of poverty be addressed in the project?

Environmental Appraisal

For Projects that have an adverse impact on the environment/climate, it is imperative that at the time of planning of these projects a proper environmental/climate change appraisal is carried out to compare costs and benefits. For projects pertaining to Sindh, Sindh Environmental Quality Standards (as formulated by Sindh Environment Protection Agency) are to be adhered to.

The commonly used tools for environmental/climate change appraisals are Environmental Impact Assessment (EIA) or Climate Change Impact Assessment.

Environmental Impact Assessment (EIA) was developed as many development projects in the past failed to take into consideration their adverse impacts on the environment. EIA has many definitions the simplest of which has been given by the United Nations and defines it as "an assessment of impacts of a planned activity on the environment" (United Nations)

Goals

The overall goal of an EIA is to achieve better developmental interventions through protecting the environment. EIA aims:

- to provide accurate and balanced information for analysis of the impact on environment so that informed decisions can be made by decision makers;
- to present unquantifiable effects that are not addressed by cost-benefit analysis or technical assessments;
- to provide information to the public;
- to present alternatives so that the least environmentally harmful one can be chosen;
- to help develop mitigation and avoidance measures for protecting the environment

Components

EIA can be thought of as a data management process with three components.

- Firstly, the appropriate information necessary for a particular decision must be identified and collated.
- Secondly, changes in environmental parameters resulting from the proposed project must be forecast and compared with the situation without the proposal.
- Finally, the actual change must be assessed and communicated to the decision makers.

From an appraiser's perspective, the proposal must be reviewed with a close consideration for environmental risk(s) that the project poses, quantification of the potential impact and risk mitigation strategies. Adherence of the project to SEPA's Environmental Quality Standards must also be ensured.

Risk Assessment and Management Planning

Risk assessment and management planning involves the following:

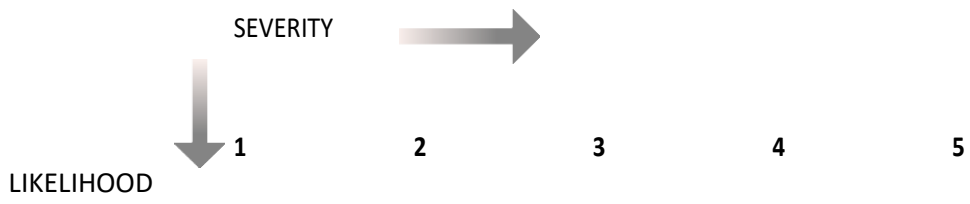
- a. **Methodology:** How will risk management be performed on the project? What tools and data sources are available and applicable?
- b. **Roles and Responsibilities:** Who are the individuals responsible for implementing specific tasks and providing deliverables related to risk management?
- c. **Budget and Schedule:** What are the estimated costs and schedules for performing risk-related activities?
- d. **Risk Categories:** What are the main categories of risks that should be addressed on the project? Is there a risk breakdown structure for the project?
- e. **Risk Probability and Impact:** How will the probabilities and impacts of risk items be assessed? What scoring and interpretation methods will be used for the qualitative and quantitative analysis of risks?
- f. **Risk Documentation:** What reporting formats and processes that will be used for risk management activities?

‘Risk Assessment’ is focused on anticipating risks associated along the time horizon of a project. A comprehensive risk analysis would help ascertain potential risks along with mitigation strategies to address the identified risks. It might be the case that a certain cost is associated with the risk and ‘internalization’ of the said cost by executing department would have financial implications. These implications must also be reflected in PC-I proposals to ensure the capacity to evaluate and mitigate potential risks without significant cost over-runs. Ideally, such risks should be clearly computed under the sensitivity analysis for different scenarios like cost-escalation or decrease in expected revenue.

Apart from looking at ‘risks’ from a financial lens vis-à-vis sensitivity analysis, overall spectrum of potential risks must be effectively assessed and categorized. The underlying sources of risk(s) must also be analyzed for pre-emptive mitigation and corrective strategies. It is worth mentioning that there might be ‘exogenous’ sources of risks associated with a project that may not be anticipated, but potential sources of risks need to be thoroughly scrutinized to minimize the probability of project facing any major problems that may significantly hamper its progress.

For example, while conceptualizing a ‘cooperative farming’ project in Shikarpur District, Government of Sindh might anticipate the risk that the surplus production might not be sold at competitive prices because the cooperative farmers have limited market connectivity. The transportation cost and time might make the endeavor financially unviable. In the short-run, the Government can guarantee buying the surplus produce to mitigate the risks for cooperative farmers. Medium-term mitigation strategies might include developing storage facilities for perishable products. Long-term mitigation strategies would include developing farm-to-market roads, creating value-chain linkages with urban centers, promoting private sector investment and an eco-system of agro-based entrepreneurship to generate income and employment multipliers.

While risks can be categorized along several dimensions, usually the severity and likelihood of risks associated with a project can be characterized by developing 5x5 Risk Matrix



1	LOW 1	LOW 2	LOW 3	MEDIUM 4	MEDIUM 5
2	LOW 2	MEDIUM 4	MEDIUM 6	HIGH 8	HIGH 10
3	LOW 3	MEDIUM 6	HIGH 9	HIGH 12	EXTREME 15
4	MEDIUM 4	HIGH 8	HIGH 12	HIGH 16	EXTREME 20
5	MEDIUM 5	HIGH 10	EXTREME 15	EXTREME 20	EXTREME 25

Risk categorization must translate into corresponding potential risk mitigation strategies with higher priority assigned to most severe and most likely risks.

Mitigation strategies can help risk management from the onset to avoid any major problems at a later stage. If the mitigation strategies are not undertaken from the onset, the fail-safe option is to develop ‘contingency actions’ to minimize the risk when the project is underway. Risk prioritization can be done by looking at the likelihood and severity of the specific risk. Some risk models postulate that the product of likelihood and (potential) impact of the risk determine severity which translates into categorization of risk as having low, medium or high severity. Risk prioritization and mitigation strategizing is then done according to the level of severity assigned to the risk. Following is a stylized example of risk categorization for a project proposal that can be followed as a template:

S. No.	Risk Description	Likelihood	Impact	Severity	Responsibility	Mitigation Action
1	Project Purpose and Need is not well-defined	Medium	High	High	Executing Agency	Develop a clearly delineated theory of change along with evidence-based needs assessment
2	Project Design and Deliverables are not aligned with each other	Medium	High	High	Executing Agency	Formulate deliverables that are compatible with the overall project objectives and design
3	Unrealistic timelines are provided for deliverables	Medium	Medium	Medium	Executing Agency	Revise timelines to avoid the over-run issues
4	Scarce resources are available to earmark for allocation	High	High	High	Planning & Development	Explore funding opportunities beyond the ADP resource envelope.
5	No contingency plan is in place for severe exogenous shocks	Low	Medium	Medium	Executing Agency	Develop a contingency plan with sensitivity analysis for shocks that may cause time over-run, cost escalation & other issues
6	Mapping of SDGs Goals/Indicators is missing	Low	Low	Low	Executing Agency	Map project’s overarching goal with the relevant SDG(s) and project indicators with corresponding SDG indicators/sub-indicators

Overall Risk Severity of the Project is **High**

Revise the project proposal to incorporate the proposed risk mitigation strategies to ensure that project is not susceptible or vulnerable to manageable factors (i.e. factors that are not part of extenuating circumstances which are outside of one’s control)

Project Appraisal Checklist

The checklist below can be used as a guiding tool for effective appraisal of project proposals

CHECKLIST OF APPRAISING PROJECT PROPOSALS (CAN BE CUSTOMIZED AS PER NEED)			
Scrutinizing 'Theory of Change'			
S No.	Criteria	Yes/No	Comments
1.	Project outcomes are aligned with corresponding sectoral strategy/provincial development framework/national development vision		
2.	Theory of Change is clear with Inputs, Outputs, Outcomes and Impact connected with a logical causal chain		
3.	Inputs/Resources are commensurate with the intended outputs (not over-/under-estimated)		
4.	All the underlying assumptions and primary & secondary objectives are valid and justified		
Overall Quality Check			
S No.	Criteria	Yes/No	Comments
5.	Information/Data is valid, reliable and consistent		
6.	Project Proposal adheres to the guidelines and the information is populated according to the PC-I format		
7.	If it is required, feasibility study conducted		
Technical Appraisal			
S No.	Criteria	Yes/No	Comments
8.	Cogent rationale for the selected technical design or approach with sufficient information on sound justification		
9.	Proposed design/approach/methodology is in conformity to provincial/national standards (international standards, if no local standards available)		
10.	Proposed design/approach/methodology is the best option to address the identified needs (comparative analysis with alternatives)		
11.	Proposed intervention has already been tested for efficacy/effectiveness		
12.	Proposed design is in consonance with the local context (i.e., existing institutional, legal, development landscape, etc.)		
13.	List of Equipment, machinery, etc. is properly quantified with demand-supply analysis		
14.	All costs and specifications are attached with updated valuations and requisite information		
15.	Standards of Equipment/Machinery are adequate and in line with provincial/national/international standards		
Financial and Economic Appraisal			
S No.	Criteria	Yes/No	Comments
16.	Financial Appraisal		
	Financial returns to investment are quantified		
	Financial costs and benefits are realistic		
	Sensitivity Analysis has been conducted		
17.	Economic Appraisal		
	Economic returns to investment are quantified		

	Economic costs and benefits are realistic		
	Externalities have been considered		
	Cost-Benefit Analysis/Cost-Effectiveness Analysis has been conducted		
	Economic Analysis has been comprehensively computed		
Social and Environmental Appraisal			
S No.	Criteria	Yes/No	Comments
18.	Environmental Standards are in line with SEQS/NEQS or any international standards (if applicable)		
19.	Public health, environmental safety and other relevant risks are considered along with potential mitigation strategies (if applicable)		
20.	In case of involuntary resettlement/displacement of population, compensation mechanisms/alternative arrangements are mentioned		
21.	Distributional access to project benefits are well-delineated with special considerations for marginalized and impoverished segments		
22.	Conservation of natural resources is considered and planned		
23.	Rights of Indigenous people are accounted for		
24.	Local community and stakeholders have been consulted		
25.	Effective targeting and delivery mechanism is clearly laid-out		
26.	Local traditions, values, culture and heritage has been considered		
27.	Gender Inclusivity and Equity implications have been incorporated		
Organizational/Managerial Appraisal			
S No.	Criteria	Yes/No	Comments
28.	Sufficient human, technical resources are available or are provisioned for in the proposal		
	Adequate experience of executing agency for executing and managing projects of similar nature		
29.	For specialized functions, provision for external support has been incorporated		

Conclusion

This guide is not meant to be an end-to-end instruction manual for PC-I appraisal as the Federal Government's Planning Manual for Development Projects is already available with most recent version revised in 2019. However, this guide aims to provide an in-depth step-by-step review of key techniques that are essential for conducting effective financial and economic appraisal of PC-I proposals. Technical sections/Appraisers can gain useful insights by perusing the tools and techniques.

Multiple facets of appraisal and the associated gaps require some introspection:

- i. **Cost-Benefit Analysis:** How to construct a sector-wise portfolio?
- ii. **Evidence-Base:** PC-I comprises of projections, but what about the actual impact evaluation of completed ADP schemes (PC-V)?
- iii. **Data Gap:** Reliance on national and provincial surveys for overall provincial/district socio-economic indicators, but what about the data on the effectiveness of public sector development investments?
- iv. **Institutional Gap:** Bureau of Statistics may be involved in province-wide survey (e.g. MICS), but what about alignment with the ADP portfolio in terms of capturing and managing data?
- v. **Data Analysis:** Are there adequate analytical skills to gauge worthwhile project investments along with the respective effectiveness?
- vi. **Utilization:** Is the data utilized to foster systemic demand for relevant evidence?

Questions that need to be asked and answered by the appraisers of project proposals:

- i. **Overall Quality:** Is the current level of appraisal satisfactory?
- ii. **Analytical Capacity:** Is the analytical capacity for effective project appraisal adequate?
- iii. **Sectoral Knowledge:** Is the sectoral knowledge sufficient for comprehensive technical appraisal of project proposals?
- iv. **Risk Insights:** Is the holistic understanding up-to-the-mark to identify, categorize and potentially mitigate anticipated and unanticipated risks?
- v. **Spectrum of Considerations:** If sufficient evidence is not provided, can the appraiser identify the gaps in project proposal? Can the appraiser suggest exact evidence to the executing agency to fill the information gap?
- vi. **Vision:** Can the appraiser gauge whether the proposed project is in line with the broader national and provincial policy imperatives? Is the proposed project duplicating efforts of another existing project? Are the projected benefits and costs realistic? Is the project timeline pragmatic? etc.

Regardless of the sectoral knowledge, the key to comprehending strengths, weaknesses, opportunities and risks associated with a project is to engage deeply with the PC-I proposal from both micro-level perspective (i.e. specific project components) and holistic perspective (i.e. where does the project fill in sectoral strategy/provincial policy/national development vision).

Note: To reiterate the major concepts covered in this guide, a review question based on an actual approved PC-I has provided in Annexure-I with the corresponding Answer Key (without computations) in Annexure-II to hone the analytical skills of P&DD Officials. A couple of additional questions on 'made-up' scenarios are also included for review of the concepts covered in the guide.

Annexure-I

Review Questions

Question 1. You are tasked to **compute the Net Present Value, Benefits-Costs Ratio & Internal Rate of Return** for a 'Four-Lane Road on Indus Highway N-55' Project, with an initial investment of Rs. 339.5 Million (Note: No need to discount the initial investment at Year 0). Is the project feasible and worth investing in? The discount rate is 12%.

After computing NPV, BCR & IRR for the base case (i.e. 12% discount rate); conduct a sensitivity analysis for the following:

- Discount Rate increases from 12% to 18%
- All Economic Costs increase by 10%
- All Benefits decrease by 10%

Does the project remain feasible for the aforementioned three scenarios too?

Following details are provided on cash inflows (benefits) and cash outflows (costs):

Year	Project Economic Costs	Project Economic Benefits
0	33339.53	0
1	11133.18	2310.19
2	44.53	3356.07
3	44.53	4401.95
4	44.53	5447.83
5	44.53	6493.71
6	44.53	7539.6
7	44.53	8309.05
8	44.53	9078.51
9	44.53	9847.96
10	4231.82	10617.42
11	44.53	11386.87
12	44.53	12386.96
13	44.53	13387.05
14	44.53	14387.13
15	44.53	15387.22
16	44.53	16387.3
17	44.53	16891.01
18	44.53	17394.72
19	44.53	17898.43
20	4231.82	29535.32

Question 2. You are tasked to **compute the Net Present Value, Benefits-Costs Ratio, Internal Rate of Return & Return On Investment** for a Preventive Healthcare Project that would run for Five years, with an initial investment of Rs. 425,000 (No need to discount the initial investment at Year 0). The discount rate is 12%. Following details are provided on cash inflows (economic benefits) and cash outflows (economic costs):

(In Million Rs.)

Cash Inflows	Year	0	1	2	3	4	5
HH Health Expenditures Saved			45,000	45,000	45,000	45,000	45,000
Public Health Expenditures Saved			25,000	25,000	25,000	25,000	25,000
Labor Productivity Increased			75,000	75,000	75,000	75,000	75,000
Savings from higher disposal income			100,000	100,000	100,000	100,000	100,000
Returns to Investment from higher savings			250,000	250,000	250,000	250,000	250,000
Cash Inflow							
PV of Cash Inflow							
Cumulative Cash Inflow							

(In Million Rs.)

Cash Outflows	Year	0	1	2	3	4	5
Initial Investment		425,000					
Software Maintenance			50,000	50,000	50,000	50,000	50,000
Data Storage			10,000	10,000	10,000	10,000	10,000
Human Resources			200,000	200,000	200,000	200,000	200,000
Opportunity Cost			50,000	50,000	50,000	50,000	50,000
Cash Outflow							
PV of Cash Outflow							
Cumulative Cash Outflow							

Question 3.

- A) As an appraiser, you are provided with five different projects along with their corresponding costs and benefits. However, resource-constraints mean that you may only choose one. Which one would you choose and why?

Project	Benefits (Rs.)	Costs (Rs.)
A	1,784,364	1,542,481
B	1,600,000	1,550,000
C	1,800,000	1,600,000
D	2,000,000	1,800,000
E	1,400,000	1,600,000

- B) As an appraiser, you are provided with five different projects along with their corresponding costs and non-monetized benefits. However, resource-constraints mean that you may only choose one. Which one would you choose and why?

Project	Deaths Averted	Total Cost (Rs.)
A	100,000	3,000,000
B	150,000	1,000,000
C	200,000	500,000
D	300,000	3,500,000
E	250,000	1,500,000

Annexure-II

Answer Key

Question 1.

Base Case (Discount Rate= 12%):

NPV= Rs. 15,629.4 Million

IRR=15.75% BCR=1.34

Project is Feasible as NPV>0, IRR>Discount Rate, BCR>1

Scenario 1 (Discount Rate increases to 18%):

NPV= Rs. -6,517.2 Million

IRR=15.75%

BCR=0.85

Project is not Feasible as NPV<0, IRR<Discount Rate, BCR<1

Scenario 2 (Cost Escalation of 10%):

NPV= Rs. 11,087.9 Million

IRR=14.49% BCR=1.22

Project is Feasible as NPV>0, IRR>Discount Rate, BCR>1

Scenario 3 (Revenue Decrease of 10%):NPV=

Rs. 9,525.0 Million

IRR=14.36%

BCR=1.21

Project is Feasible as NPV>0, IRR>Discount Rate, BCR>1

Question 2.

NPV= Rs. 241,884

IRR=33.11%

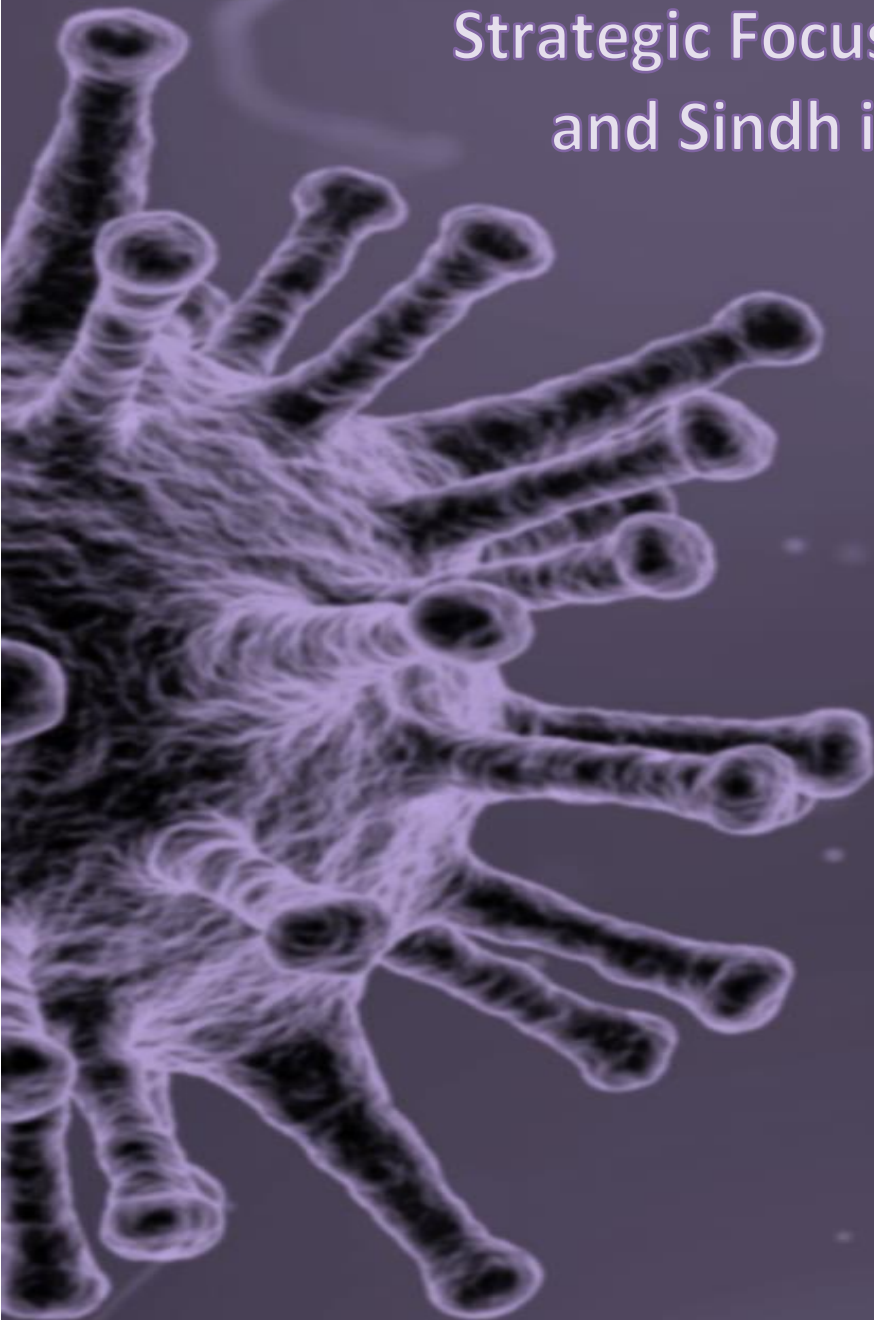
ROI=15.68% BCR=1.16

Project is Feasible as NPV>0, IRR>Discount Rate, ROI>0, BCR>1

Question 3.

- a) Project A because highest BCR of 1.16
- b) Project C because most cost-effective with 400 deaths averted for every Rs. 1000 spent

**Systematic Review of Global
Health Response to Covid-19:
Strategic Focus on Pakistan
and Sindh in Specific**



Executive Summary

With the beginning of year 2020, the world witnessed a highly contagious disease, known as Novel Corona Virus Disease 2019 i.e. "COVID-19" which has changed the lives of everyone on the planet earth. Within three months' time, this disease took shape of a pandemic, of a scale the world has never seen before. Although there have been pandemics in the past, but the scale and gravity of COVID-19 has directly or indirectly affected people from all walks of life. Therefore, it is an opportune time to delve into critical analysis of government's initiatives and plans to strengthen health systems in Pakistan (especially with reference to Sindh) in the context of COVID-19 pandemic. This research is primarily for policy makers who can direct and steer policy by understanding the current situation of health care system in Pakistan in general, and in Sindh in particular. This research can be used as a frame of reference for policy makers to make informed decisions which can positively impact the lives of millions of people in Sindh vis-à-vis health systems strengthening.

This research highlights the current situation of the existing health system in Pakistan, immediate responsive steps taken by the Federal government, Government of Sindh, and different initiatives taken by both the governments to tackle the spread of COVID-19. Furthermore, this research sheds light on how countries reacted and responded, especially the ones which were hit first. This research focuses on how countries contained the disease and limited its spread, from a health systems perspective, to draw lessons in terms of areas of improvement for Pakistan. Lastly, the research focuses on the bottlenecks present in the health systems of Sindh in particular and of Pakistan in general and how can they be overcome to effectively deal with public health problems, especially pertaining to communicable diseases.

A key finding was that with limited resources, the government of Sindh took timely and bold actions to contain the spread of COVID-19 as it has spread in countries which had more resources than Pakistan. The political leadership and provincial government of Sindh was the most pro-active in terms of pre-emptive measures and coordinated efforts to tackle the pandemic from the onset. It was also found that the federal government endeavored to achieve the dual objective of containing the spread of COVID-19 while also mitigating the socio-economic impact due to the lockdown. The research also explores the best practices which different countries had adopted to contain the spread. COVID-19 spread has highlighted the issues plaguing Pakistan's healthcare system, especially pertaining to the inadequacy to deal with infectious diseases. With adequate allocation and effective utilization, technical, financial and human resource capacities can be augmented to better deal with similar pandemics in the future.

Introduction

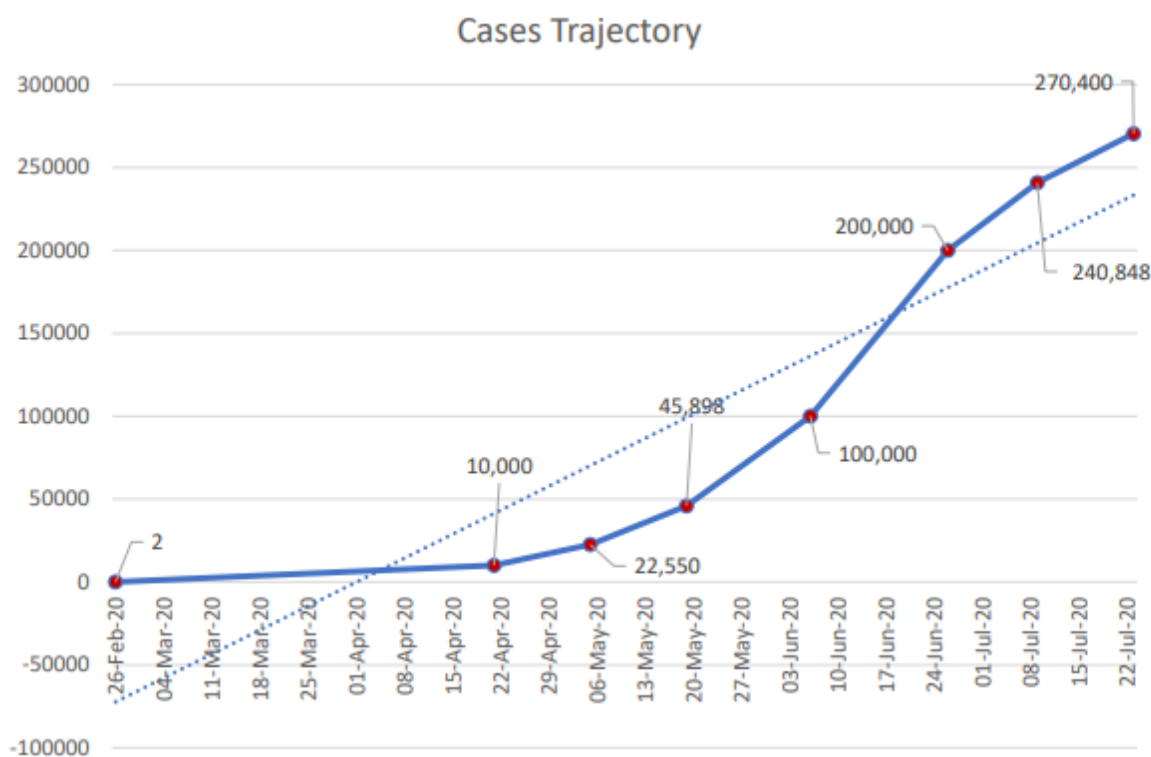
According to (World Bank, 2012), the government of Pakistan is committed to improving the equity of health outcomes and the ability to offer financial protection in the health sector through the implementation of the National Health Policy. The state vision of the National Health Policy as defined by (Ministry of Health, 2009) is "A health system that: is efficient, equitable and effective to ensure acceptable, accessible and affordable health services. It will support people and communities to improve their health status while it will focus on addressing social inequities and inequities in health and is fair, responsive and pro-poor, thereby contributing to poverty reduction (Ministry of Health, 2009)". The ministry of health further states that it is "critical to move towards a system which is able to address the challenges and prevents households from falling into poverty. In Pakistan, health sector investments are viewed as part of the government's poverty alleviation endeavor. To make progress towards achieving the [Millennium Development Goals] MDGs is a national commitment which envisages reducing poverty by 2015".

To draw key lessons from strategic planning perspective, this research report analyses the situation of health sector in Pakistan and in Sindh, the recent developments made in accordance with COVID- 19, and how countries dealt with the pandemic successfully.

Situational Analysis

Pakistan's Situation

COVID-19 had emerged in China in late 2019 and first case of COVID-19 in Pakistan was reported on 26 February, 2020 in Karachi, and the second case in Federal territory of Pakistan the same day. Both cases had travel history of Iran (DAWN, 2020). As of present i.e., 9 July, 2020 the number of cases in Pakistan have risen to 240,848 cases while 4,983 people have died due to COVID-19 (Government of Pakistan, 2020). With respect to rise in number of cases, according to (Tribune, 2020), Pakistan had crossed its unfortunate milestone of 10,000 cases on 21st April, 2020 i.e., within 56 days since the disease was first reported in Pakistan. However, after 100 days of COVID-19 in Pakistan, the number of confirmed cases rose to 100,000 on 6th June, 2020. On 26th June, 2020- the national tally crossed the figure of 200,000 confirmed cases and by 22nd July, 2020, the cases had risen to 270,400 (Government of Pakistan, 2020). The exponential rise in the cases can be clearly observed as lockdowns were eased in beginning of May, and by end of May, during the Eid-ul-Fitr days, the incidence of cases increased massively. Along with ease in lockdown, the uncertainty of spread of SARS-CoV-2 through different media caused the cases to rise. Whereas, the explanation for exponential growth of the disease is purely mathematical, more needs to be unpacked in terms of causal attribution. It was almost after two weeks of hitting 100,000 cases, the testing peaked on 19th June, 2020 i.e., 31,681 tests in a single day where 19 % tested positive. Since then, the total number of tests conducted per day has decreased where currently (as of July 15th, 2020), 24,244 tests were conducted in a day where 9% tested positive. Whereas, the number of cases around the globe have risen more than 13,255,929 resulting in 554,042 deaths (Worldometer, 2020). The following graph shows the rapid increase of cases from April till end of June with slightly decreasing trend in the incidence from July.



Sindh's Situation

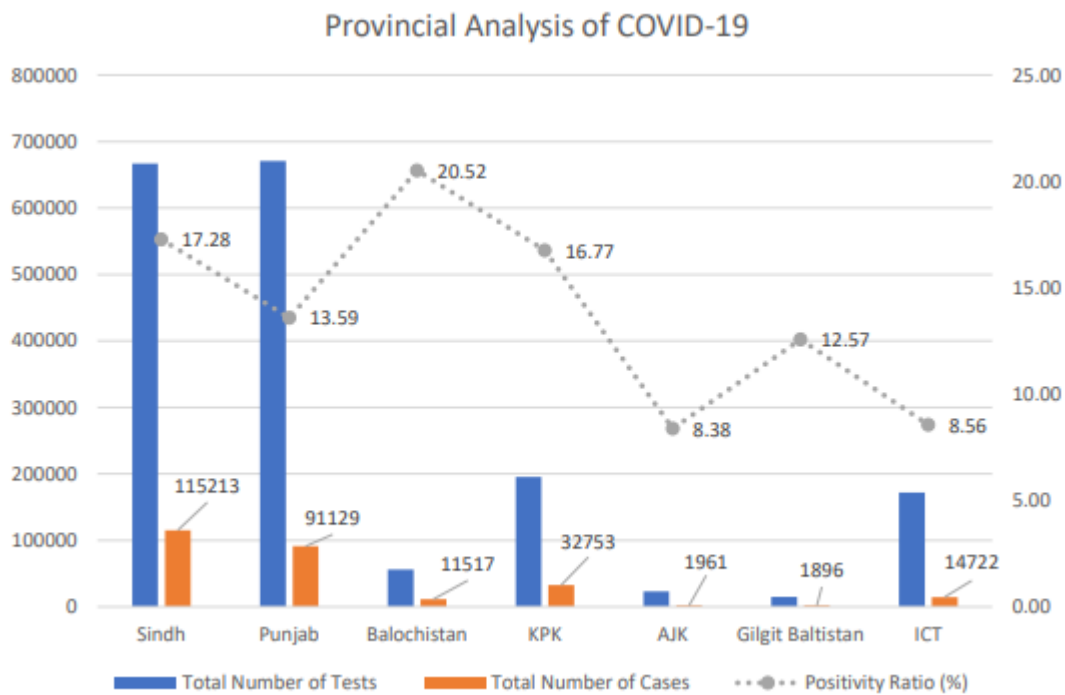
The first case of COVID-19 to be reported in Sindh was on 26 February 2020 (DAWN, 2020). As of present i.e., 9 July, 2020 the number of cases in the province of Sindh of reached 101,041, while 1702 people have lost their lives due to COVID-19 (Health Department, Government of Sindh, 2020). However, in the Punjab, there had been 85,261 cases (Government of Pakistan, 2020). Despite Punjab having more than double the population of Sindh, the number of cases has been fewer in Punjab. A reason could be that up to 10 July, 2020, the number of tests conducted in Punjab was a little more than 571,000 while, in Sindh, till the same date, more than 557,000 tests had been conducted (Tribune, 2020). This clearly shows that there have been fewer tests per capita in the Punjab which essentially means that Sindh has a significantly higher testing average than Punjab after adjusting for respective populations. Inter-provincial disparity in testing average might be driven by several reasons, but Sindh's pro-active testing is laudable.

Table 1 gives a snapshot of the positive number of COVID-19 cases in each district of Sindh as of 9 July, 2020 at 2140 hrs. Source: (Health Department, Government of Sindh, 2020). Karachi's East and South district have been the most affected districts of Sindh, both of which have more than 17,000 confirmed cases. Followed by other districts of Karachi. Whereas, all other districts of Sindh have fewer cases, where only Hyderabad, Sukkur and Ghotki have cases between 3,000 and 4,000. While, in the rest of the districts of Sindh, there are less than 2,503 cases (Government of Sindh, Health Department, 2020). The high incidence in Karachi could be due to several reasons. Firstly, Karachi is a highly dense city and can be termed as the only megalopolis of Pakistan. In Karachi, people are living in close proximities.

¹ Cases in each district of Sindh

Secondly, infrastructure of Karachi, like other megalopolises of world, is not conducive for physical distancing demands to curb the transmission of COVID-19. Other reasons of high incidence could be non-adherence of SOPs laid down by the government by the masses and overall complacent behavior of the masses.

The following chart shows the total number of cases, and total number of tests conducted across provinces, federal capital and administrative areas under Pakistan till 23 July, 2020 (National Command and Operations Centre, 2020).



Public Health and Development Response by GoS

In anticipation of the pandemic, the government of Sindh had been proactive in tackling the pandemic. Therefore, weeks before first case of COVID-19 was confirmed in Pakistan, the Government of Sindh had constituted Rapid Response Medical team on February 3, 2020. The main task of this Rapid Response Medical Team was to identify potential cases of COVID-19 and isolate them so that they do not spread the disease. Similarly, timely formation of Task Force was undertaken by the government of Sindh just a day after first case of COVID-19 was confirmed in Pakistan (Tribune, 2020). According to daily situation report of the health department (Health Department, Government of Sindh, 2020), Rapid Response Teams were made at 29 districts, and led and administered by the Deputy Commissioners and Commissioners. All the teams are equipped with relevant resources including financial, physical and medical resources.

The Task Force is headed by the Chief Minister Murad Ali Shah himself and has members which include provincial Chief Secretary, provincial health secretary, Commissioner Karachi and other health officials (DAWN, 2020). The task force was created to control the pandemic and minimize its affect in Sindh in addition to overseeing procurement, regulations and managerial aspects pertaining to the pandemic.

The following committees were constituted as a result of the Terms of References of the task force:

- Training and capacity enhancement committee
- Supply Chain Logistics Committee
- Strict Quarantine Committee
- Testing capacity enhancement committee
- Research Committee

The immediate response by the above-mentioned task force was to oversee and manage end-to-end strategic components of the COVID-19 response. Several quick strategic actions were undertaken to curb the local transmission in Sindh which included developing quarantine and isolation protocols, ensuring expeditious procurement of equipment for testing and treatment, identification of quarantine & isolation accommodation facilities, and ensuring strict airport screening protocols. Moreover, it was advised to the federal government by the Chief Minister Sindh to stop flights from Iran.

Keeping in mind how educational institutes might potentially increase the spread of COVID-19, the Government of Sindh was prompt in closing down all private and public educational institutes in the province just a few hours after the confirmation of first COVID-19 case in Pakistan (Tribune, 2020).

On February 27, 2020 an "Emergency Control Room for Novel Corona Virus" was established at Health Department of the Government of Sindh to oversee and manage the pandemic public health response in the province (Health Department, Government of Sindh, 2020).

On March 18, 2020 a "Coronavirus Emergency Fund" (CEF) was established by the Government of Sindh to fight against the coronavirus pandemic through immediate mobilization of required resources. To manage this CEF, a high-powered committee was formed, which was headed by the Chief Secretary Sindh. In order to ensure transparency, and technically sound decisions, the committee has adequate representation of private sector with requisite technical expertise. The committee includes, Dr. Abdul Bari (CEO Indus Hospital), Mr. Mushtaq Chhapra (renowned philanthropist), and Mr. Faisal Edhi (Edhi Foundation). Other members of the committee include Secretary Finance, and Secretary Health. The CEF Committee had been tasked with allocating resources and overseeing expenditure from CEF to supplement Sindh Government's efforts in combating coronavirus emergency (Finance Department, Government of Sindh, 2020).

Despite all the efforts and measures, there was an increase in the number of COVID-19 cases, therefore, on March 22, 2020 after five precious lives were lost, the Government of Sindh imposed complete ban on people's movement, with few exceptions, to control the spread of COVID-19 (Tribune, 2020).

On April 17, 2020, the government of Sindh collaborated with the Aga Khan University Hospital (AKUH). According to the collaboration, AKUH would provide free of cost training and technical assistance on COVID-19 critical care to healthcare professionals working in the public sector. As part of the partnership, the university would also provide expert coverage to public sector intensive care units via telemedicine, and capacity building services to physicians and nurses working in emergency medicine and critical care in the province of Sindh. Besides capacity building, healthcare professionals would also benefit from the University's teleconsultation services on critical care issues such as ventilator management of coronavirus patients. According to (The Aga Khan University, 2020), it was decided that "AKU experts will help manage care with doctors in Sindh as well as offer advanced training for nurses on treatment of critically ill patients and safety of healthcare workers". Other than the collaboration mentioned above, AKU also collaborated with the government of Sindh in augmenting diagnostics, and treatment capacity, ensuring transparent COVID-19 related procurement and financial management, surveillance systems, predictive modelling, zero-prevalence studies etc. Similar collaborations were also formalized with Indus Hospital which already undertook several initiatives under public-private partnerships with the government of Sindh previously (Indus Hospital, 2020).

In terms of COVID-19 responsive budgetary allocations to address the socio-economic impact, Government of Sindh took various measures to support Micro, Small and Medium Enterprises, in a COVID-19 stimulus package of more than Rs. 34 billion with a focus on social protection and economic sustainability program². Main allocations include:

- Rs. 20 billion in cash transfers under Sindh Peoples Support Program
- Rs. 5 billion in soft loans to Small and Medium Enterprises with a provision of up to Rs. 2 million for each loan along with Rs. 3 billion for Small Businesses in urban areas with a loan size up of to Rs. 0.2 million
- Rs. 1.2 billion for supporting technology-based incubators, accelerators, and innovative interventions in goods supply chain

Government of Sindh has also earmarked a total of Rs. 3 billion in subsidies for rice seeds, fertilizers and pesticides. These subsidies are targeted towards farmers with land holdings of less than 25 acres.³

In addition, the MSME package included Rs. 2 billion have been earmarked for small farmers/community-based loans in rural areas and Rs. 500 million to support livestock breeding.⁴

In addition to the economic support package, the provincial government also allocated PKR 11 billion in wheat subsidy for procurement. Despite resource constraints, the allocation is higher than previous year to vulnerable rural population due to COVID-19.⁵

Sindh government also formulated a law, now an Act, called Sindh COVID-19 Emergency Relief Ordinance, 2020. The law is designed to alleviate the problems faced by businesses and households due to COVID-19 through several initiatives such as support to residential consumers in monthly bills of water and sewerage vis-à-vis deferred payments option.

In addition to laying off workers, this acts also prevents businesses from reducing salaries during the lockdown/closure periods⁶. To offset the financial impact of facilitating the employees, Government of Sindh has given tax reductions to such businesses as an incentive to retain employees.

COVID-19 Peak, Mortality, Spread in Provinces

Although the peak of pandemic is hard to ascertain for any expert and only estimates can be given. The Prime Minister of Pakistan while addressing the nation on state television told that the peak of COVID-19 was expected to come by end of July or August of 2020 (Tribune, 2020). Similarly, mortality rate varies from time to time and place to place. If we consider the above data, we can argue the mortality rate to be around 2%. According to (Corona Tracker, 2020) the mortality rate in Pakistan is 2.1%. According to federal government's dashboard for COVID-19 (Government of Pakistan, 2020), the province of Sindh has highest number of cases at roughly 41 % cases of all Pakistan. Sindh is followed by Punjab, which has around 35% cases from Pakistan. At third number is the province of KPK, which contributes to 12% of cases in Pakistan. The province of Balochistan is at the fourth number contributes with 4.5% of total cases of Pakistan.

The federal capital, Islamabad contributes to around 5.7% cases of Pakistan. Whereas, AJK and GB combine to form almost 1.27% cases of Pakistan. With the start of pandemic, most parts of the world had gone into lockdown. Similarly, different provincial governments of Pakistan had started to enforce lockdown in different parts of the country to curb the spread of virus by end of March 2020. However, most of the lockdowns had become partial in their enforcement by the mid of May 2020 as it had been adversely affecting the economy, especially the livelihoods of vulnerable segments of population.

²Finance, Sindh Government, 2020

³Finance, Sindh Government, 2020

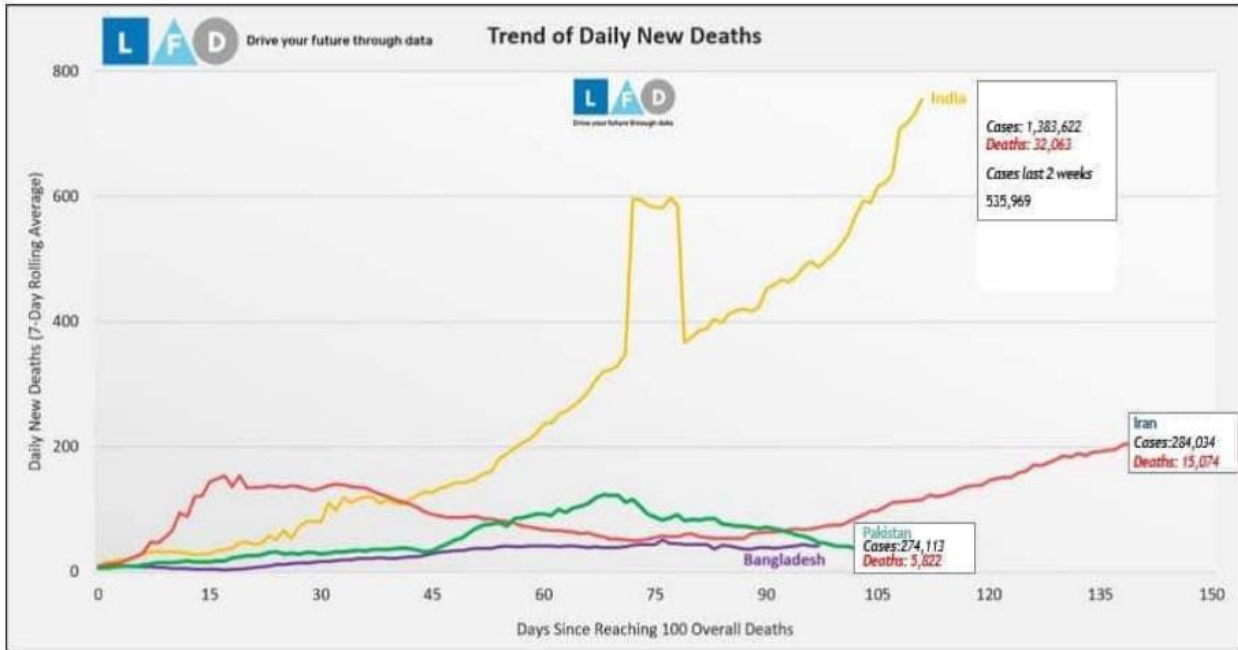
⁴Ibid

⁵Ibid

⁶EFP, 2020

REGIONAL SPREAD

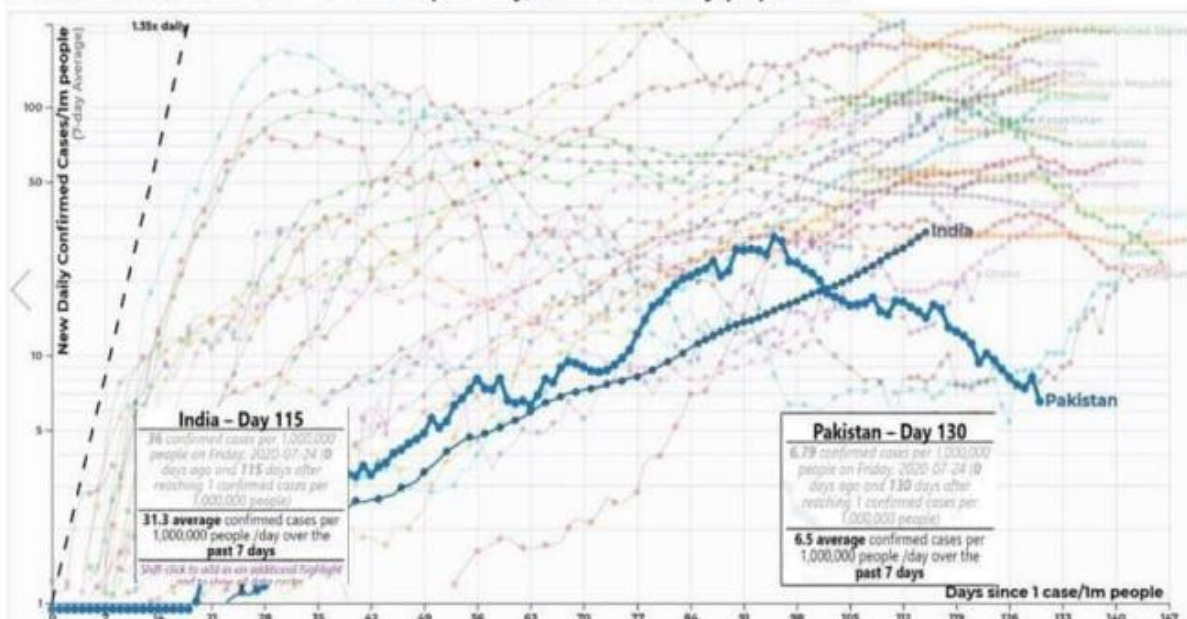
Situation Upto: 0800 hours
27 July 2020



Therefore, the National Command and Operational Centre (NCOC) was established, which is the nerve center to synergize and articulate unified national effort against COVID-19, and to implement the decisions of National Coordination Committee on COVID-19. The center is one window operation to collate, analyze and process information based on digital input and human intelligence across Pakistan through all Provinces, AJ&K, GB & ICT dedicated representatives and centers (NCOC, 2020).

NCOC identified different hotspots of the COVID-19 and enforced smart lockdown in those areas. Initially, 20 such cities with their districts were earmarked by NCOC for smart lockdown (The News, 2020). The following chart depicts how COVID-19 cases in India have been rising whereas declining in Pakistan per day, normalized by population (Khan I., Imran Khan Official, 2020). Similarly, the following chart explains the different trend of daily new deaths in the region where the number of deaths has been declining in Pakistan whereas rising in India and Iran (Khan I., Imran Khan Official, 2020).

New Confirmed COVID-19 Cases per Day, normalized by population



Global Response and Health System Readiness, Surveillance Systems, Pandemic Response to Covid-19 By Countries Which Were Hit Initially

World Health Organization

The World Health Organization (WHO) representative to China alerted the world by stating that, "Preliminary identification of a novel virus in a short period of time is a notable achievement and demonstrates China's increased capacity to manage new outbreaks." (China Daily, 2020). It was only on 11 March, 2020 that WHO declared COVID-19 a pandemic once it had swept into 114 countries and killed more than 4000 people (China Daily, 2020). According to the Director General WHO, it was the first pandemic caused by coronavirus. The WHO rightly alerted the world to prepare themselves as it was deeply concerned, both by the alarming levels of spread and severity, and by the alarming levels of inaction by the world's leaders in response to the outbreak.

By cautioning about the pandemic, the DG WHO also urged people not to be fearful because of its status as a pandemic. With regards to preparedness and assessment of the threat posed by the virus, the WHO reiterated its efforts and emphasized that the countries should also take actions.

With regards to preparedness, according to its Situation Report (World Health Organization, 2020), WHO had been in direct and regular contact with the Chinese as well as Japanese, Thai and Korean authorities. Therefore, on 2 January 2020, the incident management system was activated across the three levels of WHO (country office, regional office and headquarters). The same Situation report further claims that WHO developed the surveillance case definitions for human infection with 2019- nCoV and is updating it as per the new information becomes available. The WHO developed interim guidance for laboratory diagnosis, clinical management, infection prevention and control in health care settings, home care for mild patients, risk communication and community engagement. The WHO prepared disease commodity package for supplies necessary in identification and management of confirmed patients. The WHO provided recommendations to reduce risk of transmission from animals to humans. The WHO updated the travel advice for international travel in health in relation to the outbreak of pneumonia caused by a new coronavirus in China. The WHO started utilizing global expert networks and partnerships for laboratory, infection prevention and control, clinical management and mathematical modelling.



The WHO activated R&D blueprint to accelerate diagnostics, vaccines, and therapeutics. WHO also started to work with its networks of researchers and other experts to coordinate global work on surveillance, epidemiology, modelling, diagnostics, clinical care and treatment, and other ways to identify, manage the disease and limit onward transmission (World Health Organization, 2020).

China

Preliminary information from the Chinese investigation team, including the occupation, location and symptom profile of the people affected, pointed to a coronavirus as the possible pathogen responsible. According to Xu Jianguo, the Chinese expert who led the team evaluating the pathogen test results, the coronavirus is a novel one that can cause severe illness in some patients but not one that is readily transmitted from person to person. China has strong public health capacities and the necessary resources to respond and manage respiratory disease outbreaks, but any new developments need to be reported by the authorities in a timely manner, so that effective action can be taken and the public can be informed if they need to take any precautionary and preventive measures. (China Daily, 2020)

According to (World Health Organization, 2020), National authorities of China conducted active case finding in all provinces. Similarly, since 14 January 2020, 35 infrared thermometers have been installed in airports, railway stations, long-distance bus stations, and ferry terminals in China. Along with it, search expanded for additional cases within and outside of Wuhan City. A total of 763 close contacts including healthcare workers, had been identified and followed up and no additional cases of infection with the novel coronavirus was identified. Furthermore, active/retroactive case finding in medical institutions in Wuhan City. The Huanan Seafood Wholesale Market in Wuhan city was closed on 1 January 2020 for environmental sanitation and disinfection. Market inspection in expansion to other markets. Public education on disease prevention and environmental hygiene further strengthened in public places across the city, farmers' markets in particular (World Health Organization, 2020).

Republic of Korea

As Korea was also amongst the initial hit countries, according to (World Health Organization, 2020), contact tracing and other epidemiological investigation initiated as soon as cases arrived. The government of the Republic of Korea had scaled up the national alert level ACTIVE CASE FINDING from Blue (Level 1) to Yellow (Level 2 out of 4-level national crisis management system). The Republic of Korea health authority had strengthened surveillance for pneumonia cases in health facilities nationwide since 3 January 2020. Quarantine and screening measures had been enhanced for travelers from Wuhan at the point of entries (PoE) since 3 January 2020. The Korean government introduced an entry ban on foreign nationals from Hubei Province, strengthened visa screening of travelers from China and Japan, and designated China (including Hong Kong, Macau), Italy, and Iran as 'quarantine inspection required areas', to tighten screening of travelers from these countries (Ministry of Health and Welfare, Government of Korea, 2020). Furthermore, from March 19, all inbound travelers (Korean and foreign nationals) received temperature screening and filled out the Health Questionnaire and Special Quarantine Declaration in accordance with the Special Entry Procedure. All travelers subject to the special procedure could enter the nation after their contact information and address of residence in Korea was verified. They were also required to install either the "Self-Quarantine Safety Protection App" or "Self-Diagnosis App" on their phones to monitor if they showed symptoms that indicated infection of COVID-19 such as fever during their stay in Korea. All inbound travelers must install either of the two applications, to check their health status and record if they develop any symptom on a daily basis for 15 days beginning from the day of arrival.



In addition, the list of incoming travelers was provided to each local government (city or province) in an effort to strengthen the monitoring system.

Moreover, each local government established Local Disaster and Safety Management Headquarters led by the heads of the local governments to secure an adequate number of Infectious Disease Hospitals and beds. It was also decided by the respective government that in case, if the countermeasure required is beyond the capacity of local governments, then the central government may support necessary resources including beds, personnel, and supplies.

Greece

According to the (Reuters, 2020), the Greek government, as a precautionary measure had closed one of the schools and had traced and quarantined those people whom the first patient had come into contact with. However, how the Greece has handled the pandemic with limited resources is noticeable. According to (Ferdinando Giugliano, 2020) the government (of Greece) imposed severe social distancing measures at a much earlier stage of the epidemic compared to other southern European countries. The swift reaction has helped Greece in avoiding the tragic healthcare crisis that richer states are facing. Athens closed all non-essential shops only four days after its first Covid-19 deaths. A ban on non-essential movement in Greece came only a week afterwards. The Greek government also says it has recruited 4,200 new doctors and increased the number of ICUs by more than fifty percent of initial capacity, which should help contain a worsening of the outbreak. It is also opined that the Greek population appeared to be very mindful of respecting the lockdown rules which can be attributed to the government's steep penalties for non-compliance.

Strengthening of Health Systems by Federal Government

The Federal Government of Pakistan had taken multiple steps on multiple fronts to control the spread of COVID-19. The Federal Government's strategy was focusing on mitigating both the public health and socio-economic impact of COVID-19 pandemic and the halting of economic activities.

Formation of National Command and Operational Centre

National Command and Operational Centre (NCOC) was operationalized on the 26 March 2020 as it celebrated its 100th day on the 3 July, 2020 (Geo, 2020). NCOC, which serves as the nerve center for acting upon COVID-19 and its related problems; recommendations based on information/ data are processed including health, finance, and all matters related to COVID-19 to NCOC for real time projections and timely interventions by NCOC. The NCOC is headed by the Prime Minister himself. With the formation of NCOC in end of march, and being fully functional since April 3, 2020, NCOC has been able to galvanize support to COVID-19 response teams across Pakistan NCOC has been evaluating daily situation, and based on it has been imposing and easing lockdowns, defining SOPs for workplaces and overall steering the course of COVID-19 in Pakistan. NCOC has been instrumental in handling COVID-19 disease outbreak in Pakistan. From planning a smart lockdown to Community Mobilization to Prime Minister's relief fund to Ehsaas emergency cash program - NCOC really plays a pivotal role in tackling the COVID-19 crisis in Pakistan. At various instances, NCOC has been instrumental in expeditiously procuring necessary items to tackle COVID-19 in Pakistan. In April 2020, the NCOC, along with monitoring situation and making tough decisions, focused on procuring different items of Personal Protective Equipment ranging from masks, gloves, face-shields to production of ventilators to disinfectants. It was also the brainchild of NCOC to form the national strategy of Trace, Test and Quarantine. Management of patient load, distribution of equipment and future projections are all evaluated and handled by the NCOC. The NCOC comprises of both the civil and military leadership of Pakistan.

Improving Economic Situation

Throughout the world, economies have been badly hit by the COVID-19. Pakistan's economy also got badly affected by the pandemic and is still struggling to grow with numerous challenges. According to (Ministry of Planning, Development and Special Initiative, 2020) Pakistan's economy which was already suffering from low growth due to "macroeconomic imbalances and subsequent stabilization program" has been hit by COVID-19 during the last quarter of 2019-20. The economic growth declined historically to -0.4 percent. Activity in the manufacturing and services sector, like rest of the world, is adversely affected. It has adversely hit around 100 million daily-wage workers during lockdown enforced to control spread of COVID-19 pandemic.

Governments, both federal and provincial, attempted to provide the best health services to Corona patients, with limited resources in order to save precious lives. Government also launched a number of initiatives for poverty-hit vulnerable segments of the society by providing direct financial assistance of Rs200 billion, payment of electricity bills, deferment of rents, loans instalment, cheap credit/ refinance, lowering of policy rate to 8 percent and gradually opening the labor intensive and export related sectors of economy to save livelihoods and revitalize the economy.

Improving Health Situation

The Federal Government is committed to achieve Universal Health Coverage (UHC) with focus on health reforms and preparedness for COVID-19 as priority. All measures are being taken to improve patient-care in hospitals and ensuring availability of healthcare service providers at all levels of health care system. Federal and provincial governments are engaged in developing strategic partnerships for technical and institutional capacity-building, UHC goals and pandemic preparedness. A context specific essential package of health services considering burden of disease and cost effectiveness of interventions is being designed in alignment with Disease Control Priorities defining services at

- community level
- health centers' level
- first level hospital
- referral level hospital
- population based

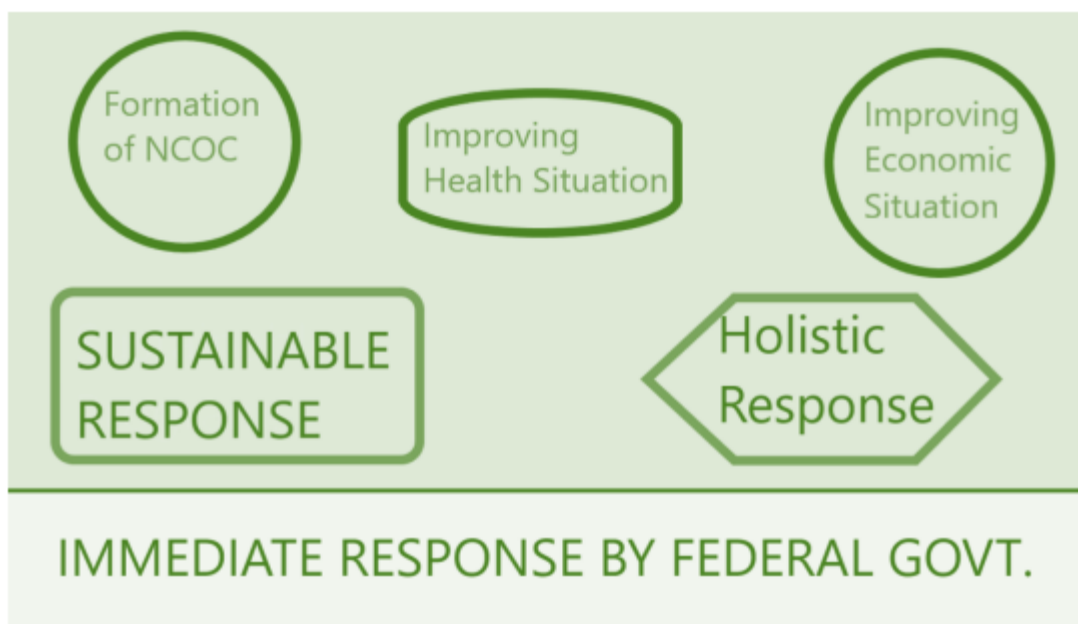
With COVID-19 outbreak, all the focus was diverted to prevent, control and respond with measures which included movement restrictions of millions with complete shut-downs, establishment of comprehensive point-of-entry protocols, establishment of 294 quarantine facilities with 139,558 beds, arrangement of surge capacities for hospitals by identifying 566 hotels with 16336 beds; establishment of 217 isolation facilities with 119,778 beds for case management; engagement of medical and nursing students, local production of personal protective equipment, establishment of COVID-19 helplines and information portals overnight to ensure timely communication to the public (Ministry of Planning, Development and Special Initiative, 2020).

Sustainable Programs

As stated above, the development programs initiated by federal and provincial governments focus on developing strategic partnerships for technical and institutional capacity-building, are all aligned with SDGs to achieve Universal Health Coverage and respond to the COVID-19 related systems challenges deploying interventions for strengthening clinical management, infection prevention and control including provision of PPES to frontline health workers; availability/sustainability of laboratory diagnostic capacity, biosecurity/ biosafety; surveillance; reporting; health workforce preparedness; emergency response; risk communications; and bolstering points of entry.

Holistic Response by The Federal Government to Tackle Pandemic

The national response has been coordinated with health and national security working hand-in hand. This was critical to integrate health system and other sectors to amplify the national capacity to absorb and adapt to the COVID-19 shock. Makeshift institutional arrangements like National Command & Control Centre (NCOC), National Coordination Committee (NCC) and Task Forces were established by the National Security Committee with supporting structures at provincial levels with multi-sectoral representation. This was critical due to the pandemic's sphere of impact expanding far beyond health, social systems and economies. Several emergency measures were undertaken to fortify the health systems by the federal and provincial government to limit the spread of the virus in face of the rising cases of COVID-19 suspects and confirmations. Surgical and N-95 masks, gloves, PPE gear, PCR testing kits and thermal guns have been procured urgently and stockpiles are being maintained foreseeing the expected exponential price hike in the next few weeks due to global shortage and demand. Donations of equipment and supplies through partner organizations and development partners have been secured. The National Institute of Health acquired the requisite capability for COVID-19 diagnostics on 1st February 2020, 26 days before appearance of the first case in the country, with the current daily national testing capacity standing at 2500-3000 tests through 18 laboratories nationwide (Ministry of Planning, Development and Special Initiative, 2020).



However, cumulative daily national testing capacity according to (National Command and Operations Centre, 2020) is 71,780 tests as of 23rd July, 2020.

Government of Sindh's Response to Covid-19 In Terms of Strengthening Health Systems

The Government of Sindh has been lauded for its timely and bold actions not just nationally but internationally by various leaders. It has been due to instrumental leadership of honorable Chief Minister Murad Ali Shah's that despite the highest number of cases of COVID-19, the province of Sindh has the lowest mortality rate, in comparison with KPK and the Punjab.

Immediate Response by the Sindh Government

According to Budget 2020-21 of Government of Sindh (Shah, 2020), the Government of Sindh followed the universally adopted approach to address the threat posed by COVID-19. Sindh was the first province in Pakistan to take steps for enforcing and implementing a lockdown. Steps were taken as soon as the first case surfaced on 26th February 2020, and schools were immediately closed to protect the children, as mentioned earlier in this report. The Sindh government moved towards closing down all places where people could gather, and a lockdown was imposed on 23rd March 2020 and continues to remain in force in certain domains. Other provinces followed suit and gradually, the rest of the country also imposed a lock down. The Government of Sindh did not rely on a lockdown alone. The provincial government diverted its resources towards providing better health facilities, and towards supporting the common man facing a potential meltdown with relief efforts, as economy came to a near standstill as a result of an imminent national lockdown.

High levels of testing, Establishment of Isolation Centers & Generation of Funds

With regards to best practices, WHO has been recommending to all countries to increase their testing so that positive cases can be separated from the negative ones. Therefore, Corona testing capacity has been enhanced to from 80 tests per day to 11,450 per day in the province of Sindh. To cope with extraordinary situation arising out of COVID-19, Health Sector, being the frontline service provider, expeditiously initiated steps to make necessary arrangements to avert big human disaster. 81 isolation centers in all districts with 8,266 beds capacity were established. By June, 2020 this capacity was increased to 8,616. For ensuring timely supplies and proper service delivery, Government of Sindh constituted Medical Procurement Committee. This Committee procured Personal Protection Equipment, Laboratory Items and Equipment and other essential Machinery, Equipment and Instrument worth Rs.2.43 billion, which includes expenditure of Rs.1.5 billion under Corona Emergency Fund and Rs.891.8 million from PDMA Fund. In addition to existing ventilators, 101 more ventilators were procured on need basis for public health sector facilities with 250 monitors to ensure timely availability of life saving services to critical patients.

Moreover, to enhance the public health care system, a number of projects are in process and many have been completed, such as infectious Diseases Hospital at NIPA Chowrangi, Karachi was supported with Rs.2.0 billion through a Grant in Aid.

Looking at The Economic Front

Government of Sindh also focused on addressing the social and economic impact of coronavirus, due to which a large segment of low-income groups were affected owing to slowed economic activity. In order to ensure that this marginalized segment of our society is looked after with dignity, Government of Sindh released over Rs. 1.08 Billion to all Deputy Commissioners of the province for ensuring that rations reach the needy at their doorsteps.

Health Specific Initiatives in Government of Sindh's Budget 2020 – 21

Health continues to remain the third largest sector with allocation for Current Revenue Expenditure of Rs.120 billion and Development, including Foreign Project Assistance at Rs.15.5 billion in financial year 2019-20. In next financial year 2020-21, total Current Revenue Expenditure is budgeted at Rs.139.1 billion while allocation for development schemes is Rs.23.5 billion. The COVID-19 virus has created a National

Health Emergency and Provincial Government have taken essential measures to improve the Health care system in the province. The budget allocation for Health department (excluding medical education) in current revenue expenditure has been enhanced by **16.1%** from **Rs.114.44 billion to Rs.132.88 billion** in the next FY 2020-21. The budget of Health Department is divided into two major segments i.e. Health Services and Medical Education. The budget estimates for Health Department for financial year 2019-20 was Rs.120.486 billion which has been increased to Rs.139.178 billion for the next financial year 2020-21.

Focus on Overall Health Sector

While it is pertinent to tackle COVID-19 at present, it is the responsibility of the government to take into consideration other diseases too. Therefore, Rs.7.0 billion have been allocated in next financial year 2020-21 for 09 vertical Programs to combat/control Polio (which despite having vaccination, unfortunately only exists in Pakistan and sometimes in Nigeria and Afghanistan), TB, Aids, Lady Health Worker Program, Hepatitis control, expanded program for Immunization and others. These Programs have also been shifted from development to regular budget in next financial year 2020- 21. Main features include Rs.559.4 million for TB Control Program in Sindh, Rs.5.5 billion are allocated for a multi-sectoral Accelerated Action Plan for reduction of stunting & malnutrition in various departments including health. Rs.1.2 billion for Lady Health Worker (LHW) Program, Rs.1.9 billion for Prevention & Control of Hepatitis in Sindh, Rs.267.9 million for Maternal, Neonatal and Child Health Program in Sindh, Rs.2.3 billion for EPI Program Sindh, Rs.1.0 billion for 200 Bedded Infectious Disease Control Hospital at NIPA, Karachi, Rs.1.0 billion, Rs.1.0 billion for upgradation and operationalization of newly completed 22 Health facilities, Rs.234.6 million for upgradation of Health care services for Lyari General Hospital Karachi and Rs.521.1 million for taken over health facilities of Proscribed organizations in Sindh.

Development for Health Sector

During current financial year 2019-20, Rs.4.0 billion had been allocated as Special Grant for Indus Hospital Karachi. Out of this Rs.2.0 billion is for its current operation and Rs.2.0 billion for Expansion of Indus Hospital. Rs.1.5 billion has been allocated for Purchase of plant and machinery in existing health facilities in Sindh and Rs.250.0 million has been allocated for purchase of furniture and fixtures for health facilities in Sindh. Moreover, Rs.5.1 billion has been allocated to NICVD, Karachi, Rs.5.1 billion has been allocated to SICVD (Lyari Karachi, Larkana, Sehwan, Hyderabad, Sukkur, T.M.Khan, Shaheed Benazirabad, Khairpur, Mithi and Karachi), Rs.2.5 billion has been adopted for PPP Node Health department, Rs.3.6 billion has been adopted for the Institute of Pir Abdul Qadir Shah Jilani, Gambat, Rs.300.0 million has been allocated to Institute of Ophthalmology & Visual Sciences Hyderabad Rs.600.0 million is allocated for Jacobabad Institute of Medical Sciences, Rs.1.7 billion has been allocated for SMBB Trauma Centre Karachi, Rs.300.0 million has been allocated for Shahdadpur Institute of Medical Sciences, Rs.5.6 billion has been allocated to SIUT, Rs.6.5 billion has been allocated to PPHI Sindh, Rs.500.0 million has been allocated to NIBD, Rs.900.0 million has been allocated for Child Life Foundation, Rs.100.0 million has been allocated for Institute of Physical. Medicine and Rehabilitation Karachi and Rs.365.0 million has been allocated to Health Care Commission, Karachi.

Grant in Aid

Grant in Aid for various health activities in Health Department Secretariat has also been proposed for the next financial year 2020-21. Main allocation include Rs.312.0 million as Grant-in-Aid for Remuneration of Polio Workers in Sindh, Rs.200.0 million for Grant-in-Aid for Kidney Center Karachi, Rs.431.1 million as Grant-in-Aid for Medicine of Blood Cancer Patients, Rs.160.000 million as Grant- in-Aid for Treatment of Thalassemia in various Health Facilities of Sindh, Rs.73.6 as Grant-in-Aid for ANF (MATRC) Centers (Karachi, Hyderabad & Sukkur), Rs.80.0 million as Grant-in-Aid for Strengthening of Chemico Bacteriological lab at Karachi & Sukkur, Rs.100.0 million as Grant-in-Aid for Cancer Foundation. Rs.383.8 million as Grant-in-Aid for Extension of CML Project for other Cancer Diseases, Rs.150.000 million as Grant-in-Aid for Dialysis in

various Health Facilities of Sindh, Rs.100.000 million as Grant-in-Aid for Fatimid Foundation Sindh, Rs.1.0 billion as Grant-in-Aid for Endowment for Welfare of HIV Aids Patients, Rs.121.1 million as Grant-in-Aid for NIMRA Jamshoro, Rs.100.0 million as Grant-in-Aid for Nigahban to maintain Surgical Unit at Civil Hospital Karachi, Rs.150.0 million as Grant-in-Aid for Patient Welfare Association Karachi, Rs.250.0 million as Grant-in- Aid for Thar Foundation for establishment of Hospital @ Islamkot and Rs.183.6 million as Grant-in- Aid for Purchase of Hepatitis B Vaccine (Birth Dose) (Shah, 2020).

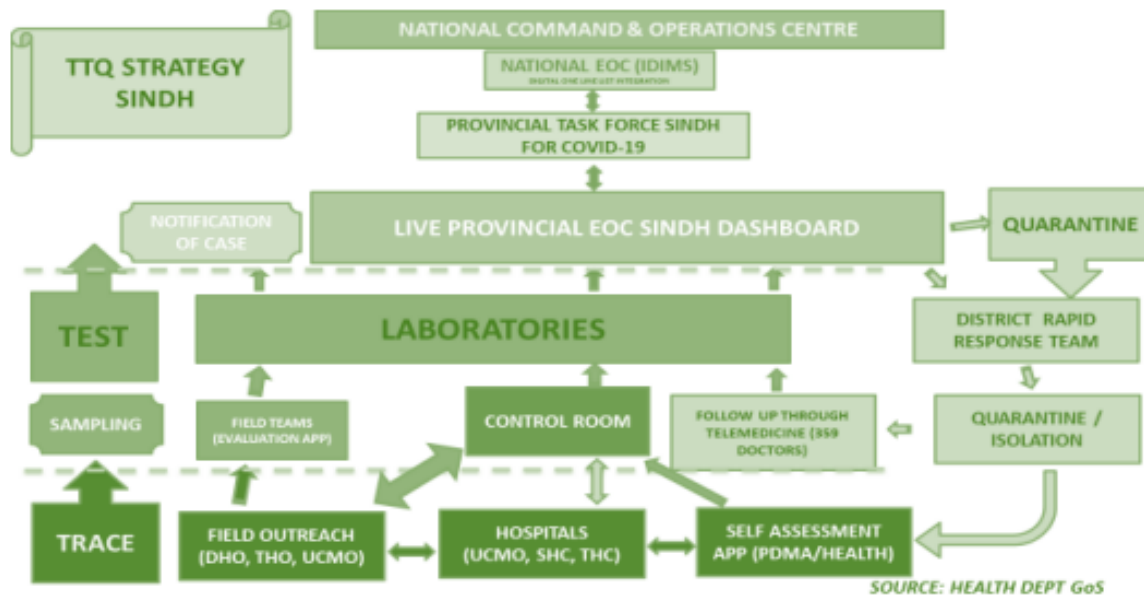
Planning & Development Board Sindh financed 174 Health Sector schemes in Annual Development Plan (ADP) 2019-20 with total cost of Rs15,511.08 million for various ongoing and new schemes including expansion and upgrading of 3 THQS and 4 DHQS, establishment of medical college and child health care institute. There was a setback with recent outbreak of more than one thousand new HIV cases in Larkana district, the situation being declared by WHO as a "Grade 2 Emergency" requiring urgent need of Anti-Retro Viral medicines, Rapid HIV Diagnostic Kits (RDTs) and strengthening of Infection Prevention and Control at Health Facilities. The require funding gap of R\$195 million was pledged by Global Fund (Ministry of Planning, Development and Special Initiative, 2020).

To cope with alarming situation arising out of COVID-19 Pandemic, Health Department, being the frontline service provider, expeditiously initiated timely steps to make all necessary arrangements to avert a colossal human disaster. In this regard, so far 81 Isolation centers (15 in Karachi and 66 in rest of Sindh) with 8266 beds capacity (1818 beds in Karachi & 6448 in rest of Sindh) have been established in Sindh and by June, 2020 this capacity has been increased to 8666 beds (2068 in Karachi & 6598 in rest of Sindh). In terms of COVID-19 Specific Hospitals, Sindh Infectious Control Hospital is completed and operational with 178 beds near NIPA Gulshan-e-Iqbal, Karachi. Similarly, a 50-bedded Hospital is operational at Gulistan-e-Johar (Karachi). Sindh Infectious Control Hospital will be institutionally being linked to 50 Bedded Hospital at Gulistan e Johar and operated under Dow University of Health Sciences, Karachi.

In addition, in coordination with Provincial Disaster Management Authority (PDMA), necessary arrangements to increase the capacity of existing hospitals would also be ensured through provision of ventilators, laboratory items, other essentially required machinery/ equipment, skill- based capacity building, recruitment of additional human resource etc. Furthermore, COVID-19 & Infectious Control-related development initiatives have also been included in ADP 2020-21:

- Establishment of 6 infectious diseases control hospitals at divisional level (estimated cost of Rs. 10 billion)
- Addition of Bio-Safety Labs at 7 Teaching Hospitals (estimated cost of Rs. 245 million)
- Upgradation of labs at 18 DHQ Hospitals (estimated cost of Rs. 540 million).

GOS has also set aside Rs. 5 billion as COVID-19 Emergency Fund for extenuating circumstances pertaining to the pandemic.



What Have Been the Best Practices and Where? What Have Countries Done to Successfully Get Out of Pandemic?

Best practices can be defined as those practices which have resulted in flattening the curve of COVID-19 cases. Most of the countries are still grappling with the impact of COVID-19. However, a few countries were able to limit the spread of disease initially and curb its transmission. Mostly, those countries that were able to effectively respond to COVID-19 were resource rich and had populations who adhered to the advisory of their governments such as Singapore, Japan, Qatar and New Zealand. However, a few countries such as Vietnam and Greece have controlled the spread of disease with limited resources. Pakistan as of now, can be considered as a country (considering its highly dense population and low healthcare resources) which has to a great extent limited the spread of disease through strategies of testing, tracing and quarantining, smart lockdowns and effective communication from various governmental bodies.

New Zealand

According to (Health Department, Government of New Zealand, 2020) on Monday 23 March, the Prime Minister issued an Epidemic Notice under section 5 of the Epidemic Preparedness Act 2006. This was based on advice received from the Director-General of Health in response to the increasingly complex and far-reaching response to COVID-19. This Government had chosen to go hard and go early in the response to COVID-19 for public health reasons. The package of measures introduced since 14 March have helped New Zealand take a precautionary approach to managing COVID-19.

It is argued that New Zealand could easily control the spread as its population is insignificant in comparison with other countries where the governments have been unable to limit the spread for instance Brazil, India, or even Pakistan. Although there is merit to the claim that populous countries with limited resources face a bigger challenge in combating COVID-19 outbreak, the effectiveness of strategies adopted by New Zealand cannot be undermined. On the contrary, there is China, who with controlled the pandemic not to spread in their own country despite the world's largest population. On the other hand, there is United States of America, which despite having top notch equipment, expertise and near-to-unlimited resources

could not control the disease and has the greatest number of cases. Therefore, the ingredients for New Zealand to limit less than 2000 cases and less than 30 lies beyond good resources and easy-to-manage population.

According to (DW, 2020), New Zealand had a swift and tough implementation of lockdown. According to New Zealand's Prime Minister, it was necessary for them to go hard and be early in action. On March 15, when New Zealand had only 100 confirmed cases and no deaths, it closed its borders to foreign travelers and made people coming home quarantine for 14 days. Then 10 days later, it introduced full lockdown measures, which were strict by international standards. Only grocery stores, pharmacies, hospitals and gas stations could stay open, vehicle travel was restricted, and social interaction was limited to within households. Those restrictions lasted for over a month before they were slowly eased again.

In addition to it, the rules were effectively communicated. Shortly before the strict lockdown, the government sent emergency text messages to residents. "This is a message for all of New Zealand. We are depending on you," it read. "Where you stay tonight is where you must stay from now on... it is likely [the strictest] measures will stay in place for a number of weeks." The government got its messaging right.

Along with effective communication, the country ramped up its testing capacity. The country could process up to 8,000 tests per day, one of the highest testing rates per capita in the world. In total, it has tested just under 295,000 people, again giving it a comparatively high per capita rate of testing.

Moreover, New Zealand had advantage of its geography. The country being a relatively isolated island greatly helped New Zealand's pandemic response. The country had more control over who can enter than other countries with large land borders. And due to its relatively low population density, meant that the virus could not travel as easily through the population, as fewer people encountered each other.

Lastly, New Zealand's government was following the best guidelines for dealing with a new virus. All the guidelines provided were religiously followed which although gave them an initial bump in their economic activity. But the same bump allowed them to prepare themselves.

Republic of Singapore

The government of the Singapore had scaled up the national "Disease Outbreak Response System Condition" (DORSCON) alert level from green to yellow (Level 2 out of 4-level national crisis management system) on 21 January 2020. The Singapore health authority had strengthened surveillance for pneumonia cases in health facilities nationwide since 3 January 2020. Medical circulars had been disseminated to all registered medical practitioners informing them of the suspect case definitions, to notify the health authorities and isolate any suspect cases, and information on the first confirmed case. Border screening measures had been implemented for flights arriving from Wuhan at the international airport since 3 January 2020. Border health measures were further enhanced on 22 January 2020 with the expansion of temperature screening measures to screen all flights from China. Health advisory notices and posters had been issued and put up as well. Intensified border screening had expanded to land and sea checkpoints. Public risk communication had been enhanced including the emphasis on social responsibility and personal hygiene practices. Contact tracing and other epidemiological investigations are still underway (World Health Organization, 2020).

Strategic Policy Prescription in Terms of Strengthening Health Systems to Address Public Health and Socio-Economic Implications of Covid-19

The existing health systems in all parts of the world were not prepared for this pandemic-and surely most of the countries' health system was overwhelmed and collapsed Similarly, Pakistan's existing health system was at a risk of being overwhelmed due to the novel coronavirus. Therefore, lockdown was necessary to equip oneself for the outbreak of a disease. Investments in health is a credible instrument to gauge whether a country places healthcare as its development priority or not. According to (World Health Organization, 2016), Pakistan's total expenditure on health as a % of GDP stands at mere 2.6 %, whereas neighboring India stands at 4.7 %, Bangladesh stands at 8 %, Turkey stands at 5.4 % and Egypt at 5.6 %⁷. This shows Pakistan spends very less on health as % of GDP with regards to other countries. Similarly, in Pakistan probability of dying under five (per 1000 live births, 2018) was 69 which is greater than most of the countries.

The health care system was devolved as a provincial subject after 18th amendment - and though provinces have established their health departments into primary, secondary and tertiary, the existence of facilities is not equal everywhere. It was in 2014, that Sindh Healthcare Commission came into being. Sindh Healthcare Commission bill was passed with an aim to make provision for improved access, equity and quality of healthcare services, to ban quackery and to provide for ancillary matters. The various domains included through this bill were governance, registration and licensing, standards of healthcare services, inspection and enforcement and funds, budget & accounts. (Khan S. A., 2019) argues that though the Punjab and KPK have improved, the gap is still prevailing in healthcare service delivery in both Sindh and Baluchistan at rural and urban settings, as he explains that restructuring of public health facilities, expanded focus on primary health care, integration of developed national public health programs, bridging of population health gap, and reformed hospitalization through decentralization is absent in the province of Sindh and Balochistan.



⁷ These figures are from www.who.int/countries and are of 2014

Similarly, (Khan S. A., 2019) further argues that in terms of health finance, Sindh lacks progressive and innovative revenue mobilization along with fiscal and debt limitation to create fiscal space, increase in health revenue allocations, and revamping of government's existing system.

According to (Government of Sindh, Health Department, 2020), the Sindh Department of Health currently has more than 14,000 Doctors 2,000 Nurses and over 12,000 paramedics serving all over the province. The province has two medical universities; one each at Karachi and Jamshoro, and three medical colleges; one each in Sukkur, Nawabshah and Larkana, 12 Nursing School, 10 Midwifery Schools and 5 Public Health School for lady health visitors. The huge network of hospitals and health facilities include 6 teaching hospitals, 5 specialized institutions for chest, dermatological and mental illness, 11 district headquarters hospitals, 27 major hospitals located in the major cities, 44 Taluka hospitals, 99 Rural Health Centers in small towns, 738 basic health units in Union Councils, 305 dispensaries in larger Union Councils, 36 MCH Centers 12 maternity Homes and 39 centers for traditional medicine. The rural health centers provide specialist care in the morning hours in addition to minor emergency services and have indoor facilities that are seldom utilized, while the BHUs and dispensaries provide outdoor medication and preventive care till 2 pm. The Rural facilities are usually ill equipped, under-staffed, and under-utilized.

According to (Chaudhry & Khan, 2020) strengthening Pakistan's health system requires strategic reorganization of healthcare delivery consistent with community needs, elevation of preventive and promotive healthcare strategies, and targeted investment in different core system components. The authors note that service delivery, financing, capacity enhancement, public policy and legislation, governance and leadership and digital transformation can lead to strengthen Pakistan's health system. There is a need to prioritize funding to design technically sound intervention and monitor results that are geared toward effective and equitable targets. It is important to engage the private sector to complement public sector efforts. (Chaudhry & Khan, 2020) further write that several studies indicate that private healthcare delivery is significant not just from a healthcare standpoint but also from an economic perspective. However, it is important to note that models of private sector contribution have to be designed and structured with careful consideration. Private providers, being market-driven actors, are heterogeneous in their objectives, size and quality, and need to be aligned to respond appropriately to challenges and opportunities. Policies must evolve to be reflective of needs and requirements of the health sector and cater to the complexity of private sector contribution.

Shedding light on the importance of public sector, (Chaudhry & Khan, 2020) argue that public sector should make an effort to calibrate its focus to improving the regulatory framework, national policy setting, disaster management and coordination, guiding financing mechanisms and setting standards for quality and patient safety. Through policy frameworks, it should define and support the role of the private sector. This will not only enable the private sector to have a clear mandate to provide safe, efficient and effective healthcare but also help the public sector concentrate on the lower socioeconomic strata of society and ensure a minimum service package can be provided for every citizen. It will provide a platform for objectively assessing standards across the country and build a systems approach to formally develop the healthcare industry-essentially contributing to the economic growth.

While writing about health financing, (Chaudhry & Khan, 2020) write that around the globe in 100 countries have health financing systems that are predominantly funded through general taxes and another 60 have payroll tax based MHI systems. Only a few countries have private health insurance financed systems (e.g. the United States). In practice, however, most countries have mixed models. Incentives should be provided to institute a third-party payment system, which can help with the risk pooling, universal definition of essential benefit package and employer/employee protection. A federal body should be mandated to provide guidance, resources and frameworks to develop the healthcare insurance industry in Pakistan.

Additionally, (Chaudhry & Khan, 2020) argue there is a need for Public Policy and Legislation, which includes, investment-friendly environment and Public Private Partnership Framework. Similarly, with regards to governance and leadership, decentralization, inter-sectoral action & inclusive involvement is needed. Therefore, for critical success, the authors point out continuity of political support and strategic investments, alignment with social and demographic needs, availability of evidence - which requires not

just on ground field work for primary data but access to quality researches which are often costly for individuals.

Gaps Within the Existing Systems and Limitations for Success

Lack of Holistic Development

Biggest problem in the health system is of under development of areas. For any health system to be at par with international standards, overall holistic development is an essential pre-requisite. To assume that great health care facilities are going to exist in a remote village with no access to roads, running water, electricity and poor infrastructure is altogether being an unfair and unrealistic assumption. According to a report by (Institute of Health Policy and Development Studies, 2005), people's health is affected by the difficult access to health services.

Disparity of Available Facilities

There is disparity in terms of available infrastructure, medical supply, and personnel. While infrastructure is related to holistic development, the level of medical supply and personnel to an extent can be augmented and elevated. Ensuring adequate availability of medical supplies also needs extended coverage of roads and networks. Budgetary allocations and then budgetary expenditure need to be streamlined, from an equity perspective, so that there is an equal access to medical supplies. However, personnel are again limited to the development of area. As (Adam Fusheini, 2016) point out, that lack of amenities such as schools, recreational facilities and accommodation for staff as well as the intermittent power failures have negatively impacted the functioning of equipment and care of drugs and medical consumables that need to be stored in refrigerator. They further argue that budgetary constraints, which is not peculiar to one province has impacted on the rollout of certain services. A highly qualified and skilled doctor or paramedic would not leave his/ her hometown, unless he/she is provided adequate accommodation, transportation and good remuneration. Unless all areas have an adequate level of infrastructure, production and social sector development, healthcare disparity would persist.

Lack of Personnel (Both Quantity and Quality)

As discussed above, personnel in terms of both quality and quantity are required for efficient functioning. Therefore, allocation and expenditures should not only be spent but also be continually increased. Even when there is an infrastructure of the health care facility - it has to be manned by educated health professionals. (Chaudhry & Khan, 2020) write that human resource deficiencies in the sector and growing unmet demand for quality care has in fact increased the burden on health care. A country like Pakistan, which has limited resources with an overgrowing population - faces challenges at every level. However, this growing population can be positively harnessed by effective state policies to benefit the quantity of human resources lacking in our health care systems.

Healthcare Training Facilities/Institutions

As (Nishtar, 2010) writes that with the making of Pakistan, there had been a focus on medical colleges and thus producing doctors. However, with regards to paramedic training institutes, there has been meagre development. It is further argued that only after many years, it was Aga Khan University which started

training nurses. For a long time, it was only Armed Forces Institute of Nursing and Aga Khan University School of Nursing. Similarly, it is common to see that many doctors have graduated from Pakistan, prepare and leave for foreign countries thus contributing to the brain drain. Inadequate number of trained paramedics has severely plagued the healthcare system of the country. Although the country is investing in paramedics training and has been able to develop a considerable network of lady health workers for outreach activities, there is a lot that needs to be done to institutionalize and oversee the recruitment, training and continuous capacity development of the paramedics.

Responsiveness to Public Health Emergencies and Disasters

Like it did in many parts of the world, the pandemic exposed the inadequate health systems responsiveness to emergencies and disaster situations. Responsiveness does not only mean getting real-time data, but also having institutional arrangement to utilize that data for effective response to the emergent situations. For example, in Sindh's context, having a 'District Health Information System' that provides basic health facility-level disaggregated data is beneficial. However, the data system alone is futile without active surveillance systems that pre-emptively act upon spikes in cases of a disease to control and contain the outbreak. In times of emergencies and disasters, we see the concept of 'sector blurring' where non-government organizations (NGOs) are on the forefront and more systematic in their response as compared to the government. Our health system cannot afford to continue with a 'knee-jerk' reaction to every emergency and disaster.

Recommendations to Strengthen Public Health Systems

For any public health system to thrive, it is necessary to have adequate funding and resources. Adequate resources can go a long way in strengthening the public health human resources. Human resources are not restricted to qualified doctors or nurses only. Well-rounded professional administrators are also required who can administer the workforce effectively and ensure retention with performance-based incentives. Similarly, as there is a lot of burden on the already overwhelmed health system, it is necessary for the public to be aware of communicable and non-communicable diseases for prevention through community mobilization.

Simple hygiene practices which have been hugely promoted by health officials for COVID-19 can and would result in lesser number of communicable diseases. Likewise, a good healthy lifestyle which includes exercise, healthy food and stress-free lives can result in reducing the number of non-communicable diseases. Therefore, in order to strengthen the health system of Pakistan, it is necessary for the public to practice healthy lifestyles which essentially entails focusing on pro-active preventive measures in addition to the curative side of healthcare. Other than what has been mentioned above, following points should be given importance:

Strengthening Primary, Secondary and Tertiary Health Facilities

The public sector delivers healthcare through a three-tiered delivery system and a range of public health interventions. Despite the significant role played by the private sector, the government is still the largest institutional provider of health infrastructure in the country. Basic Health Units (BHUs) and Rural Health Centers (RHCs) form the core of the primary healthcare structure. Secondary care -including first and

second referral facilities providing acute, ambulatory and inpatient care - is provided through Tehsil Headquarter Hospitals (THQS) and District Headquarter Hospitals (DHQs), which are supported by tertiary care from teaching hospitals (Chaudhry & Khan, 2020). A healthy and functioning healthcare delivery system mandates mutually supportive and symbiotic relationship and integrates primary, secondary and tertiary care. Such integration and several strategies could be planned and implemented to improve healthcare delivery system of Pakistan. It is necessary that there is a shift from curative biomedical model towards more extensive and holistic approach. Simultaneously, socio-cultural and environmental aspects need to be addressed to improve the health of the people. A decentralized system where districts are delegated powers would result into ownership and responsibility thereby, improving service delivery. An adequate amount of allocation of funds should be targeted towards capacity building of administrators at district levels. There should be representation of stakeholders in policy making. Other key measures can be taken to improve Healthcare sector of Pakistan; control population growth, increase literacy rate, increase health budget, control corruption in public health projects, regionalization of Healthcare services, and promote health education, proper check on quackery and exchange of human resource and knowledge with developed countries (Hassan, Mehmood, & Bukhsh, 2017).

Harnessing Public-Private Partnership to Improve Service Delivery

Clear deliverables and a partnership model between the government and private providers can bring efficiency to the system and increase value for all stakeholders by ensuring aligned provision of services in an equitable manner (Chaudhry & Khan, 2020). The authors further note that partnership with the private sector can provide an opportunity to contribute by combining resources, aligning the supply chain and provide missing services for communities. This will help mitigate the current focus on building large-scale facilities that span across all levels of care with a mixed result in improving overall population health. It will also open avenues to provide security to current employees in the public sector to work across both private and public sectors and learn new skills to enhance their contribution. Structuring of contracts, particularly financial and transactional modalities like reimbursement methodologies, should consider the challenges of capital deployed by private actors which is driven by shareholder value. A transparent, fair and comparative formula for return on capital should be devised to level the playing field for factors like subsidies that are exclusive to the public sector. Similarly, results-based framework (RBF) and disbursement-linked indicators as instruments of performance management guiding PPP rather block grants should also be incorporated in harnessing Public-Private Partnership to Improve Service Delivery.

Leveraging Information, Communications and Technology for real-time data on diseases (electronic surveillance, M&E systems, etc.) for informed decision-making Digital transformation is a key enabler to deliver effective and efficient care across various population segments. It spans across patient-centric technologies to system-process oriented usage to increase efficiency. Innovation is key in adapting different levels of digital transformation across a delivery system. Recent experience with Covid-19 has highlighted the criticality of digital technologies to maintain access to care despite infection control challenges.

Spending on medical technology accounts for high investment and ought to be properly planned based on an optimal balance of cost-benefit to achieve the desired outcomes. These are areas in which the private sector interest can bring value, since it provides lucrative investment opportunities and mutually beneficial solutions (Chaudhry & Khan, 2020). Another example of innovation is telemedicine, which is utilizing existing technology to bring innovative and affordable approaches to healthcare delivery in Pakistan. Public programmes such as the Government's Covid-19 Health Advisory Platform and Telehealth platform and private programmes, such as Sehat Kahani, provide mobile-based telehealth solutions. They leverage the high levels of mobile penetration across Pakistan and, through partnerships, connect underserved communities with qualified medical practitioners for telephonic or virtual consultations.

Mobile technology also has the capacity to reach underserved communities with general preventative health information in easily understood formats given the country's illiteracy challenges. With private sector investment and partnerships, telehealth and tele monitoring programmes can improve communications to increase outreach of public health promotions and behavior-change initiatives (Chaudhry & Khan, 2020).

Vertical and Horizontal Integration (Federal-Provincial, Integrated Infectious/Communicable Diseases Facilities, Etc.)

As (Chaudhry & Khan, 2020) argue fragmentation through systemic misalignment of incentives and lack of coordination within and among institutions has led to inefficiencies- Impacting quality, cost and outcomes, and reinforcing the need for improvements in integrated care. Therefore, authors opine that data should be expanded to include public and private service provision. There should be strong consolidation from provincial DHIS and other vertical based systems to create a fully functional integrated national healthcare system Allocative and technical efficiency in terms of resources; not just budget increments (invest in high-impact schemes) and work on effective resource mobilization.

In expanding coverage to promote health outcomes and financial protection, countries need to raise enough and sustainable revenue efficiently and allocate it equitably to provide individuals with a basic package of essential services. Health spending has typically been outpaced by economic growth and is expected to continue this path. This necessitates financial sustainability to be a key factor from the outset by ensuring the extent of the challenge is diagnosed properly. Simultaneously, revenue sources must be broadened while containing costs through an appropriate use of resources. These revenue streams must be managed to pool health risks optimally (equitable and efficient) so that individuals are provided with "insurance" coverage against unpredictable catastrophic medical care costs (Chaudhry & Khan, 2020).

Strengthening and/or revitalization local governments to ensure quality healthcare service delivery at grass-roots level. Decentralization can be very effective in managing delivery of care with local support. It can bring decision-making closer to the communities it serves, better understanding of contexts and environments, and deepen the understanding of healthcare challenges, along with participatory policymaking. The extent of decentralization can be phased to align with local leadership and infrastructure development (Collins, 1988). Recent development in Local Government structures will have implications on how health services are designed, delivered and managed in provinces. It will be important to ensure that the implementation of new systems aligns closely with UHC goals and objectives.

The local government and social protection sectors play an important to support the health sector. The government can play a facilitating role in providing a platform to hold relevant conversations, while leveraging help from the semi-private sector eventually resulting in healthcare service delivery at grass-roots level (Chaudhry & Khan, 2020).

Responsive Public Health Emergencies and Disaster Responsive Institutions

Dedicated health and disaster management units are required to have a robust system of surveillance with an early warning system that predicts potential outbreaks. The information should be effectively utilized to contain any potential outbreak or epidemic. Predictive analytics can be used to pre-emptively identify high-risk populations in terms of potential infectious spread. However, it must be reiterated that technology, or lack thereof, is not a first-order problem when it comes to responsive health systems.

Effective and efficient utilization of health information systems can go a long way in curbing the spread of communicable diseases. Addressing the problem from onset can significantly alleviate the burden of overbearing caseload from the existing health system. At the inception stage, these systems might require significant human resources, but as the processes are automated, the overall health information ecosystem in Sindh can move to a more technical and leaner setup. Existing network of polio workers, lady health workers, community health workers and social mobilizers can be leveraged and expanded for any outreach efforts that are required to supplement the infectious control functions of health units. An integrated electronic database with real-time updates with public and private health institutions is the need of the hour because majority of country's population seeks private healthcare. Partner Institutions, like Indus Hospital, are already well-equipped with end-to-end digital systems. Government can engage such institutions to not only improve the overall public sector health information systems, but also the capacity of human resources to effectively response to emergencies and disasters.

Political Leadership and Pro-Active Communication

The initial spread of COVID-19 in Pakistan went unnoticed due to lackadaisical approach towards border control and port quarantine. However, the political leadership of Sindh took prompt action when the health experts apprised them of the dangers of a laissez-faire approach towards a novel virus. Chief Minister Sindh quickly brought on key epidemiological experts on board to not only guide the public health efforts, but also oversee the expedited procurement of all the relevant equipment to tackle the pandemic. Similarly, esteemed and credible philanthropists were brought on-board to oversee the Corona Emergency funds utilization for transparency. The most critical component of provincial government's response to COVID-19 was its proactive communications with Chief Minister giving daily situation briefings on media himself. This apprised the community about the dangers of COVID-19 becoming an epidemic that could debilitate the fragile health system of the country. Quarantine, Isolation and Critical-Care facilities were expanded in a very short span of time based on rapid needs assessment. Lockdowns were also initiated to stem the tide of novel Corona during uncertainty, but NGOs were also engaged to ensure food distribution to households. All other provincial governments soon followed suit and the federal government constituted NCOC for inter-provincial coordination while closely monitoring the emergent situation. All the subsequent decisions were primarily made on real-time data analysis that culminated into a dynamic response mechanism with all the key stakeholders on a single platform. Essentially, Government of Sindh used epidemiological data to make crucial decisions to curb the tide of COVID-19. This evidence-based approach was soon followed by all other provinces and was then concretized at federal level in the form of NCOC. Careful evaluation of real-time data led to timely decisions pertaining to lockdowns while carefully treading on the precarious trade-offs of livelihood versus lives.

Conclusion

COVID-19 pandemic is a completely novel situation for the entire world, but Pakistan has distinguished itself in its response, given the resource-constraints it faces. The country's response to the first wave of COVID-19 was lauded and recognized globally. This should not result in complacency as the situation will be precarious until a vaccine is developed and is accessible to all in the developing world. With all the well-deserved praises garnered for the public health response and mitigating the socio-economic impact of COVID-19, the Federal and Provincial governments must critically assess the public health and disaster response systems within the country. A critical gap is the dearth of quality 'data systems' that can be used by the governments to effectively target the vulnerable segments of the population for health, economic or social protection programs. In emergencies and disasters, ad-hoc rapid needs assessment exercises have to be carried out to map the 'high-risk', 'needy' or 'vulnerable' segments of populations.

Strengthening of the 'data systems' should not be restricted to merely updating the national socio-economic registry. A dynamic end-to-end database has to be maintained and updated along sectoral lines by the government. For Government of Sindh, District Health Information Systems can be used as a frame of reference to develop a dynamic centralized database that also incorporates private sector facility-level data. This effort needs to be coupled with capacity building of the data- users and decision makers. Just like any dormant asset, unutilized data is a dead capital. To full realize the potential of data, a demand has to be generated from the system vis-à-vis evidence- based planning and policy formulation. Strengthening health systems to deal with both communicable and non-communicable diseases cannot and should not be restricted to increasing allocation of resources. Efficient resource utilization can only be realized if the decisions for health systems strengthening are grounded in evidence. In Sindh's context, the revision of 'Sindh Health Sector Strategy (2012-20)' must be undertaken with a focus on both public health emergency responsiveness, and effective operationalization and utilization of the data eco-system for evidence- based planning and implementation.

The following strategic action matrix delineates proposed actions that can be undertaken along the lines of service delivery, health financing, capacity enhancement, public policy & legislation, governance & leadership, and digital transformation to significantly improve health systems' efficiency and effectiveness in the country and all provinces.

Strengthening Health Systems Strategic Action Plan Matrix					
S. No.	Indicator	Short-term action(s)	Medium-Term action(s)	Long-Term Action(s)	Department(s)
1	Service Delivery	Incorporation of Quality systems Improving facilities, clinical and medical services	Including private sector Standards of Construction	Patient experience Clinical processes Efficient workflow	Health Department Planning and Development Department Finance Department, Works & Services Department
2	Health Financing	Financing reforms General-tax financing, managed by an NHS or ministry of health (MOH) Payroll tax financed MHI (Mandatory Health Insurance) managed by a quasi-public entity	Strategic purchase program PPP models can be used to formalize such structures, whereby, the management and ownership is transferred to a private entity, while the government purchases the services Private sector-based health insurance financed by contributions to private voluntary insurers	Incentives should be provided to institute a third-party payment system. Centralized body with strong provincial linkages should be mandated to provide guidance, resources and frameworks to develop the healthcare insurance industry in Pakistan.	Finance Department Planning Commission Planning and Development Department Health Department , Private Sector and Health Insurance Providers
3	Capacity Enhancement	Building Workforce Capacities The national strategy should cover healthcare requirements for the population at large and cover both public and private service providers, medical colleges, skills and training institutes	Engagement of the private sector will be crucial since it is providing a platform for not just educating, but also training nursing and other allied health staff. Performance-based human resource management must also be instituted	Overall capacity enhancement will result in the development of not just the province but will also help other provinces as surplus capacity can then be shared. Capacity development institutions can be strengthened and utilized for generating revenue	Health department Finance Department Ministry of interprovincial coordination Planning Commission Planning and Development Department, SE&LD, STEVTA, Private Sector
4	Public Policy & Legislation	Investor friendly environment to attract local and	A comprehensive PPP framework must be built in consultation with all	Consistency and continuity in policies to ensure protection for the investor	Sindh Healthcare Commission, PPP Nodes in Health and Finance

		international investment focus on the systemic reforms to ensure equitable and efficient distribution of healthcare benefits	key stakeholders with a special focus on results-based contract management	foreign donation can also be incorporated build capabilities within existing human capital with a keen focus on efficiency in healthcare delivery	Departments, Department Private sector health care institutions Health Department
5	Governance and Leadership	Responsiveness to local requirements, and high engagement with local healthcare workers linkages with education, food security, agriculture and livestock, housing, sanitation, water, environment, IT, local government and social protection sectors will be important to support the health sector	Intersectoral action & inclusive involvement align with local leadership and infrastructure development	Implementation of new systems aligned with UHC (Universal Health Care) goals and objectives linkages with education, food security, agriculture and livestock, housing, sanitation, water, environment, IT, local government and social protection sectors will be important to support the health sector	National Parliament for consensus Health Departments (both federal and provincial) Inter provincial coordination ministry Local governments, cantonment boards
6	Digital Transformation	Easily implementable digital solutions need to be linked with service delivery functions to maximize efficiency of health spending, health promotion and disease prevention, disease surveillance and other related functions. Capacity development of healthcare professionals in making better use of big data and information systems should also be undertaken	Digital Technologies through which Spending on medical technology accounts for high investment and ought to be properly planned based on an optimal balance of cost-benefit to achieve the desired outcomes. National and regional registries can be linked with digital health system to support efficient and effective deployment of resources	End-to-end digital health systems. Public health purposes, such as public health surveillance for disease control, public safety emergencies and for providing information to policymakers. m-Health and e-Health initiatives for capacity development, knowledge transmission and improved service delivery	Ministry of Science and Information Technology (Federal) Finance Department IT Department Health Department Planning and Development Department, Punjab Information Technology Board, National Incubation Center, and other healthcare entrepreneurs for cost-effective digital solutions.

Appendix - I

S.NO.	DISTRICT	POSITIVE
1	Karachi East	19782
2	Karachi South	16934
3	Karachi Central	11677
4	Karachi Malir	7251
5	Karachi West	6151
6	Karachi Korangi	5885
7	Hyderabad	3560
8	Sukkur	2997
9	Ghotki	2681
10	Khairpur	2114
11	Larkana	1762
12	Shaheed Benazirabad	1046
13	Shikarpur	982
14	Jamshoro	833
15	Sanghar	798
16	Mirpurkhas	735
17	Dadu	656
18	Jacobabad	616
19	Kashmore at Kandhkot	581
20	Kambar at Shahdadkot	555
21	Badin	496
22	Naushero Feroze	492
23	Thatta	345
24	Tando Allahyar	331
25	Tando Muhammad Khan	268
26	Umerkot	263
27	Matiari	256
28	Sujawal	255
29	Tharparkar	238

Appendix – II

List of hospitals, isolation and Corona Testing Centers in different cities of Sindh (as of 9 July 2020)
Source: (Health Department, Government of Sindh, 2020)

District	Name of Facility (Hospital)	Isolation Centre	Corona Testing Centre
Sukkur	GMMC Girls hostel new Sukkur	GMMMC Hosp. Sukkur– 170 beds	Ghulam Muhammad Mahar Medical College (GMMMC) Sukkur
	Taluka Hospital Rohri	IHS Hospital Labour Colony – 72 beds	
	Taluka Hospital Panoakil		
	Quarantine Center Labour Colony		
	HIS Hospital Labour Colony		
	Government Hospital Bagargi		
	GMMMC Hospital Sukkur		
Ghotki	DHQ Hospital Mirpur Mathelo	TTC Dahark– 170 beds	
	THQ Ubaoro	Educator School Ghotki– 50 beds	
	THQ Khangarh	Ghazali School Ghotki– 50 beds	
	THQ Dahariki	IBA Community School Ubauro– 80 beds	
	Home Isolated at Taluka Ubauro	GPS Khanpur Mahar – 60 beds	
	THQ Ghotki	DHQH Mirpur Mathelo – 50 beds	
	Gazali School Ghotki		
Khairpur	KMC Civil Hosp KHP	Foreign Facility Hostel S.A.L.U – 50 beds	GIMS
	Pir Syed Abdul Qadir Shah Jillani Institute of Medical Sciences	KMC CIVIL HOSPITAL – 80 beds	
		Pir Syed Abdul Qadir Shah Jeelani Medical Institute – 30 beds	
Larkana	Bibi Asifa Dental College Larkano	SMBHU Areja Quarantine Campus – 100 beds	Chanda Medical College Larkana
	THQ RatoDero	Asifa dental college hospital @ cmc H Larkano – 52 beds	
	THQ Dokri		
	THQ Bakrani		
	SMBBMU @ Areeja		
	RHC Naudero		
Kashmore-Kandhkot	Cadet College Karampur	Cadet College Karampur Isolation – 75 beds	
	THQ Kashmore		
	THQ Kandhkot		
	RHC Tangwani		
	RHC Karampur		
	RHC Ghouspur		
	MALC Centre Kandhkot		
RHC Buxapur			

	Isolation centre Dera More (Proposed)			
Jacobabad	Gazali Public School	Ghazali Public School Jacobabad – 20 beds		
	Govt Boys Degree College	SABQA Public School Mubarkpur – 30 beds		
	Govt Girls Degree College	Govt. Degree College Boys – 50 beds		
	SABQA Institute Mubarakpur	DHQ Hosp. Jacobabad– 30 beds		
Shikarpur	Haji Lutiflah Bhayo Memorial Hospital	RBUT Hosp. Shikarpur – 6 beds		
	Public School	Lutifullah Bhayo Charitable Hosp. - 12 beds		
		Army Public School – 100 beds		
Kambar-Shahdadkot	DHQ KAMBER	DHQ KAMBER– 100 beds		
Shaheed Benazirabad	Isolation Ward Labour Colony	Labor Colony Nawabshah- 512 beds		
	PMCH Nawabshah			
	Quaid e Awam University Nawabshah Multipurpose hall	PMCH Nawabshah – 65 beds		
Naushero Feroze	Bahria Foundation College	Bahria Foundation College (Hostel) Padidan Road N-Feroze – 100 beds		
		Star Grammar Higher Secondary School Tharushah Road N-Feroze – 120 beds		
		Civil Hospital N-Feroze – 14 beds		
Sanghar	Civil Hospital Sanghar	shahdadpur Institute Of Medical Sciences Shahdadpur - 8 beds		
	Poly Technical College Sanghar	Poly Technical College Jhol Road - 100 beds		
Hyderabad	Isra Hospital	Isra University Hosp. Hala Naka Hyderabad – 204 beds	LUMHS Hyderabad	Hospital
	SGH Kohsar Latifabad	Kohsar Hosp. Latifabad – 90 beds		
	LUMHS Hyderabad	LUH, Hyderabad – 300 beds		
Dadu	Civil Hospital Dadu	C.H Dadu - 13 beds		
	Hepatitis Center Dadu	Hepatitis Centre Dadu – 50 beds		
	Taluka Hospital Mehar			
	Taluka Hospital KN shah			
	Taluka Hospital Johi			
	RHC Radhan Mehar			
Jamshoro	Govt Hospital Noriabad	Syed Abdullah Shah Institute of Medical Science Sehwan 32 - beds	Syed Abdullah Shah Institute Sehwan (SASIMS)	
	ICD Kotri	ICD Kotri - 120 beds		
	SASIMS Sehwan	New Labour Flats SITE Area Kotri- 15 beds		
		DHQ Hospital Kotri – 60 beds		

Matiari	Civil Hospital Matiari	Sindh Small Industries Corporation Quarters, near Hala- 20 beds
	RHC Khyber	DHQ Matiari – 10 beds
	RHC Odera Station	
	RHC Saeedabad	
	Sindh Small Industry Flats at Hala	
	THQ Hala	
Tando Allah Yar	DHQ Hospital TandoAllahyar	DHQ Hospital Bukera Road Tando Allahyar -40 beds
Tando Muhammad Khan	DHQ Hospital TandoAllahyar	DHQ Hospital Bukera Road Tando Allahyar -40 beds
Badin	Civil Hospital (Indus) Badi	Civil Hospital (Indus) Badin – 45 beds
	RHC Dei	
	THQ Shaheed Fazil Raho	
	THQ Matli	
	RHC Thari	
	RHC Tando Ghulam Al	
	RHC Pangrio	
	RHC Nindo	
	RHC Khoski	
	RHC Kadhan	
Sujawal	Dewan Sugar Mill	Civil Hospital (Indus) Badin - 45 beds
	THQ Sujawal	
	RHC Daro	
	RHC Chohar Jamali	
Thatta	Cambridge School Makli	Cambridge School Makli (Managed by DHQ Makli) -80 beds
Mirpurkhas	Civil Hospital Old	New DHQ Building – 50 beds
	THQ Digri	Muhammad Medical College Mirpurkhas – 20 beds
	THQ Kot Ghulam Mohammad	Shaheed Z.A Bhutto Sports Complex Tando Adam – 46 beds
	RHC Tando Jan Mohammad	
	RHC Phulladiyoon	
	RHC Noukot	
	RHC Jhudo	
	PCB Ground	
	RHC Mirwah Gorchani	
	New DHQ CIVIL Hospital	
	Mohammad Medical College & Hospital	
Tharparkar	Al Khidmat Hospital (Private)	SAZDA Bungalows Kheensar - 7 beds
	THQ Nagarparkar	Mono Technical College - 50 beds
	THQ Khome jo par	Al Khadimat Hospital – 30 beds
	THQ Diplo	Al Mahdi Hospital – 20 beds
	THQ Chachro	Thar Foundation Hospital – 15 beds
	Thar Foundation Hospital (Pvt)	

	SAZDA Banglow (Pvt)			
	RHC Islamkot			
	Mono Technical College			
	Love & Trust Hospital (Pvt)			
	BHU Kaloi			
	BHU Chelhar			
	Al Mahdi Hospital (Pvt)			
Karachi	50 Bedded Hospital Mansoor Nagar Orangi Town	Field Isolation Center @ Expo – 590 beds	Advanced Centre	Diagnostic
	RHC Baldia	DUHS OJHA CAMPUS – 40 beds	AKU Hospital Karachi	
	RHC Keemari	KMC 50 Bedded Hospital Pathan Colony (purposed)	Children Hospital	
	RHC Mangopir	Sindh Govt. Lyari General Hosp. – 98 beds	Children Hospital	
	RHC Shershah	Dr. Ruth K.M Pfau Civil Hosp. Karachi – 68 beds	Civil Hospital Karachi	
	UHC 15 Orangi Town	JPMC, Karachi – 100 beds	Dr. Essa Laboratory & Diagnostic Centre	
	Sindh Govt Hospital, New Karachi	Lakhani Hosp. – 50 beds	Hashmanis Lab (Numaish)	
	Sindh Govt Hospital, Liaquatabad	SGH, Liaquatabad – 20 beds	INDUS Hospital Karachi	
	Karachi Institute of Heart Diseases	Gadap city Hospital – 118 beds	JPMC	
	Abbasi Shaheed Hospital	Dumba Goth Hospital – 70 beds	Liaquat National Hospital & Medical College	
	Hussain lakhani hospital	SGH Saudabad malir – 12 beds	OJHA Dow Campus Karachi	
	Aga Khan University Hospital	Sindh govt. hospital 5 No. Korangi – 22 beds	PNS Shifa	
	DUHS OJHA	25 Bedded Hospital korangi 1 1/2	SIUT	
	Expo Center		South City Hospital	
	Gadap City		Zia Ud Din Hospital	
	Civil Hospital Karachi		Zia UdDin Hospital (Clifton)	
	SIUT		Zia Ud Din Hospital (Clifton)	
	Lyari General Hospital			
	JPMC			
	Quarantine Labour Flats			
	Gadap City Isolation			
	Dumba Goath Isolation			
	Indus Hospital			
	Sindh Govt Hosp Shah Faisal Colony			
	Sindh Govt Hospital Korangi no 1 ½			
	Sindh Govt Hospital Malir Shed			
	UHC Babar Market Landhi			

Appendix – III

(Pictorial Overview of GoS Initiatives for COVID-19)



CM Sindh (Murad Ali Shah), chairing a meeting of the provincial task force on COVID-19.

Visited Indus Health Network Lab where sample of majority of passengers from Taftan are being tested.



Chief Minister Sindh - Syed Murad Ali Shah inaugurating 140 bedded High Dependency Unit (HDU) at the Expo Centre, Karachi.



Media Briefing on Corona virus with experts Dr. Faisal Mahmood Head of Infectious disease A.K.U.H. and Dr. Bari of Indus Hospital - here Dr. Bari is apprising about the facts of the current situation and how best to manage it.



CM Sindh - Syed Murad Ali Shah Inaugurating a newly developed 54 Bedded Infectious Disease Facility for COVID-19 affectees located at NIPA, Karachi.



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Climate Change Displacement and Local Solutions in Coastal Communities in Sindh (IDMC)



Adapting on the move

Climate change displacement and local solutions in coastal communities in Sindh, Pakistan

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Abstract

Coastal communities are increasingly at risk from the negative impacts of climate change, including more intense storms, floods, coastal erosion, and sea intrusion. Socioeconomic and political factors make people vulnerable to these hazards, with disasters causing significant land and livelihood loss, ultimately resulting in displacement. This paper presents some of the findings of a qualitative study conducted in 2019-2020 in Sindh province in southeast Pakistan, to better understand people's vulnerabilities, agency, and responses to the risks of climate change, disasters and displacement. We discuss the main determinants and pathways to climate change related displacement of coastal communities, and introduce some of the adaptive responses which strengthen displaced people's agency against ongoing threats.

Climate change displacement in Sindh's coastal zone is a gradual and complex process, consisting of a mix of temporary and permanent, forced and voluntary migration. A generation ago, the communities were displaced from locations now submerged by the sea. Further sea level rise and poor Indus river water management affect both the environment and the communities' main livelihoods of fishing and agriculture. Living on the margins, they have little influence on these high-level global and regional environmental and political processes.

Lacking basic infrastructure and schools in their current location, many services are currently provided by non-governmental organizations (NGOs), including through Community Based Organizations (CBOs), which were established to improve people's livelihoods, health and nutrition, and empowered communities to engage with authorities and institutions. Supported by sufficient resources, improved policies and institutional frameworks, these CBOs can play an important role in durable solutions to further climate change related displacement by enhancing adaptive capacity in current locations, as well as supporting safe onwards migration.

Introduction

A Volatile Coast

South Asia is at high risk of climate change induced disasters and related displacement, in particular in coastal areas.¹ The World Bank estimates that by 2050 the slow onset impacts of climate change will have caused 40 million people in the region to leave their homes.² Pakistan currently ranks 5th on the Global Climate Risk Index, which captures to what extent countries have been affected by the impact of weather-related disasters.³ Located in southeast Pakistan, Sindh is its third largest province in area and second largest province in population size, with over 48 million inhabitants in 2017,⁴ of which about 53 percent live in rural areas.⁵ The province consists of three geographically distinct zones, covering the Kirthar mountain range in the west, the central alluvial Indus river plain, and an eastern desert region, each with their own environmental challenges. The province has a subtropical climate and experiences hot summers and cool winters, with increasingly unpredictable rain patterns during monsoon season in July and August.

Coastal communities in Pakistan are increasingly at risk from climate change related hazards, including more intense storms, floods, coastal erosion, and sea intrusion.⁶ Environmental changes exacerbate the annual monsoon floods and droughts, while the effects of climate change are exacerbated by overexploitation of Indus river water for irrigation, resulting in riverbank and coastal erosion.⁷ The coastal communities we interviewed were displaced over two decades ago, moving inland from their previous location in the delta, after losing land and water sources due to disasters and environmental degradation.⁸ Respondents mentioned the sea level is continuously rising, further destroying mangrove forests and farmland, and affecting fisheries, requiring livelihood diversification strategies including labor migration. Displacement within these coastal communities is therefore a complex phenomenon, consisting of temporary and permanent migration of communities, households, and individuals, with regular on- migration and returns.⁹

This report aims to provide an overview of the vulnerabilities and coping mechanisms of displaced communities in the coastal areas of Sindh, which are at continuous risk of climate change and (further) displacement. We provide an overview of migration trajectories, putting these into their environmental and socio-economic context.¹⁰ Subsequently, we present how communities cope and adapt to ongoing threats, and provide recommendations to strengthen people's agency.

¹ World Bank, "Groundswell - preparing for internal climate migration". 2018. [Online](#).

² Ibid.

³ Eckstein et al, "Global Climate Risk Index 2020". 2020. [Online](#)

⁴ Pakistan Bureau of Statistics, "Population Census". 2017. [Online](#)

⁵ Government of Pakistan, 2009.

⁶ UNDRR, "Disaster Risk Reduction in Pakistan, Status Report 2019". 2019. [Online](#)

Asian Development Bank, "Climate Change Profile of Pakistan". 2017. [Online](#)

⁷ Haines, D., "Building the Empire, Building the Nation: Development, Legitimacy, and Hydro-Politics in Sind, 1919– 1969". 2013. Karachi: Oxford University Press

⁸ Salik et al, "Climate change vulnerability and adaptation options for the coastal communities of Pakistan". 2015.

[Online](#)

⁹ ODI, "Climate change, migration and displacement". 2017. [Online](#)

¹⁰ Islam and Winkel, "Climate Change and Social Inequality". 2017. [Online](#)

Methods and Objectives

We used a case study approach, including a literature review of secondary qualitative and quantitative data, followed by semi-structured key informant expert interviews. Subsequently, Focus Group Discussions (FGDs) and observations were conducted in two displaced coastal communities of Miro Dablo and Haji Siddique Faqirani Jat villages in Keti Bandar sub-district (Taluka) of Thatta district in Sindh (Figure 1).



Figure 1: Study location in Sindh province, Pakistan (WWF-Pakistan, 2020)

Semi-structured interview questionnaires included questions on demographic and socio-economic data, displacement experience, current livelihoods, and future plans. Participants were informed about the voluntary bases of participation at the start of data collection, with information and informed consent letters available in English and local languages. Interviews were conducted in Urdu and Sindhi, the local language of the affected communities, transcribed and translated into English. Fieldwork and secondary data were analyzed through a structured thematic analysis to identify themes and concepts, which were synthesized into evidence matrices.

Community: in this study: a group of people living in the same village as their primary residency.

Displaced: "persons who have been forced to leave their homes or places of habitual residence, as a result of or in order to avoid the effects of disasters or environmental degradation, and who have not crossed an internationally recognized state border" (adapted from the Guiding Principles on Internal Displacement).¹¹

Community Based Organization (CBO): in this study: a group of people elected by the community to lead planning for, and improvement of, a community's socio-economic status, health, well-being, and overall functioning.

Climate Change: "a change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer."¹²

Disaster: "severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic, or environmental effects."¹³

Vulnerability: "a function of exposure, sensitivity, and adaptive capacity: the propensity or predisposition to be adversely affected."¹⁴

Adaptation: "the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities."¹⁵

Limitations

Our study was limited by gaps in comprehensive and structured quantitative demographic population data, a lack of environmental displacement data in Sindh at provincial and local level, and the lack of female interlocutors.

Context: Risk and Vulnerability

Environmental Degradation

The Indus river, after which the province is named, is central to Sindh culture and livelihoods, with over 70 percent of its average annual flow diverted for irrigated Kharif (summer) and Rabi (winter) crop cultivation.¹⁶ According to the World Bank, irrigation has decreased annual Indus freshwater flow to the delta from 150 to less than 10 Million Acre Feet (MAF).¹⁷ As a result, during summer months, the outflow of the Indus to the Arabian sea is practically non-existent, resulting in the loss of sediments and a decrease in the nutritional status of soil, as well as seawater intrusion into the delta. Sea intrusion may impact the river up to 65 kilometers upstream, affecting 39 percent of total agricultural land, with 11 percent now unsuitable for further cultivation (Figure 2). Respondents reported that the coastline has shifted 22 kilometers inland since 1993, threatening their current lives and livelihoods. As there is no comprehensive demographic data available, and displacement data is only collected ad-hoc during disasters, it is unclear how many people and homes have been affected over the years.

¹¹ UN OCHA, "Guiding Principles on Internal Displacement". 1998. [Online](#)

¹² IPCC, "Glossary of terms. In: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation". 2012. [Online](#)

¹³ Ibid

¹⁴ Thomas et al, "Explaining differential vulnerability to climate change: A social science review". 2019. [Online](#)

¹⁵ IPCC, "Glossary of terms. In: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation". 2012. [Online](#)

¹⁶ Laghari et al, "The Indus basin in the framework of current and future water resources management". 2012. [Online](#)

¹⁷ World Bank, "Socioeconomic Study and Proposal for Livelihood Improvements: Badin and Thatta Districts, Sindh, Pakistan". 2005. [Online](#)



Figure 2: Shelters and fishing nets in Kharo Chan on barren salinized land (photo: D. Braam)

Despite ongoing environmental degradation, the region still hosts one of the largest global mangrove forest tracts, which acts as a natural buffer against sea intrusion, and provides resources such as wood and fodder,¹⁸ however the forest is greatly reduced due to the lack of fresh water and overexploitation.¹⁹ This reduction has affected local wildlife, fisheries and increased seawater intrusion, which combined with waterlogging has further contributed to widespread soil salinization.²⁰ Sea intrusion and salinization is a major driver of displacement in the coastal areas, initially gradually as household members move for labor and livelihood purposes, eventually displacing entire communities.

Livelihoods

Our fieldwork sites in rural Thatta district are amongst the least populated areas in Sindh, with almost half of the district's population living in the coastal areas.²¹ Income levels and purchasing power in the district are very low, with an average of USD 21 in rural households (2005).²² A longitudinal study by the International Food Policy Research Institute (IFPRI) found that households in Sindh became poorer between 1986 and 2005 due to disasters and increased household sizes.²³ Coastal communities traditionally depended on a diverse range of livelihood options including agriculture and livestock farming, however since becoming permanently displaced, they rely on fishing and daily wage labor. Fishing takes place in small wooden boats in small groups of up to ten people dividing the catch, with the largest share going to the owner of the boat.²⁴

¹⁸ Dehlavi, A. and Adil I.H., "Socioeconomic baseline study of Pakistan's Coastal Areas". 2012. [Online](#)

¹⁹ World Bank, "Socioeconomic Study and Proposal for Livelihood Improvements: Badin and Thatta Districts, Sindh, Pakistan". 2005. [Online](#)

²⁰ Haines, D., "Building the Empire, Building the Nation: Development, Legitimacy, and Hydro-Politics in Sind, 1919– 1969". 2013. Karachi: Oxford University Press

²¹ Ibid

²² World Bank, "Socioeconomic Study and Proposal for Livelihood Improvements: Badin and Thatta Districts, Sindh, Pakistan". 2005. [Online](#)

²³ Lohano H.R., "Poverty dynamics in rural Sindh, Pakistan". 2009. [Online](#)

²⁴ World Bank, "Socioeconomic Study and Proposal for Livelihood Improvements: Badin and Thatta Districts, Sindh, Pakistan". 2005. [Online](#)

The communities interviewed belonged to the Jat Baloch and Mallaah tribes, consisting of 60 households on average, with household sizes ranging from 6-12 people. Both tribes depend on fishing, their main distinction being their secondary livelihood: while the Jats traditionally own camels, the Mallaah raise cattle for milk consumption and monetary value.²⁵ As camels are more resilient to disasters such as floods and droughts, the tribal affiliation of a community influences their resilience.²⁶ As one of our respondents confirmed: '[during the 2008 cyclone] our camels were safe, as they can swim'.

Climate change continuously impacts people's livelihoods, through unpredictable Indus water flows, declining fish stocks and prices, exacerbated by increase in illegal fishing with fine-maze nets,²⁷ and licensing challenges favoring large commercial fisheries.²⁸ Meanwhile, disaster policies – such as the prohibition of fishing during cyclones, as we experienced during our fieldwork, greatly impacts the resilience of the coastal communities (Figure 3).



Figure 3: Idle fishing boats in Hajamro creek due to the threat of cyclone Kyarr in late 2019 (photo: D. Braam)

Infrastructure and Services

The destination locations where the displaced communities settled, are now called Miro Dablo and Haji Siddique Faqirani Jat villages. While initially connected to the electricity grid, they lost access during the 1999 cyclone disaster, and remain unconnected to surfaced roads and services: 'there are no schools, health facilities, dispensaries, there is no water or light'. The lack of fresh water supply primarily affects the poorest population.²⁹ A technical assessment conducted in 2010 showed that almost 60 percent of piped water supply schemes across districts malfunctioned, with much unsuitable for drinking purposes, and 47 percent of the population lacking access altogether, attributed to a lack of maintenance.³⁰ Fresh water of dubious quality is purchased from private water tankers at high cost, often consisting of untreated surface water brought to the village from creeks just a few miles up the road.

²⁵ IFAD, "Country Technical Note on Indigenous Peoples' Issues". 2012. [Online](#)

²⁶ Ganju G., "Kutch's Kharai breed, the world's only swimming camels, battle the tide of an uncertain future". 2019. [Online](#)

²⁷ WWF, "Study on Knowledge, Attitudes and Practices of Fisherfolk Communities about Fisheries and Mangrove Resources - Kalamat Khor". 2005. [Online](#)

²⁸ Ibid

²⁹ Ibid

³⁰ Tahir M.A. et al, "Technical Assessment Survey Report of Water Supply Schemes". 2010.

Over the past decades, the socio-economic status of households has deteriorated, including a generational fall in literacy, affecting livelihood diversification and future opportunities.³¹ While the Sindh government has committed to provide free education, the availability of and access to schools in the coastal areas remains limited, particularly for girls.³² In the communities visited, there was one madrassa – a religious school - for young boys in Miro Dablo, while none of the other children received any education, as schools were either destroyed during the 1999 disaster, or closed due to a lack of teachers. As a result, the elder generation in the Jati village can read and write, while none of the children can.

Movement Patterns

Disasters, Climate Change and Displacement

Disasters are complex phenomena influenced by socio-economic and political factors, with resource-poor communities most at risk.³³ Studies show that the frequency of disasters in Sindh increased in the last century.³⁴ Respondents reported an increase in annual rainfall, regularly resulting in flooding of the villages and access routes. Increased glacier melt into Indus tributaries and water distribution mismanagement puts the region at further risk.³⁵ Climate change further exacerbates the scale of disasters, as sea intrusion and coastal erosion are accelerated by the impact of cyclones, increasingly leading to displacement.³⁶

Over the past decades, Sindh’s coastal communities have gradually been forced to move further inland as livelihoods and land are lost due to seawater intrusion and salination, caused and/ or exacerbated by a series of cyclones, floods, and drought (Figure 4). Comprehensive displacement data due to climate change and environmental degradation within these populations is not available however. While ad-hoc disaster displacement data is recorded by authorities, climate change displacement is gradual, mixed, and primarily affects hard-to-reach populations.³⁷

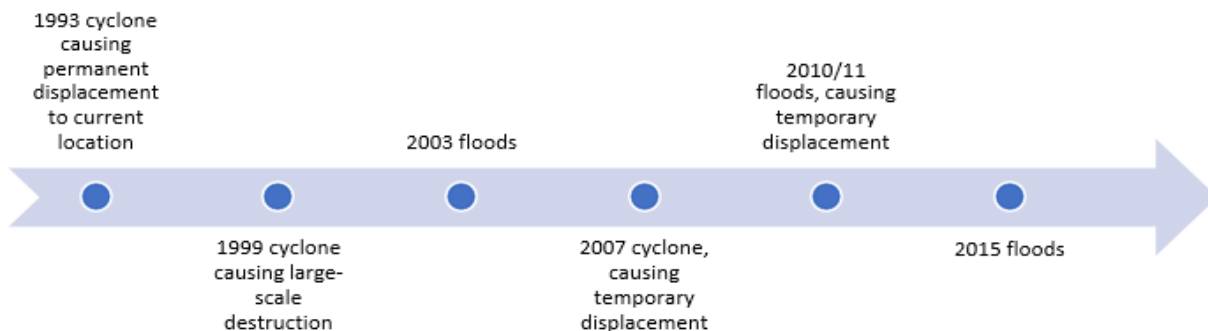


Figure 4: Timeline of major disasters and displacement affecting the Miro Dablo and Haji Siddique Faqirani Jati communities between 1990 and 2015 as remembered by the interlocutors.

While using displacement as an emergency adaptation mechanism, respondents did not phrase their displacement in the context of climate change, rather as a set of disasters, affecting each generation differently.³⁸

³¹ World Bank, "Socioeconomic Study and Proposal for Livelihood Improvements: Badin and Thatta Districts, Sindh, Pakistan". 2005. [Online](#)

³² Ibid

³³ ODI, "Climate change, migration and displacement". 2017. [Online](#)

³⁴ Ahmed, "Disaster risks and disaster management policies and practices in Pakistan: A critical analysis of Disaster Management Act 2010 of Pakistan". 2013

³⁵ UNDRR, "Disaster Risk Reduction in Pakistan, Status Report 2019". 2019. [Online](#)

³⁶ Ibid

³⁷ PDMA, [Online](#)

³⁸ Salik et al, "Climate change vulnerability and adaptation options for the coastal communities of Pakistan". 2015. [Online](#)

Permanent Relocation and Onwards Migration

Displacement drivers are multiple and interlinked: for instance, political choices regarding land and water management, as well as socio-economic factors determine the vulnerability and resilience of people to the effects of climate change and displacement.³⁹ While disasters may initially cause temporary displacement, this becomes permanent once agricultural land is lost for further cultivation. In addition, displacement is often mixed between forced and voluntary migration, with households or individuals opting to temporarily or permanently relocating to urban centers for livelihood opportunities, if limited natural resources are available. Most people are reluctant or unable to move however, especially when they lack pre-established connections in destination areas.⁴⁰

Respondents reported how communities and households split up, either during, or as a result of displacement. Some people moved after losing their assets, others followed once they were confident that the destination area was secure. Displacement therefore causes the disintegration of social support networks, increasing protection risks, such as family separation, child protection challenges and gender-based violence.⁴¹ Furthermore, displacement to new environments and host communities may put communities at increased risk of structural discrimination, and further social, economic, and natural shocks.⁴²

Hajamro creek: The Haji Siddique Faqirani Jat community was permanently displaced to their current location in 1993, after a storm destroyed their houses further down Hajamro creek. The resulting sea intrusion split the community: while some moved inland to areas where freshwater was available for their livestock, moving their animals by foot during low tide, the majority of the community chose to move permanently to the location where they previously resided during high tide in winters, remaining close to the sea for fishing. Arriving only with moveable assets, they settled in their current location constructing basic shelters from wood and straw, with some building materials donated by NGOs (Figure 5). In 2008 the community was temporarily further displaced to the hilly areas during a cyclone, for which the government provided some transportation. One again the community split up, this time by individual household, each receiving assistance in separate relief camps, while camels were left on their grazing island - deemed safe as they can swim. During a major Indus flood in 2011, the community received a warning and moved once again, however returned after a few days. During the floods of 2010 and 2011 the fresh water level was very high, negatively affecting fisheries. At the time of research, yet another cyclone passed through, and the men were not allowed to take their boats out, directly impacting their livelihoods. Measures affecting fishing have long term impacts, including through displacement, if the community needs to seek new sources of income.⁴³

³⁹ Thomas et al, "Explaining differential vulnerability to climate change: A social science review". 2019. [Online](#) Climate and Migration Coalition, "Moving Stories: Pakistan. The voices of people who moved during flooding". 2013. [Online](#)

⁴⁰ ODI, "Climate change, migration and displacement". 2017. [Online](#)

⁴¹ Oxfam, "Uprooted by Climate Change, Responding to the growing risk of displacement". 2017. [Online](#)

⁴² ODI, "Climate change, migration and displacement". 2017. [Online](#)

⁴³ Ary News, "Cyclone Kyarr: Three-day fishing ban imposed in Karachi". 2019. [Online](#)



Figure 5: Arriving after displacement, constructing a new home (photo: L. Kumar)

Due to the lack of formal resettlement schemes, displaced communities settled on either marginal land not under tenancy, land acquired during land reforms, or public land. As even 'public' land may remain under the control of powerful individuals, land ownership is difficult to obtain for the displaced, and their connection to the land remains limited.⁴⁴ These challenging environmental conditions put them at risk of further displacement, occurring on a continuum of forced and voluntary migration.⁴⁵

While most displaced are keen to remain in their current location, rural-urban migration has potential beneficial effects on household's resilience.⁴⁶ Individuals may migrate to diversify income sources or reduce the strain on the household economy.⁴⁷ Respondents reported that labor migration is common, with individual household members – mostly young men – either temporary or (semi-)permanently migrating to urban centers, supporting their family through remittances. However, in urban centers, labor migrants are at further risk from shocks, including socio-economic challenges due to systemic discrimination, but also climate change impacts,⁴⁸ which was highlighted during the unprecedented 2020 monsoon rain, primarily affecting the poorest areas of Karachi where many migrants live.⁴⁹ Permanent returns occasionally occur if the migrant is unable to find work or struggles to access services.

Institutional Framework

There are significant political and institutional barriers to comprehensive climate change and displacement responses, including compartmentalization of climate change, disaster risk reduction and displacement departments, policies and responses.⁵⁰ As a federal democratic parliamentary republic, powers in Pakistan are shared between the federal government and the provinces.⁵¹ Furthermore, disaster management

⁴⁴ World Bank, "Socioeconomic Study and Proposal for Livelihood Improvements: Badin and Thatta Districts, Sindh, Pakistan". 2005. [Online](#)

⁴⁵ IDMC, "Community resilience and disaster-related displacement in South Asia". 2015. [Online](#)⁴⁶ Ishfaq S.M., "Rural-urban migration and climate change adaptation: policy implications for Pakistan". 2018. [Online](#)

⁴⁷ IOM, "Pakistan Migration Snapshot August 2019". 2019. [Online](#)

⁴⁸ Ishfaq S.M., "Rural-urban migration and climate change adaptation: policy implications for Pakistan". 2018. [Online](#)

⁴⁹ Ebrahim Z., "Karachi a victim of poor planning, bad governance – and floods". 2020. [Online](#)

⁵⁰ Noshirwani M., "Climate Change Adaptation: Political and Institutional Analysis, Sindh". 2012. World Wide Fund for Nature – Pakistan

authority is split between civilian and military actors.⁵² These divisions have contributed to isolated climate change and disaster response mechanisms, while displacement is only to a very limited extent addressed in regulatory frameworks.

The Federal Ministry of Climate Change developed its National Climate Change Policy in 2012.⁵³ The policy considers migration as one of the most important climate change threats to Pakistan, aiming to 'curb rural-to-urban migration, develop infrastructure and support facilities in smaller agro-based towns and periphery urban areas', without any provision for displacement.⁵⁴ This does not align with international instruments such as the 2015 Sendai Framework, or the 2018 Global Compacts on Migration and Refugees, which call for options for safe and orderly migration.⁵⁵

The National Disaster Management Authority (NDMA) is headed by senior army personnel.⁵⁶ At provincial level, the Sindh Provincial Disaster Management Authority (PDMA) provides warnings and forecasts to better prepare communities. Civilian district level disaster authorities formally coordinate departments at district and local level, however these are currently only operational during disasters. While NDMA drafted a national disaster response plan, Sindh does not have any formal provincial disaster management legislation. Instead, PDMA uses ad-hoc contingency plans and standard operating procedures when a disaster is declared.⁵⁷ Vertical coordination and cooperation is limited, with PDMA collecting disaggregated data on loss and damage, displacement and relief assistance only during disasters, irregularly sharing these with NDMA.⁵⁸

In Sindh, environmental management coordination is the responsibility of the Environment Section of the Planning and Development Division, while the management of Sindh's coastline falls under the Coastal Development Authority (CDA), both lacking resources for coordination capacity.⁵⁹ The public sector governance gaps in Sindh have resulted in one of the largest rural-urban social gaps in human development in Pakistan.⁶⁰

Resilience and Adaptation

According to the World Bank, successful adaptation strategies include 'investing in climate-smart infrastructure, diversifying income generating activities, building more responsive financial protection systems, and educating and empowering women'.⁶¹ Respondents' adaptation mechanisms largely rely on income diversification through daily wage labor, borrowing money from other community members for livelihood investments such as microenterprises, livestock or fishing gear, and state insurance. The lack of educational opportunities has created a generational difference in people's agency, limiting future diversification opportunities for the community. Future permanent relocation to urban centers to obtain services and livelihood options is viewed as a viable adaptation option, once the effects of coastal erosion and salination become too hard to mitigate.

⁵¹ Gazette of Pakistan, "Constitution 18th Amendment Act". 2010. [Online](#)

⁵² Madiwale and Virk, "Civil-military relations in natural disasters: a case study of the 2010 Pakistan floods". 2011. [Online](#)

⁵³ Government of Pakistan, "National Climate Change Policy". 2012. [Online](#)

⁵⁴ Ibid

⁵⁵ ODI, "Climate change, migration and displacement". 2017. [Online](#)

⁵⁶ Cochrane, H., "The role of the affected state in humanitarian action: A case study on Pakistan". 2008. [Online](#)

⁵⁷ PDMA, [Online](#)

⁵⁸ IDMC, "Internal Displacement Index Report". 2020. [Online](#)

⁵⁹ Sanchez-Triana E. et al, "Institutional Analysis of Sindh Province's Environmental Sector. 2015. World Bank [Online](#) Mahar and Solangi (ed), "Review of Sindh Coastal Development Authority Act 1994 and Sindh Coastal Development Plan". 2017. [Online](#)

⁶⁰ World Bank, "Socioeconomic Study and Proposal for Livelihood Improvements: Badin and Thatta Districts, Sindh, Pakistan". 2005. [Online](#)

⁶¹ World Bank, "Groundswell - preparing for internal climate migration". 2018. [Online](#).

Localizing Responses

To increase communities' resilience to the effects of climate change and further displacement, CommunityBased Organizations (CBOs) have been established with the support of NGOs. CBOs are not-for-profit organizations, acting as community-centered voluntary organizations, facilitating participation in social and economic development programmes, ranging from infrastructure to (health) education, and microfinance support. The objective of CBOs is to improve livelihoods, health, nutrition and literacy status of the targeted populations to alleviate poverty and empower local communities.⁶²

External organizations provide services through the CBOs, such as agricultural training to small farm holders by the UN Food and Agriculture Organization (FAO), and health clinics by People's Primary Healthcare Initiative (PPHI). Activities are conducted in public meeting rooms, built following a risk and responsibility sharing principle: materials for the rooms are donated by NGOs, while land is made available by the CBO members themselves, who are also in charge of ongoing operational and maintenance management and costs.⁶³

CBOs contribute to disaster risk reduction through 'Participatory Mangroves Conservation Management Plans', disaster warning and preparedness mechanisms, and the planting of mangroves, which are used for livestock fodder (Figure 6). CBOs also assist women with small loans for home-based income-generating activities such as shops (Figure 7).⁶⁴



Figure 6: housing and livestock in Miro Dablo village (photo D. Braam)

⁶² Memon M., Mithani S., "Enhancing institutional capacity building of nongovernmental organizations (NGOs) and community based organizations (CBOs): Impact of an innovative initiative" 2003. [Online](#)
Hussain et al, "The role of community based organizations in rural development: a case study of selected CBOs in district SWAT". 2008. *Sarhad Journal of Agriculture* 24 (4) pp749-754

⁶³ WWF, "Establishment of Offices for the Cluster Mangroves Management Unit MMUs/CBOs".

⁶⁴ World Bank, "Socioeconomic Study and Proposal for Livelihood Improvements: Badin and Thatta Districts, Sindh, Pakistan". 2005. [Online](#)



Figure 7: Miro Dablo village shop run by women (photo D. Braam)

Researchers have pointed out that a lack of financial and human resources affects the effectiveness of CBOs, in particular their role in political decision making.⁶⁵ However, our respondents strongly felt that the CBO increased their input in relief agencies' responses, and empowered community leaders to connect with authorities. This was highlighted by a paper evaluating the 2010 superfloods response in Sindh, where communities without established CBO lacked leadership, representation and power to influence institutions working on prevention, rescue and recovery.⁶⁶ Faced with projected increases in internal displacement due to ongoing coastal erosion and sea intrusion, CBOs could play an important role in the provision of safe migration, facilitating communities, households and individuals.

Conclusion

The negative effects of climate change and disasters exacerbate local environmental degradation in the coastal areas of Sindh in Pakistan. The lack of fresh water, fertile land, and resulting losses of livelihoods are key drivers for forced displacement. While preventing displacement remains the focus of (sub-)national disaster risk reduction and management policies, the adverse effects of climate change will further increase coastal erosion and sea intrusion, affecting communities' ability to remain in their current location, eventually forcing many to move on.

Communities therefore need to be supported both in-situ and during safe migration to more appropriate destinations. Some of this support can very well be provided by CBOs, given appropriate resources, supported by improved legal and institutional frameworks. The proposed recommendations below include short-, medium, and long-term solutions to be addressed at different governance levels, while prioritizing support to communities' agency (Figure 8).

Recommendations

- Protection from climate change related displacement:
 - Strengthen contextualized data collection for policy and decision making, using local 'movement stories' to understand better the challenges and risks faced during (onward) migration;
- Protection during displacement:
 - Support safe land relocation for displaced communities, in collaboration with community representatives/ CBOs, based on historical ties and livelihood options.
 - Provide safe migration options to separate households and individuals, using CBOs for awareness and capacity building: develop legal and institutional frameworks to ensure migrants are included in public services in destination locations.
 - Localize responses by further strengthening communities' agency through CBOs, providing appropriate and sufficient training and resources to enable local disaster risk reduction and adaptation decision making and planning;
 - Support locally owned livelihood diversification and adaptive mechanisms to alleviate poverty, including small livelihood investments, marketing, seed variations, and insurance mechanisms suitable for rapid implementation, to align with international financial protection standards.

⁶⁵ Rafique and Khoo,, "Role of community-based organizations (CBOs) in promoting citizen participation A survey study of local government institutions of Punjab, Pakistan". 2017. *International Journal of Sociology and Social Policy* 38 (3/4) pp 242-258

⁶⁶ Akbar Ali R. and Mannakkara S., "Factors affecting successful transition between post-disaster recovery phases: a case study of 2010 floods in Sindh, Pakistan". 2020. [Online](#)

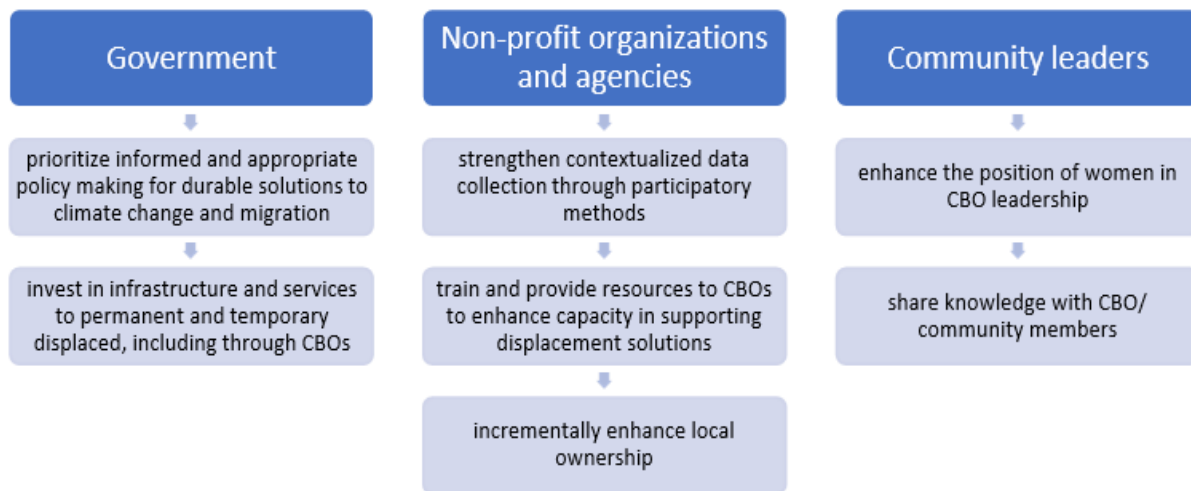


Figure 8: Proposed actions at government, agency and local level

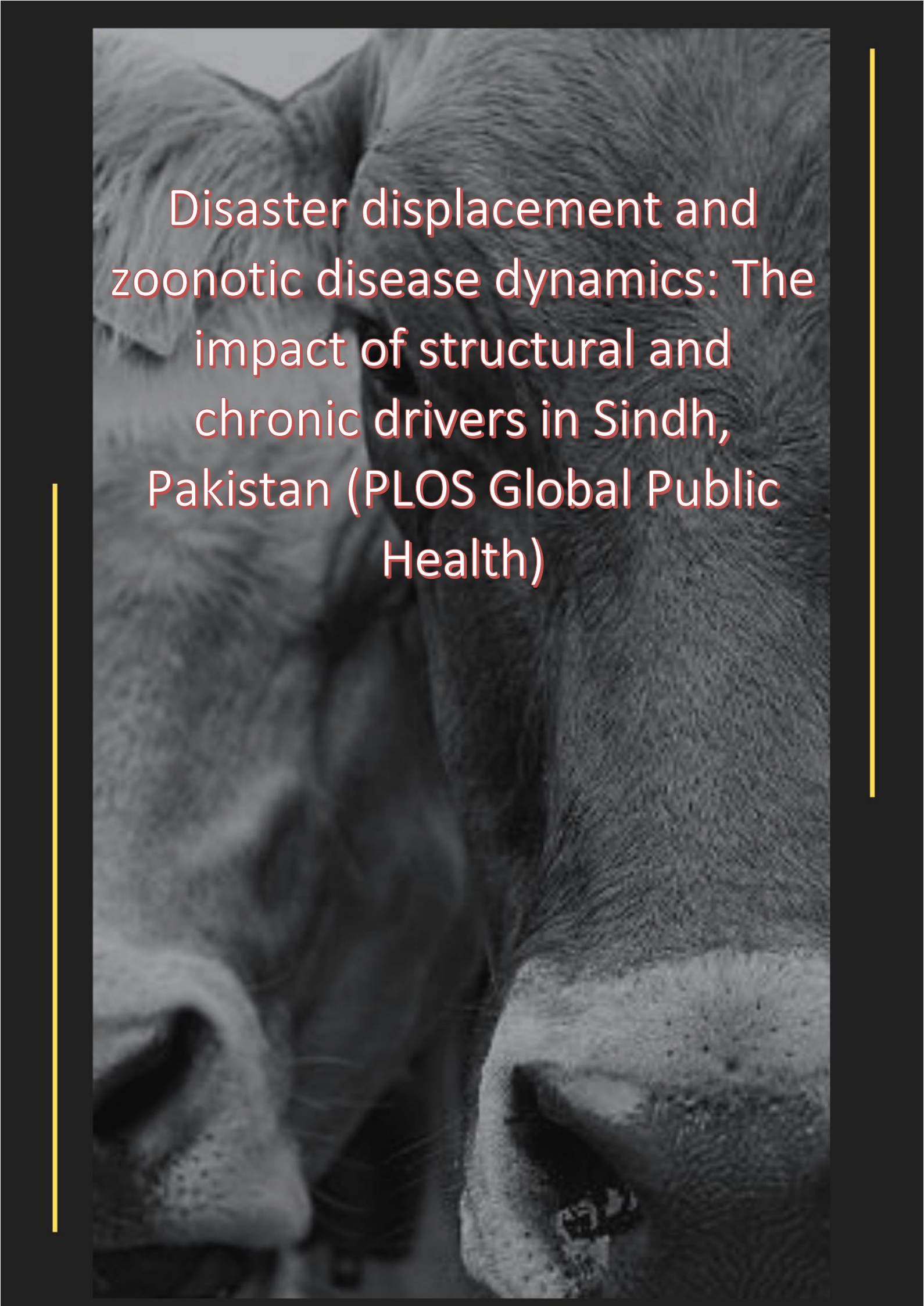
Author Profiles

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Ethics and funding

The study protocol was approved by the Human Biology Ethics Committee at the University of Cambridge (protocol number HBREC.2019.25) and approved in Sindh by the Planning and Development Department, Research and Training Wing of the Government of Sindh. Funding was provided by the Gates Cambridge Trust, the Department of Veterinary Medicine at the University of Cambridge, St John's College, Cambridge Global Food Security and the Mary Euphrasia Mosley Fund. The Research and Training Wing of the Planning and Development Department of the Government of Sindh, NRSP and WWF Pakistan provided logistical arrangements and support.

A close-up, grayscale photograph of two donkeys' faces, showing their eyes, ears, and snouts. The image is slightly blurred, creating a soft, textured background for the text.

Disaster displacement and
zoonotic disease dynamics: The
impact of structural and
chronic drivers in Sindh,
Pakistan (PLOS Global Public
Health)

Abstract

Projected increases in human and animal displacement driven by climate change, disasters and related environmental degradation will have significant implications to global health.

Pathways for infectious disease transmission including zoonoses, diseases transmitted between animals and humans, are complex and non-linear. While forced migration is considered an important driver for the spread of zoonoses, actual disease dynamics remain under researched. This paper presents the findings of a case study investigating how disaster displacement affected zoonotic disease transmission risk following the 2010 'super-floods' in Sindh province, Pakistan. We interviewed 30 key informants and 17 household members across 6 rural communities between March and November 2019, supported by observational studies and a review of secondary data. Results were analyzed using the eco-social theoretical framework. Buffalo, cattle and goats were often the only moveable asset, therefore livestock was an important consideration in determining displacement modality and destination location, and crowded locations were avoided to protect human and animal health.

Meanwhile however, livestock was rarely included in the humanitarian response, resulting in communities and households fragmenting according to the availability of live-stock provisions. We found that rather than a driver for disease, displacement acted as a process affecting community, household and individual zoonotic disease risk dynamics, based on available resources and social networks before, during and after displacement, rooted in the historical, political and socio-economic context. We conclude that in rural Sindh, disaster displaced populations' risk of zoonoses is the result of changes in dynamics rooted in pre-existing structural and chronic inequalities, making people more or less vulnerable to disease through multiple interlinked pathways. Our findings have implications for policy makers and humanitarian responders assisting displaced populations dependent on livestock, with a call to integrate livestock support in humanitarian policies and responses for health, survival and recovery.

Introduction

The risk of zoonoses, diseases transmissible between animals and humans, depends on complex interactions between biological, environmental, socio-economic, political, technological factors [1, 2]. These determinants of health are increasingly considered in epidemiological research beyond reductionist characterizations of health-disease processes. Human and animal movement, in particular unplanned and forced migration, is often named one of these determinants [3–8]. The breakdown of health services, malnutrition, movement into new ecological zones, and subsequent crowding, poor shelters and sanitation increase the risk of infectious disease transmission, with exhaustion, malnutrition, stress arising from displacement further increasing disease susceptibility in animal and human populations [9–11]. Concern for zoonoses has resulted in the exclusion of ruminant livestock species in formal relief camps, affecting people's livelihoods, resilience and recovery [12], with livestock support and veterinary public health rarely considered and funded within humanitarian responses. As most population displacement takes place in countries and communities where livestock plays an essential role in people's livelihoods and food security [13], the lack of consideration of animals in displacement has severe short- and long-term consequences, exacerbating poverty and ill health [14].

Epidemiological research in humanitarian emergencies has largely remained focused on health outcomes and disease data, ignoring structural and contextual drivers [15]. Patterns of morbidity and mortality are linked to political and socio-economic inequities, which may be exacerbated or mitigated by formal and informal mechanisms and structures [16]. These mechanisms and structures, which often arise from (colonial) histories and patriarchal systems, compounded by macro-sociological institutional arrangements, and economic systems, are largely ignored [17, 18]. Occupying an undefined legal space, Internally Displaced Persons (IDPs) are particularly subjected to structural violence in the form of discrimination or exploitation, while facing systemic and structural obstacles to healthcare or other services [19]. During displacement, people may be forced to live on marginal land or in substandard housing [20], settings which exacerbate the spread of infectious diseases [21].

Traditional epidemiological outbreak narratives associate vulnerability with the probability that individual becomes ill within a given period [22]. In this study we expand this definition to consider 'vulnerability' as a condition determined by physical, social, economic and environmental risk factors or processes, that increase the susceptibility of an individual or a community to be harmed by the impacts of zoonotic pathogens [23]. Vulnerability to zoonotic disease depends not only on the presence of pathogens, but on a variety of community and individual level characteristics, including the availability and distribution of resources, social status, connections, and health needs, which are influenced by socioeconomic and demographic factors determined through colonization, development, health policies, or other structural inequalities [22, 24–26].

This paper builds on the recent theoretical critiques of the social determinants of health, using an eco-social theoretical framework for a systematic integrated analysis to consider drivers behind differences in zoonotic disease risk during displacement, more specifically acknowledging the societal arrangements of power and resources [27]. Eco-social theory, first developed by Krieger in 1994, provides a framework for the inclusion of social theory and determinants of health to highlight and address disease distribution based on a systems approach [27–30]. Using its concepts, we can analyze dynamic and interacting micro- and macro-level processes in individual and population health. Krieger (2001) argues that non-contextual description of social determinants hampers understanding of causes of disease.

Rather than focusing on the negative health outcomes of displacement, such as overcrowding and unhygienic living conditions, these can be framed as biological expressions of pre-existing and structural inequalities,

rooted in the historical, political and socio-economic context. We use this framework to explore a case study of the 2010 ‘super-floods’ in Sindh province in Pakistan. Lacking comprehensive animal and human health data, we do not compare individual and population health differences, rather we use eco-social concepts to discuss the influence of displacement to risks and pathways to zoonotic disease, with the aim to highlight areas for humanitarian and policy interventions. Through the eco-social theoretical approach, we consider interlinkages and factors which do not always allow for specific quantitative risk measurement, rather creating a ‘web of causation’ considering multilevel risk factors [29].

Methods

We employed a case study methodology as the most relevant approach to answer an open research question about a complex contemporary phenomenon within a real-life context [31]. The case study was explored using semi-structured key informant and household interviews with community observations, supported by a review of available secondary qualitative and quantitative data drawn from both open and subscription databases, including data obtained from key informants during interviews. All data was analyzed using a thematic analysis methodology.

Study Area and Participants

Sindh province covers three geographically distinct zones: the mountainous Kirthar Range in the west, the central alluvial Indus river plain, and the eastern Thar desert region extending into India, with an estimated total population of 48 million people, 51 percent of which is considered rural [32]. The province has a subtropical climate, consisting of hot summers and unpredictable rain patterns during monsoon season in July and August. The Indus river, after which the province is named, is central to Sindh culture and livelihoods, supplying an extensive network of irrigation for agriculture [33, 34]. The province is an important source of food supply to the rest of the country, with over 7.6 million acres of cultivated land for cash and food crops, with the highest cultivation density in the north and along the Indus [32]. Sindh is a primary producer of fruits and vegetables suitable to its climate, including dates and tomatoes, and is the second largest producer of staple crops after the province of Punjab [32]. Live-stock contributes over 55 percent to Sindh’s agriculture sector, with cattle, buffalo, goats and sheep the main animals kept [32]. Rural livestock keepers derive up to 40 percent of their income from livestock, with the majority keeping less than four animals [35]. For our study, we focused on Thatta and Sujawal districts, based on their high disaster risk according to the Pakistan National Disaster Management Authority (NDMA), and high livestock dependency. Home to the Indus Delta, low-lying areas within these districts are regularly flooded, including during the nationwide 2010 super-floods, one of the most destructive disasters the country ever experienced in terms of damages and displacement.

We selected individuals for semi-structured key informant interviews using purposive and respondent driven sampling based on their technical, process and interpretive knowledge and expertise in public health, veterinary health and/or disaster displacement response, across government, United Nations (UN), non-profit and community-based organizations.

In addition, we conducted semi-structured household interviews and observational studies in selected communities across the districts, which had been displaced during the 2010 super-floods. Local staff members from the National Rural Support Programme (NRSP) selected six communities across the districts, which had been displaced during the 2010 super-floods. In each community, we interviewed at least two households, except in one community where a death during the research period prevented us from returning. The communities included in the study consisted of 40 to 250 households, clustered into patrilineal cultural groups. Households—defined by the Pakistan Bureau of Statistics as those sharing kitchen facilities—consisted of 5–12 members, usually parents and their children. Where grandparents

live in the same house, these were counted as part of the household. Households (n = 12) were purposefully sampled based on socio-economic status reflected in livestock ownership (buffalo, cattle and/ or goats), and retention before and after displacement, and semi-structured interviews were conducted with those adult household members responsible for animal husbandry and/ or livestock product processing, both male (n = 10) and female (n = 7), with both male and female household members interviewed in 5 of the sampled households.

Data Collection

The semi-structured questionnaires focused on demographic and socio-economic characteristics, experiences of displacement, human and animal health and health-seeking practices, and were adjusted based on the individual's role and experience in their field, in particular during the 2010 super floods disaster. A key characteristic of semi-structured interviews is that these are flexible in the sense that participant respondents can refocus the interview based on the areas they feel most relevant. Questionnaires were developed based on secondary data review in collaboration with the Planning and Development Department Research and Training Wing in Sindh, and refined iteratively during the interviews.

Key informant interviews were conducted in the federal capital Islamabad, provincial capital Karachi and district capitals Hyderabad, Thatta and Sujawal between March–November 2019, at days and times chosen by the respondents.

Household interviews were conducted in October–November 2020. The interviews followed semi-structured questionnaires with questions focusing on demographic and socio-economic characteristics, experiences of displacement, human and animal health and health-seeking practices, using a multisite design to improve external validity [36].

To counter gender-based barriers to data collection, the lead researcher was supported by both a female and male translator. Data collection was conducted in respondents' indigenous language Sindhi. Interviews were recorded after approval from the respondent, and transcribed into English. Household interviews were conducted during daytime due to security and resource constraints. Due to the communal household settings in Sindh, most interviews were conducted with more than one individual present. Observations within and around the household and community were made and recorded through photos and field notes to support contextualization and triangulation of the responses. The validity and reliability of data was strengthened by regular cross-checking responses with participants [36]. Following the qualitative research principle of data saturation, we continued interviewing until no new data and concepts were introduced, using a flexible approach for applied inductive thematic analyses [37, 38].

Ethical Considerations

The study protocol was approved by the Human Biology Ethics Committee at the University of Cambridge (protocol number HBREC.2019.25) and in Sindh by the Planning and Development Department, Research and Training Wing of the Government of Sindh, which provided all required permits and approvals for conducting research. Information and informed consent letters were available in English and Sindhi. Participants were informed about the study during face-to-face recruitment, by telephone and/or e-mail, and informed about the voluntary bases of participation at the start of data collection. Copies of the study protocol and consent forms were available and shared with participants upon request. Key informants and household participants gave written consent, or verbal for illiterate respondents and where participants considered signing the consent form a potential risk to their anonymity. Verbal consent was recorded on a digital recorder before the start of the interview. for data collection and recording of interviews. Verbal consent was approved under HBREC.2019.25 as the study presented no more than minimal risk of harm to respondents. To preserve participants' anonymity, the analysis and discussion do not include any personal identifiable information.

To minimize the risk of exploitation and damaging research practices among vulnerable and marginalized community participants, we avoided discussing traumatizing events around the displacement experience by using semi-structured rather than closed questionnaires allowing participants to refocus discussions. We focused on communities who received support from NRSP to minimize risks of extractive research. The power imbalance between researcher and participant was mitigated as much as possible by the selection of households and individual participants through local NRSP staff, who are members of the respondents' communities.

Data Analysis

Interview and secondary data was coded manually in English, and themes constructed from the data using a thematic analysis approach [39]. Data from interview notes and transcripts was synthesized into matrices using the constructed themes (Community, Assets, Preparation, Loss, Displacement, Reconstruction, Health, Veterinary, Status, and Vulnerability), and triangulated with primary and secondary data, consisting of wider literature on the super floods, livestock and public health and diseases in Sindh [39]. Three second order themes were constructed and interpreted drawing on the eco-social theory, which aims to improve understandings of epidemiological risk factors, using a multidisciplinary approach to analyze individual- and community-level data in ecological and social contexts [30]. The theory considers biological and environmental factors, but importantly includes political and economic processes, and socio-economic inequalities, and how these express themselves in health outcomes, which is highly relevant in often structurally marginalized displaced populations. The second other themes form the structure of the results section, identifying the multilevel factors, dynamic processes and pathways affecting zoonotic disease risk in displacement contexts [30].

Limitations

The qualitative case study methodology does not aim to provide generalizable research findings, acknowledging that people and phenomena depend on their context and circumstances, although some of its findings may be applicable to similar groups in comparable situations [40].

Selection bias was introduced by selecting only communities which received humanitarian assistance by NRSP in the aftermath of the 2010 super-floods for ethical considerations, while recall bias may have

occurred during recollection of disaster and displacement events. The presence of NRSP staff members and a representative from the Sindh Government may have introduced a level of reporting bias.

We present our study findings using the global themes assigned within the thematical analysis. The findings are presented in chronological order along a spatiotemporal scale, starting with a description of the scale of the disaster and loss, displacement experiences and the impact on communities, and return and recovery since the super-floods, and reflect on our findings in the Discussion section.

Results

The Small Doomsday

Even though the disaster occurred almost ten years before our study, people remember it well: one participant recalls it as ‘the Small Doomsday in our time’ (male livestock owner and daily wage laborer, CAHH2), the most severe disaster they ever experienced. Unstable climatic conditions during the pre-monsoon phase, and heavy rainfall during the monsoon resulted in unprecedented floods in July and August 2010, affecting 20 million people across Pakistan [41]. Floods started in northern Pakistan in July, with the heaviest flooding moving southward towards Sindh in early August. In Sindh, 7.4 million acres of land were flooded and 800,000 houses damaged or destroyed. Infrastructure such as power stations, transmission towers, irrigation systems, barrages, bridges, and roads were lost, many of which have not been rebuilt [42, 43], and 11.7 percent of all health facilities were damaged or destroyed [41, 44]. Over 30 percent of the 7.2 million flood affected people in the province was displaced [41], with 1.3 million sheltering in formal relief camps and many more in informal settlements [45] (Fig 1).

Due to its scale, the disaster was called the ‘super-floods’ in its aftermath, and still referred to as such. The floods affected both harvesting seasons, destroying the kharif monsoon crop and hampering planting for the rabi spring crops. The province suffered almost half of the total damage to agriculture in the country [41]. Local wheat storage and animal fodder were lost, fresh water supplies were affected, and the Kharif agriculture season aborted, while planting for the Rabi season was delayed due to remaining water, sand and silt deposits [44].

“On the 5th Ramzan the flood hit. The noise of the water sounded like an earthquake. There was only one Suzuki [pick-up truck] in the village to move the women, it was suffocating. The men had to walk with the animals. There was panic and the bridge was so crowded we were afraid it would break. Some people were dropped off in Thatta or Makli, but those areas were too crowded. It was too far to walk for some animals and these were left behind on the road. My brother in law drove in a Suzuki to tell the men herding the animals where the water was. When he slept, the water came at night and he almost drowned in the car.”

(female livestock and shop owner, CFHH2)

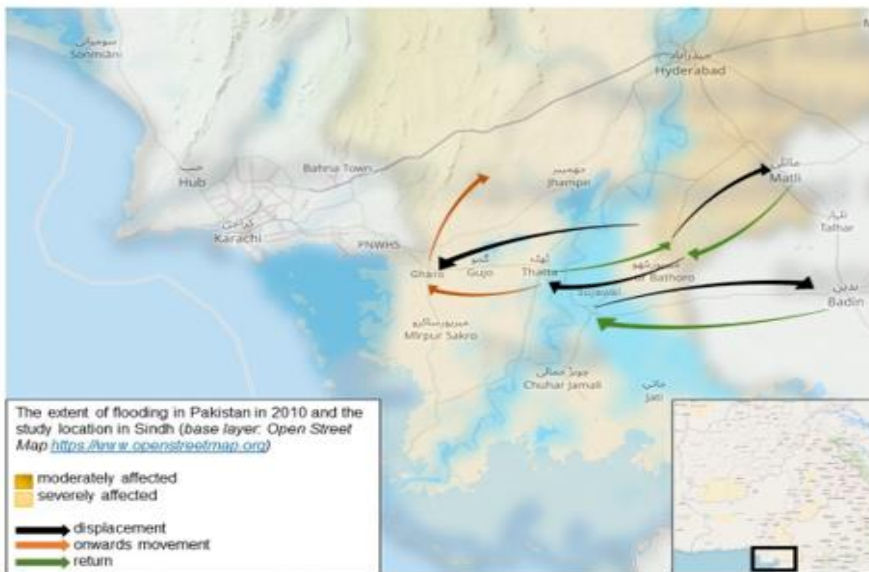


Fig 1. Location of fieldwork in Sindh in Pakistan and major displacement routes during the 2010 super-floods.

<https://doi.org/10.1371/journal.pgph.0000068.g001>

While all communities were warned about the upcoming floods, either through media, authorities, politicians, police or relatives upstream, only one community collectively relocated before the water reached their village. Unwilling to abandon their livelihoods and important source of nutrition, many people were reported to refuse to relocate without their livestock [46]. Most participants did not physically move until they saw the water streaming into the community ‘with their own eyes’. Houses were rapidly flooded, sometimes inundated as high as six feet, and people scrambled to get away in time.

“we saw the water coming and had a few days to prepare (. . .) all houses were flooded up totwo-thirds of the doorway (. . .) wood and straw structures were destroyed”

(female livestock keeper and community leader CAHH1)

In Sindh, over 1.2 million livestock and 6 million poultry were killed [46]. Among our participants, some households lost half of their livestock herd due to drowning. One community lost around 30–40 livestock, another initially had to leave their animals behind to save them- selves, returning the next day to see which livestock could still be saved.

“The loss of animals was more impactful than the loss of our house” (female caretaker

of livestock in partnership, CEHH2).

Livestock Over Community

In rural Sindh, livestock were described as ‘the center of the household’ and the most valuable asset, often considered ‘family members’, and often central to the displacement experience. In the chaos of the super-floods, roads were crowded and flood water hampered movement, forcing some people and livestock to walk for four days to safe locations. Animals were lost or killed through road accidents, exhaustion, electrocution, lack of feed and water, while once in the destination location, animals were at further risk of starvation and disease [46]. Those animals that survived the disaster and subsequent displacement, were at increased risk of disease due to exhaustion, starvation, and the mixing with other displaced or host population’s herds. Weak and young animals were most susceptible to diseases, and many were sold cheaply to be able to buy food, shelter materials and fodder.

“after the floods, households in need of money would sell their animal in one of the government allocated livestock markets, usually a small ruminant or heifer”

(key informant, provincial government)

In some communities local political and/ or army leaders provided buses to move people and sometimes trucks for the animals, however these did not have enough capacity for the entire population. Some households managed to rent cars or tractors for female household members, while male household members walked along with their animals, participants describe how ‘people already weak from fasting had to move’ (male livestock and shop owner, CIHH2).

“We left the village before the water came; politicians provided vehicles [to evacuate] the people, while animals walked”

(male livestock owner and daily wage laborer, CGHH1)

Respondents suggested that displacement often occurred in stages, as some initial destination areas were subsequently flooded or considered unsuitable living environments, eventually displacing some of our participants up to 50 kilometers from their homes. Communities supported by the army were housed in formal relief camps, without space provided for their animals, causing households to split up as male family members stayed with the animals. Women remained in formal relief camps with young children, as the traditional caretakers in a household, with one female participant commenting: ‘first the children get sick, then us’ (female livestock owner, CHHH1).

“we were relocated by buses from the government (. . .) we could choose to go to Makli, but we went to Gora to stay close to our animals (which was brought by the) men and boys by foot (. . .).”

(female livestock keeper and community leader, CAHH1)

In other locations where it took time for formal assistance to arrive, livestock keepers moved on to find a suitable location with fodder and water for their animals, while the poorest households without livestock stayed put, dividing communities. A participant from one of the poorest households reflected: ‘in times of disaster it is every man for himself’ (female caretaker of livestock in partnership, CAHH3). Throughout the country, a third of displaced moved at least twice [42].

“people prioritize their animals, [for instance] during the 2010 super-floods people insisted that their animals were rescued first (and displacement) destinations are often chosen based on their suitability for animals.”

(NRSP)

During displacement, animals suffered from suffocation due to what was described as a ‘swelling of the throat and nose’, fever, and bloat. In the dry, hilly areas, displaced people found that Foot and Mouth Disease (FMD) was (and remains) endemic. Participants used traditional treatment methods before calling a veterinarian in late stages of disease, which spread easily with animals herded closely together during displacement. Some participants moved with their animals away from crowded settlements, partly because of increased disease risk from ‘other communities’. This distrust of others was reflected by one participant who mentioned that ‘outsiders bring bad hygiene into the village’.

“In 2010 we [first] moved to the dams next to the river (. . .) the Shirazi leadership moved all people to Gharo (. . .) where there was FMD and we did not want to live too close to other people because of these diseases [so the community split up]”

(male livestock owner and daily wage laborer, CAHH2)

“In Makli, lots of animals were kept in one place so diseases spread [we] lost 4 buffalo, 5 cattle and many goats, [the boys] moved to another hilly area with the animals”

(male livestock keeper and school teacher, CEHH1)

While none of the participants directly acknowledged the possibility of disease transmission from livestock, we found that many were indeed aware of zoonotic disease risk, as the increase in respiratory and gastrointestinal infections during displacement was at least partially attributed by respondents to a lack of hygiene living close to their livestock. Although most households would usually not sell sick animals or use their produce, many were forced to during displacement. While milk was not always boiled, respondents mentioned this is as much a result of a lack of time, fuel, and alternative foods, as a lack of awareness [47], with several respondents referring to relevant cultural and disease control practices: ‘milk is boiled for preservation [and] to kill the germs’ (female livestock and shop owner, CFHH2). Hands are traditionally washed with water or sand if the former is not available, before and after handling animals.

Participants reported that the burden of infectious diseases increased during disaster displacement, including fever, respiratory and gastrointestinal disease, which in the literature is primarily attributed to a lack of safe drinking water and sanitation facilities [48], while scorpion and snakebites caused fatalities. While the humanitarian health cluster was providing assistance in the region through UN agencies, international and national NGOs, and vaccinations were provided in formal camps, none of our participants mentioned receiving free healthcare. Instead people visited and paid for overburdened private health facilities near their respective destination areas. During and after the super-floods, FAO provided limited livestock vaccinations and feed, however this was not coordinated by national disaster management authorities. Even current seasonal FMD vaccination campaigns only reach about 10 percent of formally registered cattle, according to a local veterinarian. None of our participants reported receiving any livestock support and gaps in veterinary disease surveillance resulted in inconsistent zoonotic disease prevalence data collection (DoL).

“during the 2010 super-floods, many people were displaced to Hyderabad and Karachi, others moved to the roadside (. . .) organizations provided livestock vaccinations, medication, the government provided shelter, food was provided but no livestock feed.”

(provincial government official)

“in 2010 assistance was provided in camps and along roads and river banks, but because veterinary clinics were flooded and staff evacuated, the response was slow; while medication and vaccines were supplied to camps, diseases got worse”

(Department of Livestock Thatta)

Humanitarian assistance hardly ever reached those herding the livestock in remote areas, while those participants who moved east rather than west, away from the Indus and further from Karachi, were subsequently cut off from formal relief efforts by flooded roads, and became dependent on host populations. As many communities and households split up, rather than remaining a mutually supportive collective, displaced households became dependent on new community structures as outsiders [22]. This division of households had great psychosocial effects, with one of our female participants describing the experience as ‘mental torture’ (female livestock and shop owner, CIHH1). Another female participant mentioned feeling ‘like an orphan’, away from her husband (female caretaker of livestock in partnership, CAHH3). Others felt uncomfortable between unknown households from different tribes and returned to dams or bridges closer to home, sometimes even returning while their village was still flooded.

Relief and Recovery

Respondents mentioned returning to their villages after 2 to 4 months, borrowing or renting vehicles for transport, sometimes paid for by selling more livestock. Some villages were still flooded 4 months following the disaster, and only those houses built on higher ground could be used. Faced with destroyed houses and agriculture, people remained dependent on external assistance. Humanitarian and government agencies provided shelter material, tents, hand-pumps and food, prioritizing the poorest households. A restocking initiative resulted in poor households selling the provided goats, as they were in need of cash and unable to feed the animals. Some participants found their houses looted, and stolen IDs meant they were not eligible for electronic cash assistance cards [41]. While receiving humanitarian assistance within the relief camps, on return to their home village women were less likely than men to have an identity card, hampering access to assistance in the aftermath of the super-floods [45].

The National Disaster Management Authority (NDMA), which had only been recently established at the time, formally coordinated the initial humanitarian response, supported by the army, Provincial Disaster Management Authorities (PDMA) and District Disaster Management Authorities (DDMA), the latter headed by the District Commissioner, a government appointee [49]. As local governance structures were still in transition following the 18th amendment to the Constitution, whereby power was devolved to the provinces, including the responsibility for health and livestock, the PDMA and DDMA had limited response capacity and structures [46, 50]. Due to the scale of the disaster, national and international aid agencies and charities supported the provision of emergency assistance, coordinated through the humanitarian cluster approach, handing over delivery of services to 'early recovery working groups' by April 2011 [41, 48]. As the disaster took place during Ramzan, the ninth month of the Islamic calendar observed as a month of fasting, prayer, reflection and community, private philanthropically contributions were significant. However due to the lack of disaster response infrastructure and capacity, the response in Sindh remained relatively slow compared to the rest of the country [41].

"Most assistance was provided close to Karachi, which was easier to reach for people with private gifts"

(NRSP Sujawal)

Having survived both disaster and displacement, in most communities the health of humans and animals was primarily affected following their return. Nationwide, around 77 percent of people reported illness within their household in the six months following the floods [42]. Data from the health cluster showed that within the first year over 37 million medical consultations were reported in flood affected districts, the most common being acute respiratory infection (23%), skin diseases (11%), acute diarrhea (9%) and suspected malaria (6%) [41], a common disease which is usually prevented by the use of mosquito nets, which were not available during displacement. Respiratory and gastrointestinal infections in many cases worsened after returning to polluted water sources in home villages, and by October 2010 laboratory testing confirmed the outbreak of cholera [51]. Water from hand-pump wells was contaminated, causing disease and the death of four children in one village.

"I suffered from Hepatitis C after the floods, it was common and some people died because of it. After the floods, the hand pump water was tested by NGOs [and identified] as a cause for diseases"

(male livestock keeper and school teacher, CEHH1)

At the time of research, sanitation and water supply in the villages remain limited. The poorest households do not have latrines, whereas the less poor families in larger villages have only recently started constructing their own. Water sources vary from hand pumps, usually shared among households, to irrigation canals and surface water, in which we often noticed bathing buffaloes. While the super-floods polluted the few water sources within communities, the provision and quality of water has always been, and remains, poor. Across

rural Sindh the rural population lacks access to water supplies, while most of the rest not suitable for consumption [52]. Almost every village visited had an ongoing drainage problem in agricultural fields since the floods, for which they blame the lack of governmental response.

“there is enough water in the Indus, but the water management system is bad” (male livestock owner and migrant worker, CHHH1)

Those households with savings left after the disaster and displacement, pooled funding to rebuild brick houses. As we visited the communities nine years after the super-floods, we noticed that most participants still live in small 1–2 room *kutchas* built out of wood and mud, while less poor households constructed brick homes. The largest house we visited— owned by the community leader— consisted of four rooms around a central covered space used for storage and parking. One household spent three years reconstructing their brick home using a bank loan, which was repaid by selling buffaloes. Some households managed to replace *kutchas* houses with brick, while a few individuals managed to increase their livestock herd. The households interviewed now owned up to 24 livestock, usually a combination of buffalo, cattle and goats. The poorest households used a ‘partnership’ system, whereby livestock is not owned by the caretaker themselves, but on loan from a relative or wealthier acquaintance. All produce is kept and used by the caretaker, while profit on sales is returned to the owner.

“Before the 2010 floods we had 30 buffalo and cattle (. . .) some died, some were affected by disease and were sold, at returning to the village we had 20 animals left”

(male livestock owner and daily wage laborer, CAHH2)

The main livelihood of the communities remains subsistence agriculture and livestock keeping, with animals central to people’s lives and livelihood, for both economic and cultural reasons [53]. Cattle and buffalo are kept for milk, and surplus is sold on the market, while goats are kept for their meat or sold for cash, to buy agricultural input, food, or pay for services such as veterinary and healthcare. Both men and women milk the animals, depending on household traditions, and some poorer households milk other people’s cattle. Some households own a few acres of agricultural land and/ or work as daily laborers for other small-holders or a landlord out of necessity [33].

“(. . .) the tenancy act is not implemented, there remain issues with land boundaries, water management and cost sharing. In Sujawal farmers share at 25/75 basis (. . .) 1–2 acres of land is not enough to live from, therefore people also have to conduct daily wage labor.”

(FAO)

Participants mentioned it took between 3 to 6 years for agriculture production to return to pre-flood levels and villages to be reconstructed, with support from national and international governmental agencies and civil society organizations. Girls’ access to education improved after the influx of aid, with larger communities now providing education to young children (up to 10–12 years), although there are concerns about the quality. While most villages are now connected to the electricity grid, power is only provided between 2–8 hours a day. For many however, life has become harder since harvests and livestock were lost, and the pro-longed inundation of fields and water sources caused permanent salinization.

“[during the super-floods] all harvest was lost and it took three years to recover (. . .) the floods affected the supply of fresh drinking water, now they have to go as deep as 50 feet to find it. (. . .) while they are now in a ‘better’ position, we are still worse off than before the floods, as there is no daily wage labor.”

(male livestock keeper and school teacher, CEHH1)

Income levels and purchasing power among participants therefore remain low, directly affecting food intake. To contribute to household income, young male household members often work as daily wage

laborers in factories or doing road construction, while others migrate to urban areas, in particular after harvest season when there is no local agricultural labor. Women contribute to household income through selling embroidery. All communities had small shops, selling basic items such as soap and snacks, with some selling basic medication. Transportation options were limited, while some households owned motorbikes, ownership of chin-chi's (three-wheeled motorbike/car hybrids) and cars was very rare. Small trucks ('Suzuki') were hired to transport goods and people to and from larger towns or cities for access to markets and services.

Recently, poverty and prices increased, with participants reporting a decrease in purchasing power due to ongoing inflation and the lack of daily wage labor, partially an unintended result of the recent closure of factories due to political counter-corruption measures. Interestingly, the poorest households mentioned little change, or being 'better off' than in 2010, as they had no livestock at that time, and they did not have to repay animals held in 'partnership' lost in the super-floods. Furthermore, with increased funding and visibility, NGOs and relief agencies increased their involvement after 2010, and in some communities the position of girls and women improved slightly by facilitating education and paid employment for women.

Among others, NRSP has trained communities in disaster management and formed disaster committees with disaster preparedness plans, which include safe areas identified together with the communities suitable for livestock. In 2015 this system was used with line departments including PDMA, health and livestock, and resulted in fewer losses.

Discussion

The eco-social theory of societal patterns of disease distribution posits that in socially unequal societies the absolute burden of disease rests on those with less power and fewer resources [27], as it increases the risk of excess exposure to hazards and pathogens, inadequate health-care, ecosystem degradation and lack of land ownership, resilience and agency [29]. These vulnerabilities are largely constructed, with people made vulnerable through political and social inequalities. Even before the super-floods, Sindh province could be considered disadvantaged, with one of the highest rates of inequality and lowest literacy rates [54], and the highest levels of malnutrition and food insecurity within Pakistan, with chronic malnourishment affecting the immunity of 84 percent of the population [44]. Inequality, economic marginalization and the lack of a comprehensive healthcare system has led to high levels of infectious diseases, including zoonoses, although these are rarely formally diagnosed among disadvantaged population groups in rural Sindh [55, 56].

The super-floods disaster exacerbated these chronic vulnerabilities [57]. Disaster displacement only occurs when people are vulnerable to natural hazards, with those lacking resources living in low-lying riverine areas most at risk [46]. Mustafa describes how vulnerability to floods in Pakistan depends on land ownership, sources of livelihood, political and institutional connections, class and gender, thereby affecting individuals within communities differently [58]. Historical developments resulted in a democracy heavily influenced by feudalism, and high socio-economic inequality in rural Sindh [59], exacerbating the impact of hazards by the unequal distribution of resources, reserves and ability to prepare. The British colonial administration institutionalized the Mughal feudal practice of landownership and tax collection by agents by granting land owners property rights to secure their revenue base and political interests [33, 34, 54], while tenants worked the land, paying for cultivation themselves, often through loans either from the landlords or money lenders [33]. Currently, almost 64 percent of rural families are landless tenants, often indebted to a landlord for generations [44]. Agriculture land remained privatized after independence, with landlords continuing to exercise political control, irrigation and water distribution [54], affecting all of our

participants' communities. This persistent system has caused Sindh to have the largest rural-urban social gap in Pakistan, according to the World Bank [54].

Structural inequality before and during displacement was reflected in the marginal geographic location of settlements, stress and trauma, the availability of sufficient quantity and quality food and water, and structural lack of access to adequate health, veterinary and other services [45]. Our study indicates that available connections, social status and resources before disaster played a significant role in determining people's disaster displacement experience. Better connected communities received early warnings, and transportation support from government, tribal affiliates, or political allies—usually the landowners on whose land the community lives and works. Limited availability and capacity of transportation during the super-floods resulted in a divide between classes within communities however, whereby the poorest households were left to their own devices.

Communities, households and individuals therefore experienced displacement differently, depending on available resources, the position of the community within a wider (tribal and political) relations network, the position of the household within the community, and the role of individual household members. These determined whether they were able to afford or receive transportation and/ or whether were hosted in a destination location conducive to live-stock, with some of the population groups considered most vulnerable by humanitarian actors ending up away from animals, particularly affecting women. Structurally disadvantaged in decision making, resource allocation and access to education and health services, women are less likely to access healthcare, which Shaikh and Hatcher (2005) attribute to their limited role as decision maker and control over resources, limitations to travelling alone, and likelihood of facing language barriers due to unequal education [60].

Movement, separation and uncertainty caused exhaustion, stress and other psychosocial issues with a detrimental effect on immunity, including in animals. Despite these and pre-existing vulnerabilities to disease, during displacement zoonotic disease dynamics were complex and non-linear. Livestock were central to people's decision making during the super-floods linked to transport options and destination location. The latter was often determined by live-stock owners based on their knowledge of infectious human and animal disease transmission risk. While key informants claimed that rural communities were generally not aware of zoonoses, risk factors and routes of transmission [47, 61], our study showed a more nuanced picture. Zoonotic health conditions in the communities were already challenging before the disaster, with most respondents lacking resources for veterinary health care, while the misuse of medication and unregistered quacks when resources are available, increases the risk of infectious disease and antimicrobial resistance (AMR) [55]. Veterinary and public healthcare in Pakistan are characterized by a mixed system of public and private providers, with many public sector employees working in private practice after hours, while public services are underused due to a lack of trust and general dissatisfaction [25, 55, 60]. These studies report a generalized belief that 'free medicine is bad medicine', an attitude that the authors believe is rooted in colonialism, with outbreaks such as the recent HIV epidemic in children in Sindh, caused by the reuse of needles by someone posing as a medical professional, exacerbating this mistrust [62]. Poor governance and low public investment, partially caused by structural adjustment programs enforced by international donors through the International Monetary Fund (IMF), have resulted in chronically under-resourced public services [25, 61, 63, 64]. During the super-floods, public health systems and health facilities in destination areas therefore quickly became overburdened once displaced sought treatment.

This shows that structural and chronic drivers, rooted in historical and political structures, affected people's vulnerability to disaster, displacement and zoonotic disease. The availability of informal networks and resources at origin, transit and destination locations, and the availability and prioritization of (humanitarian) assistance, determined stress, food, water and sanitation. This was further complicated by unhygienic living conditions in displacement, which increased susceptibility to disease. Ultimately, people's ability to respond to these disease risks was primarily driven by their pre-existing status, socio-

political connections and resources.

Rather than framing zoonotic disease risk in displacement as a result of increased pathogen interaction between animals and humans, such 'risk' needs to be re-conceptualized as the interaction of biological, environmental, socio-economic and political factors. Movement itself is not a determinant, rather the process which alters biological susceptibility, based on pre-existing vulnerabilities grounded in structural inequalities, playing out differently dependent on resources and connections during displacement. Considering these complexities, the eco-social model seems an appropriate fit based on the experiences garnered from our respondents.

Social science research adds crucial insight into complex local, social and political processes affecting disease transmission and control. Zoonotic disease risk in displacement contexts cannot be reduced to one narrative, and must be considered with an interdisciplinary approach to uncover intersections between biomedical, historical, political, and behavioral factors. With this study, our aim was to provide depth and context to a so far under-explored topic, rather than provide data for extrapolation, however our study does provide contextualized data and theoretical concepts useful for subsequent qualitative and quantitative study to further engage with the topic [65].

Conclusion

The findings from our study speak to several areas where mitigation of infectious diseases and the effectiveness of support services generally during displacement can be greatly improved. These areas of improvement include targets before, during, and after displacement. The findings from our study make it clear that the bulk of disease prevention, including the prevention of zoonotic spillover, occurs before the disaster that necessitates displacement transpires. In order for zoonotic disease mitigation activities to be most effective, it is necessary to engage with and address vulnerabilities within the population ahead of time.

In order to improve zoonotic disease mitigation activities and the general wellbeing of the displaced communities after the event has occurred, responders and donor agencies need to acknowledge and better accommodate livestock in their responses, as livestock showed to be an important factor during the 2010 super-floods' disaster displacement of rural communities. The findings from our study make it clear that this will not only increase the effectiveness of existing interventions and help families stay together during displacement but also leave them better able to resettle and re-establish their livelihoods post-displacement. From our study and previous work in this area, it is apparent that it was upon returning to their communities after having been displaced when risk of disease outbreaks was the greatest. Increased support during this crucial stage of resettlement is therefore warranted. These findings should support enhanced understanding of zoonotic disease dynamics during displacement, providing entry points for inclusive discussions for better interventions and policies. By involving communities in these processes, their agency can be increased to impact the division of power, land and resources. Addressing pre-existing inequality and vulnerability will improve preparedness, adaptation, resilience and response to disasters and displacement, thus reducing zoonotic disease transmission risk.

Finally, a key finding from our study was the heterogeneity of experiences and vulnerability within the displaced communities. The markedly varied trajectories and needs of different subsets of the community need to be taken account in order for interventions and aid to be delivered effectively. This is an area where the design of interventions and services would benefit from greater input from other disciplines, including anthropology. This will require donor funding and political will, as well as engagement of both international and national stakeholders for more inclusive, interdisciplinary research and response

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RESEARCH HIGHLIGHTS 2020-21

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