

Indus Floods Research Project

Final Technical Report

Date of Submission	15 July 2013
IDRC Grant Number	106487-001
DFID PO #	40042124
Name of the Project	Building research capacity to understand and adapt to climate change in the Indus Basin
Country (Project site)	Pakistan
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Submitted to	IDRC- Asia Regional Office, New Delhi, India DFID-Research and Evidence, Asia, New Delhi, India

**This report is presented as received from project recipient(s).
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Indus Floods Research Project



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ACRONYMS

ADB	Asian Development Bank
AKRSP	Aga Khan Rural Support Programme
BISP	Benazir Income Support Program
DRR	Disaster Risk Reduction
DFID	Department for International Development
DVR	Demographic Vulnerability Ranking
ERRA	Earthquake Reconstruction Recovery Authority
GCISC	Global Change Impact Studies Centre
HVI	Human Vulnerability Index
ICIMOD	International Centre for Integrated Mountain Development
IDRC	International Development Research Centre
INGO	International Non-Governmental Organization
IOM	International Organization for Migration
IPCC	Intergovernmental Panel on Climate Change
ISSET	Institute for Social and Environmental Transition
ISSET-PK	Institute for Social and Environmental Transition - Pakistan
LHW	Lady Health Worker
MPhil	Master of Philosophy
MSc	Master of Science
NDMA	National Disaster Management Authority
NGO	Non-Governmental Organization
PDMA	Provincial Disaster Management Authority
PMD	Pakistan Meteorological Department
SLD	Shared Learning Dialogue
SRSP	Sarhad Rural Support Programme
SOAS	The School of Oriental and African Studies
SRF	Single Reporting Format
TRDP	Thardeep Rural Development Program
RSPN	Rural Support Programmes Network
UN	United Nations
UNDP	United Nations Development Programme

EXECUTIVE SUMMARY

This final technical report covers the findings, outcomes, outputs and activities of the project named “Building research capacity to understand and adapt to climate change in the Indus Basin, Pakistan.” The project was funded by International Development Research Centre (IDRC) and Department for International Development (DFID) of the United Kingdom. It was implemented by Institute for Social and Environmental Transition (ISET) and Rural Support Network Programme (RSPN) in Pakistan with its member rural support programs (RSPs.) Agha Khan Rural Support Programme (AKRSP) conducted the research in Chitral District, Sarhad Rural Support Programme (SRSP) in Charsadda District, and Thardeep Rural Development Program (TRDP) in Dadu and Tharparker Districts.

The impacts of the 2010 Indus floods in Pakistan presented a fundamental challenge that cut across all aspects of life in Pakistan. From livelihoods of rural populations to food supply for urban areas, the core gateway transport, communication, energy, health, water control and institutional systems, upon which populations depend, failed. Prior research on hazards in Pakistan has demonstrated that vulnerability to hazards is constructed along class and gender inequalities and is embedded in everyday geographies of access to resources, state policies and social power (Halvorson, 2002, 2003.) However, current infrastructure engineering and relief oriented flood policy reflects little understanding of or sensitivity to issues of social vulnerability. Very little focuses on the underlying conditions that influence vulnerability and the ability to recover from flood events. Bouncing back intuitively requires access to basic resources, the ability to communicate, access food, water, transport and finances

but the role these services play is both poorly understood and documented. There is a massive knowledge gap on the level performance of these systems required to help build the resilience of marginalised populations.

The main objective of the research undertaken through this project was to generate knowledge on climate related hazards in the Indus Basin in Pakistan and their impact on marginalised communities, along with the factors that enable their recovery following the floods. Specific causes for their vulnerability were diagnosed and strategies to build resilience were identified.

We hypothesised that **resilience (including food security) is negatively affected where core gateway systems¹ are fragile and subject to failure and where populations are socially or economically marginalized.** This framework was developed by the ISET network based on past work in India, Nepal and Pakistan. The study used a quasi-experimental approach to look at resilience of households and communities through observing their ability to recover from the shock of the 2010 Flood. The observations from recovery were used to validate the conceptual framework developed by the Institute for Social and Environmental Transition (2008), which identifies access of core gateway services as a main contributor to adaptive capacity among vulnerable populations exposed to a changing climate.

As the title suggests, this project scoped the essential issues that need further research to be able to identify strategies that would reduce the vulnerability of populations exposed to climate-related risks. This report and detailed appendices summarise the major findings of this exploration.

¹ See ISET, 2008 where the adaptation framework defines core (such as ecosystem: water, air, land) and gateway systems (such as communication, financial, social services etc.), the role of institutions, organization and networks, governance and that of social protection.

The project produced the following four distinct outputs that are accompanied as appendices to the report:

1. **Report on Findings from the Field** (Analysis of field data and four district reports) Developed as potential for a peer-review paper and addresses the original Output 2 in the project proposal. It provides empirical links between basic services (such as improved basic health, credit and communication) and the resilience of communities through an innovative quasi-experimental research design that uses recovery from floods as an indicator of resilience. The results have far reaching implications for adaptation strategies for future climate-related disasters in developing countries. Recovery rates show very strong correlation with certain gateway services. Some services appear to be crucial across different regions whereas others vary.
2. Khan, F.A. and Salman, A. 2012, A Simple Human Vulnerability Index To Climate Change Hazards For Pakistan, International Journal of Disaster Risk Science, September 2012, Volume 3, Issue 3, pp 163-176. **Published (peer-reviewed) paper** and also a MPhil. thesis paper that earned a distinction from, Quaid-i-Azam University, Pakistan. The paper shows that universal indices for vulnerability are not very useful for comparing different social and geographic conditions along the Indus River. This resonates with the results seen in the research mentioned above.
3. **Exploring Demographic Dimensions Of Flood Vulnerability In Rural Charsadda, Pakistan.** A

Master's Thesis that earned a distinction from SOAS, University of London. Proposed to be extended to all four sites for this project and published as a peer-reviewed paper. This research has definitive results in terms of effectively targeting the most vulnerable in natural disasters by using readily available demographic data and focusing on gender related demographic criteria. The gender ratio has the strongest correlation with recovery rates across a variety of demographic indicators. These results are similar to those focussed on services. A high correlation between gender and access may explain these results.

4. **Report on Desk Study:** A comprehensive compilation and meta-analysis of all reports and evaluations produced by Government, Donors and Civil Society (including media) on the recovery effort after floods 2010, with special emphasis on the institutional issues in the recovery process. It also includes an analysis of formal literature on the topic and financial analysis of the recovery and reconstruction efforts.

Besides the above outputs, ISET – Pakistan was established as a functional research organisation with local capacities. Staff from the participating organisation gained technical capacity in both formal education through higher degrees and through on-the-job training in conducting both qualitative and quantitative research.

KEYWORDS:

Resilience, Climate Change, Disaster Risk Management, Development, Adaptation, Pakistan

THE RESEARCH PROBLEM

The impacts of the 2010 Indus floods in Pakistan represent a fundamental challenge that traverses all aspects of life in the country. From livelihoods of rural populations to food supply for urban areas, the core gateway transport, communication, energy, health, water control and institutional systems, upon which populations depend, failed during the floods. The floods had immediate consequences for people across all levels of society in Pakistan but the impact on the poor and marginal populations was both severe and direct.

Prior research on hazards in Pakistan has demonstrated that vulnerability to hazards is constructed along class and gender inequalities and is embedded in everyday geographies of access to resources, state policies and social power (Halvorson, 2002, 2003). After the public outcry in the aftermath of the 1973 floods, the government reworked policy from risk acceptance to risk control, primarily through engineered flood protection infrastructure (Mustafa and Wescoat, 1997). But infrastructure engineering and relief-oriented flood policy reflects little understanding of or sensitivity to issues of social vulnerability. This policy is further complicated by the impending uncertainty that climate change will bring.

Research is required in order to shift the current policy on risk control toward approaches that both reflect patterns of social vulnerability and incorporate the implications of climate change. Such research must focus on both the social aspects and the political economy of floods in the Indus Basin and must address factors beyond the sphere of flood control and risk management per se. In most situations, available research focuses

directly on the impacts of flooding and the proximate factors (such as early warning or control structure designs) that influence them. Very little research focuses on the underlying conditions that influence vulnerability and the ability to recover from flood events. Bouncing back intuitively requires access to basic resources, the ability to communicate, access food, water, transport, finances but the role these key services play is both poorly understood and documented. There is a massive knowledge gap on the performance of these systems required to help build the resilience of marginalised populations. Within this larger reality lie questions of access to services and the resilience of the systems themselves to floods or droughts. Attention needs to be given to how marginalised groups in the population are threatened by major flood events and how floods affect their access to gateway services such as land, water, communication, energy, and the other systems that should, intuitively, enable recovery.

A large part of this question is to better understand the factors that make people initially vulnerable to such events and then provide insights on how one could plan in advance or rebuild in a way that those vulnerabilities are minimised. Knowledge generated on the causes of differentiated impacts on different population groups would have been beneficial to the one of the largest recovery efforts in Pakistan's history and could still benefit other climate-related disasters elsewhere. The core challenge is thus to diagnose the role access to basic systems plays in the resilience of people and their ability to recover following a disaster. If this can be diagnosed, it can play a critical and valuable role in both post-disaster reconstruction and development activities.

OBJECTIVES

The main objective of this project's research was to generate knowledge on climate-related hazards in the Indus Basin in Pakistan and their impact on marginalised communities, along with the factors enabling recovery following the floods. This would in turn mean that the specific causes for their vulnerability could be diagnosed and that strategies to build resilience could be developed.

The core activities articulated in the original proposal for the research were as follows:

- To understand the impact and issues in recovery and reconstruction through a rapid synthesis of various situational reports, real time evaluations and other material (newspaper articles, etc.) post floods.
- To map the relief effort in terms of key actors and institutions in post-Indus floods (who is doing what, where, with what resources and capacities).
- To inform the government's proposed Build Back Better program with knowledge generated through secondary data analysis of ISET's work in the region and globally.
- To understand what happened and why it happened along a transect in the Indus Basin with key stakeholders facilitated by RSPN and other local organisations in Pakistan.
- To help establish ISET-Pakistan as a formal link with international ISET partners and facilitate strategic regional learning alliances and policy dialogues, particularly across Trans-boundary Rivers.

The project was designed and undertaken immediately following the major floods in Pakistan in 2010. It was intended to document the factors that contributed to vulnerability and early recovery from the floods in ways that could reduce future vulnerability. Over the period of the project, however, there was a radical shift in institutional responses to disaster recovery and dramatic restructuring of the Government through 18th Amendment to the Constitution (explained in desk study mentioned below.) Since the uptake of rapid lessons was not possible through the disparate delivery mechanism that resulted from this unplanned devolution, research outputs and peer-reviewed papers for wider dissemination were given preference. The desk study was conducted and serves more as a record for documenting the recovery effort and lessons for future disasters. However, in the field research three strands of work were undertaken to optimise the learning opportunity from the event and to build capacity among the ISET Pakistan staff and partners to undertake independent research on climate-related disasters.

THEORETICAL FRAMEWORK

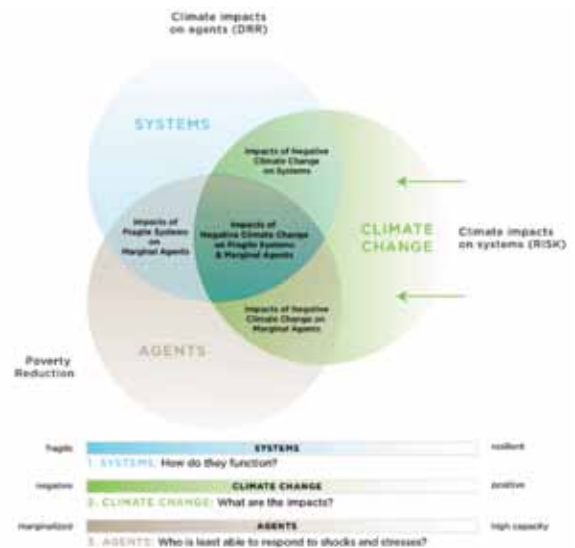
In both the flood and drought cases, we hypothesise that **resilience (including food security) is negatively affected where core gateway systems² are fragile and subject to failure, and where populations are socially or economically marginalized.** This framework was developed by the ISET network based on past work in India, Nepal and Pakistan. Under this framework, social and economic marginalisation is hypothesised as the primary factor limiting both access to and the ability to use and obtain benefits from gateway systems. As a result, insecurity during flood or drought events is likely to be highest where fragile systems and marginal populations overlap. This intersection makes those affected more vulnerable. Resilience, the reverse of vulnerability, will be highest where gateway systems are flood and drought-adapted and where access to benefits that population gains from these systems is not constrained by social marginality.³ This is illustrated in Figure 1 below.

In development parlance, systems and agents support livelihoods and weakness in either of these two causes poverty. People that lack basic services, such as health, education and water, are less developed and considered poor. Hence, the goal of development is not just to reduce income poverty but also to improve access to basic services. This paradigm shift was manifested in the Millennium Development Goals. Similarly, disasters disrupt livelihoods and various risk reduction measures have been sought to either minimise these risks or reduce exposure. Climate change is an additional stressor to livelihoods of the underdeveloped or poor. Impacts of climate change are likely to further increase the livelihood disruption and reduce the availability of services, especially where systems are weak and

those accessing them are already poor and, hence most vulnerable.

Using systems as a basis for analysis allows us to identify causes of vulnerability, where vulnerability is treated as a symptom of exogenous factors rather than trying to define it as a state in itself. Defining vulnerability in terms of inherent conditions becomes very problematic because some of the critical factors, such as gender, age and ethnicity, are not attributes that can be altered. Therefore, it is very hard to find resilient pathways for reconstruction or development when systems that support livelihoods and access to these systems are not differentiated from the other factors that contribute to vulnerability or resilience.

Figure 1
Systems, Agents and Climate Change



2 See ISET, 2008 where the adaptation framework defines core (such as ecosystem: water, air, land) and gateway systems (such as communication, financial, social services etc.), the role of institutions, organization and networks, governance and that of social protection.

3 This is very similar to the argument Sen made in relation to floods and food security in Bangladesh.

This research, therefore, concentrates on critical gateway systems to evaluate what contribution these systems that are exogenous to persons and households may have on building adaptive capacity among those at risk (or those who suffered from the Indus Floods.) ISET's previous work on adaptive capacity and resilience already indicates that certain critical services play a role in a population's ability to shift livelihood strategies

and develop resilience. These empirical observations are found in much of ISET's previous work and this particular research aims to quantitatively establish these links and test the theoretical framework. The Indus Floods allowed us to systematically test this framework in different social and geographic conditions and give us an even deeper understanding of what services are critical and under what conditions.



METHODOLOGY

The methodologies used under this project ranged from desk research, to primary and secondary methods for data collection in the field. Detailed surveys on systems and recovery were undertaken at four sites along a transect down the Indus River. Under this framework, we hypothesise that resilience (including food security) is negatively affected where core gateway systems⁴ are fragile and subject to failure, and where populations are socially or economically marginalized.

Although full testing of the framework and the above hypothesis was not possible within the scope of the research under this project, we decided that the flood provided an opportunity to objectively test factors contributing to relative resilience through differentiation between the recovery rates of households and communities. As a subset of our larger general hypothesis, we propose that access to modernised gateway systems before the flood should correlate with recovery rates. We could test this by statistically examining whether or not differential recovery rates correlated with quantifiably verifiable measures of system access. These factors included access to a range of services before floods, the duration of access, and also other factors, such as the demographic composition of households and communities.

This methodological approach represented a shift away from more qualitative techniques designed to evaluate resilience. In prior projects, we had worked on vulnerability assessment using a sophisticated and nuanced methodological approach (Mustafa et al., 2011) but were limited to a very rudimentary quantitative analysis under it. Application of this approach involved

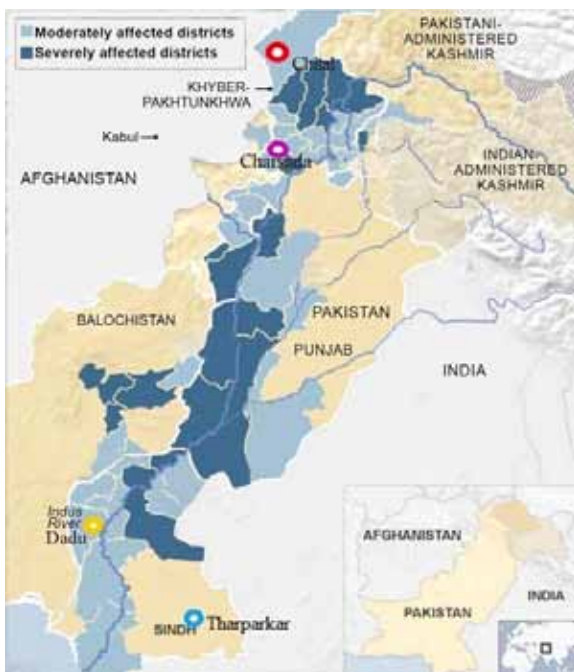
the generation of a vulnerability index by assigning values to complex abstract constructs, such as social networks and services. This was prone to subjectivity in assigning values and weights to different factors that contribute to vulnerability. It also precluded testing the validity of our hypothesis because vulnerability was not objectively observed but rather predicated by characteristics that had already been defined. Testing for their contribution (or even correlation) to vulnerability was, as a result, a moot point. In addition, because the approach relied on social characteristics, using the same index or value scales across different geographic and social settings was also a challenge because complex social constructs are very contextual.

We also considered using other approaches to quantitative analysis. There have, for example, been attempts to undertake very sophisticated quantitative analysis of adaptive capacity such as that by Di Falco (Di Falco, 2011). We decided, however, that this would not really contribute to testing of this project's core hypothesis. Although the statistical methods are extremely objective in their analysis, their rigorous application usually necessitates over simplification of the concepts of adaptation and resilience. For example, in this case populations are classified as adapters and non-adapters, which is theoretically very naïve. Moreover, determination that a single factor contributes to adaptive capacity requires a massive sample size and time series of data, which was not possible within the scale of our research project. Also, the statistical methods used for such research need expert application, and cannot be readily used by local researchers.

⁴ See ISET, 2008 where the adaptation framework defines core (such as ecosystem: water, air, land) and gateway systems (such as communication, financial, social services etc.), the role of institutions, organization and networks, governance and that of social protection.

Therefore, our approach had to be objective, but not overly simplistic. The floods provided us an opportunity to design a quasi-experimental methodology where the impact and recovery from floods was measured against factors (treatments) we had hypothesised to be contributing to adaptive capacity and resilience. These treatments were directly measurable (through surveys) through access to key services—roads, communication systems, health services, education, etc. There was also an observational aspect to the approach that was based on very objective criteria related to the recovery rate. Simpler statistical methods, i.e. non-parametric tests such as Chi Square (Mann-Whitney U), and probabilistic methods, such as Fisher Exact tests, were used to draw results from smaller samples that were not normally distributed. To minimize the sample size, we used qualitative analysis (shared learning dialogues) to identify the households that recovered the fastest and those who did not (tails of the distribution in the population) and drew comparisons between factors such as access and duration of use of services prior

Figure 2
Geographical location of selected districts



to the floods. These were then objectively verified through a quantitative recovery index to ensure validity. The mixed method reduced the sample size and also provided qualitative information on the recovery, hazard, livelihoods and other aspects of communities in various geographic and social settings. It allowed us to test whether or not access to key services prior to the flood contributed to post-flood recovery. It did not, however, allow us to test whether or not the resilience of such systems (e.g. the continued functioning and rapid recovery of the systems themselves) contributed to resilience of the flood-affected populations.

Site and Sample Selection

To incorporate a large geographical variation along the Indus transect, the study sample includes the following areas (Figure below):

- High mountains (Chitral district);
- Indus-Kabul confluence and piedmont (Charsada district);
- Plains (Dadu district);
- Desert/coastal (Tharparkar district).

These areas represent the major physical features of the Indus River Basin. They include the upper reaches, where glacial melt feeds the river, the piedmont, the plains, and the desert. In addition, they also cover a wide social and political spectrum in Pakistan and were severely affected by the 2010 floods. In each selected district, at least two 'most affected' villages were chosen and within each, a minimum of 30 households was surveyed. As a preliminary exercise, an index was created that used census data to identify villages that had relatively lesser access and use of basic services (see Khan and Salman, 2012). This was done so that we targeted relatively less developed areas and also to make sure that service differentials existed in the study areas. The field teams in each district were asked to choose areas that were severely affected by floods and had similar exposure to make comparisons possible.

Qualitative Methods

The qualitative part of the study was conducted through a shared learning process that employed participatory tools. Field teams jointly developed the process and tools in a three-day workshop. Table 1 below shows the type of data collected and the tools that were used. All the teams were present in the workshop and then acted as

the master trainers for field staff at the specific sites. This exercise allowed us to document the local geographic and livelihoods system context. It also highlighted the climate-related hazards that are expected to impact livelihoods adversely.

Table 1: **Qualitative Data Collection Tools**

Pre-Steps (Revenue village level)	Comparison between most vulnerable and resilient groups (gender segregated)			
	Hazard	Livelihood	Availability and Access to Services	Social Networks
<ul style="list-style-type: none"> • Identification, Selection of UCs & Villages • Initial Contact– (Community Activists) • Transect Walk <ul style="list-style-type: none"> ▪ System/Services ▪ Vulnerability of services • Basic Information • Mapping <ul style="list-style-type: none"> ▪ Natural Resources/ boundaries • Hazard Mapping • Timelines (event/impacts) <p>Selection of communities that are resilient and vulnerable (with similar exposure to hazard)</p>	<p>Ranking;</p> <p>Responses;</p> <p>Proposed Solutions/ Ranking;</p> <p>Institutional options.</p>	<p>Diagrams: (livelihood Sources);</p> <p>Calendars (Seasonal, agricultural etc.);</p> <p>Daily Gender Workload Charts;</p> <p>Decision Making Matrix.</p>	<p>Listing of services/ timeline;</p> <p>Decision Making Matrix;</p> <p>Mobility matrix (internal and external).</p>	<p>Narrative;</p> <p>Matrix of Institutional Mapping (organization, community, network, linkages etc.);</p> <p>Political affiliation;</p>

Quantitative

In the shared learning process the teams asked the community to jointly identify households that were recovering well and those that were relatively slow in recovery. In each village, at least 15 households were identified in each category. In some places it was not

possible to have the requisite number of households so additional/neighbouring villages were included. A total of 235 households were surveyed in all four districts using purposive sampling criteria.

Table 2: **Summary profile of the sample households**

District/villages	Sample Households (no.)	Total Population	Household Size	Male: Female Ratio %	Adults per House Hold
Chitral	60	415	6.9	105.4	4.9
Gouch	15	108	7.2	111.8	4.6
Madaklasht	15	85	5.7	80.9	4.4
Rambur	15	120	8.0	126.4	6.0
Sheikhandeh	15	102	6.8	100.0	4.7
Charsadda	56	344	6.1	112.3	4.4
Agra	26	176	6.8	104.7	4.8
Kharkai	30	168	5.6	121.1	4.1
Dadu	69	506	7.3	121.9	5.1
Luqman Shahani	28	206	7.4	114.6	5.3
Saeed Khan Shhahani	17	118	6.9	140.8	4.3
Seelaro	24	182	7.6	119.3	5.5
Tharparkar	50	386	7.7	115.6	4.8
Bhakuo	30	214	7.1	137.8	4.8
Haryar	20	172	8.6	93.3	4.8
Grand Total	235	1651	7.0	114.1	4.8

Recovery Index

In order to quantify recovery, our survey data was used to create an index to measure the material recovery of the surveyed households (see Appendix 2). We used the housing damage data as a measure for material recovery, in terms of how much of the housing assets were rebuilt, though the following formula:

$$\text{Recovery rate (RR)} = \frac{\text{Recovery (or increase) of assets after the flood}}{\text{Damage to assets due to floods}}$$

$$\text{RR (\%)} = \frac{(Ac - Aa)}{(Ab - Aa)} \times 100\%$$

where;

Aa= Assets after the flood

Ab= Assets before the flood

Ac= Current Assets

Among assets owned by families, housing structure is by far the most expensive and accounts for majority of the material assets. Housing damage data is also readily available and easily verifiable, and therefore the housing structure was used as the proxy for material recovery. Moreover, since the research took place in a data scarce environment, recall data had to be used, in which case housing structure damage and recovery was most likely to be remembered accurately. In Mithi District, where houses are made of mud, a locally available natural material, most houses had been reconstructed by the time the villages were surveyed. In that case, the recovery rate was measured by the date of reconstruction⁵.

The recovery rate was used to triangulate the information given in the qualitative shared learning dialogues. The index was applied to the well-recovered and lesser-recovered groups of households. There were a number of households that had to be eliminated from the sample because they did not meet the housing recovery criteria. Households with minimal damages to the housing structures were also eliminated to keep rigor in the sampling criteria. Statistical testing was also conducted to ensure that the extent of damage to the housing structure was not affecting recovery rates and we found no significant correlation between the extent of damages and recovery rate in all locations (10) except one, namely Kharkai in Charsadda.

As the recovery index measures recovery in relation to the original asset base, it is not biased by the absolute value of the assets. Therefore, the recovery index does not differentiate on the basis of absolute wealth. Poverty measurement and reduction is a topic that is of much importance and needs research on its own merit.

Logistic regressions were also used on the above data sets to see if the findings from the recovery indices corroborated a vulnerability index constructed from readily available census data. The result of the analysis were limited by the representation of the Indus Basin through our data set, however, some of the findings regarding use of standardized vulnerability indices were indeed revealing as discussed in Khan and Salman (2012). Detailed descriptions of methodologies used are described in the Appendices and mentioned in the outputs sections below.

⁵ The data showed that houses were rebuilt after harvests so they could be easily grouped by harvests after which they were built.

Table 3: House Structure Damage Recovery Status In The Sample Households (Hh) As Of September 2011

District/Village	Total HH Surveyed	Number of HHs damaged	House structure damage recovery rate %				
			No recovery	1 to 50	51 - 75	75-100	>100
Charsadda	56	51	27.5	21.6	-	49.0	2.0
Agra Payan	26	21	33.3	9.5	-	57.1	-
Kharakay	30	30	23.3	30.0	-	43.3	3.3
Chitral	60	27	33.3	7.4	3.7	55.6	-
Gouch	15	8	50.0	12.5	-	37.5	-
Madaklasht	15	15	26.7	6.7	6.7	60.0	-
Rambur	15	4	25.0	-	-	75.0	-
Sheikhhandeh	15	-	-	-	-	-	-
Dadu	69	68	1.5	17.6	8.8	67.6	4.4
Luqman Shahani	28	28	3.6	14.3	7.1	64.3	10.7
Saeed Khan Shhahani	17	16	-	6.3	-	93.8	-
Seelaro	24	24	-	29.2	16.7	54.2	-
Tharparkar	50	50	-	-	-	100.0	-
Bhakuo	30	30	-	-	-	100.0	-
Haryar	20	20	-	-	-	100.0	-
Grand Total	235	196	12.2	12.8	3.6	69.4	2.0

Source: Project survey



PROJECT ACTIVITIES

The project funds were used to carry out the mentioned research. As budgeted, Rural Support Programmes Network, and its member Rural Support Networks carried out the field research. The staff of ISET Pakistan supported the teams. Researchers from both ISET-PK and ISET-International contributed to the research and also helped build capacity among the Pakistan team to manage research at a larger scale. All of the activities budgeted under the project were used to produce the research outputs described in the next section. Specific activities supported under the project included:

1. Desk-based research to find relevant literature and secondary data;
2. Training and capacity building workshops for field partners (the rural support networks);
3. Field surveys by the rural support networks with extensive technical support from ISET;
4. Joint analysis of the data collected through literature, secondary data and field surveys by the field partners and ISET staff. Workshops for data analysis were also used as opportunities to enhance field partner capacities;
5. Policy analysis and government engagement through extensive 1-1 and small group meetings by ISET staff with key government officials
6. Dissemination of results through a major national workshop
7. Production by ISET staff of the core reports and other products of the project as listed below under outputs.

In addition, the capacity building of core staff of ISET in Pakistan was supported by trainings provided by ISET's international staff through meetings in Boulder and participation in the intensive writing workshop in Hua Hin (2012). ISET-International administrative staff also spent extensive time training staff in Pakistan through remote means.

Research in disaster struck areas is very sensitive. For example, one of our initial partners parted ways with the project because of subsequent floods (2011 and 2012) in the lower areas of Indus plain. This led to changing of partners in the field and further need for training of staff from the new partner. The delays caused by this led to an application for extension, which was kindly granted. The process of training and backstopping of these partners, however, took longer than expected and led further funding overruns that ISET has fully absorbed.

In addition to the substantial challenges and need for flexibility in working with partners elements of the project, specifically the registration of ISET-Pakistan as an independent organization were delayed by the slow processes required to move approvals through the government bureaucracy. In both the research itself and the registration process, the project depended on factors beyond its direct control. As a result, a key learning from the project is the critical importance of: (1) allowing substantial time and flexibility in project budgeting, scheduling and targeting to account for factors that are difficult to predict in advance and beyond the direct control of the project; and (2) responding quickly and flexibility to adjust project characteristics when such events occur. This is particularly true in contexts, such as those following disasters, where organizations face many demands on their time and focus.

Beyond the research and registration process itself, the project team learned the critical importance of establishing efficient but highly flexible administrative and financial support systems to support the research process. ISET as a whole went through a major process of growth during the period when this project took place and needed to replace the existing systems (which had served very well in the past) with systems capable of handling a much larger scale of research. Key elements

in the design of these systems (particularly related to enabling project managers to have real-time access to work planning and budget status information and the need for systems that can automatically produce reports according to the very different requirements of different donors) were learned on the basis of operational challenges faced by the project and ISET's administrative group during the project. Systems capable of addressing

the administrative and management challenges faced in the project have now been designed and are in place for ISET as a whole.

Despite the challenges on management side the research was carried out and following are the unique findings for each of the outputs under this research project.



Report on Desk Study

The literature review provided valuable insight into the mechanisms, approaches and processes—or lack thereof—at play in a massive humanitarian disaster. By tracking the public discourse, backing it up with solid data, and engaging with key stakeholders bi-laterally around controversial issues prior to more public discussion, we were able to present a strong summary of key issues and policy changes needed in Pakistan and obtain broad stakeholder agreement to those needs. These are presented below.

The meta-analysis and financing reviews were not as illuminating as we had hoped due to lack of material and inconsistencies in published financial figures. Nonetheless, the broad conclusions we have been able to draw do provide insight into oversights, gaps, and omissions in both the academic analysis and thinking around the 2010 floods and the policy response to flooding in Pakistan. This information can be used to provide clear starting points for further analysis.

Core Recommendations from the Desk Review and Lessons Sharing Workshop

1. Given the limited capacity of 3–4 days of early warning, Pakistan Meteorological Department (PMD) needs to enhance its capacity to generate reliable and timely weather predictions considering climate change factors. Investments have to be made to expand the limited resources and infrastructure of the Met Department. Besides prediction capacity, communication of the early warnings to end-users needs to be focused, i.e. the people through the cell phone networks may be more effective (Oxfam, 2011; Federal Flood Inquiry Commission, 2011; NDMA, 2011).
2. Road-network and highways and other physical infrastructure should be designed with provision of culverts and escape channels that can drain floodwater sufficiently so that they do not exacerbate the situation by standing floodwater. The National Highway Authority and the Federal Flood Commission, has been ordered by the Judicial Flood Commission to carry out a country-wide survey of the road-network vulnerable to floods should come up with designed capacity of flood prone sections based on last historical flood such as in 2010. The communities living around these structures should also be consulted over the drainage needs. (Federal Flood Inquiry Commission, 2011).
3. Hundreds of planned and spontaneous breaches occurred during the 2010 floods owing to a host of factors, which include among others lack of pre-flood poor maintenance and years of negligence by the Provincial Irrigation Departments. Massive encroachment and development within the floodplain that blocked natural flows of floodwater was caused by oversight in implementation of flood regulations. (Federal Flood Inquiry Commission, 2011).
4. Thousands of acres of land have been brought under cultivation by raising private embankments. Hundreds of industrial units were established, thousands of humans settled in areas located within the floodplain mostly inhabited by the poor. These need to be vacated and removed as ordered by the Judicial Flood Commission. For landless poor living in the floodplain, an arrangement/system may be devised whereby these rural poor can use the floodplain during the non-flood period.
5. Predominant discourse during the 2010 floods, like every major flood, has been for the most part to have more dams to avert floods. Dams, in general, do well with floods of low and moderate level though they cause aggradations over time and deplete riverbeds. For large floods dams are ineffective. Apart from non-structural measures, open basin management gaining currency within flood management regimes also deserves the attention of flood managers in Pakistan.
6. Conflicting findings such as Karakoram anomaly or decreasing of temperature during monsoon have made the impact of climate change in the Upper Indus and associated flows downstream very

uncertain. Given the unavailability of long-term quality data that can support the reliable modeling and validation coupled with challenging topography has made climate analyses difficult. Longer-term research is required to determine the impact of climate change in Upper Indus (ICIMOD, 2009).

7. Hydrolic structures in Indus basin cater to a North-South flow of water. Current floods show that both seawater surges and flash floods that come laterally due to high rainfall in dry areas, or once the water from the Indus channel flowed out due to breaches or overtopping, is not able to return to channel. The flooding is exacerbated by the current irrigation and drainage structures in the deltaic plain. These need urgent attention for rectification and redesign the drainage system to cater to lateral flows (SLD DRR/NDMA, 2011.)
8. The protection of hydraulic infrastructure is a priority for flood managers, and because of this, planned breaches are carried out in order to save these structures by inundating the surrounding areas. To protect those whose lands get inundated or house damaged, they should be compensated fully for their losses. The compensation plan should be linked to the breaching protocols for the flood control agencies.
9. Floods are not all about destruction. Floods are a boon for ecosystems, as they replenish wetlands, recharge groundwater, provide fertility to the topsoil, and wash out various viruses and harmful insects, etc. The perception about floods needs to change and the benefits of floods should also be highlighted.
10. Majority of people living in flood-affected areas are poor with no legal ownership of land. Ownership of land is critical for livelihood and shelter. The issue of landlessness came out very strongly during the 2010 floods and it is recommended that landless households be given land titles from the state as it would build resilience and reduce poverty. The Government of Sindh's ongoing initiative of land distribution to landless peasants particularly women-headed households may serve as a model (World Bank & ADB, 2010; Oxfam, 2011; UNDP, 2011; various newspapers).
11. Local government institutions played a key role in disaster management in the earthquake of 2005. The local governments with adequate legal and financial powers, which they were entitled to, under the abolished Local Government Ordinance 2002 to deal with disaster risks and emergencies will result in a much more effectively managed response (Federal Flood Inquiry Commission, 2011; Oxfam, 2011).
12. Given the limited capacity of the state and non-state actors to deal with flood disaster on the scale similar to 2010, and the fact that people were the first responders, local level disaster management capacity building is critical for initial response. Community based disaster risk management interventions with the communities located in hazard prone areas would be very useful in disaster risk reduction (UNDP, 2011; Oxfam, 2011; NDMA, 2011).
13. The existing parallel structures and overlapping mandates to deal with disasters coupled with various constitutional modifications has further complicated the disaster management system in Pakistan. Establishment of the Ministry of Climate Change is a welcome step with the NDMA and GCISC is attached to it. The Pakistan Meteorological Department (PMD), Emergency Relief Cell, Earthquake Reconstruction Recovery Authority (ERRA) Civil Defense and other such relevant entities have been merged into it for better coordination and effective management. Such steps are also required at the provincial and regional level where similar structures and entities exist and could be brought under Provincial Disaster Management Authority (NDMA, 2011; Oxfam, 2011).
14. In the overall context of aid effectiveness, the issue of value for money transparency and accountability of some UN agencies and the INGOs was questioned by the government, donors and the civil society. The UN and international NGOs, as well as other humanitarian actors should make their operations more transparent and cost effective. Besides the UN, as per the Paris Declaration norms should not overstep its mandate and be accountable to the government and follow its priorities (NDMA, 2011).

15. Given the limited capacity to manage disaster at the scale of the 2010 floods, across the board there is a dire need to review and restructure systems and mode of operations by the government, the UN, INGOs and other humanitarian actors. The areas that need to be reviewed for improvement include data gathering and its integration coordination mechanisms, prioritization of response, targeting availability of funds on fast track basis and its efficient utilization. The NDMA and its provincial counterparts, PDMA, lack critical human and financial resources to work effectively. This must be addressed on an urgent basis to deal with future disasters (NDMA, 2011; Oxfam, 2011).
16. Baseline surveys and allied assessments are crucial for decision making in order to keep timeliness in disaster situations. Data gathering, data management and data sharing remained a problem during the 2010 floods. This has to be looked at critically in order to modify instruments and put in place responsive systems to effectively collect, collate, analyze and integrate data for programming and decision-making. There was general dearth of gender specific data, and disaggregated data related to gender was hard to come by during the 2010 floods. This made it impossible to measure the impact on women and its analyses, as well as how their special needs were addressed. While revamping the data management systems mechanism has to be worked out to ensure that the gender disaggregated data is made available at all stages of response (NDMA, 2011).
17. Mainly concentrated in the north of Pakistan, the humanitarian community donors and INGO realized that there are areas in Pakistan that need support other than the north or northwest. Given the marginalization, poverty and other deprivations prevalent in southern Punjab, Sindh and Baluchistan, the international community should continue their interventions on a long-term basis in these areas.
18. For reconstruction interventions the government, given the financial crunch, chose the least costly option, which is 'build as before'. Even so, the government can build smartly by efficiently utilizing the resources as well as through intensive monitoring.
19. The cluster system adopted by the UN was cumbersome and, therefore, not effective. In the case of the 2010 floods, rolling out of life saving sectors might have been more effective rather than working in all eleven clusters. The ways in which a cluster approach will work effectively in large scale disasters should be reviewed for future needs. (NDMA, 2011).
20. A Single Reporting Format (SRF), an online self-reporting system, was a good initiative meant to give an overview of humanitarian activities in terms of who is doing what and where for tracking of funds and planning. It remained a non-starter as not all stakeholders reported on it until it was made a mandatory reporting requirement before all stakeholders abandoned it. The SRF could be an effective tool if reporting on it is made mandatory. Hence it should be owned by the government and the UN and be revived for future use as a mandatory requirement (NDMA, 2011; UN, 2010.)
21. The Citizen Damage Compensation Programme (aka the watan card scheme) was a success in terms of providing much needed cash to flood affected households in order to meet their immediate needs. Speedy redressal mechanisms and fast tracking processes can make it more effective and transparent for future cash transfer programmes (IOM, 2011; NDMA, 2011; Oxfam, 2011)
22. Social protection programs, such as the Benazir Income Support Program (BISP) or watan cards, can play an important role in building resilience against climate change. Realigning these towards climate related vulnerability could bring huge returns in resilience building. The families that received compensations as part of the watan card were able to restore their livelihoods faster than those who did not have access to social protection programs for various reasons.
23. The Government contributed significantly in both cash and kind towards the relief recovery and reconstruction. Various public sector organizations at the federal, provincial, and district level spent

on the response by utilizing existing budgets or re-directing funds from different heads. The federal government made specific allocations as well. However, there is no system available to track them and to know where they were spent in terms of sector area or expenditure.

24. The agri-inputs support package was also a success and a positive intervention. Supply of certified seeds and fertilizers provided to small farmers enabled them to cultivate their lands for the next crop. Compound feeds provided for animals in flood affected areas had similar impact. Such interventions could help with fast recovery for farmers if these are implemented with proper targeting, clear eligibility criteria and efficient distribution (NDMA, 2011).
25. As the water started to recede, spontaneous recovery interventions by the affected families, philanthropists, foreign governments, INGOs, and local organizations began. The formal early recovery processes was delayed considerably and missed out most of the targets and became irrelevant in many cases. For disaster of this scale and scope, relief and recovery interventions should be planned and implemented simultaneously (NDMA, 2011).
26. So that housing recovery interventions are compatible and cost-efficient in terms of design and flood resistance, the federal, provincial and district level entities should provide monitoring mechanisms and direction to actors involved in housing sector at the early recovery stage (Oxfam, 2011).
27. The transparency and accountability mechanisms designed for the reconstruction phase included over-sight council and third party evaluations. Web-portal on reconstruction interventions became defunct or remained deactivated. This raises questions regarding the progress and impact of reconstruction interventions. This needs to be rectified as reconstruction is ongoing and will take years to complete (Oxfam, 2011).

Report on Findings from the Field – Role of Access to Basic Services in Resilience

From this part of the primary research we can see that there is a clear correlation between both access and duration of usage, and the rate of recovery measured through housing assets. Critical gateway services for each area are dependent on geographic and social conditions and the level of development in the area. Some general conclusions can, however, be drawn. The areas chosen for this study are mostly rural communities, the majority of which derive their livelihoods from natural resources and have access to a very low level of social sector services and hence, a few basic services tend to be showing the difference between those who managed to recover faster than those who did not. The summary results for different services are outlined below.

Electricity

Where there is no universal coverage, access to electricity was a major difference between those who recovered faster and those who did not. Electricity opens doors to many other services especially communications etc., elongates the workday and can have indirect effects like improving girls enrollment in schools. Public sector professionals are also more likely to serve in areas with electricity and do not like to be posted in areas where electricity is not available. Therefore, availability of electricity increases the availability of services that in the long run helps communities diversify livelihoods through skill enhancement, knowledge and the ability to communicate as we saw in Chitral, where people used seasonal migration as a strategy for reducing reliance on the forest. Supply of electricity had a similar effect in Tharparkar, which is a desert. Dadu and Charsadda district also had a higher number of well-recovered households having access to electricity.

Water

Improved drinking water was a critical service in Dadu where people depend on poor quality surface water. This water is usually taken from irrigation watercourses and is not healthy. Households with access to hand-pumps and “sweet” ground water tended to recover faster. Such interventions could be useful for most of the Southern Punjab and Sindh where the poorest people in Pakistan live and where floods contaminate surface water supplies. In Chitral, however, where the surface water is of high quality, a piped water scheme did not seem to make a difference.

Sanitation

Sanitation coverage is abysmally low in Pakistan. Where these services were used (in Charsadda and Chitral) there was a clear difference in recovery rates. In the plains, having drainage seemed to be making the difference. Although sometimes the coverage was too small for latrine usage to make statistically significant conclusions, its use was exclusive to those households that recovered well in Dadu, Charsadda and Chitral. Therefore, sanitation seems to be the most common thread among those who recovered better from floods in all geographical areas. Proper drainage along the streets was also important and where this did not exist people recovered slower and feces were seen in the streets. Where there were drains and/or streets were paved, people were less likely to defecate in public locations. Sanitation is, of course, likely to be of most importance in densely populated areas where inundation flooding occurs and results in contamination of surface water sources. It is relatively less important in areas such as Chitral or desert locations where population densities are low and the potential for contamination of drinking water sources is also low.

Health

Health was found to be important in all places and that corroborates with the water and sanitation results. People who had access to better health facilities tended to recover faster. Lady health workers seemed to be the health care providers of last resort and tended to those who could not access any other health facilities (hence

a negative relationship). Given the health care coverage that visiting health workers provide, more emphasis on training and support of LHWs may help improve the provision of health services. The NGOs clinic seemed to be providing better services than LHW and government Basic/Rural Health Units in Chitral. This may be an alternative to the formal system for improving healthcare in Pakistan.

Credit

Credit services played a key role in Charsadda, Chitral and Dadu. In Chitral, it was used to finance the trip down country for seasonal migration and consumption smoothing over winter months. Similarly, people with access to credit had better recovery in both Dadu and Charsadda. In Charsadda, it was mainly credit from shopkeepers, whereas in Dadu it was formal credit from banks. In Tharparkar, which has a very small cash based economy and works more through barter, people reported that those who could access credit bought the scarce and expensive seed after the 2011 floods. Therefore, they took advantage of the soil moisture and recovered faster. Others had to wait until the next season, when seeds were more widely available. Although in Tharparkar, we could not statistically prove this relationship due to a small sample size, but seed availability had been a well know factor in faster recovery. Di Falco (2011) through a very complex experimental design came to the conclusion that farmers in Ethiopia with access to credit were much more likely to adapt and benefit from climate change.

Mobility and Transport

In areas with a good road network, communities are able to access basic services if they have accessible mobility and transport. This may be restricted by cost as we saw in Charsadda, where only those who could afford were using it to access better services, or by social norms where female children are not allowed to attend schools that are outside the village. Both in Seelaro, Dadu and Shishikoh, Chitral communities were restricted from mobility because of the vulnerability of the roads to floods and landslides, respectively. In such cases only services that were locally available could be used. Due to the presence

of NGOs and social cohesion in Madaklasht, people were able to get these services locally but communities in Gowch and Seelaro were either not well organized or did not have alternative institutional options (Dadu) for the provision of these services. Due to the lack of access and electricity, doctors and teachers could not staff even the facilities given by the government.

A Simple Human Vulnerability Index To Climate Change Hazards For Pakistan

This article explores the spatial pattern of vulnerability to climate change hazards in Pakistan by developing a Human Vulnerability Index (HVI). For this purpose, we use Population Census 1998 and Agriculture Census 2000 data. The HVI places the 103 districts of Pakistan in rank order and looks at whether there is a correlation between human vulnerability and exposure to disaster of the districts with respect to climate change hazards such as floods. The HVI is further validated using an independent flood recovery data set (the recovery index). The study found that the HVI may be a useful tool for identifying vulnerable regions and districts for resource allocation. But the HVI is a poor tool for vulnerability assessment at community and household levels.

For this purpose, we used logistic regression analysis, which indicates that the adult literacy rate, ownership of livestock, and access to electricity are the three (out of six) key variables (that included population, type of housing and basic services such as electricity and water) that play a critical positive role in recovery after the 2010 floods. The primary data collected from households also reveal that the 2010 Pakistan floods have equally affected standing crops, livestock, and house structures. More than two-thirds of sample households had rebuilt their house structures, whereas livestock recovery was negligible since the floods. We also found that the 2010 floods affected some of the poverty regions of the country, but that there is a very weak systematic correlation between human vulnerability and disaster exposure.

The above findings mean that causes of vulnerability lie outside exposure, which is the main assumption in infrastructure based risk reduction. In addition, it proves that the same index cannot be used for different geographical and social settings. These results are in congruence with the first study, which shows that access to different services correlate with recovery in different locations. Hence creating universal vulnerability indices are not a good way of measuring or planning resilience.

Exploring Demographic Dimensions Of Flood Vulnerability In Rural Charsadda, Pakistan

This paper explores the demographic characteristics that affect flood vulnerability in rural Charsadda, Pakistan. It develops a Demographic Vulnerability Ranking (DVR) method and applies it to vulnerable households in Charsadda, in order to distinguish between the more



vulnerable and less vulnerable households. The ranking assesses household vulnerability using the demographic composition of the individuals that make the household. The method is validated against the Damage And Recovery Index, developed by the Institute for Social And Environmental Transition Pakistan (ISET-PK)(Khan and Salman, 2012), which differentiates between vulnerable and resilient households to floods, using damage and recovery data. Although, specific to Charsadda, the DVR method can be used in other locations, provided that they are geographically and culturally similar to Charsadda. The DVR examines household size, gender, adult illiteracy, age dependency and income dependency of the individuals within the household in order to assess vulnerability to floods. This study identifies gender as the most vital demographic characteristic, in households recovering from floods in Charsadda. It then follows that early relief and recovery operations for floods could focus on targeting households with a higher gender ratio in order to be most effective.

This result has a demographic variable that correlates very strongly with recovery process. Having more than one correlating variables is not necessarily contradictory and it entirely possible that access of services is heavily dependent on gender in this area and hence both results reaffirm each other. The qualitative research shows that the women were invariably constrained in mobility, decision making and hence accessing services.

Capacity Building

Capacity building activities undertaken as part of the project are listed below:

1. As mentioned before, two of the staff members from the core research team were able to get advanced academic qualification from being a part of this research. Degrees in MPhil. and MSc. were awarded to them with distinction.



2. The teams involved in field research were trained to implement complex research projects. Although they had initial difficulty, training and handholding during research built their capacity and confidence to perform independent research in the field. These teams run major disaster recovery and development projects in their respective areas and have taken on projects that provide micro-hydro electricity, biogas, basic health services in areas where these services have had a role in building adaptive capacity.
3. As a network, the office of ISET–Pakistan was established and an effort was put into building capacities to undertake research where supported. ISET–Pakistan is already working with the Climate and Development Knowledge Network on heat and shelter, and with the International Institute for Environment and Development on evaluative frameworks for measuring success of adaptation projects within Pakistan.
4. Besides aiding in the establishment of ISET–Pakistan, the project also strengthened cross learning and capacity building among ISET partners through shared work and strengthening administrative and financial systems for greater transparency and seamless functioning among partners.
5. For the ISET network as a whole, and for ISET–Pakistan once registered, key administrative and accounting systems were developed that will enable both organizations involved, and the network as a whole, to function in an efficient and accountable manner while retaining the flexibility to respond to changing conditions. These include development

of and training in work-planning systems that allow project leaders to manage time inputs and link those to budgets. They also include on-line systems for managing complex projects involving multiple documents and outputs. Key tools for efficient operation that were identified or developed during the course of the project include:

- a. An ISET-wide framework for work planning that can be tied to project and institutional budgets that are updated monthly.
- b. The “Teamwork” on-line document and project management system (www.teamwork.com).
- c. The “Harvest” system for time tracking (<https://isetinternational.harvestapp.com/account/login>).
- d. Refined and upgraded accounting software for large scale operations (ISET in Pakistan has not yet been trained on this because it can not be established until the formal registration comes through).

The capacities built above are likely to be fully sustainable and, in fact, will contribute to the sustainability of ISET in Pakistan and our partners as well. Some of the contributions to capacity (such as the degrees obtained by project members and the results of trainings for project partners) will contribute to the capacity in Pakistan regardless of whether or not ISET continues or they remain with us. Other capacities, particularly those related to administration and finance, are already contributing to the operations of the ISET network and its function as a regional research partnership.

PROJECT OUTPUTS

Over the project period, the following products have been produced. These are accompanied appendices to the final technical report:

1. Report on Findings from the Field (Analysis of field data and four district reports) Developed as potential peer-review paper and addresses the original Output 2 in the project proposal. It provides empirical links between basic services (such as improved basic health, credit and communication) with resilience of communities using innovative quasi-experimental research design using recovery from floods as an indicator of resilience. The results have far reaching implications for adaptation strategies for future climate related disasters in developing countries. Recovery rates show very strong correlation with certain gateway services. The exact services, however, differ in each region although there is some commonality. (Appendix 2)
2. Khan, F.A. and Salman, A. 2012, A Simple Human Vulnerability Index To Climate Change Hazards For Pakistan, International Journal of Disaster Risk Science, September 2012, Volume 3, Issue 3, pp 163-176. Published (peer-reviewed) paper and also a MPhil. thesis paper that earned a distinction from, Quaid-i-Azam University, Pakistan. The paper shows that universal index for vulnerability are not very useful for comparing different social and geographic conditions along the Indus river. This resonates with the importance of different services seen in the research mentioned above. (Appendix 3)
3. Exploring Demographic Dimensions Of Flood Vulnerability In Rural Charsadda, Pakistan. A Master's Thesis that earned a distinction from SOAS, University of London. Proposed to be

extended to all four project sites and published as a peer-reviewed paper. This research has definitive results in terms of effectively targeting the most vulnerable in natural disasters by using readily available demographic data and focusing on gender related criteria. Gender ratio has the strongest correlation with recovery rates among demographic indicators. These results are similar to those on services. A high correlation between gender and access could explain these results. (Appendix 4)

4. Report on Desk Study: A comprehensive compilation and meta-analysis of all reports and evaluations by Government, Donors and Civil Society (including media) on the recovery effort after floods 2010 with special emphasis on the institutional issues in the recovery process. It also includes an analysis of formal literature on the topic and financial analysis of the recovery and reconstruction effort. (Appendix 5)

The outputs from the project scope out further areas for research and also give some direction in methodologies that can be used to analyze future catastrophes. Rather than a simple damage analysis, the research provide an opportunity to identify key services in each location that strengthen resilience, and how such critical gateway services may be identified and prioritized in other locations and disasters. The overall policy finding on the importance of improving access to basic systems and reducing the fragility of those systems in disaster resilience must, thus, be nuanced by recognizing that the importance of different systems depends heavily on context—sanitation, for example, being more important in wet and humid environments where disease spreads rapidly as opposed to arid and sparsely populated zones.

Field partner organizations, as mentioned earlier, have embarked on energy, health and other basic service projects in disaster hit areas (i.e. 2011 and 2012 floods) and have prioritized community based development programs based in the finding from this research, which validates the priorities of the local population and demonstrates positive contribution to recovery from unforeseen risks.

In addition to the above core policy finding, there are some early recommendations from our field research that focus on research practice. These include:

1. The importance of mixing qualitative and quantitative tools in research processes. Qualitative processes, such as the Shared Learning Dialogues used in this project, provide critical contextual

information without which it would be impossible to interpret more quantitative data. Quantification is, however, often of equal importance in that it forces articulation of hypotheses and actual evaluation of relationships.

2. Engagement processes: As found by many other researchers, involving local actors and communities in the research process is central to their ownership of results. Engagement is, however, of particular importance in post-disaster contexts. These contexts tend to be dynamic and highly politicised. Unless research activities are undertaken in a manner that engages closely with key stakeholders, they run into substantial risks. Confused communications, misinterpreted roles, political missteps, etc., can damage not just the research itself but also the communities it seeks to assist.



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RESULTS

It would be logical to assume that these services allow people to develop adaptive capacity in terms of income diversification and changing strategies as calamities hit them. A corollary to this hypothesis would be that those who do not have these basic gateway services before the calamity have a harder time recovering. For adaptation and development planning, this has significant implications. Since most climate related hazards are unpredictable, most of the adaptation and recovery is expected to be autonomous for which the vulnerable and exposed communities need to have basic adaptive capacity to recover. Despite the record UN appeal for recovery, we see that it had a very small role in the actual recovery of most households that we surveyed and it was up to their own resilience on how fast they recovered and adapted to the new realities after the floods.

Therefore, unless they have these critical basic services available and accessible, any adaptation intervention would not be very effective. Hence, investment in these critical services as identified through our analysis for each site is essential part of adaptation planning and implementation. Also, this study shows that there is a new dimension to the tension that is found between adaptation and development activities where they go hand in hand as well as strengthen the outcomes in both development and ability to adapt to climate change. It also provides credible avenues for investment into

adaptation that has co-benefits in terms of development. In a rural agro-pastoral system, as a word of caution, one would say that not all development interventions necessarily build resilience, and that one has to be careful in identifying the critical interventions as some can be maladaptive and exacerbate the pressures that populations and the climate are putting on our ecosystems. For example, in droughts, digging deeper and pumping out water may work in recovery for the short term but may actually increase vulnerability to future events. All good adaptation strategies should reduce pressure on natural resources and possibly conserve the threatened resource.

The methods used in this study can be useful in assessing the critical gateway services for any disaster struck area and offer a useful way of utilising damage and recovery assessments for future development and resilience planning. Since the method depends on lessons from disaster recovery, its use will be limited to those areas that have recently been hit by disaster, however, we are also aware that disasters are catalysts for bringing investment into areas that are neglected in the usual development processes. Hence, this methodology can be very useful in spending the large amounts of disaster-related funding in ways that support the much-needed development and also provide a basis for building resilience in the uncertain and risk-laden future.

PROJECT OUTCOMES

The outcomes of the project are detailed in Appendix 1. Since this was a time-bound scoping study, the outcomes do not go beyond findings and knowledge generated through the initial enquiry. Given the relevance of some of the findings, it may be useful to develop some of the strands of research into peer-reviewed papers so they come in purview of the IPCC processes. Also, having them published with open access would help their uptake into climate change and disaster communities.

For policymakers and donors we need policy briefs and well laid out publications that may be more easily read and absorbed. All of this requires resources that should be sought and used for further analysis into the issues.

For the ISET network, this project was essential in proving some of the paradigms that we have developed. Links between services that are a part of development activities as well as the ability to recover faster were essential to prove, as this is where hypotheses were posited. Overall, for a relatively low level of investment we believe the research produced initial results that are of fundamental significance to building resilience for communities and marginalised people in a world where risks are multiplying. Specifically, the project is demonstrating the connection between access to basic services and the ability of populations to recover from disasters or other disruptive events. This has significant implications for basic development programs, initiatives to reduce disaster risks and initiatives to enable adaptation to climate change.



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APPENDIX 1

Questions for CCW-supported project teams:

Water quality/availability, adaptive capacity, and risk

1. Within the scope of your project activities, have there been improvements in the quality and/or availability of water, especially for vulnerable communities? Have risks or the awareness of the risks associated with climate change (e.g. flooding, drought, sea-level rise, storms, etc.) been understood or reduced? If so, please describe how.

Since this was a scoping project for future research there no interventions made on basis of the project activities, however, the knowledge level among our partners (who are development and implementation rural support programs, the largest implementation NGOs in Pakistan) has been influenced by the findings. The partners have understood that certain services in their areas of work are critical to building resilience and the ability to recover from disaster. This includes access to clean water and sanitation, particularly in the areas where inundation flooding can occur. Also they observed that some simple practices in hygiene and otherwise can go a long way in protecting water sources. For example in desert areas wells with walls around them (for protection from animals) were the ones that did not get filled with sand in the rains. Hence all new dug wells have a new wall around them.

2. Has the project put in place strategies for building adaptive capacity of people and institutions to respond to climate change? Have you observed a measurable change in the adaptive capacity of the communities or institutions associated with your project? Please describe. (*Note: Building adaptive*

capacity implies that the project has improved the ability of people (through access to resources, such as financial, human, social and natural capital) to modify practices to cope with and manage the negative impacts of climate change.)

Once again, since this was a scoping study, it did not include a major communication component focused on local populations. The partners who are participatory development organizations have, however, launched massive decentralised energy (both micro-hydel and bio-gas) projects. They have also invested in basic healthcare projects and are working towards better educational outcomes. All of these services have been shown to correlate with faster recovery from disasters. They are, as a result, now being seen as strategies to support adaptive capacity as well as basic development projects.

Has the project identified barriers that are impeding the uptake of existing technologies and strategies for improving water resources management? If so, please describe these barriers.

Gender has been one of the strongest barriers in accessing basic services in one of our sites. This is a common finding in many areas. More research is needed to identify effective avenues for overcoming gender barriers in access to services and to reducing the gender divide that creates in relation to the ability to recover from disasters and adapt to climate change.

Climate change adaptation research methods

4. Did researchers involved in the project apply relevant research methods (e.g. economic analysis, social vulnerability assessment, gender analysis, hydrological and climate modeling, etc.) to improve

water management in the context of climate change? Which methods were particularly valuable or innovative?

The study used both qualitative and quantitative methods. The use recovery index as a measure of resilience was of most importance in this case. Using this indicator we were able to correlate various factors that we hypothesised to contribute to adaptive capacity. However, the use of mixed methods that combine qualitative and quantitative techniques was essential in understanding why certain populations were more vulnerable than others on purely social aspects. Shared learning techniques were also important methodologically both for basic data collection and in order to interpret observations in relation to local contexts.

5. Were researchers involved in the project (including students) trained to use relevant methods (e.g. economic analysis, social vulnerability assessment, gender analysis, hydrological and climate modeling,

etc.) to conduct their research? How did they apply these methods? When relevant, please indicate the number of students involved in the project.

Two of the research team member got advance degrees (M.Phil and MSc.) in Environmental Economics in this project based on research in under this project. Both the dissertations secured distinction. Their reports are attached with the final technical report.

Engagement of research users and policy influence

6. How did researchers work with policy makers in the project? What worked well, and what challenges did the team encounter?

The shared learning dialogue process kept the team engaged with a diverse array of stakeholders from local communities to national level policy makers. Where issues were controversial one-on-one discussions



were essential as a precursor to more public meetings. Thereafter joint meetings were held for forming consensus among policy stakeholders on issues and their causes.

7. Did project team members improve their ability to communicate research results to diverse audiences? How?

The project team members were exposed to diverse audience but beyond this direct experience no additional skills were learnt. The shared learning process gave team members ample engage with different stakeholders – which in itself is a valuable learning experience. In addition, ISET has been investing heavily on an institutional level (beyond this project) in developing improved communication strategies. Team members were exposed to these strategies and had experience including much more visual elements in presentations policy makers and other audiences. Presentation skills were, as a result, enhanced.

8. Were any technical and/or policy options identified through the research? Have any of the technical and/or policy options developed through the project influenced policy change at the local, regional or national level?

Findings from the project were immediately taken up by the partner rural development organizations. These activities remain at regional level. Since larger dissemination activities were not supported under the scoping project budget, wider policy influence was not anticipated. The above said, however, results from the project do have significant policy implications and additional dissemination could result in significant policy impacts.

Future research plans

9. Have you or your partners been able to secure additional resources to carry out further research related to adaptation to climate change and/or water resources?

This project was already co-funded by DFID. ISET-Pakistan has already secured projects with Climate Change Development Network (CDKN) and International Institute of Environment and Development (IIED). With CDKN it is looking at costs and benefits of introducing measures to reduce heat stress and with IIED it is helping develop a bespoke evaluative framework for adaptation related programs. ISET-Pakistan is also looking at other research funding opportunities.

10. Based on your research experience, what do you feel are priority areas requiring additional research?

In our opinion more work needs to be done in understanding “why” some people are more vulnerable than others and what systemic factors make them so. Also how institutions and systems can be improved to remove these sources of vulnerability. Overall, a much more systematic approach to research on adaptation and resilience than has generally been undertaken by organizations working in the field is required. We believe the systems-agents-institutions-exposure framework used as the basis for the current project has potential to provide this. The current project investigated a very narrow specific set of issues related to post-flood recovery. Wider priorities for future research would focus on the key features of systems that contribute to their fragility, the differential behavior of agents as stresses from climate change increase and the enabling and constraining characteristics of institutions. These features need to be explored in relation to disaster risks, interconnected rural and urban economies and differential vulnerability. As the world grows increasingly interconnected, understanding of human vulnerability needs to expand beyond narrow definitions to incorporate the interaction across scales between systems, the political-economic and social position of individuals, human capacity and behavior. This is a rich and critical area for research that can provide key insights for policy and other interventions to address vulnerability and increase adaptive capacity.

