Mainstreaming disaster risk reduction and climate adaptation in the Indus Eco-region

Report on CDKN/START project with WWF-Pakistan and LSE

By Ali Dehlavi (WWF), Rab Nawaz (WWF), Farrukh Khan (WF) and Ben Groom (LSE)

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Introduction

The objective of this research is to establish the immediate and long-term impact of natural disasters on the well-being of affected households in Pakistan, and to document and evaluate their coping strategies and the role of disaster aid. In general micro-economic studies such as this are few and far between, although their number is increasing as vulnerability and adaptation to climate change becomes an important policy issue.

Previous studies of the immediate and longer-term impacts of natural disasters, such as hurricanes, floods and earthquakes, tend to find that some households are able to recover to their pre-disaster levels of well –being, using a variety of coping strategies. On the other hand, some households do not recover very quickly, while others are pushed into a so-called 'poverty trap' from which they do not recover at all (Carter et al 2006a, 2006b).

In recent years, as throughout its history, there have been a number of large scale flooding events on the Indus River in Pakistan. These have been disastrous for those located in the vicinity: Farming livelihoods were affected via loss of land and/or livestock, fisheries activities were hindered, particularly in the Indus delta area, and household capital such as housing and machinery were often destroyed. The questions concerning loss of well-being, coping strategies and recovery are therefore highly pertinent in the context of Pakistan. Microeconomic studies of this issue in Pakistan are scant and so the nuances of the particular arrangement of institutions, markets and social networks, and their role in determining the immediate outcomes and recovery have not been researched in any kind of detail. The one exception to this is a recent study of the role of risk sharing at the household level using data from 2001 and 2004 (Takashi 2014), which found a) that different shocks (health, flood, drought) affect households in different ways, while social networks and other risk sharing mechanisms tend to reduce the impact of natural disasters and health shocks to the point of being negligible. Most importantly, impacts are heterogeneous. Relatedly, Zimmerman and Carter (2003) provide theoretical predictions for rich and poor households. Their prediction suggest that poor households will tend to smooth assets over time since they are highly dependent on them for sustaining future well-being, while rich household will consumption smooth by running down their assets to maintain their well-being.

With these ideas in mind, in this study we are particularly interested in establishing the impact of the flood and investigate the strategies households undertake to maintain their well-being and to cushion the blow of flooding: do household sell assets to ensure that consumption is maintained? Do households reduce consumption in order to maintain their asset base to maintain future well-being? Furthermore, are different occupations affected in different ways? In particular is agriculture affected more than fisheries? Finally, what are the adaptations that households make in response, to disasters?

In order to answer these questions we undertook a household survey of around 300 households in two distinct areas both of which were affected by the flooding in 2009-2010. The approach we take to do this is to use the survey data to evaluate the nature and value of the immediate loss of some of the chief determinants of household well-being: assets, income and consumption, as a result of being effected by a natural disaster. We first undertake a graphical analysis which reveals how the distribution of these outcomes has changed over time for the various income groups and for those hit by the flood as well as a control group who quite by chance were not. We then evaluate the immediate and medium-term effect of the natural disaster on these

determinants of well-being by looking at the impact immediately post-flood and later on in what we call the 'recovery period'.

The impact of flooding on the Manchar and Chotiari Communities?

Data and Methods

In order to evaluate the impact of the flood on household in the two regions of interest we look at simple measures of current and future well-being: consumption, income and assets. The household survey obtained detailed data on these aspects of households, along with other more general socio-economic data. The outcome variables are consumption, income and assets each measured in PKR (2012). Each of these is self-reported and constructed from an itinerary of assets, income sources and expenditure items. Details of these items can be found in Appendix 2 which contains the questionnaire. Section C shows that typical asset items include land, capital and housing, while income items include agricultural and off-farm incomes, while consumption items include food and other products.

The periods for which we have data are the year before the flood (2009), the year immediately after the flood (2010) and 2012. Respectively we call these periods the pre-flood, post-flood and recovery period and index them as $t = 0, 1, 2$ respectively. Data was collected for household that were hit by the flood (the treated group) and those that were not hit by the flood (the control). Table X provides summary of the some of the more important household level data for the treatment and control groups, respectively those hit by the floods and those not hit by the floods, for each area.

We first present the results of graphical and statistical analysis for each of the regions. The graphical analysis reveals the changing distribution of consumption, income and assets over the duration of the flood and the initial part of the recovery period until 2012. We use non-parametric kernel density estimates which reveal the entire distribution of the data in each period for the treated and control groups over this time horizon. While this is an extremely accessible way to look at the data, it does not lend itself well to general quantitative interpretation.

Difference in Differences method

In order to provide a more quantitative interpretation of the impact embedded in the diagrammatic analysis we undertake a Difference in Difference (DID) analysis. This allows us to say something about the average impact of the flood on the three outcome variables: consumption, income and assets, while controlling for any initial differences in these variables between the treatment and control group, general secular trends in these variables. Furthermore, since we essentially have panel data based on recall data of previous periods, the DID analysis also allows us to control for unobservable factors that are fixed over time that may have determined whether a household was in the treatment or control group. I.e. whether they were affected by flooding. Examples of such factors may include geographical features, unobservable household behavioural characteristics such as how prudent the household is, and so on.[1] The idea behind the method is to isolate the

[1] For a detailed explanation of this approach see Angrist and Pischke (2009, Ch.5) or Wooldridge (2006, Ch.21).

pure impact of flooding on the outcome variables, free of selection bias from observables and unobservable characteristics.

Formally speaking, the DID method works as follows. The simplest model takes the following form:

$$(1) \qquad Y_{it} = \alpha + \beta D_{it} + a_i + u_{it}$$

Where Y_{it} is the outcome variable, D_{it} is a dummy variable which is equal to one if a household *i* is subject to the flood at time *t,* and zero otherwise. The terms a_i is an unobservable 'fixed effect' which reflects all the unobservable characteristics of the household that are fixed over time, such as individual motivation or ability. The parameter β represents the impact of the flood on the outcome variable and can be identified and estimated under certain assumptions. The basic idea behind this model is that we estimate the change in the outcome variable for the treated group over time, and remove from this the change over time for the untreated group. The basic assumption here is that the treated group *would have evolved like the untreated group had they not been treated*. That is, the untreated group are assumed to be a valid counterfactual control group for the treatment group.

In order to deal with the potential for selection bias (the idea that those that were hit by the flood differed systematically in unobservable ways from those who were not hit by the flood) we undertake the DID analysis using the 'fixed effects' estimator of β. This removes the influence of unobserved heterogeneity among households, reflected by a_i, on the estimate of β. Given that we have 3 years of data there is a number of ways in which the model in (1) can be specified.

Pre-flood – Post-flood analysis: Two Periods

The simplest approach we use in the analysis is to estimate equation (1) estimator over two periods: the pre-flood and the post-flood periods. Here D_{2it} is equal to zero in the pre-flood period (t = 0) and equal to 1 afterwards (t = 1) for the treated group. D_{it} is everywhere zero for the untreated group. Here, β reflects the immediate impact of the flood on those affected by the flood compared to the untreated group.

$$(2) \qquad Y_{it} = \alpha + \beta_1 D_{1it} + a_i + u_{it} \qquad (t = 0,1)$$

Pre-flood to Recovery analysis: Two periods

Here we compare the outcome variables pre-flood to its level in the recovery period. Here the 'treatment' dummy is defined as D_{2it} is equal to zero in the pre-flood period (t = 0) and equal to 1 in the recovery period (t = 2) for the treated group. D_{it} is everywhere zero for the untreated group. The analysis is undertaken using data from period t = 0 and t = 2 respectively and the interpretation of β is that it reflects the longer term impact of the flood on those affected by the flood compared to the untreated group.

$$(3) \qquad Y_{it} = \alpha + \beta_2 D_{2it} + a_i + u_{it} \qquad (t = 0, 2)$$

Pre-flood to Recovery analysis: Three periods

Here we compare the outcome variables pre-flood to its level in the recovery period. Here D_{it} is equal to zero in the pre-flood period (t = 0) and equal to 1 in the post-flood (t = 1) *and* recovery period (t = 2) for the treated group. D_{it} is everywhere zero for the untreated group. The analysis is undertaken using data from all three time periods and the interpretation of β is that it reflects the average impact of the flood on the outcome variable over the two periods after the flood, compared to before the flood. The model is:

$$(4) \qquad Y_{it} = \alpha + \beta_3 D_{3it} + a_i + u_{it} \qquad (t = 0, 1, 2)$$

Three period analysis

Using three periods of data allows us to estimate the impact immediately and in the long-term within the same model. This requires the definition of two treatment variables, $D_{1it}\ and\ D_{3it}$. D_{1it} is the dummy variable from the Pre-Post analysis in equation (2), while D_{3it} is the dummy variable in the 3 period analysis. The model estimated is as follows:

$$(5) \qquad Y_{it} = \alpha + \beta_1 D_{1it} + \beta_3 D_{3it} + a_i + u_{it} \qquad (t = 0, 1, 2)$$

For each region analysed we undertake each of these analyses.

Heterogeneous impact: Impact by income quartile

We also control for 'income quartile' to see whether the impact of the flood is stronger for a particular income or wealth group and hence has distributional consequences. The theoretical work of Zimmerman and Carter (2003), as well as previous empirical work by Fafchamp et al. (1998), provides a theoretical and empirical rationale for thinking that the impact of natural disasters is likely to be heterogeneous, and certainly will differ by income levels. In order to evaluate this we derive indicator variables for the quartile of the distribution a household is located in the 2009 pre-flood period. We then interact these indicator variables with the treatment variables in each case. Say we are interested solely in which half of the distribution a household lies, then the empirical model in the pre-post-flood analysis of equation (2) would be as follows:

$$(6) \qquad Y_{it} = \alpha + \beta_1 D_{1it} + \beta_4 D_{Ui} * D_{1it} + a_i + u_{it} \qquad (t = 0, 1)$$

where D_{Ui} is equal to 1 if the household is in the upper half the income or wealth distribution, and zero otherwise. The sign of β_4 would tell is whether the richer group had a low or a higher impact of the flood.

We now turn to the analysis proper, starting with a graphical analysis.

Results for Chotiari: Graphical Analysis

The impact on agricultural households in Chotiari: Consumption

Appendix 1 presents some descriptive statistics for the Chotiari dataset. In this section we look at the impact of flooding on the agricultural households of the Chotiari region. We first present a graphical analysis which looks at the changing distributions of income consumption and assets for the pre-flood, post-flood and recovery periods. These periods are defined as the year before the flood (2009), the year immediately after the flood (2010) and 2012. Figures 1a and 1c refer to consumption for the treatment group (those hit by the flood) and illustrate respectively the changing distribution of income from the pre-flood period to the post- flood period, the pre-flood to recovery period and the post-flood to recovery. Figure 1d shows the pre-flood to post-flood consumption distribution for the control group, which was unaffected by the flood.

The diagrams can be understood as follows. The x-axis measures the consumption level, while the y-axis measures the likelihood of, or the proportion of the sample, consuming at each level of consumption. The higher the line, the higher the proportion of people at that level of consumption. As we can see, the highest proportion of households can be found at around 20000 PKR per annum, while a much smaller proportion of the households have consumption levels at 60000 PKR.

The overall message of the diagrams is that consumption has not really changed markedly between the pre- and post-flood period. In fact the distribution has moved to the right indicating a general increase in consumption levels, particularly at higher levels of consumption. In terms of consumption, the distributions are very similar throughout. There is certainly no general decline in consumption levels. Figure 1d shows that the consumption of the control group is unaffected in the post-flood period, as we would expect.

The impact on agricultural households in Chotiari: Income

Figures 2a – d provide the same information with regard to income. The general interpretation here is as follows. The comparison of the pre-flood and the post-flood income levels in Figure 2a shows that there is a higher likelihood of being at a low level of income after the post-flood. We do now know who these people are particularly, but they appear to be coming from the lower end of the income distribution. The fact that the pre and post-flood lines are more or less touching is an indication that the likelihood of being at the higher income level is unchanged after experiencing the flood. In sum, the flood has had a negative impact on incomes.

Figure 2b compares pre-flood and recovery levels of income. The lines are almost identical indicating that whatever changes took place in the aftermath of the flood disappear in the recovery period. Figure 1c illustrates the moderate growth in incomes as the curve shifts to the right making more or less all higher consumption levels more likely. Lastly Figure 2d shows that the income of the control group is unaffected by the flood, which is to be expected.

Figures 1a-1d. The impact on consumption (PKRs 2012, per annum) in Chotiari

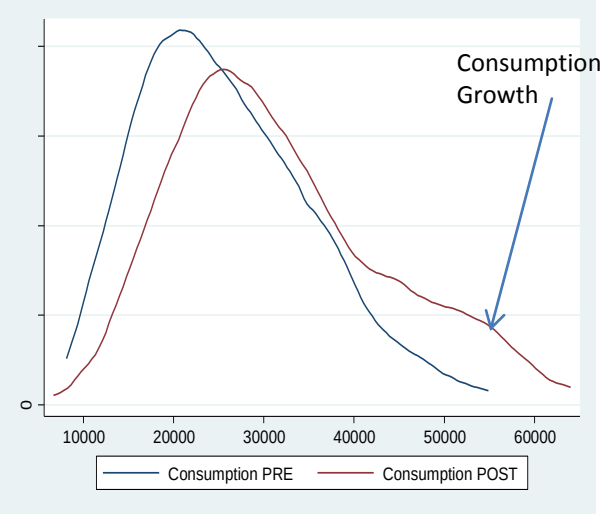

Figure 1a. post flood to pre-flood

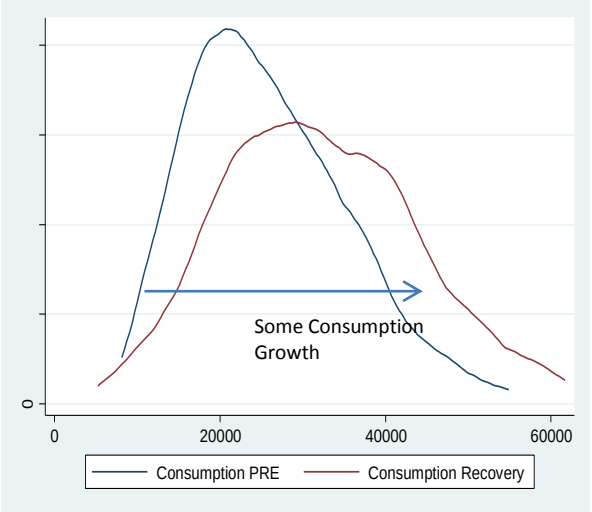

Figure 1b. Pre flood to recovery period

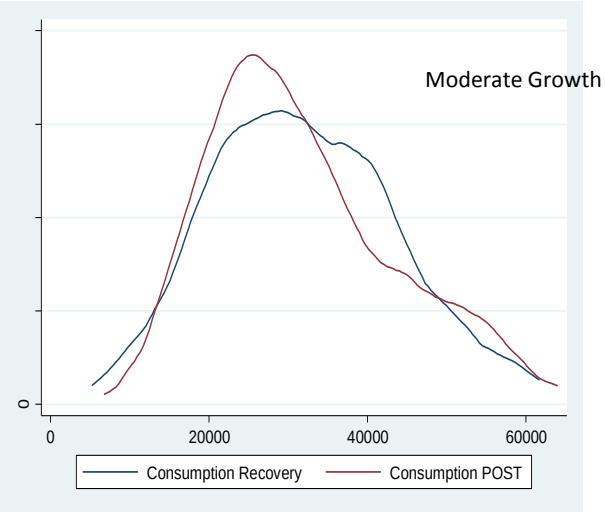

Figure 1c. Post flood to recovery period

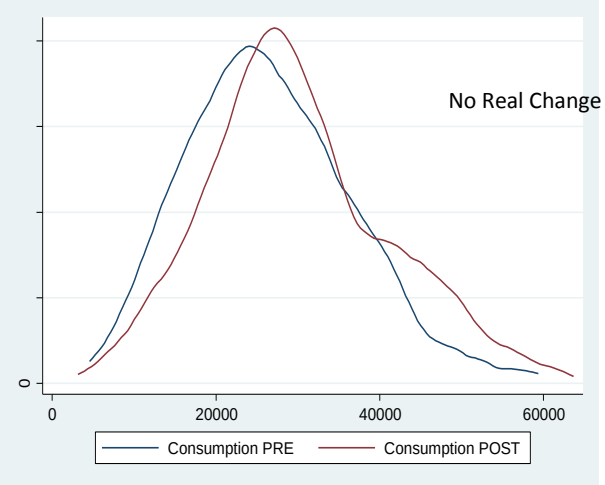

Figure 1d. Pre flood to post flood (Control group)

Figures 2a-d. The impact on income (PKRs 2012, per annum) in Chotiari

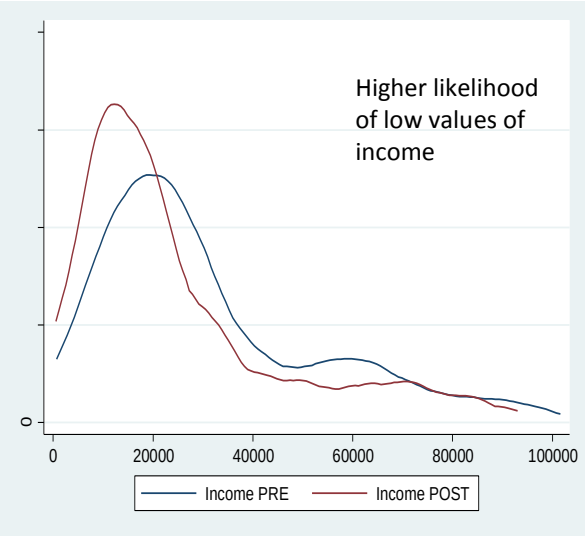

Figure 2a. post flood to pre-flood

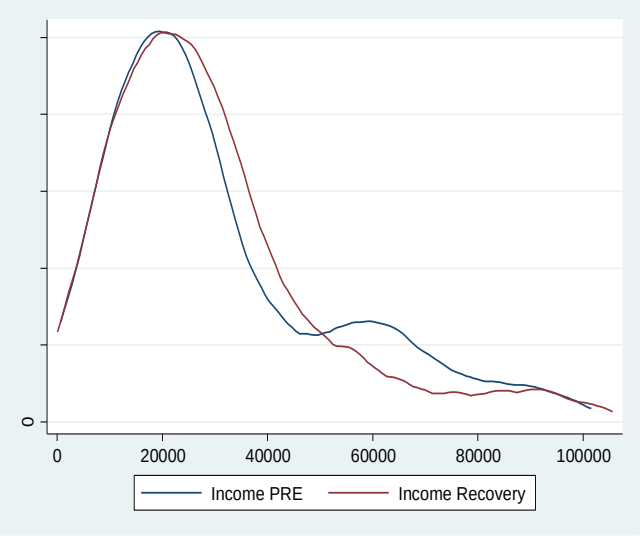

Figure 2b. Pre flood to recovery period

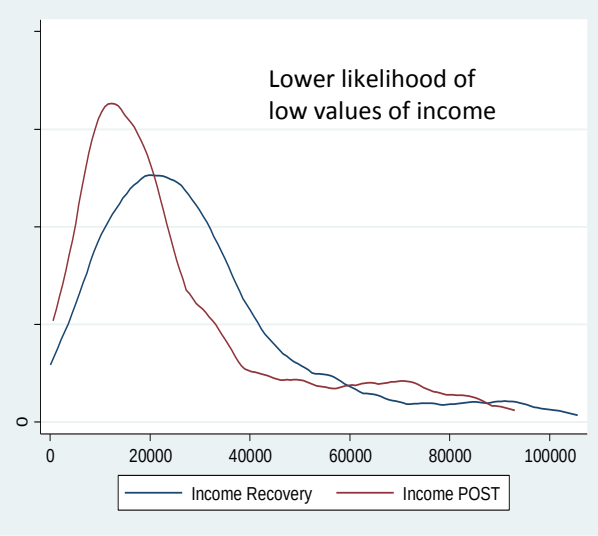

Figure 3c. Post flood to recovery period

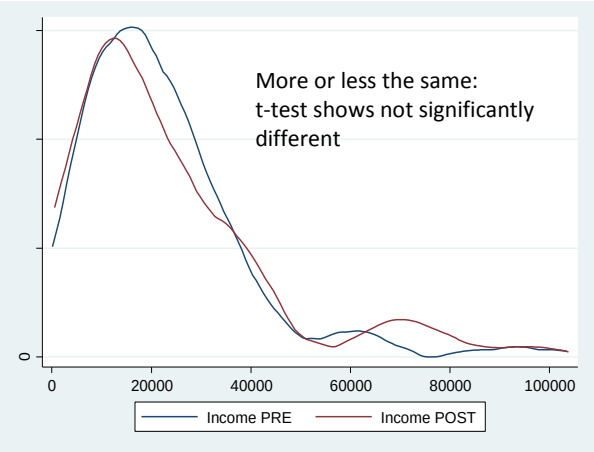

Figure 2d. Pre flood to post flood (Control group)

Figures 3a-d. The impact on assets (PKRs 2012, per annum) in Chotiari

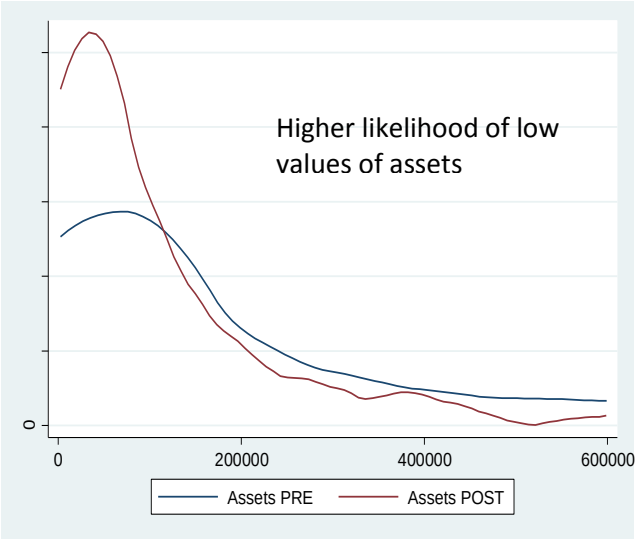

Figure 3a. post flood to pre-flood

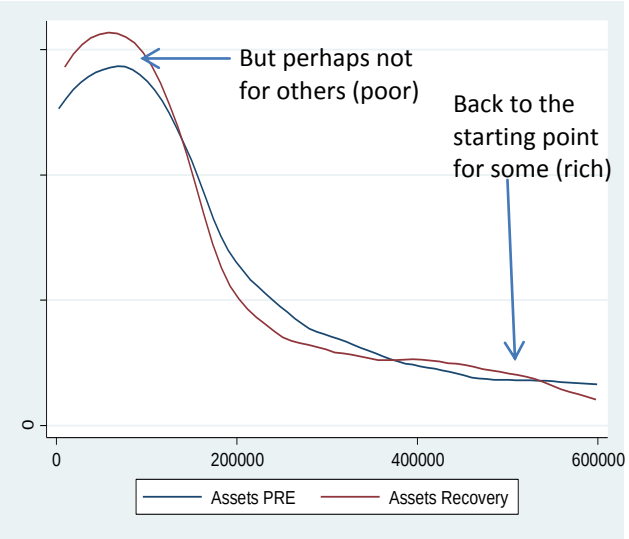

Figure 3b. Pre flood to recovery period

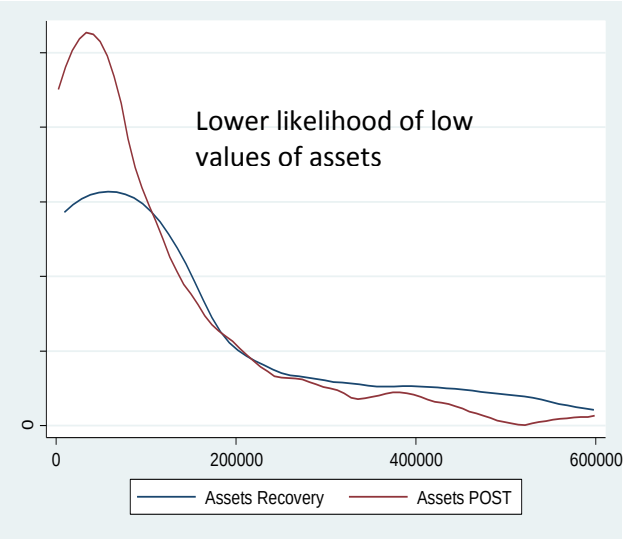

Figure 3c. Post flood to recovery period

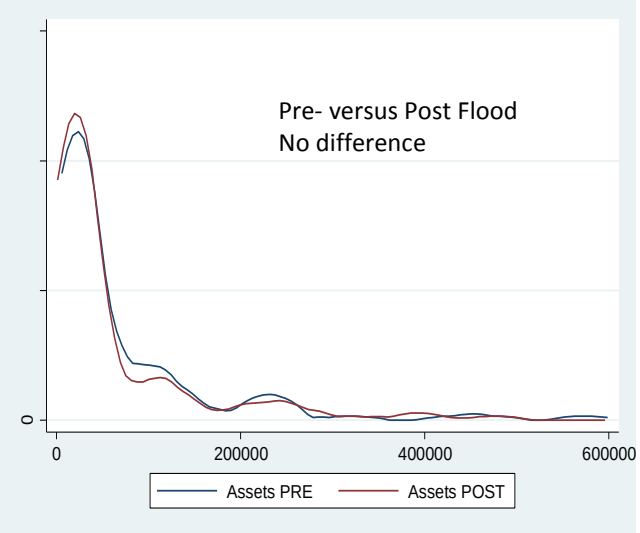

Figure 3d. Pre flood to post flood (Control group)

The impact on agricultural households in Chotiari: Assets

The previous results beg the question: How can it be that consumption has been largely unaffected by the flood, while incomes have been negatively affected. The answer to this question can be found in the analysis of the impact on assets found in Figures 3a-d.

Figure 3a compares the distributions of assets pre- and post-flood. The diagram shows a clear spike in the post-flood asset holdings at the low levels of assets. Elsewhere the distribution is lower than the pre-flood assets across the board. This indicates general and heterogeneous reductions in assets from all levels of asset holdings. Figure 3c shows that the value of assets is more or less restored recovers by the recovery period since the distance between the two distributions narrows. Figure 3b shows this recovery between the post-flood and recovery period as the peak at low asset values falls. There are indications that the recovery is not complete though in Figure 3b since the diagram suggests a higher proportion of people with low levels of assets in the recovery period than in the pre-flood period.

In summary these figures provide a detailed picture of the changing nature of the distribution of consumption, income and assets in the pre- and post-flood and recovery periods. They provide a qualitative story of consumption smoothing in the face of lower incomes which is potentially financed by consuming and/or selling assets. This accords with the theoretical picture painted by Zimmerman and Carter (2003) for richer households who consumption-smooth, rather than poorer households who prefer asset-smooth: limit the negative effects on their productive assets.

However, while the diagrams provide a detailed picture of what is happening at each level of asset, income and consumption, they do not provide any particular evidence of the causal nature of the impact nor of the statistical and economic significance of the impacts on households. We now turn to this.

Results for Chotiari: Difference in Differences Analysis

As discussed the survey elicited recall data for a variety of pre- and immediately post-flood characteristics. In particular data on consumption, income and assets were collected motivated by the standard theoretical and empirical predictions found in Carter et al (2006a; 2006b), Zimmerman and Carter (2003) and Takayoshi (2014) inter alia. The graphical analysis shows the distribution of these data. The following tables show the economic and statistical significance of the results.

Table 1 shows the results of the fixed effects estimation of the models shown in equations (2) and (3), that is, the two-period analysis. Also estimated is a model that allows for heterogeneity of the impact by income quartile, with the lowest quartile acting as the reference category.

Variable	ASSETS (1)	ASSETS (2)	INCOME (1)	INCOME (2)	CONSUMPTION (1)	CONSUMPTION (2)
FLOOD1	-70119.6***	-103659.2***	-3242.9	15128.1***	296.7	1841.5
FLOOD1*inc2		57311.1		-18577.5***		-1895.8
FLOOD1*inc3		80100.1*		-17774.1***		-2345.3
FLOOD1*inc4		-9650.0		-31696.7***		-1568.0
year1	-6440.8	-6440.8	411.5	411.5	2376.5***	2376.5***
_cons	134606.1***	126612.3***	15644.2***	14629.7***	17404.5***	17228.2***
N	376	350	376	350	376	350
r2	0.1	0.2	0.0	0.2	0.3	0.3

legend: * p<.1; ** p<.05; *** p<.01

Table 1. Impact in Chotiari on Assets, Income and Consumption (PKRs, 2012): Pre-flood, post-flood analysis

Variable	ASSETS (3)	ASSETS (4)	INCOME (3)	INCOME (4)	CONSUMPTION (3)	CONSUMPTION (4)
FLOOD3	12176.2	99550.3**	33.6	5733.2**	-905.6	1590.1
FLOOD3*inc2		-107481.3**		-5063.3		-3172.7*
FLOOD3*inc3		-42258.1		-4638.1		-2704.2
FLOOD3*inc4		-160808.5***		-11263.3***		-3208.2
year2	37026.6**	37026.6**	1094.3	1094.3	5439.1***	5439.1***
_cons	129351.4***	124645.7***	15353.5***	14825.5***	16818.4***	16964.6***
N	375	359	375	359	375	359
r2	0.1	0.1	0.0	0.1	0.5	0.5

legend: * p<.1; ** p<.05; *** p<.01

Table 2. Impact in Chotiari on Assets, Income and Consumption (PKRs, 2012): Pre-flood to recovery period

Summary of DID results for Chotiari

In Table 1 the parameter on the variable FLOOD1 is an estimate of the impact on the outcome variable. Consider the impact on assets first. The model ASSETS (1) shows the estimates of equation (2) in the previous section for assets and shows a loss between the pre-flood and immediate post-flood periods or around PKR 70000 on average for the sample. The model ASSETS (2) shows how this loss is distributed between income quartiles. The interaction terms with income quartiles all have a positive sign, indicating that the losses for the poorest quartile were larger on average in absolute terms than for other income groups. Yet, none of the interaction terms are statistically significant at the 5% level, and only the third quartile of income could be

argued to have experienced a lower level of impact since the coefficient on FLOOD*inc3 is positive and significant at the 10% level. So, in short, there is some heterogeneity of impact by income groups, but this is a weak result statistically. The loss in assets is valued at around 70000PKR, on average a 50% loss.

Model INCOME (1) shows that on average the loss of income was insignificant compared to the control group. However, this hides heterogeneity among income groups. Model INCOME (2) shows that in fact the poorest quartile benefitted from an income gain post-flood compared to the control group, while the second and third quantiles were not affected at all.[2] The richest quartile, on the other hand, sustained income losses of around 16000 PKR (15128.1 – 31696.7), compared to the control group, which is highly statistically significant.[3] This is approximately a 50% loss of income for this group.

As for consumption, Models (1) and (2) in Table 1 indicate that there has been no impact of the flood on consumption. Taken together the results paint a picture of consumption smoothing in response to the flood. This is facilitated by sale of consumption of their asset-base.

Table 2 shows the results of a similar DID analysis comparing the pre-flood (2009) with the recovery period (2012). This provides an indication of the medium-term impact of the flood after between 2 and 3 years of recovery. The overwhelming conclusion arising from Table 2 is that the negative impacts illustrated in Table 1 are not permanent, although there is heterogeneity among households.

With regard to assets, the first and third income quartiles have a higher value of assets in the recovery period than in pre-flood compared to the control group: they more than recover from the losses recorded in the post-flood period. For the second and fourth income quantiles, asset values are not significantly different in each of these periods. Simply put, whatever the immediate impact of the flood, these groups are indistinguishable, in terms of assets, from those that were not hit by the flood by 2012. So, for all income groups, asset values are at least restored to what they would have been in the absence of the flood by 2012.

The complete picture of impact that we can see from Table 1 and 2 is that those hit by the flood smooth consumption by selling assets. The poorest quantile more than recovers their asset values compared to those not hit by the flood.

[2] Note that an F-test of the null hypothesis that the coefficients of FLOOD1+FLOOD1*inc2 = 0 and FLOOD1+FLOOD1*inc3 = 0 fail to reject the null hypothesis for the ASSETS (2) model.

[3] We reject the null that the sum of these coefficients is equal to zero.

Results for Manchar: Graphical Analysis

Figures 4 (a – d) to Figures 6 (a – d) show the equivalent graphical analysis for the predominantly fishing orientated communities of Manchar. The analysis of these distributions of consumption, income and assets tell a different story of the impact of the flood on these determinants of well-being which speak to the source of livelihoods in this region. The descriptive statistics show that Manchar is a much poorer area than Chotiari, with lower levels of assets, consumption and income. According to theory, this may change the nature of responses to disasters. The occupational differences will also be important here.

The impact on households in Machar: Consumption

Figures 4a shows that the distribution of consumption shifts more or less uniformely to the right as we move from the pre-flood period to the post-flood period. In short, consumption levels are increasing over this period. Figure 4b and 4c show that this trend seems to continue between in the post-flood period particularly for higher consumption levels (one can see that the distribution has greater mass at higher levels of consumption in the recovery period). Looking at Figure 4d we see that a similar trend happens for the control group, with consumption levels increasing between the pre-flood and post-flood periods.

Given the consonance between the trends of the treated and control groups, this suggests that there will be very little impact of the flood recorded on consumption. While this appears similar to the Chotiari case, it is not yet clear whether the pattern of impacts on income and assets will be similar.

The impact on households in Machar: Income

Figure 5a shows a similar pattern for incomes as for consumption. For those hit by the flood, Figures 5a-c shows that incomes increase in the pre- to post-flood period, and somewhat between the post-flood and recovery period. Figure 5d shows a similar pattern (albeit a slightly different distribution) for the control group. In short, there is a lower proportion of households at low levels of income with each successive period for both treatment and control groups. Again, this is suggestive of minimal impacts of the flood on incomes in this region.

The impact on households in Machar: Assets

The distribution of assets in Manchar is far more skewed than in Chotiari. This can be seen in the long right hand tail of the distribution. This is an indication that inequality is higher in Manchar, with most people having very few assets, and very few people having large amounts of assets. The analysis shows that assets are much lower in the post-flood period, with the distribution having shifted to the left and the mode now being at a lower level of asset holdings. The main losses appear to be coming from the 15000PKR to 30000PKR range, where the likelihood of holding this level of assets has diminished post-flood. Figure 6c shows that that the level of assets is more or less restored by the recovery period, since the distributions coincide and are largely indistinguishable.

Figure 6d shows that the control group, those unaffected by the flood, also suffers a minor reduction in asset values in the pre- to post-flood period, presumably for different reasons.

Figures 4a-d. The impact on consumption (PKRs 2012, per annum) in Manchar

Figure 4a. Pre-flood to post-flood

Figure 4b. Pre-flood to recovery period

Figure 4c. Post- flood to recovery period

Figure 4b. Pre-flood to post-flood (Control Group)

Figures 5a-d. The impact on income (PKRs 2012, per annum) in Manchar

Figure 5a. Pre-flood to post-flood

Figure 5b. Pre-flood to recovery period

Figure 5c. Post- flood to recovery period

Figure 5d. Pre-flood to post-flood (Control Group)

Figures 6a-d. The impact on Assets (PKRs 2012) in Manchar

Figure 6a. post-flood to pre-flood

Figure 6b. Pre flood to recovery period

Figure 6c. Post flood to recovery period

Figure 6d. Pre-flood to post-flood (Control Group)

Results for Manchar: Difference in Differences Analysis

The qualitative analysis is suggestive of the impact of the floods being heterogeneous at different parts of the income, consumption or asset distribution. The following tables show the economic and statistical significance of these differences using DID analysis, that is, by comparing the outcomes of those hit by the flood to the counterfactual of those not hit by the flood.

Table 1 shows the results of the fixed effects estimation of the models shown in equations (2) and (3), that is, the two-period analysis. Also estimated are models that allow for heterogeneity of the impact by quartile of the income distribution, with the lowest quartile acting as the reference category.

Summary of DID results for Manchar

Table 3 shows the results for two models for each of assets, income and consumption. The analysis compares the pre-flood and post-flood outcomes for the treated and control group. The ASSETS (1) model suggests that on average those hit by the flood ended up with lower assets than the control group by around 23000PKR. ASSETS (2) disentangles this average and shows that the source of this reduction in asset values liesin the upper quartiles of the income distribution, with the only statistically significant effect coming from the 3rd quartile of income whose assets are reduced in value by approximately 40000PKR. Apart from a decline in income for the highest income quartile, this is the only significant impact on these hit by the flood compared to the control group.

Table 4 confirms what was predicted from the graphical analysis: compared to the control group there the flood has no impact on consumption, income or assets in the medium to long-term according to this DID analysis. In fact the first 3 income quartiles are slightly better off in terms of income and consumption in the recovery period.

One interpretation of these results is that the rich have reduced their assets in order to smooth consumption in response to the flood. The poor have either not lost assets or have not used them to smooth consumption. This is only partially in line with the theoretical predictions of Zimmerman and Carter (2003) for instance. Neither does this accord with the idea that the flood has pushed household into a poverty trap.

Variable	ASSETS (1)	ASSETS (2)	INCOME (1)	INCOME (2)	CONSUMPTION (1)	CONSUMPTION (2)
TREAT	-23168.7***	-10186.0	-667.7	226.9	1399.0**	1008.0
TREATinc2		-21714.3		-351.7		205.2
TREATinc3		-41150.0**		-91.1		-606.7
TREATinc4		1401.7		-2751.8**		1536.7
y1	-22830.6***	-22830.6***	3163.2***	3163.2***	2715.4***	2715.4***
_cons	97377.2***	96626.2***	7850.4***	7800.7***	16426.9***	16344.4***
N	411	394	411	394	411	394
r2	0.3	0.3	0.3	0.4	0.4	0.4

legend: * p<.1; ** p<.05; *** p<.01

Table 3. Impact in Manchar on Assets, Income and Consumption (PKRs, 2012): Pre-flood, post-flood analysis

Variable	ASSETS (1)	ASSETS (2)	INCOME (1)	INCOME (2)	CONSUMPTION (1)	CONSUMPTION (2)
TREAT3	-6146.3	-15721.4	-40.0	1619.5*	1643.0**	3296.9***
TREAT3inc2		15579.6		-1215.7		-1731.6
TREAT3inc3		-8699.4		-451.5		-1943.8
TREAT3inc4		19866.4		-4042.7***		-2677.1*
y2	-11097.4*	-11097.4*	1017.7***	1017.7***	5446.9***	5446.9***
_cons	97367.0***	97236.5***	8008.3***	7890.4***	16638.4***	16379.5***
N	414	397	414	397	414	397
r2	0.0	0.1	0.1	0.1	0.6	0.6

legend: * p<.1; ** p<.05; *** p<.01

Table 4. Impact in Manchar on Assets, Income and Consumption (PKRs, 2012): Pre-flood to recovery period

Caveats

There are numerous caveats that need to be mentioned in evaluating this preliminary excursion into the data. Aside from the fact that more investigation of the underlying heterogeneity of the impact needs to be undertaken, there are some serious issues concerning the econometric identification of the impact measure. The DID method relies on assumptions which in this dataset are untestable. For instance, the following assumptions must hold:

1) The trend in the transitory unobservable determinants of the outcome must be the same for the treatment and control groups

2) There can be no spillover between the treatment and control groups: e.g. via induced price changes (e.g. due to increased demands for commodities in the control group area), migration away from the flooded area, and so on.

3) Conditional on the unobservable fixed effects, the incidence of flooding must be random and not correlated with the unobservable determinants of household outcomes. If it were the case that those who were hit by the flood we those of a particular type, then the analysis is invalidated.

In addition to this there may be data problems that remain despite extensive and prolonged cleaning. One major worry is the use of recall data. It could be that serious measurement errors are arising in the outcome and explanatory variables. For instance, the descriptive statistics show that income levels are consistently underestimated since they are often lower than the reported consumption levels. It could be that poor or even strategic memories of the pre and post-flood periods are introducing variation that drives the results shown here.

Nevertheless, the results appear to tell an intuitive story about the impact of flooding, and this may be a measure of the quality of the data.

Discussion of Results

Taken as read, the results indicate that on average the impact of the flood has had no long-lasting effect on consumption, income or assets in either Chotiari or Manchar. Even when one disaggregates the analysis by income groups, there is no indication that being hit by the flood has caused any permanent effects or pushed household into a poverty trap.

The level and pattern of impact differs across districts though. In Chotiari, all income groups appear to smooth their consumption levels, since these do not differ across the pre-, post-flood and recovery period, compared to the control group. All income groups that are hit by the flood have diminished assets in the post-flood period. Assets are reduced by 50% on average, and incomes for the richest quartile are reduced by a similar margin among the richest quartiles. This is commensurate with the behaviour of richer households: consumption smoothing by partially running down assets, that is predicted by economic models of behaviour under risk, as well as evidenced in empirical work around the world (e.g. Carter et al., 2006a; Zimmerman and Carter, 2003).

In Manchar the story is different. The first thing to notice is that Manchar is much poorer in terms of assets, and hence consumption and income. The impact of the flood on assets is only negative among the richer quartiles. Here, the evidence suggests either that consumption is smoothed by running down assets, or, given

that the impact on the poorer quartiles of income is also negligible, it could be that the flood had negligible impact per se. One possible reason for this is that the predominantly fisheries oriented livelihoods were augmented by the flooding, whereas the agricultural livelihoods were affected negatively, albeit temporarily.

However, a great deal more work is required in order to investigate the complete and nuanced story of the way in which the flood has been dealt with, the features that have attenuated or exacerbated the shock and the way in which people have been able to return to, and in some cases exceed the levels of assets, consumption and income of the control group.

Further research should focus on the role of credit institutions, local risk sharing, financial and other disaster aid, all of which, with more time, can be analysed using the dataset here.

References

Carter M.R, Little, P.D., Mogues, T. and Negatu, W. (2006a). Poverty Traps and Natural Disasters in Ethiopia and Honduras World Development Vol. 35, No. 5, pp. 835–856.

Carter M.R, Little, P.D., Mogues, T. and Negatu, W. (2006b). Shocks, Sensitivity and Resilience: Tracking the Economic Impact of Natural Disasters on Assets in in Ethiopia and Honduras. IFPRI Development Strategy and Governance Development Working Paper No. 32.

Fafchamps, M., C. Udry, and K. Czukas. (1998) Drought and Saving in West Africa: Are Livestock a Buffer Stock?, Journal of Development Economics 55(2) 1998 pp.273-305.

Kurosaki T (2014). Vulnerability of household consumption to floods and droughts in developing countries: evidence from Pakistan Environment and Development Economics, page 1 of 27.

Zimmerman, F. and M. R. Carter. (2003) Asset Smoothing, Consumption Smoothing and the Reproduction of Inequality under Risk and Subsistence Constraints. *Journal of Development Economics* Vol.71 2003 pp.233-260.

Appendix 1. Descriptive Statistics

Control Group

Variable	Obs	Mean	Std. Dev.	Min	Max
Income	114	23275.45	19873.17	500	98000
Consumption	114	29947.81	10909.3	6600	60200
Assets	114	86850.01	162923.2	1000	887000

Treated Group

Variable	Obs	Mean	Std. Dev.	Min	Max
Income	78	24952.09	21190.36	1000	88000
Consumption	78	31679.49	11405.51	11000	59700
Assets	78	125565.4	188852	1	1082000

Table A1.1. Descriptive Statistics for Chotiari (PKR, 2012)

Control Group

Variable	Obs	Mean	Std. Dev.	Min	Max
Income	124	7407.371	3234.942	500	18000
Consumption	124	15894.11	6591.175	3200	43200
Assets	124	87635.17	52673.49	8000	295000

Treated Group

Variable	Obs	Mean	Std. Dev.	Min	Max
Income	115	10333.83	4878.874	1000	22500
Consumption	115	18548.52	6530.915	3900	38550
Assets	115	64139.58	44386.76	2000	190200

Table A1.2. Descriptive Statistics for Manchar (PKR, 2012)

Appendix 2: Questionnaire

"Mainstreaming disaster risk reduction and climate adaptation in the Indus Eco region"

Household Survey (250 households)

Chotiari, Sanghar

Complete address: _____ Village GPS Code: _____ HH GPS code_____

Name of Respondent with Father's/Husband's Name: _____

Age of the respondent: [ ][ ]

Relationship of the Respondent with the Head of Household: [ ]

Relation with head of the household:

1. Self;
2. Wife/husband;
3. Son/daughter;
4. Son-in-law/daughter-in-law;
2. Grand son/grand daughter;
6. Mother/Father;
7. Brother/sister;
8. Other relatives;
9. Other non-relatives

Date of interview:

Visit Date __/__/__

Interviewer's name : _____

Supervisor's name : _____

Checked by : _____
(Checker's Name & Signature)

Edited by : _____

(Editor's Name & Signature)

Codes:

Zero (0): Not available/ No Response

NA: Not applicable

Household:

Household is defined as group of people living under the same roof and sharing a budget for food.

Time Period:

Pre-Event: Conditions prior to 2010 Floods (Jan-Dec 2009)

Post-Event: Immediately after the floods (Jul -Dec 2010)

Recovery: Current situation (Jan - Dec 2012)

SECTION A: HOUSEHOLD CHARACTERISTICS

A1. Basic structure and livelihood source

Table A1.2: Family Structure and Livelihood Source

Person Code		Relation with head of family *1		Gender*2		Age (years)		Education status*3		Principal Means of livelihood*4	
A121		A121a		A121b		A121c		A121d		A121e	
A122		A122a		A122b		A122c		A122d		A122e	
A123		A123a		A123b		A123c		A123d		A123e	
A124		A124a		A124b		A124c		A124d		A124e	
A122		A122a		A122b		A122c		A122d		A122e	
A126		A126a		A126b		A126c		A126d		A126e	
A127		A127a		A127b		A127c		A127d		A127e	
A128		A128a		A128b		A128c		A128d		A128e	
A129		A129a		A129b		A129c		A129d		A129e	
A1210		A1210a		A1210b		A1210c		A1210d		A1210e	
A1211		A1211a		A1211b		A1211c		A1211d		A1211e	
A1212		A1212a		A1212b		A1212c		A1212d		A1212e	

*1 Relation with Family Head: Self [1]; Wife/husband [2]; son/daughter [3]; son/daughter in law [4]; Grandson/daughter [2]; Mother/father [6]; Brother/sister [7]; other relatives [8]

*2Gender: Male [1]; Female [2]

*3 Education status: Read & write [1]; Primary [2]; middle [3]; matriculation [4]; intermediate [2]; graduate [6]; masters [7] illiterate [8]

*4. Means of livelihood: Livestock [1]; Fisheries [2]; Agriculture [3]; Government Employee [4]; Laborer [2]; unemployed [6]; pensioner [7]; other_____ [8]

Table A1.3: Impact of Extreme Events*

Which of the following natural hazard events have your household experienced in the past 10 years? Y/N			**How were you affected by these events?*1**		**How did you cope with the losses?*2**	
2010 Floods	A13		A13a		A13b	
2011 Floods	A13		A13a		A13b	
2012 Floods	A13		A13a		A13b	
Drought	A13		A13a		A13b	

*1 Loss of livestock (1); loss of housing/ storage/ animal shed; (2) loss of family member; (3) loss of any other asset (machinery, etc.) (4); Loss of farmland (5); Health affected (6)

*2 Took out a loan to cover expenses (1); Sold off farm assets (machinery, livestock) (2); Relied on savings (3); Worked as a laborer/other work away from farm (4); Financial support from relatives/local villagers (2); Government/NGO assistance (6); Other (specify)_____ (7)

* *Remaining questions ask about a single event i.e. 2010 Floods; this is the only table asking about multiple events.*

SECTION B: OUTPUT, INPUTS AND PRICES

B4: How many years have your household continuously grazed livestock on grazing pastures in your vicinity? [ ] [ ]

B2: Who do you pay to graze _____ Govt. Agent (1); Landlord (2); other _____(3)

B3: Has the government department ever attempted to restrict your access to the local grazing area? Yes / No

Table B4. Livestock (Production, consumption, and prices etc.)

	Type of Animal *1	No. of Animals	Ownership arrangement		Home consumption [Nos. /Yr.]	No. of animal sold (In a year)			No of grazing trips*3 (In a month)	Time taken in a trip (In minutes)		Who mainly grazes livestock? *3	Other accompanying member? *4
			Own	Shared		Nos. Sold	Farmer's Price (PKR)	Market Price (PKR)		Graze	One way Travel	Enter Person Code (including females)	
Pre- Event	B41	B41a	B41b	B41c	B41d	B41e	B41f	B41g	B41h	B41i	B41h	B41h	B41h
	B42	B42a	B42b	B42c	B42d	B42e	B42f	B42g	B42h	B42i	B42h	B42h	B42h
	B43	B43a	B43b	B43c	B43d	B43e	B43f	B43g	B43h	B43h	B43h	B43h	B43h
	B44	B44a	B44b	B44c	B44d	B44e	B44f	B44g	B44h	B44h	B44h	B44h	B44h
	B45	B45a	B45b	B45c	B45d	B45e	B45f	B45g	B45h	B45h	B45h	B45h	B45h
Post- Event	B46	B46a	B46b	B46c	B46d	B46e	B46f	B46g	B46h	B46h	B46h	B46h	B46h
	B47	B47a	B47b	B47c	B47d	B47e	B47f	B47g	B47h	B47h	B47h	B47h	B47h
	B48	B48a	B48b	B48c	B48d	B48e	B48f	B48g	B48h	B48h	B48h	B48h	B48h
	B49	B49a	B49b	B49c	B49d	B49e	B49f	B49g	B49h	B49h	B49h	B49h	B49h
	B410	B410a	B410b	B410c	B410d	B410e	B410f	B410g	B410h	B410h	B410h	B410h	B410h
Recovery	B411	B411a	B411b	B411c	B411d	B411e	B411f	B411g	B411h	B411h	B411h	B411h	B411h
	B412	B412a	B412b	B412c	B412d	B412e	B412f	B412g	B412h	B412h	B412h	B412h	B412h
	B413	B413a	B413b	B413c	B413d	B413e	B413f	B413g	B413h	B413h	B413h	B413h	B413h
	B414	B414a	B414b	B414c	B414d	B414e	B414f	B414g	B414h	B414h	B414h	B414h	B414h
	B415	B415a	B415b	B415c	B415d	B415e	B415f	B415g	B415h	B415h	B415h	B415h	B415h

*1 (1) Cows (2) Buffalo (3) Goats (4) Sheep (2) Camels (6) Horses (7) Asses (8) Mules (9) Others

*2 including for sacrifice, gifting, marriages, religious and other festivals

*3 Enumerators to ask for B41h-B41l once if the effort is same for all types of animals.

B8: Livestock - Input and other cost

	Input Costs for a typical trip (PKR) *1								Other Fixed and Variable cost [PKR Per year]									
	Transport cost		Hired Labor Cost		Rental Cost (e.g. boat)		Other Cost (e.g. equipment rental, fee for access of grazing pastures)		Purchase of Fodder		Water		Medical		Stall Feeding		Hired Labor for animal maintenance	
Pre-2010 Floods	B51		B51a		B51b		B51c		B51d		B51e		B51f		B51g		B51h	
Post-2010 floods	B52		B52a		B52b		B52c		B52d		B52e		B52f		B52g		B52h	
2013	B53		B53a		B53b		B53c		B53d		B53e		B53f		B53g		B53h	

*1 enumerator should prompt respondent about hired labor (resource cost), payment to grazing land owner (other cost), and, possibly in case of a drought, use of boat to collect fodder (transport cost).

B6. Animal Produce (Production, consumption and prices)

	Animal produce *1		Total Monthly production (In Kg)		Monthly Home Consumption (In Kg)		Farmer Price of sales (PKR)		Market Price of sales (PKR)		Time (minutes / day)				Input costs for typical preparation (PKR)					
											To prepare		Delivery		Transport cost		Ingredient cost		Other cost	
Pre- Event	B61		B61a		B61b		B61c		B61d		B61e		B61f		B61g		B61h		B61i	
	B62		B62a		B62b		B62c		B62d		B62e		B62f		B62g		B62h		B62i	
	B63		B63a		B63b		B63c		B63d		B63e		B63f		B63g		B63h		B63h	
	B64		B64a		B64b		B64c		B64d		B64e		B64f		B64g		B64h		B64h	
	B65		B65a		B65b		B65c		B65d		B65e		B65f		B65g		B65h		B65h	
Post- Event	B66		B66a		B66b		B66c		B66d		B66e		B66f		B66g		B66h		B66h	
	B67		B67a		B67b		B67c		B67d		B67e		B67f		B67g		B67h		B67h	
	B68		B68a		B68b		B68c		B68d		B68e		B68f		B68g		B68h		B68h	
	B69		B69a		B69b		B69c		B69d		B69e		B69f		B69g		B69h		B69h	
	B610		B610a		B610b		B610c		B610d		B610e		B610f		B610g		B610h		B610h	
Recovery	B611		B611a		B611b		B611c		B611d		B611e		B611f		B611g		B611h		B611h	
	B612		B612a		B612b		B612c		B612d		B612e		B612f		B612g		B612h		B612h	
	B613		B613a		B613b		B613c		B613d		B613e		B613f		B613g		B613h		B613h	
	B614		B614a		B614b		B614c		B614d		B614e		B614f		B614g		B614h		B614h	
	B615		B615a		B615b		B615c		B615d		B615e		B615f		B615g		B615h		B615h	

*1 (1) Milk; (2) Butter; (3) Ghee; (4) Animal hair; (2) other _____ (please inscribe “other” produce here)

TABLE B7: Fish catch (Harvest, consumption and prices)

	Season	Total Catch in a month (In Kg)		Average No. of fishing trips per month		Fish Species (Name three most common species only)*1		Production (Typical Catch in Kg per trip)		Total home consumption (Kg in a trip)		Price (PKR/Kg)				Post-harvest losses (Kg Per trip)	
												Fisher's price		Market price (or middleman)			
Pre-Event	Season 1	B71		B71a		B71b		B71c		B71d		B71e		B71f		B71g	
						B72b		B72c		B72d		B72e		B72f		B72g	
						B73b		B73c		B73d		B73e		B73f		B73g	
	Season 2	B74		B74a		B74b		B74c		B74d		B74e		B74f		B74g	
						B75b		B75c		B75d		B75e		B75f		B75g	
						B76b		B76c		B76d		B76e		B76f		B76g	
Post- Event	Season 1	B77		B77a		B77b		B77c		B77d		B77e		B77f		B77g	
						B78b		B78c		B78d		B78e		B78f		B78g	
						B79b		B79c		B79d		B79e		B79f		B79g	
	Season 2	B710		B710a		B710b		B710c		B710d		B710e		B710f		B710g	
						B711b		B711c		B711d		B711e		B711f		B711g	
						B712b		B712c		B712d		B712e		B712f		B712g	
Recovery	Season 1	B713		B713a		B713b		B713c		B713d		B713e		B713f		B713g	
						B714b		B714c		B714d		B714e		B714f		B714g	
						B715b		B715c		B715d		B715e		B715f		B715g	
	Season 2	B716		B716a		B716b		B716c		B716d		B716e		B716f		B716g	
						B717b		B717c		B717d		B717e		B717f		B717g	
						B718b		B718c		B718d		B718e		B718f		B718g	

Enumerators to specify months of each season: season 1_____ and season 2_____.

*1 Theli (1); Rahu (2); Morakhi (3); Jerki (4); Pamplet (5); Soa (6); Singhari (7); Daahi (8); Gulfam (9); Sariyo (10); Gandhan (11); Khago (12) Chitro, Shakur; Goj (13); Daya (14)

TABLE B8: Cost of Inputs for Fishing Trip

Cost of Inputs	Pre-2010 Floods				Post-2010 Floods				2013			
	Per trip (PKR)		Monthly (PKR)		Per trip (PKR)		Monthly (PKR)		Per trip (PKR)		Monthly (PKR)	
Diesel/Fuel	B81		B81a		B81b		B81c		B81d		B81e	
Motor repairs	B82		B82a		B82b		B82c		B82d		B82e	
Net repair	B83		B83a		B83b		B83c		B83d		B83e	
Ice	B84		B84a		B84b		B84c		B84d		B84e	
Ration	B85		B85a		B85b		B85c		B85d		B85e	
Boat maintenance	B86		B86a		B86b		B86c		B86d		B86e	
Other expenses	B87		B87a		B87b		B87c		B87d		B87e	
Total	B88		B88a		B88b		B88c		B88d		B88e	
	B89		B89a		B89b		B89c		B89d		B89e	

Table B9. Agricultural products: outputs, inputs, prices

Time period	Season	Crops Incl. fallow *1	Area planted (Acres)	Tenure Arrangement *2	Production (No of Maund – i.e. 40 kg)	Home Consumption No of Maund – i.e. 40 kg)	Farmer Price of sales (PKR per Maund)	Market Price of sales (PKR per Maund)	Input Costs for Cultivated Crop (In PKR)							
									Fertilizers	Pesticides	Abiana or water tax	Hired labor (days/season)	Own labor (days/season / person)	Tube well (incl. fuel cost)	Machinery rental*3	Others (e.g. transportation)
Pre-Event	Rabi	B61	B91a	B91b	B91c	B91d	B91e	B91f	B91g	B91h	B91i	B61	B61	B61	B61	B61
		B92	B92a	B92b	B92c	B92d	B92e	B92f	B92g	B92h	B92i	B92	B92	B92	B92	B92
	Kharif	B93	B93a	B93b	B93c	B93d	B93e	B93f	B93g	B93h	B93h	B93	B93	B93	B93	B93
		B94	B94a	B94b	B94c	B94d	B94e	B94f	B94g	B94h	B94h	B94	B94	B94	B94	B94
Post- Event	Rabi	B95	B95a	B95b	B95c	B95d	B95e	B95f	B95g	B95h	B95h	B95	B95	B95	B95	B95
		B96	B96a	B96b	B96c	B96d	B96e	B96f	B96g	B96h	B96h	B96	B96	B96	B96	B96
	Kharif	B97	B97a	B97b	B97c	B97d	B97e	B97f	B97g	B97h	B97h	B97	B97	B97	B97	B97
		B98	B98a	B98b	B98c	B98d	B98e	B98f	B98g	B98h	B98h	B98	B98	B98	B98	B98
Recovery	Rabi	B99	B99a	B99b	B99c	B99d	B99e	B99f	B99g	B99h	B99h	B99	B99	B99	B99	B99
		B910	B910a	B910b	B910c	B910d	B910e	B910f	B910g	B910h	B910h	B910	B910	B910	B910	B910
	Kharif	B911	B911a	B911b	B911c	B911d	B911e	B911f	B911g	B911h	B911h	B911	B911	B911	B911	B911
		B912	B912a	B912b	B912c	B912d	B912e	B912f	B912g	B912h	B612h	B912	B912	B912	B912	B912

*1 List of Grain and Cash Crops grown by the household(1) Wazan (Wheat);(2)Chawal (Paddy Rice);(3)Kado Loki (Bottle Gourd);(4)Tuori (Ribbed Guord);(2)Bengan (Eggplant);(6)Bhendi (Lady Finger);(7) Hari Mirch (Green Chilies);(8)Tematar (Tomatoes);(9)Khira (Cucumber);(10)Kerela (Bitter Guord);(11)Gidra (Musk Melon);(12)Pan (Piper Bettle);(13)Kela (Pan);(14)Papita (Pansy Flower);(12)Narial (Coconut);(16)Cheekoo (Mud Apple);(17)Ganna (Sugar Cane);(18)Kapas (cotton);(19)Aam (Mango);(20)Aloo (Potato);(21)Other (Specify here_____)

*2. Own land and cultivated (1); own land and rent to others (2); share cropped land, give details _____ (e.g. sharing ratio) (3); Land rented in (pay fixed rate to landlord) (4); Use of fractuary right (2); Other (specify)_____ (6)

B10: Which farming activity is carried out by female members of the household? (Also, mention days in a month) _____

SECTION C: Asset Ownership, Income and Consumption

Table C.1: Assets owned: quantity and value

Type of assets	Pre- Event				Post- Event				Recovery			
	Quantity		Value (PKR)		Quantity		Value (PKR)		Quantity		Value (PKR)	
Land (In acres)	C11		C11a		C11b		C11c		C11d		C11e	
House	C12		C12a		C12b		C12c		C12d		C12e	
Storage facility	C13		C13a		C13b		C13c		C13d		C13e	
Animal Shed	C14		C14a		C14b		C14c		C14d		C14e	
Tractor	C15		C15a		C15b		C15c		C15d		C15e	
Plough	C16		C16a		C16b		C16c		C16d		C16e	
Tube well	C17		C17a		C17b		C17c		C17d		C17e	
Boat	C18		C18a		C18b		C18c		C18d		C18e	
Net	C19		C19a		C19b		C19c		C19d		C19e	
Motor/ Engine	C110		C110a		C110b		C110c		C110d		C110e	
Motor Vehicle	C111		C111a		C111b		C111c		C111d		C111e	
Motor Bike	C112		C112a		C112b		C112c		C112d		C112e	
Donkey Cart	C113		C113a		C113b		C113c		C113d		C113e	
TV	C114		C114a		C114b		C114c		C114d		C114e	
Generator	C115		C115a		C115b		C115c		C115d		C115e	
Telephone	C116		C116a		C116b		C116c		C116d		C116e	
Mobile Phone	C117		C117a		C117b		C117c		C117d		C117e	

T**able C.2: Household Income and Consumption**

Monthly Household Income (In PKR)	Pre- Event		Post-Event		Recovery	
Total Monthly Income	C21		C21a		C21b	
Farming	C22		C22a		C22b	
Livestock sold	C23		C23a		C23b	
Livestock produce	C24		C24a		C24b	
Business (shops, factory etc.)	C25		C25a		C25b	
Land Rental (and house)	C26		C26a		C26b	
Salary/ daily wages	C27		C27a		C27b	
Equipment Rental	C28		C28a		C28b	
Fishing	C29		C29a		C29b	
Remittances from other household members & relatives	C210		C210a		C210b	

Table C3: Household Consumption

Monthly consumption	Pre- Event		Post-Event		Recovery	
Total Monthly expenses	C31		C31a		C31b	
Total Food items bought	C32		C32a		C32b	
• Meat (chicken, beef etc.)	C33		C33a		C33b	
• Cereal (Wheat, rice)	C34		C34a		C34b	
Total Food items consumed	C35		C35a		C35b	
• Meat (chicken, beef etc.)	C36		C36a		C36b	
• Cereal (Wheat, rice)	C37		C37a		C37b	
Education	C38		C38a		C38b	
Health care (doctor's fees and purchase of medicines)	C39		C39a		C39b	
Miscellaneous	C310		C310a		C310b	

C4: Did any school going children in your household discontinue schooling post floods to ease expenses? Yes/ No

If yes, mention person code including females _____

C5: Did your family members suffer illness or injuries **because of floods**? Yes/ No

If yes, mention person code including females and their illnesses _____

C6: Which member of the household took part in the rebuilding and rehabilitation process? Mention person code including females

_____

Section D: Institutional Arrangements

D1: Village Profile

Facilities Available in your village (Tick as appropriate)	Pre Event		Post Event		Recovery	
School	D11		D11a		D11b	
Drinking water and Sanitation	D12		D12a		D12b	
Dispensary/ hospital	D13		D13a		D13b	
Veterinary Facility	D14		D14a		D14b	
Shop/market	D15		D15a		D15b	
Roads	D16		D16a		D16b	
Public Transport	D17		D17a		D17b	
Telephone network	D18		D18a		D18b	
Internet access	D19		D19a		D19b	
Electricity supply	D110		D110a		D110b	
Farmer associations	D111		D111a		D111b	
NGO/ CBO	D112		D112a		D112b	
Water availability for fields	D113		D113a		D113b	
Others	D114		D114a		D114b	

D2: Type and source of household credit

	Credit Source *1		Loan (In PKR)		Interest rate/ year		What is the repayment time? (In months)		Collateral for the loan? *2		Where did you primarily spend this loan?*3		Have you defaulted on any of these loans? If yes, mention the date of default.		Were the terms of loan revised after default? (e.g. increased interest rate, penalty)	
Pre-Event	D21		D21a		D21b		D21c		D21d		D21e		D21f		D21g	
	D22		D22a		D22b		D22c		D22d		D22e		D22f		D22g	
	D23		D23a		D23b		D23c		D23d		D23e		D23f		D23g	
Post-Event	D24		D24a		D24b		D24c		D24d		D24e		D24f		D24g	
	D25		D25a		D25b		D25c		D25d		D25e		D25f		D25g	
	D26		D26a		D26b		D26c		D26d		D26e		D26f		D26g	
Recovery	D27		D27a		D27b		D27c		D27d		D27e		D27f		D27g	
	D28		D28a		D28b		D28c		D28d		D28e		D28f		D28g	
	D29		D29a		D29b		D29c		D29d		D29e		D29f		D29g	

*1 Bank (1); Micro finance institute (2); Farmer associations (3); Land lord (4); Relative or Friend (2); Local Lender (6); Middleman

*2 Land (1); share of output (2); other asset (3); other (specify) (4)

*3 Buy inputs (seeds, fertilizer, machinery) (1); invest in equipment/ land (2); buy food/clothing/medical care (3); education/training (4)

D3: Do you owe money or any other asset (land, machinery, boat) to anybody else (for instance, parents, relatives, friends). _____

D4: Have you ever been refused a loan by any lender? Mention the reason and source: _____

D5: Has your household given out loans in the past 5 years, but the borrower defaulted? Mention amount and reason for the default: _____

Table D6: Have you received any subsidy/ Aid from the following sources post event

	Source*1		**Which household member received it including females? (Enter person code)**		**Financial Aid** (In PKR)		**Food Aid (If yes, mention the duration in the column)*2**		**Housing**		**Subsidy (e.g. seed, fodder) (If yes, mention the duration in the column)*2**	
Pre-Event	D61		D61a		D61b		D61c		D61d		D61e	
	D62		D62a		D62b		D62c		D62d		D62e	
	D63		D63a		D63b		D63c		D63d		D63e	
Post- Event	D64		D64a		D64b		D64c		D64d		D64e	
	D65		D65a		D65b		D65c		D65d		D65e	
	D66		D66a		D66b		D66c		D66d		D66e	
Recovery	D67		D67a		D67b		D67c		D67d		D67e	
	D68		D68a		D68b		D68c		D68d		D68e	
	D69		D69a		D69b		D69c		D69d		D69e	

*1 Government (1); NGO, specify source _____ (2); Relatives/ Neighbors/ friends (3); Benazir income support program (4); Other (Pls. specify) _____

*2 only after the event (1); for a month (2); for a year (3); other _____ (4)

Table D7: Has your household undertaken following adaptation measures to lessen the impact of natural disaster?

Adaptation Measures (Tick as appropriate)	Pre- Event		Post-Event		Recovery	
Rain water harvesting	D81		D71a		D71b	
Constructions of flood defense infrastructure (e.g. raise banks, enlarge reservoirs, upgrade drainage systems etc.)	D72		D72a		D72b	
Water conservation (Construction of bunds around fields, or land leveling to preserve water for the crops)	D73		D73a		D73b	
Shift to alternate livelihood means (including migration to other cities)	D74		D74a		D74b	
Shift in cropping patterns,m nuhu or cultivation of a different variety of crop, because of climate variability	D75		D75a		D75b	
Relocation/ Movement of assets	D76		D76a		D76b	
Restriction of settlement in disaster prone areas by the government	D77		D77a		D77b	
Construction of disaster resilient shelter (government/ on households own initiative)	D78		D78a		D78b	
Early warning system: mention source_____	D79		D79a		D79b	
Insurance schemes against flood damage (for livestock, houses, cultivated crop etc.)	D710		D710a		D710b	