STUDY

SOCIOECONOMIC
BASELINE
of Pakistan's Coastal Areas

2012

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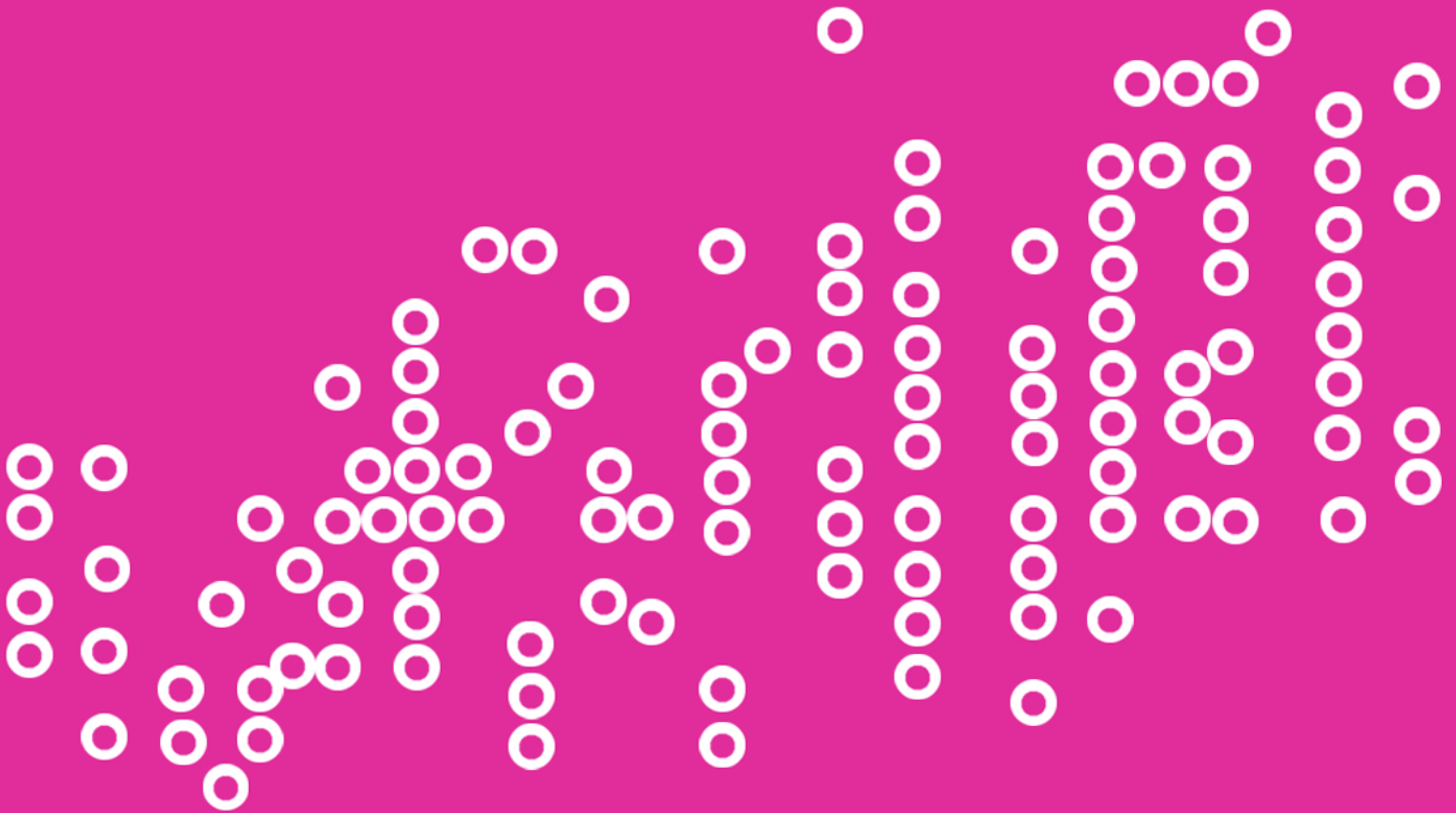
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WWF is one of the world's largest and most experienced independent conservation organizations, with over 5 million supporters and a global network active in more than 100 countries. WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

Socioeconomic Baselines: Kharo Chan, Keti Bunder, and Jiwani

Building Capacity on Climate Change Adaptation in Coastal Areas of Pakistan (CCAP), WWF – Pakistan

FOREWORD BY WWF – PAKISTAN

The World Wide Fund for Nature Pakistan (WWF – P) has from 2010 onwards taken on scientific research into the climate change adaptation response of Pakistan's coastal communities and on the determinants and impacts of climate change adaptation in agriculture intense sectors of Pakistan's economy. Concrete results expected from these 3-5 year long initiatives concluding in 2015 include recommendations to planners and policy makers on food security, in the latter case, and, in the former case, the implementation of union-council level adaptation plans for coastal communities residing in Thatta, Karachi, and Gwadar districts. The approval by the Federal Cabinet of a climate change policy in April 2012 can only support such initiatives, by no means standalone initiatives, through provision of institutional engagement and the kind of momentum needed for Pakistan to better define its interests and priorities in the face of climactic variability and change.

The Building Capacity on Climate Change Adaptation in Coastal Areas of Pakistan (CCAP) project (2011-2015) is made possible through the generous support of the European Commission. This paper represents the efforts and joint works by partners LEAD Pakistan and WWF UK and associates in Bangladesh, Iran and India. It forms a crucial part of the CCAP study in putting in place a baseline by which to measure and monitor change at the community level. This is particularly important for providing a foundation to a series of papers that has been commissioned to empower stakeholders with factual, up to date, and non-partisan information required to elaborate, notify, and begin implementing union-council level adaptation plans in coastal districts from 2013 onwards. Papers in this series that are to be published in 2012 include: 1) an Indus River environmental flows study; 2) a graphic information system based hazard map of coastal areas including the Indus delta; 3) a climate data modeling study forecasting trends in sea level rise, precipitation, and temperature specifically in coastal areas; 3) a political and institutional analysis to assist practitioners to mainstream adaptation measures at the provincial and federal levels; 4) a community based vulnerability assessment to help define the adaptation priorities of villagers at Keti Bunder, Kharo Chan, and Jiwani and suitable interventions in this regard; and, 5) a series of other ballasting studies and tools, such as a study to assess the extent of salinization of productive agricultural lands and its expected adaptation impacts, and, a decision support system to supply historic sub-district level time-series data on rainfall and temperature.

CCAP is proud to release the present study and anticipates that it will greatly assist the identification of vulnerable communities and where increased adaptive capacity is most needed. This baseline study is important and stands out by its recognition and focus on the impacts of climate change on the livelihoods of coastal communities, rigorous and comprehensive analysis on livelihood indicators that take into account community priorities and challenges, climate change and the poverty-environment nexus and its relationship to environment and climate related household decisions. Important findings include existing adaptation strategies that can and should be built upon to strengthen them. This quality baseline will go a long way in informing policymakers and project implementers, with reliable data on where their efforts and focus are most required.

Rab Nawaz

Director - Sindh
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Executive Summary

The World Wide Fund for Nature – Pakistan's (WWF-P's) Building Capacity on Climate Change Adaptation in Coastal Areas of Pakistan or CCAP project (see www.wwfpak.org) envisages establishing climate resilient ecosystems that sustain Pakistani coastal communities' livelihoods by 2025. To fulfill this objective, a 5-year action programme (2011-2015) initially focuses on Kharo Chan, Keti Bunder, (and Jiwani, a research but not an action site) for vulnerability assessments, climate adaptation plans, and policy mainstreaming to secure adaptation and climate resilient investment into sectoral and local development plans.

This report details results of socioeconomic baselines based on field surveys carried out at Kharo Chan (28-31 December 2010), Keti Bunder (8-10 October 2011), and Jiwani (17-24 October 2011). The Kharo Chan baseline survey was carried out by WWF-P's Indus for All Programme as part of its Phase II plans. With minor changes and the introduction of new comparative graphs, e.g., for income analysis, the authors have borrowed the write up on methodology and results of the Kharo Chan baseline as it was reported in WWF-P Indus for All Programme's "Phase II Socioeconomic baseline" (2010). The format and section numbering in the present CCAP report closely follows that of the Phase II Socioeconomic baseline in order to allow readers to easily access, reference and compare numerical results across reports, survey instruments, and databases generated by the baselines.

The purpose of the Socio-economic Baseline and Needs Assessment Study is: (a) to design action and policy interventions for the project based on the physical, social, and institutional information obtained; (b) to produce benchmark information for monitoring certain testable performance indicators. These indicators will be used concurrently with implementation measures during the 2012 – 2015 period as well as mid-project and post-project assessment and evaluation cycles.

The report is structured geographically, reporting results of each site separately. However, a comparison of sites under thematic headings is undertaken in this executive summary. The report first details methodology (2.1 and 2.2) and income analysis of all sites (3.21 and 3.22), then repeats the following content for each site: livelihood indicators besides income, community priorities / challenges / organizational status, climate change and the poverty-environment nexus, and women's livelihoods, health and access to facilities (3: Kharo Chan, 4: Keti Bunder, and 5: Jiwani). The survey instrument and sampling frames are annexed to this document.

The database created from these surveys will be periodically updated as an ongoing monitoring tool and will be made available on the website from 2013 for research purposes. The database will be posted as a ".dta" file in STATA-12 command based econometrics software. When queried with the help of the questionnaire, which will also be posted, simple commands in the software can generate high-level statistical analyses on subsistence and economic activity and its relationship to environment and climate related household decisions.

Key cross-cutting findings are presented in what follows. First, we note that more than 40% of our sampled households at Keti Bunder fall below the PKR poverty line (i.e., about PKR 50, as adjusted for inflation after 2007-08), while about 20% fall below the national poverty line at Jiwani. Of the three sites, Kharo Chan shows the highest incidence of poverty as measured by the national poverty line, with nearly 50% of households earning PKR 50 per day or less. Monthly average household incomes, with mean figures bracketed alongside site names in descending order, are as follows: Kharo Chan (PKR 21,144), Jiwani (PKR 19,716), and Keti Bunder (PKR 13, 002).

Second, several and significant obstacles stand in the way of shifts out of poverty as indicated by livelihoods indicators examined in CCAP's socioeconomic baseline. The savings ratio, i.e., net household savings divided by net income, for Kharo Chan is in the 11%-30% range while it is slightly above 30% for Keti Bunder. At Jiwani, savings are lowest at villages Okar and Jiwani, with average net monthly savings of households lying between PKR 500 and PKR 30,595, according to an alternative calculation method examining outflows of monthly expenditures adopted by a 2011 Pakistan Wetlands Programme study in 2011. Average loan / debt taken on by given households ranges from PKR 13,800 (Jiwani), to PKR 55,000 (Keti Bunder), and to PKR 120,000 (Kharo Chan). Livestock ownership represents an important means of insurance or safeguard that can be used as a contingency measure or to supplement income. By this measure, vulnerability in the face of shocks to regular streams of income would appear to be highest at Keti Bunder. On the whole, in terms of the numbers of households owning cows/buffalo, Kharo Chan would appear to be least vulnerable, while ownership of goats, asses, and camels is quite widespread at Jiwani. Hours spent hauling water is an indicator of the opportunity cost of time borne by households -- time that could be spent productively accumulating assets to boost or complement household livelihood and welfare -- and is highest at Kharo Chan (it takes villagers at Ali Utradi village an average of 2-4 hours for a return trip). Illiteracy is highest at Keti Bunder where 80% of households reported not having schooled at all; and, it is the lowest at Jiwani where 14% of households reported illiteracy. The male to female illiteracy ratio, when it is at parity or above, signals a low disparity in educational levels: Kharo Chan has a ratio of 1.32, while Jiwani shows least educational attainment for women as compared to men with a ratio of 0.15 (Keti has a ratio of 0.82).

Third, we find that women have significant constraints that prevent them from contributing to monthly earnings, to fulfill their roles as mothers since access to health facilities are limited, and, in the absence of public information sources, we find them vulnerable to risks such as climate variability. Illiteracy is lowest at Kharo Chan (50%) and highest at Keti Bunder (97%). Vocational skills such as rilly making, hat making, embroidery, and sewing are most diversified at Jiwani and least so at Kharo Chan. In terms of health care, our questionnaire did not enable us to examine aspects of affordability of consultations, or, accessibility such as one-way distances. However, we find that a greater number of women reported having had consultations with public doctors at Keti than at Jiwani. Information sources are most diversified at Jiwani where they include newspapers, TV, radio, friends/relatives, and mobiles.

Fourth, we found more exclusive fishers at Keti Bunder (68%) than at Jiwani (53%) or Kharo Chan (48%). Though a basic indicator, high natural resource dependency is tied closely to vulnerability. The significant margins made by middlemen at all three sites suggest fishers are unlikely to develop their businesses and slowly earn higher average unit prices and increase profits over time. A high dependency on a single natural resource stock is sustainable only if natural resource management practices are followed, which we know is not the case at CCAP sites. The levels of

poverty in our sample further suggest a low potential to earn sufficient to save and invest earnings, and, therefore, a low incentive to stagger and spread natural resource extraction over time.

Fifth, we find a variety of priorities and challenges at each site. Water supply is a widespread and primary priority at both Kharo Chan and Keti Bunder. It is less so at Jiwani where the majority of households pay under PKR 50 to obtain water. Perhaps the next most widespread priority is obtaining access to basic health units. Road construction is a priority among inland villages at Keti Bunder and Kharo Chan, and is a priority for all villages barring four at Jiwani. The demand for schools is evident in the high numbers of respondents in nearly all villages at both Jiwani and Keti Bunder. In terms of challenges, as the surveys were conducted within a period of 2-3 months of severe floods or unprecedented rains, responses convey requirements in terms of relief and rehabilitation at all three sites. Unemployment is a major challenge at Keti Bunder and Jiwani, while disease prevalence is the next most common reported challenge at all sites.

Sixth, linkages between poverty and environment are likely to be identified and established considering the presence of preconditions such as high natural resource dependency in terms of primary income sources, reports of declining fish and forest stock, and extremely low levels of earnings and savings. At Kharo Chan there is high dependence on natural resources, both fish stock and productive land. At Keti Bunder dependence on fisheries is very high, with 77% of all heads of households reporting that they are exclusive fishers. Households at Jiwani rely on a variety of livelihoods that are dependent on natural resource extraction and use including wood based enterprise, sale of NTFPs, agricultural production, aquaculture and fisheries. All respondents engaged in such resource extractive activities considered that these activities contributed to over 80% of their monthly household income.

Seventh, this report produced preliminary insights on classes of climate change adaptation strategies adopted by villagers at Jiwani, Keti Bunder and Kharo Chan. In some cases, these are 'averting' actions, e.g., migration, or, in other cases, these are 'mitigation' actions that would lessen the severity of livelihood impacts from climate change, e.g., storage of water, or, climate-induced insurance savings, or, diversification of livelihoods. At Kharo Chan, changes in sowing and fishing expedition dates, along with water storage in response to changes in precipitation can be attributed by many respondents to climate change. At Keti, only half of the sample reported taking any adaptation actions. Among those who reported adopting strategies, a high number migrated from as many as five villages, while changed fishing dates were reported at two villages. At Jiwani water storage was reported by 20% or more of all households in as many as 3 villages, while livelihoods diversification is a highly significant adaptation strategy in 6 villages.

Principal site wise findings, with village-level recommendations, are as follows:

1. At **Kharo Chan**, where monthly average household income is PKR 21,144, approximately half of all sampled households fall below the national poverty line. Nearly half reported receiving **loans** which on average were PKR 120,000. The majority or 80% borrowed from middlemen. This suggests that **revenue enhancing interventions** such as provision of jetty construction, refrigerators and mobile ice boxes, must concomitantly examine business strategies that place fishers / farmers in more direct contact with buyers (there is a 25-30% disparity between fisher and market prices across all fish types). Loans are reported as a priority in Haji Hameer Memon and Babiyo

villages, both of which are characterized by exclusive farmers. Besides possibly indicating complex relations among farmers and middlemen, this priority could indicate the need for a capital investment into agricultural inputs or farming implements to enhance yields. As 79% of our sample does not own boats, provision of boats can assist in enhancing incomes, so long as it is carefully accompanied by measures to prevent overfishing and livelihoods diversification.

With 44% of households reporting no access to **educational facilities**, villages reporting educational facilities as a priority are Ahmad Balani, Haji Mir Muhammad, Haji Qadir Bux, Haji Hameer Memon and Babiyo. Those villages from which households are required to cover the longest distances to reach schools are Chachlo and Muhammad.

Villages where **drinking water availability** is scarcest are Ahmad Balani and Runjha, while highest times reported for fetching water are for villages Ali Utradi and Hadi Qadir Bux. These four villages may be prioritized when the Indus for All Programme intervenes / invites involvement from stakeholders who specialize in providing solutions to water scarcity.

As concerns **health facilities**, villages that would appear to be neglected and possibly in need of priority interventions include: Runjha, Lal Muhammad Khaskheli, Sanhri, Ali Utradi, and Essa Baloch. In terms of **disease prevalence**, diarrhea and malaria are the foremost problem and any intervention targeting these diseases would at once assist all villages, barring one or two only.

Interventions in the area of **agriculture** would be warranted for the following crops, listed by those most commonly grown: wheat, pan (betel leaf), rice, ribbed gourd, bananas, cotton, and maize.

In terms of **community priorities** of villages, water supply is most urgently needed at Ramzan Sehto, Essa Balani, Lal Mohammad Khaskheli, and Gul Mohammad Jat. Schools are a major priority at Ahmad Balani and Haji Qadir Bux. Other priorities are listed in detail in Fig 3.29. The single biggest **challenge** faced by the community is floods at this time, with the possible exception of Essa Khaskheli, Ahmad Balani, and Lal Mohammad Khaskheli where respondents did not mention floods as a challenge at all. It is perhaps worth noting that tribal clashes were mentioned at Babiyo, while police injustice was listed as a challenge by several households at Haji Qadir Bux.

Women's livelihoods, health and access to facilities shows in the first instance a hugely undiversified skill base, highly concentrated on embroidery with sewing only implicating 10% of our sample. With sales of embroidery fetching a total monthly profit of PKR 620 on average, there is clearly scope for improving value added even in this particular area. CBO membership is absent, with no real organized and regular union council membership activities. Early warning work in the area of vulnerability of coastal communities to climate variability and change will find this report's findings on information sources valuable.

2. At **Keti Bunder** monthly average household income is PKR 13,002, the lowest of all from among CCAP's socioeconomic baseline. Just over half of our reporting households receive **loans** of about PKR 55,139. About 10% of our sampled households own land of plot sizes up to 300 acres. Boat ownership was reported for all villages in our sample, with the highest concentration of ownership by village at Tippun.

As regards access to **educational facilities**, of the total sampled households, 50% reported having no access to educational facilities at all. Among those with access, only 2% reported availability of middle level education facilities. The male-female illiteracy ratio is 0.82.

As regards **community priorities** at Keti Bunder, with the exception of Haji Mamu, school construction / availability occupies a large share of overall responses. Water supply is an issue at all villages excepting Haji Sheedi, Hajamro, Kangri, and Bhoori. Dispensaries are a priority in 7 out of 11 of sampled villages, with very high need in Bhoori, Kangri and Haji Moosa Jatt.

As concerns **health facilities**, CCAP would need to help focus the attention of its social sector specialist stakeholders at villages Mahmood Dablo, Haji Mamu, Tayab Jatt, Haji Sheedu, Kangri, Haji Moosa Jatt, and Bhoori where there is reportedly no access to health facilities at all. In terms of **disease prevalence**, diarrhea is the most common complaint among villages in our sample, followed by skin and eye diseases.

Agricultural asset ownership, unlike the other CCAP sites, is limited to very few households and involves ownership of land by 10% of our sample only. Of this 10%, half of the reporting households said they had cultivable land of 20-800 acres and the other half 1000-7000 acres.

In terms of **women's livelihoods, health and access to facilities**, rilly making is the major vocational skill and earns women approximately PKR 700 per month on average, but this demand is not constant. There is extremely high female illiteracy at Keti Bunder, reported at 97% for 2011. As there is an absence of any significant investment in education facilities in the past 4 years, there is little chance of a forward movement from the 2007 baseline recorded at the time by the Indus for All Programme. As information about means of communication adopted by women is a useful guide in designing early warning systems, the CCAP may wish to use the following information early on in its project design: 70% of women report that information is obtained through mobile phones, while 10% mentioned radios.

3. At **Jiwani** monthly average household income is PKR 19,716, the second highest from among CCAP sites. Loan sizes are in the order of PKR 13,800, nearly a tenth of what on average is required by households at Kharo Chan. Borrowing is mainly from relatives and/or middlemen. Agricultural machinery ownership covers a tractor each in the case of two households (villages Gunz and Robar), one household owning a plough (village Panwan), and no household owning a pump.

As regards access to **educational facilities**, most villages, with the exception of Dirr Nokabad and Daran, have at least one educational facility. Illiteracy is not as high here as it is at Keti Bunder and Kharo Chan, 14% compared to 80% and 66%, respectively. The male to female illiteracy ratio is 0.15, i.e., 14% illiterate males compared to 90% illiterate females. **Water charges** are very low compared to other sites, well over 90% of those sampled pay below PKR 50 per month.

As concerns **health facilities**, government hospitals are present at Bandari, Kohsar, Kargoshi, and Panwan villages only. Malaria and Diarrhea are remarkably present in most villages, at levels exceeding 30% of all reporting households in most cases. Typhoid is reported in six villages, but is almost certainly an

underestimate. For example, according to PWP (2011) 7% of all sampled households at Panwan reported typhoid, while none reported it in our survey.

Agricultural asset ownership covers a tractor each in the case of two households (villages Gunz and Robar), one household owning a plough (village Panwan), and no household owning a pump. As much as 82% of the sample own mobile handsets, with half of these households owning more than a single handset. Mechanized transportation of any type, including vehicles or motorcycles is reported by 44% of all households.

In terms of **Community priorities** Dispensaries are a major priority at all villages except at Dara Ghulam Rasool, most acutely at Bandri, Robar, Okar, and Jiwani. The second highest priority is schools and roads, with roads demanded by over 50% of households at Gauthri Bazar and schools reported as a priority by 70% or more in Dara Ghulam Rasool and Nok Dirr.

Women's livelihoods, health and access to facilities reveal that sewing is the principal source of earnings from women as well as their main skill set. The second highest shares of skills are for hat making and embroidery, in about equal amounts. On average, income earned from any livelihood occupation, from among the 17% of sampled women who reported earnings, is approximately PKR 5,030 per month. As many as 41% of our sample report use of a private doctor, while 44% responded that they consult with public doctors for all types of treatment. All villages without exception report consultations with public/private doctors.

1. Introduction

The World Wide Fund for Nature – Pakistan's (WWF-P's) Building Capacity on Climate Change Adaptation in Coastal Areas of Pakistan or CCAP project (see www.wwfpak.org/ccap) envisages establishing climate resilient ecosystems that sustain Pakistani coastal communities' livelihoods by 2025. To fulfill this objective, an initial 5-year action programme (2011-2015) is underway at Kharo Chan, Keti Bunder, and Jiwani for vulnerability assessments, climate adaptation plans, and policy mainstreaming to secure adaptation and climate resilient investment into sectoral and local development plans.

The CCAP's mandate covers selected coastal communities in Thatta district and Gwadar districts. Pakistan's has a coastline stretching approximately 990 kilometers, with an Exclusive Economic Zone of 240,000 square kilometers. Jiwani is located in Gwadar district, which along with Lasbela forms Balochistan's 770 kilometer coastal expanse from the Hab River's mouth in the east to the Iranian border in the west. Kharo Chan and Keti Bunder are both located in district Thatta along Sindh's 350 kilometer long coastline, which also includes Badin and Karachi districts.

By mid-2012, the CCAP will have produced the following 6 studies to legitimize its call for government to adopt climate adaptation plans: Community Vulnerability Assessments, Best Adaptation Practices, Climate Data and Modeling Analysis, a Political and Institutional Analysis, a GIS hazard Mapping, and an Environmental Flows study. Policy makers, planners, academics, and other stakeholders will have also contributed to a synthesis report containing the main results of these studies by end-2012.

Before reporting the specific results of the 2011 Kharo Chan, Keti Bunder, and Jiwani baselines, we note here a few key developments and definitions which will help place the baseline in a country context and assist the reader to understand climate change discourse. First, according to Maple Croft's vulnerability rankings, Pakistan has jumped to 16 in 2010-2011 from its previous position at 29 in 2009-2010. Note that, the Intergovernmental Panel on Climate Change (IPCC) defines vulnerability as "the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes" (IPCC, 2007). The term "adaptation" describes vital steps taken by affected communities in response to impacts from climate change. Vulnerability in connection with adaptation and climate change impacts, at its simplest, is indicative of the degree of susceptibility to hazard impacts.

As stated above, Pakistan is a country now ranked 16th, up from 29th by Maplecroft's (2010) Vulnerability Index. This ranking, along with three consecutive years of flood related devastation in Sindh (2009, 2010, 2011), changes in monsoon patterns, and the lack of coastal resilience to cyclones (Phet 2011, Yemyin 2007) and storm surges, provides evidence of Pakistan's increasing vulnerability to climate change.

The CCAP focuses on the impacts of climate change on coastal ecology and settlements. The project aims to support adaptation and improved coping capacities among communities and government partners. Programmatic focus will be on supporting robust livelihoods, and community and ecosystem resilience. The project will work in selected sites in district Thatta (Keti Bunder and Kharo Chan) in Sindh, and district Gwader (Jiwani) in Balochistan.

Coastal communities, in this context, are particularly vulnerable to climate change as they are exposed to storm surges, cyclones, sea level rise and sea level intrusion and livelihood disturbances such as reduced fish stocks and unsafe seas due to extreme weather systems.

2. Methodology

2.1   The Survey Methodology, Survey Dates, and Questionnaire Design:

The CCAP's sampling strategy is geared to produce a representative sample of our three research sites in order that consistent estimates of population means and totals can be calculated.

A 2-stage stratified cluster sampling strategy was employed at all 3 sites. This approach allowed us to offset the prohibitive financial, time, and informational constraints required to elicit a simple random sample. For each research site, we determined the appropriate sample size approximately by selecting a 95% confidence interval and an error of 5%.

Stratification of villages was utilized as follows: (a) two strata were defined, small (<= 12 villages) and large (>= 12 villages) villages. The rationale for this is that where there is heterogeneity, stratification can significantly reduce standard errors. Without stratification, a simple 2-stage cluster sample is expected to omit some village types completely, to the detriment of the precision of population estimates.

In the 2-stage cluster sample, at stage-1 a random sample of villages (clusters) was selected within each strata wherein sampling was proportional to population (using population proportional to size or PPS sampling). No less than 10 villages, and up to 15 villages were selected (exceptionally more were selected to oversample natural resource dependency). The reason for a sample size of 10 is that: (a) 10 or so clusters have empirically been tested and found to be a useful number for precision; (b) limiting clusters limits costs; and, (c) observations are self-weighting if there is proportional sampling.

At stage-2, from each village a random sample of 10 households was selected. This sample is self-weighted and each household has the same probability of being sampled within a stratum since there is proportional sampling of clusters The rule of thumb that was used in relation to sampling within the cluster was to make sure the sample does not fall below 10, while noting that very little precision is gained from samples greater than 30. The more homogenous the cluster sample, the lower the sample needed to attain a particular level of precision. In some studies, as the within sample increases, the design effect[1] increases.

The same underlying sampling strategy was used at all CCAP sites. The sample sizes and populations of each survey site are given in table 2.1 below.

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[1] The term 'design effect' refers to the discrepancy between the standard errors associated with simple random sampling (SRS) and other sampling strategies such as cluster sampling. The design effect measures the extent to which the accuracy of a survey design differs from SRS, e.g., a design effect of 2 would indicate that the sample would have to be doubled to achieve the same desired level of precision.

Table 2.1: Sample Sizes and Populations for CCAP Socioeconomic Baseline Surveys

CCAP Research Sites	Sample Size	Population (2011, projected)	Proportion of Population
Kharo Chan	132	33,058	0.4
Keti Bunder	291	30,766	0.9
Jiwani	576	19,000	3.0

Note: female surveys in sample sizes bracketed: Kharo (14), Keti Bunder (68), Jiwani (332)

Table 2.2 below provides an example from Kharo Chan of the sampling frame and the random sample of villages from this frame. The villages that were randomly sampled are indicated in the column entitled "villages", the column entitled "strata" indicates if villages were considered small (=1) or large (=2), while the final column indicates the size of the sample taken from the sampled village. The pattern was followed for Keti Bunder and Jiwani and tables are shown in Annex I.

Table 2.2. Sampling Frame and Startified Cluster Sample for Kharo Chan

Village Name	Creek	No Of HH	Population	Strata	Villages	Targeted Sample	Total Sampled
Abdullah Khati		53	342	2	1	10	10
Abdullah Mirbhar		8	52	1	0	0	0
Ahmed Balani		11	68	1	1	10	2
Essa Balani		11	68	1	1	10	2
Essa Khaskhali		16	102	2	1	10	3
Gul Muhammad Jat	Mutni Creek	5	34	1	1	5	1
Jamoot Chuta Khaskhali (Arif Samo)		5	34	1	1	5	10
Juman Gadu		9	59	1	0	0	0
Lal Muhammad Khaskhali		5	34	1	1	5	1
Munno Khashkheli		10	65	1	0	0	0
Ranjha		11	68	1	1	10	1
Sumar Sohto		10	65	1	0	0	0
Umar Jo Goth		11	72	1	0	0	0
Gul Muhammad		16	102	2	1	10	1
Ismael Kattyar		10	65	1	0	0	0
Ramzan Sehto	Padwari Creek	53	342	2	1	10	3
Usman Mallah		9	59	1	0	0	0
Utthar Goth		10	65	1	0	0	0
Sanhri	Samri Creek	5	34	1	1	5	1
Haji Mir Muhammad	Betri Creek	5	34	1	1	5	12
Ali Utradi		63	410	2	2	20	13
Essa Baloch		42	273	2	1	10	5
Haji Qadir Bux	Kharand Creek	68	444	2	1	10	8
Haro Baloch		14	91	2	0	0	0
Wali Muhammad		12	78	1	0	0	0
Achar Shaikh		9	59	1	0	0	0
Babiyo		173	1127	2	2	20	26
Ghulam Qadir Baloch	Inland Village	8	52	1	0	0	0
Haji Hameer Memon		26	171	2	2	20	33
Sajanwari		9	59	1	0	0	0
Total		696	4527	40	20	176	132

* Note: Of the total sampled of 132, there were 118 male heads of household and 14 females interviewed; villages actually sampled are bolded

Baseline surveys were conducted as follows: Kharo Chan (28-31 December 2010); Keti Bunder (8-10 October 2011), and Jiwani (17-24 October 2011).

Teams of both male and female enumerators were trained by the Programme Economist, Indus for All Programme, at the Programme Management Unit office in Karachi on 28 December 2010 and again on 7 October 2011 for Keti Bunder and Jiwani. Key training items covered included: familiarity with survey instrument modules, enumerator data entry protocols,

memorization of standard patter accompanying the questionnaire, methods for corroborating the validity of respondents' answers, and techniques to facilitate the task of data entry operators.

A reconnaissance survey and pilot testing of the (male and female) questionnaire was conducted on 29 December 2010 at Kharo Chan. This was overseen by the Programme Economist, Indus for All Programme.

A separate male and female questionnaire were administered at all CCAP sites (see questionnaires in Annex II).

The male survey instrument design includes three basic modules: (a) profile of household members; (b) their access to social infrastructure and perceptions on environmental, social and economic challenges; and, (c) sources of income and expenditure in both disaggregated and aggregated forms. The female survey captures complementary detailed information on health, natural resource dependency, livelihoods, and household priorities, all from a gender perspective.

Lessons from the Indus for All Programme's 2006-2011 experience have been incorporated in CCAP's baseline report. For example, datasets from the Programme's 2008 Total Economic Valuation surveys are referenced to corroborate measures of income and fish catch.

The questionnaire design includes questions on climate change adaptation to provide CCAP a baseline, in particular, for: assessment of existing adaptation measures, if any, and the demand/need for help with adaptation.

2.2.   Methodology for Income Determination:

Per capita income per day is estimated for 2010 for Kharo Chan and for 2011 at Keti Bunder and Jiwani, using USD and PKR poverty lines for contextualization. The following methods were used to test robustness of the incomes obtained:

(a) Standard questionnaire section on: annual household income sources identifying individual household members' salary and employment status, estimates of all inflows including property ownership, land rental, and remittances, among others;

(b) Questionnaire section on: total monthly expenditures (enumerators trained to help respondent identify counterintuitive expenditure items);

(c) Corroboration of income and savings values estimated in "a" and "b" (above) using data from questionnaire sections (listed in parentheses) eliciting volumes and average unit prices accrued from: livestock sales (D1), agricultural sales and sharecropping arrangements (D13), fishery sales (D15), income from enterprise based on sale of timber (D18), non-timber forest products (D17), and vegetation / handicrafts made from vegetation derived from lakes (D16).

(d) Corroboration of each of the average price and volumes associated with items in "c" based on datasets from four years prior (2007) covering agriculture and inland / marine fisheries, among others, at Keti Bunder.

(e) Following "d" (above), extrapolation of three-year and four-year average inflation, in order to cross-check the plausibility of price and volume figures obtained in "c" above.

(f) Interviews with leaders in industry and business associations representatives to ascertain whether the plausibility of price and volume figures in "c" above.

Our command-based econometrics software, STATA-12, allowed us to maintain records (available upon request) of our cross-checking work which is stored in ".do" (store of command routines), ".dta" (database store), and ".log" files, the latter being the equivalent of a lab notebook of actions maintained by bench scientists to: (i) allow easy replication, (ii) monitoring and evaluation of work, and (iii) records of exact small details needed for replication as a contingency against loss of methodology notes.

3. Kharo Chan Coastal Ecosystem

3.1   Summary Profile of Kharo Chan:

Kharo Chan lies along Sindh Province's coastline of approximately 350 km, a significant part of which comprises the Delta of the River Indus. Kharo Chan itself covers an area of 778 sq km. Besides Kharo Chan, other talukas of Thatta and Badin Districts falling on the coastline include Keti Bunder, Ghorabari, Jati, Mirpur Sakhro, Shah Bunder, Badin, and Shaheed Fazal Rahu. Kharo Chan's taluka – also known as a union council – is headquartered at Baghan.

In terms of overall demographics, Kharo Chan has 1 union council, 41 revenue villages, and 4,385 households (Govt. of Sindh, 2001). If we extrapolate the population to 2011, using the national growth rate of 2.2% and an average household size of 6.5 from our sample, we obtain a total population of 33,058 for Kharo Chan taluka. The male-female ratio, as per the 1998 census, is 1.16.

Existing community organization and membership may be gleaned from past interventions. The Sindh Coastal Community Development Project (NRSP, 2009) reports 33 community organizations formed with a membership of 495, and 8 village development plans completed. The 3 revenue villages, with 11 village names bracketed, where interventions are ongoing include:

- Atharki (Haji Moosa Katiar),

- Mor Chadai (Haji Noor Ahmed Jat, Yar Mohammad Burj, Yar Mohammad Sholani, Khamiso Khaskheli, Haji Gul Mohammad Jat, Ghani Sholani, Haji Hashim Sholani, Jaffer Mughal),

- Dolho Sholani (Aitbar Ali Shah, Muhammad Yaqoob Murghar / Balouch)

Community organization based on our survey instrument (sampling 118 males and 14 females), reveals only 4 male members of community based organizations, 2 each in village Babiyo (Deh Babiyo) and village Haji Hameer Memon (Deh Bit Mehar). We note that these do not coincide with Sindh Coastal Community Development Project villages listed above. Also noteworthy is that there are no females interviewed with community organization membership. The Programme's 2008 socioeconomic baseline notes the presence back in 2006 of the "Nojawan Social Welfare Association" (contact

person: Yaqoob Urghar Baloch) and the United Memon Welfare Association (contact person: Abdullah Memon). The status of these CBOs would need to be verified.

As regards socioeconomic dynamics and resultant pressures exerted on natural resources, and as noted in the Programme's 2008 socioeconomic baseline, we note mangroves tend to be pressured by cutting and extensive camel browsing. The browsing activity was observed to be highest around the Kharo Chan creek area; its increase and decrease, among others, appears to be related to the increasing cost of drinking water transportation (camels are brought in when other means of transporting drinking water increases), and increased camel prices and sales of camels due to a rise in demand from Afghanistan and Iran.

Natural resource pressures have also resulted from insufficient water flow downstream Kotri. Here we note that at least 117,823 ha of land was lost due to sea erosion, of which 81% fell in the category of "totally eroded by sea" covering 21 dehs out of a total of 41 dehs in Kharo Chan (Govt. of Sindh, 2004). A similar amount was reported for Keti Bunder, namely 113,959 ha. The list of 50 villages at Kharo Chan affected by low pressure cyclonic systems in 2004 and 2007 is available in table 5 of Annex C in the Programme's 2008 socioeconomic baseline.

While we provide a detailed report in subsequent sections of this report on health facilities, and other basic facilities, we note that the 1998 Population Census places the number of basic health units at 1 and dispensaries at 9. This was unchanged up until about a year ago according to Sindh Coastal Community Development Project (NRSP, 2009). Relevant sections of the report below reference official Government of Sindh statistics on health, education, etc.

3.2.1   Income Analysis:

In this section we estimate daily per capita income at ***Kharo Chan (2010) and Keti Bunder and Jiwani (2011)***, based on methodology described in section 2.2 above. This section therefore does not repeat in subsequent site-specific reporting.

Pakistan's last estimated poverty line (2007-08) is PKR 948.47 per capita per month (Economic Survey of Pakistan, 2009-10). It is calorie-based and reflects expenditure on calorie intake of 2,350 calories per adult equivalent per day, along with consumption expenditure on non-food items. The next poverty-line will be adjusted at the time of estimation to account for inflationary impacts in intervening years. Similarly, the latest international poverty line estimated by the United Nations Statistical Division, the World Bank and the University of Pennsylvania, using 2005 purchasing power parity, is USD 1.25 per person per day. In terms of this headcount index, between 1981 and 2005, the proportion of Pakistanis living below USD 1.25 declined from 73% to 23%. In terms of the Millennium Development Goal 1, whose achievement requires the halving of people whose income is less than USD 1 a day between 1990 and 2015, Pakistan's prospects will see a setback owing to the 2010 floods and delays in reforms that would free fiscal resources needed to increase development spending.

At the time of the survey, 28 December 2010 (Kharo Chan), 8-10 October 2011(Keti Bunder) and 17-24 October 2011(Jiwani), the economies in rural areas at CCAP's research sites would have been negatively affected by damages to private and public infrastructure from the July 2010 floods (besides loss to life and livelihoods), weakened domestic consumer and business confidence, stopped / slowed government spending on large and small public projects as the government's fiscal position worsened, and food inflation heading for peaks only witnessed before in FY09. As ecosystems

tend to be situated on marginal lands, and that natural resource dependent communities [at Phase II sites] are situated on such marginal lands, we can almost confidently assume that sites were not injected with purchasing power, as with some large-scale agricultural rural areas of Pakistan, as a result of windfall gains from the surprising strength in international commodity prices post-August 2010. Similarly, while jumps in remittances and aid flows experienced post July-2010 did turn the current account for July-September FY-11 into a surplus the balancing in the overall health of the economy will not have trickled down to CCAP coastal communities in any way.

Looking ahead, the shock to food supplies following the floods and government's continuing borrowing from the State Bank of Pakistan (for large outlays to provinces and energy subsidies), suggests that inflation will continue to be pushed from its mostly 12-15% levels in the 12 months from November 2010 to November 2011 to remain at the 13% level in 2012. Risks of associated and consequent impacts on CCAP coastal communities are high – e.g., food inflation jumped from 15% in August to 20% levels up to January 2011. The economy's external position and exchange rate have remained stable so far, but average incomes of the poor are unlikely to be helped by the state as public finances follow a medium-term trend of consolidation due to higher outlays of humanitarian assistance, reconstruction and lower revenue collection. This may for example delay the already uncertain construction of "Zulfiqarabad" port and tourist city destined for the coastal belt and adjoining areas of Jati, Shah Bunder, Keti Bunder and Kharo Chan, and intended to bring economic uplift and ease pressure on Karachi.

3.2.2 Income Categories Across Sites:
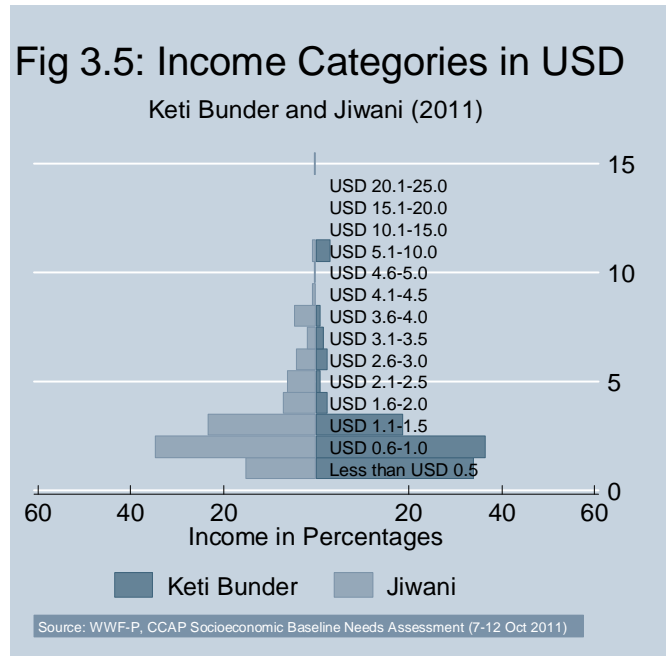
Against this backdrop, we turn first to all 6 permutations comparing income slabs of site samples (Fig 3.1 – 3.6). In Fig 3.1, e.g., the x-axis measures the sample percentage of households for 2 given sites reporting incomes that are first broken into daily per capita figures and then grouped in ascending order (from bottom to top) into horizontal bars representing PKR intervals or "categories" as per the y-axis legend.

Fig 3.1: Income Categories in PKR
Kharo Chan (2010) and Keti Bunder (2011)

Source: WWF-Pakistan, CCAP (7-12 October 2011 Keti Bunder survey) and IFAP (28-31 December 2010 Kharo Chan Survey)

Fig 3.2: Income Categories in PKR
Jiwani (2011) and Keti Bunder (2011)

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)

Fig 3.3: Income Categories in PKR
Kharo Chan(2010) and Jiwani (2011)

Fig 3.4: Income Categories in USD
Kharo Chan (2010) and Keti Bunder (2011)

Fig 3.5: Income Categories in USD
Keti Bunder and Jiwani (2011)

Fig 3.6: Income Categories in USD

Kharo Chan (2010) and Jiwani (2011)

The chart displays the following income categories (from top to bottom): USD 20.1-25.0, USD 15.1-20.0, USD 10.1-15.0, USD 5.1-10.0, USD 4.6-5.0, USD 4.1-4.5, USD 3.6-4.0, USD 3.1-3.5, USD 2.6-3.0, USD 2.1-2.5, USD 1.6-2.0, USD 1.1-1.5, USD 0.6-1.0, Less than USD 0.5. The horizontal axis shows Income in Percentages, ranging 60 40 20 20 40 60, with a vertical scale marked 0, 5, 10, 15. Legend: Kharo Chan, Jiwani.

Source: WWF-P, CCAP (7-12 Oct 2011 K Bunder) and IFAP (28-31 Dec 2010 K Chan)

Adjusting for inflation after 2007-08, we may take the Government of Pakistan's official poverty line, translated into a daily per capita basis, to be about PKR 50 in calendar years 2010 and 2011. This corresponds to the first, bottom most income category in Figures 3.1 - 3.3. Viewed this way, just under half of all sampled households at Jiwani fall below the poverty line while corresponding shares at Keti Bunder and Kharo Chan are 43% and 50%, respectively (figures 3.1 - 3.6). At all sites, stated incomes do not vary significantly from computed income result0s using our methodology (see section 2.2).

To reiterate, Kharo Chan shows the highest incidence of poverty of all sites as measured by our extrapolated poverty line. Slabs below PKR 200 per day per capita show inconsistent patterns across sites, with the PKR 101-150 bar containing fewer than 10% of sampled households in the case of Kharo Chan and Keti Bunder but nearly 20% in the case of Jiwani; and, with the PKR 51-100 bar containing approximately 20% of sampled households at Kharo Chan, but nearly double the amount, or, 40% in the case of Jiwani and Keti Bunder. As can be seen, outliers were not removed from our data.

Using the international poverty line of USD 1-1.25, at least 60% of sampled households at all 3 sites fall below the poverty line (figures 3.4 - 3.6).

In terms of monthly average household income, the mean figure is bracketed alongside site names in descending order as follows: Kharo Chan (PKR 21,144), Jiwani (PKR 19,716), and Keti Bunder (PKR 13,002).

While these are not reported here in detail owing to differences in methodology, PWP (2011) has devised its own classification of poor, middle and rich wealth classes that are usefully applied at the village level for Jiwani. According to the study, village Dir Nokabad and Daran fall entirely under the poor category, while Bandri village has no rich category. The former two villages, according to the study have monthly per capita incomes below PKR 3,000 (half of the present study's initial estimate for Jiwani as a whole, before following step "c" in our income determination methodology, see section 2.2).

3.3   Other Livelihoods Indicators:

With bearing to income are other indicators of livelihoods that are reported presently, including: savings, loans, asset ownership (land, livestock, and factors of production), access to basic facilities (water, education, health, veterinary, toilet), and migration patterns (which can lower subsistence farming yields as the elderly are frequently left behind to tend to livelihoods).

As regards savings, we estimate a savings ratio (i.e., net household savings divided by net income). For Kharo Chan, the ratio is approximately 11% to 30%. This may not be implausible, given small farm size savings for rural Punjab of 27% from 1967 to 1992 (Azhar, 1995). The role of interest rate policy and financial institutions in encouraging rural savings is negligible. Empirical evidence in Pakistan suggests nearly 2/3 of consumption expenditure of poor rural agricultural households is on food (ibid). Expenditure on such items as medicines, education, fuel, lighting, religious and social functions, and recreation is by comparison very small. Income generated off-farm, or, from secondary sources, can augment primary income by 20-35%; however, the same source suggests economies within food expenditure are another significant source of savings and are primarily obtained from cutting down on non-cereals (e.g., milk, milk products, meat, fruit and other protective foods).

Our findings on loans provide another reason why interpretation of the savings ratio is complicated. Up to 40% of our sample reported receiving a loan, which on average was PKR 120,000. For fishers, loans are almost essential for the months of June and July during which fishing stops, with repayment (and savings) scheduled for November-February when yields are high. Sources of lending did not include banks in our sample, instead 19% borrowed from relatives, while the rest borrowed from middlemen (from within the reporting 40% of our sample, there were 48% non-responses to inquiries on sources of loans). Monthly installments ranged from PKR 500 to PKR 10,000, with a monthly interest below 10% but also up to 30% in some cases. Loans were for the most part taken 3 years ago, with regularity in repayments reported by only 53% of respondents.

We had asked respondents to indicate if there was migration in their household, the cause, whether permanent, and the number of persons who migrated and their relationship to the head of household. This helps us assess whether lower subsistence farming yields could be expected as the elderly are frequently left behind to tend to livelihoods when younger household members migrate. There were only two cases of seasonal / regular migration, suggesting that households at Kharo Chan are ostensibly not being displaced by floods and climate variability. This result tallies with findings at Keti Bunder, where recent research reports no evidence of "mass migration" from Tippun and Bhoori villages and only temporary migrations in 1999 and 2007 owing to cyclones (Salman, 2010).

Land ownership shows that 35% of our sample owns up between 20 - 400 acres of land. The highest concentration of land-owning households is to be found in Haji Hameer Memon, followed by Babiyo and Gul Muhammad Jat, where fewer exclusive fishers are to be found.

As regards livestock, table 3.1 (below) shows that a small proportion of households (no more than 14% of our sample) own any livestock. The total number of sales of all animal types by reporting households (between 1 and 5 for 2010) confirms

that livestock ownership is a subsistence activity and not a commercial livelihood source. Reported livestock sales, using reported average unit prices, were included in our computation of income in section 3.2.
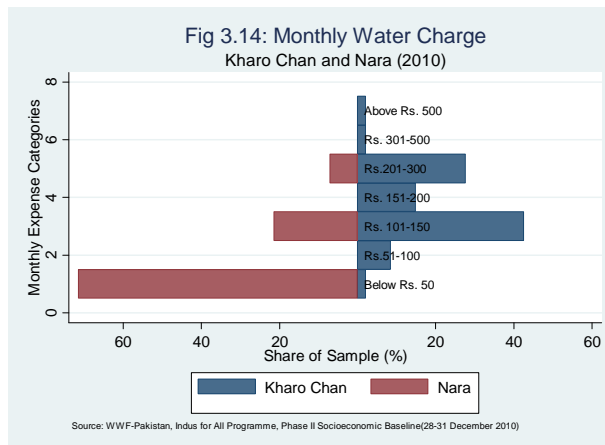
Table 3.1. Livestock: Estimated Mean (Nos.)

Livestock Type	Households	Monthly Household Mean	TOTAL
Cow	12	4 (3.8)	48 (13.29)
Buffalo	12	5.6 (7.8)	67 (27.13)
Sheep	7	5.7 (3.5)	40 (9.12)
Goat	17	3.4 (2.3)	57 (9.32)
Asses	1	1 (-)	1 (-)
Hen	12	14.6 (28)	175 (97.08)

Note: Sampled households reported no ownership of camels, horses, and mules.

Factors of production are interesting indicators not just of livelihoods and living standards, but can also reveal mitigation expenditure against climate change. As regards agricultural machinery, only 1 individual in village Babiyo owned a plough and two tractors, while 5 persons had paid for tube wells (also villages Babiyo and Haji Hameer Memon). Slightly less than 20% of our sample owned mobile phones, having paid between PKR 1,200-6,000 for the handsets. As much as 75% of mobile phone ownership (15 mobile owners) is limited to farmers living at Babiyo and Haji Hameer Memon. Ownership of generators, engine transportation, and televisions is restricted only to 1-2 individuals, located in Babiyo village.

Water is a scarce and expensive resource. Fig. 3.14 shows that monthly water charges at Kharo Chan are concentrated for the most part at PKR 100-300 per month (as is the case with Keti Bunder, see Fig 4.1), with less than 5% of the sample paying below PKR 50. This contrasts with Nara (Fig 3.14) and Jiwani where over 60% and over 90% of the samples, respectively, pay less than PKR 50.

Fig 3.14: Monthly Water Charge
Kharo Chan and Nara (2010)

Source: WWF-Pakistan, Indus for All Programme, Phase II Socioeconomic Baseline(28-31 December 2010)

Sources for outdoor water (per cent of sample bracketed) are: wells (34%), lake/canal (18%), hand pumps (8%) and storage tanks (8%). A single indoor water connection is reported in the case of a resident of Babiyo village, whereas 31% of the sample reported having an indoor hand pump connection. Sweet and drinkable water is reported by all villages, except for Ahmed Balani and Runjha villages. Interestingly, among the highest times reported for fetching water are at Ali Utradi and Hadi Qadir Bux (2-4 hrs for a round trip).

The educational status of Kharo Chan's inhabitants is shown in Fig 3.15 below. Clearly the overwhelming majority are illiterate. The male to female illiteracy ratio is 1.32, i.e., 66% illiterate males compared to 50% illiterate females. As many as 44% of sampled households reported having no access to educational facilities, while 3% reported using a madrassa. The remaining households reported the following levels offered by accessed facilities (per cent of households bracketed): primary (24%), middle (6%), and matriculation (21%).

Fig 3.15 Educational Status
Kharo Chan

Source: WWF-Pakistan, Indus for All Programme, Phase II Socioeconomic Baseline(28-31 December 2010)
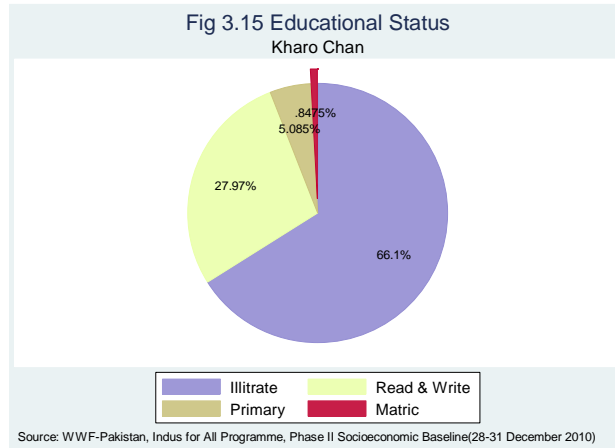
Out of a total of 34 functional schools in taluka Kharo Chan, only 1 is a secondary school while the rest are primary schools (Government of Sindh, 2002). The Goths in which they are located are: Sajan, Umeed Ali, Navrani, Mohammed Khan, Chelsram, Hale Khan, Narwari, Khuda Baksh, Khachar, Chachlo, and Muhammad. Narwari and Hale Khan together are served by only 3 schools, while Chachlo and Muhammad may have the longest distances to cover to reach the nearest schools.

In terms of availability of health facilities, there are three dispensaries in taluka Kharo Chan, namely: "NGO Fishri" and "Kharo Chan" dispensaries (located closest to goth Khuda Baksh), and BHU Sajanwari (located closest to goth Chelsram) (Government of Sindh, 2002). Reported availability of health facilities for our sample is given by village in Fig 3.16. Village Babiyo and others above it in the graph show no answers for any of the four categories of health facilities we asked about (there were some non-responses), while no one in the sample reported access to a government hospital.

Fig 3.16: Availability of Health Facilities
Kharo Chan (2010)

Source: WWF-Pakistan, Indus for All Programme, Phase II Socioeconomic Baseline(28-31 December 2010)
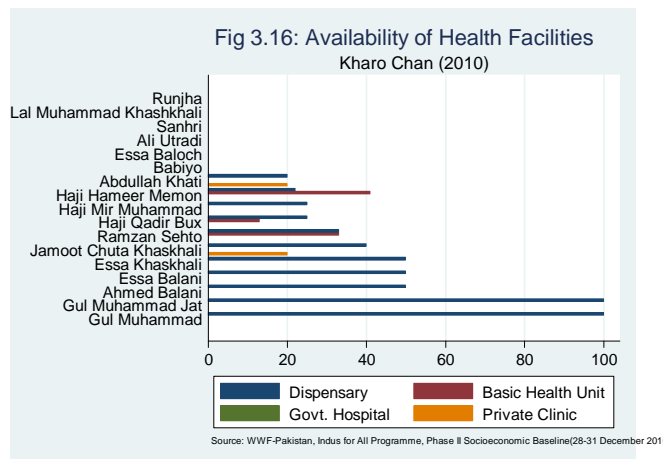
In Fig 3.16, villages that reported access both to private clinics and dispensaries include Jamoot Chuta Khaskhali and Abdullah Khati. Villages reporting access to both basic health units and dispensaries are Haji Hameer Memon, Haji Qadir Bux, and Ramzan Sehto. At Gul Muhammad and Gul Muhammad Jat 100% of respondents sampled reported access to dispensaries.

Distances to reach health facilities are covered in less than 30min (one-way) as reported by several respondents each in Babiyo, Haji Hameer Memon, and Jamoot Chuta Khaskhali.

Fig. 3.17 (below) shows disease prevalence by village (diseases not reported are regrouped along the vertical axis, the percentage of responses to disease types are shown on the horizontal axis). There is an evident high prevalence of diarrhea and malaria. Cholera, jaundice and typhoid are the next most prevalent diseases.

Fig 3.17: Disease Prevalence (% by Village)
Kharo Chan (2010)

Source: WWF-Pakistan, Indus for All Programme, Phase II Socioeconomic Baseline(28-31 December 2010)
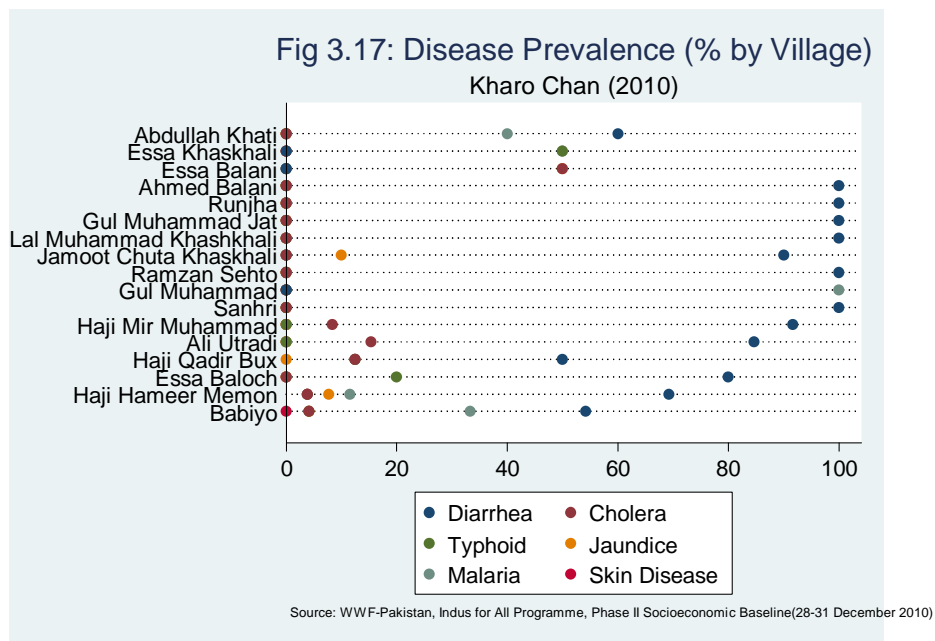
Fig 3.18 (below) provides village wise information on types of toilet facilities. Open space dominates, almost exclusively across the board. Pit latrines are reported in Ramzan Sehto, Haji Hameer Memon, and Babiyo. Toilets are not to be found indoors (49% of our sample reported living in 1 room, while 34% reported 2 rooms).
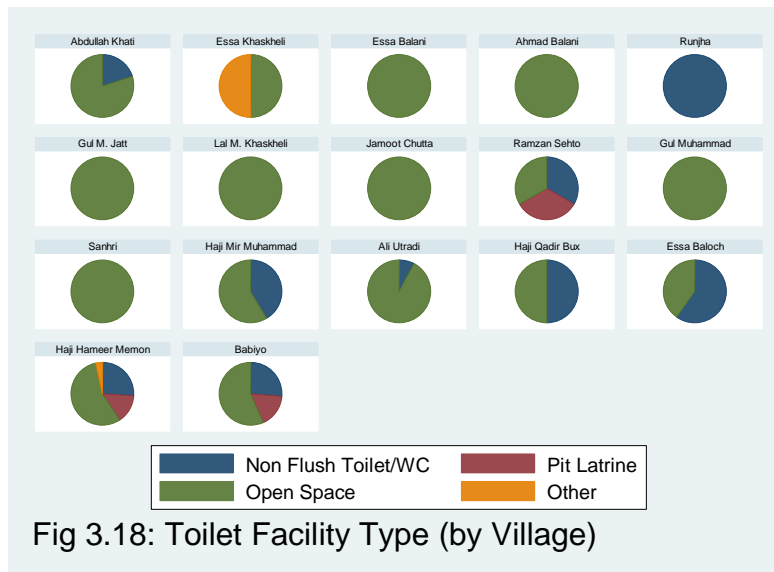
Fig 3.18: Toilet Facility Type (by Village)

As regards veterinary facilities, 14% of our sample reported having access to a local veterinarian while only 2% reported visiting a veterinary facility. Reporting villages, i.e., ones concerned with use of veterinary facilities, include: Abdullah Khati, Essa Khaskhali, Gul Muhammad, Haji Mir Muhammad, Haji Qadir Bux, Haji Hameer Memon and Babiyo.

In terms of energy sources, only a single respondent based in Ramzan Sehto reported reliance on both gas and electricity.

3.4   Livelihoods

3.4.1   Fishing:

In this section we summarize the varieties of fish that are caught, sold and consumed. In bar charts of figures 3.19 – 3.26 reported price data are displayed (both prices received by fishermen themselves, as well as the actual market prices received by the intermediaries known as middlemen). All prices refer to 2010 (comparisons made with Keti Bunder refer to 2007 prices).

3.4.1.1 Seasonal Fish (Fig 3.19 and Fig 3.20):

The disparities shown here between fisher and market prices reflect the complicated arrangements between intermediaries, widely called 'middlemen', and the fishers themselves. At Kharo Chan, the disparity remains between 25-30% across all three fish types, while that for Keti Bunder exceeds 100% in all cases. As regards a comparison between 2010 and 2007 market average unit prices, Soaa remains closest to following the 3-year average inflation figure of 14.9%. This is vastly exceeded for Jellyfish (204%) and Paplet (201%). Interviews conducted in March 2011 with fish industry leaders and association members confirm the plausibility of such high price rises in the past three years. World prices have risen sharply (FAO's aggregate Fish Price Index increased from 110.3 in March 2008 to 115 in March 2010); however, a significant upward price push derives from the fast recent growth in illegal trade among Pakistani and Iranian fishers, who exchange fuel priced well below Pakistan's Oil Companies Advisory Committee rates, and low priced fish that similarly fetches high margins in Iranian markets.

Fig 3.19: Average Fisher and Market Prices
Seasonal Fish Species (Kharo Chan, 2010)

Source: WWF-Pakistan, Indus for All Programme, Phase II Socioeconomic Baseline(28-31 December 2010)

Fig 3.20: Average Fisher and Market Price of Fish
Seasonal Fish Species (Keti Bunder, 2007)

WWF-Pakistan, Indus for All Programme, Total Economic Value survey(5-13 March 2008)
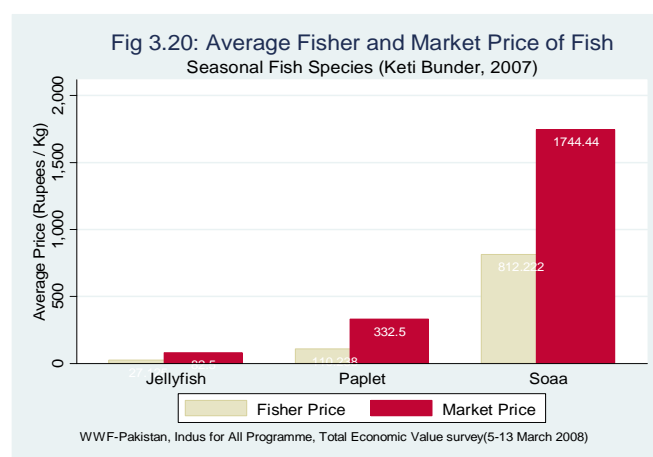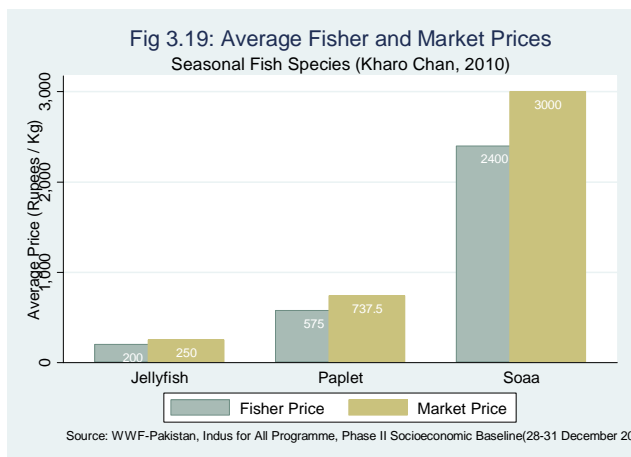
3.4.1.2 Annual Fish (Fig 3.21 and Fig 3.22):

At Kharo Chan, the disparity between fisher and market prices ranges from 48-219% with the least disparity for Chodi and the highest for Shrimp. In the case of Keti Bunder in 2007 the disparity exceeds 140% in all cases, with Shrimp similarly topping the list. As regards a comparison between 2010 and 2007 market average unit prices, Shrimp and Chodi fall below the 3-year average inflation figure of 14.9%. This is exceeded only slightly for Crab (26%), while Mushko shows a price increase that roughly seven times average inflation for the period (111%). Again world prices and illegal trade with Iran are causal factors, with inter-species variation having to do with extremely high prices associated with fish maws in certain species.

Fig 3.21: Average Fisher and Market Prices
Annual Fish Species (Kharo Chan, 2010)

Source: WWF-Pakistan, Indus for All Programme, Phase II Socioeconomic Baseline(28-31 December 2010)

Fig 3.22: Average Fisher and Market Price of Fish
Annual Fish Species (Keti Bunder, 2007)

WWF-Pakistan, Indus for All Programme, Total Economic Value survey(5-13 March 2008)
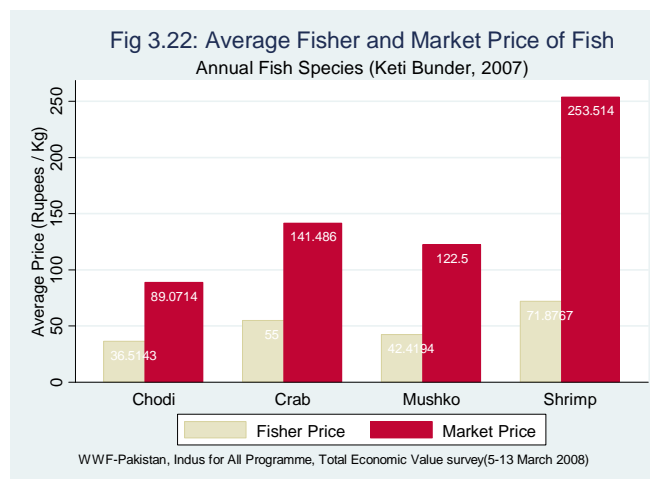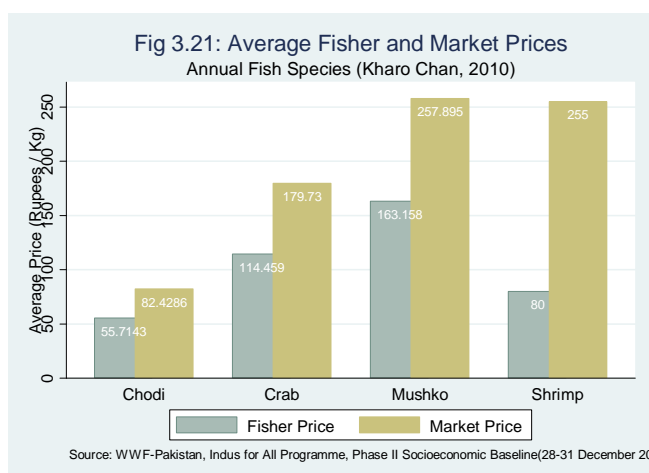
3.4.1.3 Annual Fish (Fig 3.23 and Fig 3.24):

The disparity between market and fisher prices at Kharo Chan ranges from 16-53%, with the least disparity in Danthi and most in Khaga. At Keti Bunder, the range is 120-339%, with Dangri topping the list and Khaga showing the least disparity. The emerging pattern suggests that disparities have either been lower at Kharo Chan than at Keti Bunder throughout, or, that recent changes have favored fishers (either at one or both sites), though one would have to investigate further before

being able to rule out other hidden arrangements favoring middlemen. Market average unit prices in the 2007-2010 period show that Khaga and Danthi fell below the average 3-year inflation figure of 14.9%. It is noteworthy that, whatever inter-year cycles may have ensued since 2007, prices of Danthi are unchanged while Khaga prices have fallen by 25%. Goli and Dangri have remained slightly above inflation for the period.

Fig 3.23: Average Fisher and Market Prices
Annual Fish Species (Kharo Chan, 2010)

Source: WWF-Pakistan, Indus for All Programme, Phase II Socioeconomic Baseline(28-31 December 2010)

Fig 3.24: Average Fisher and Market Price of Fish
Annual Fish Species (Keti Bunder, 2007)

WWF-Pakistan, Indus for All Programme, Total Economic Value survey(5-13 March 2008)
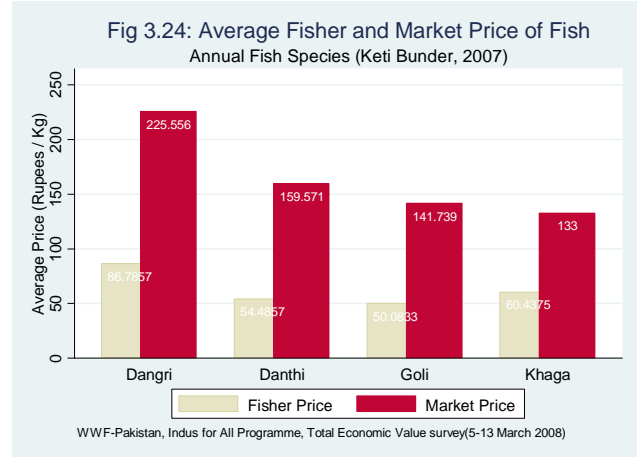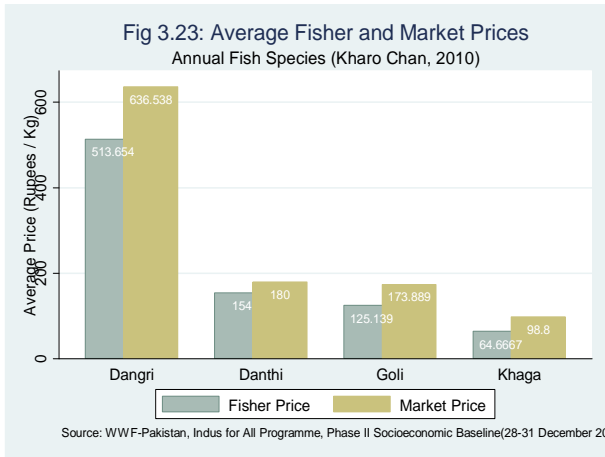
3.4.1.4 Annual Fish (Fig 3.25 and Fig 3.26):

We focus here on Gundh alone, noting that Keti Bunder showed a disparity in market-fisher prices of 133% in contrast to 35% in the case of Kharo Chan. Prices of Gundh have risen by 160% above mean 3-year inflation.

Fig 3.25: Average Fisher and Market Prices
Annual Fish Species (Kharo Chan, 2010)

Source: WWF-Pakistan, Indus for All Programme, Phase II Socioeconomic Baseline(28-31 December 2010)

Fig 3.26: Average Fisher and Market Price of Fish
Annual Fish Species (Keti Bunder, 2007)

WWF-Pakistan, Indus for All Programme, Total Economic Value survey(5-13 March 2008)
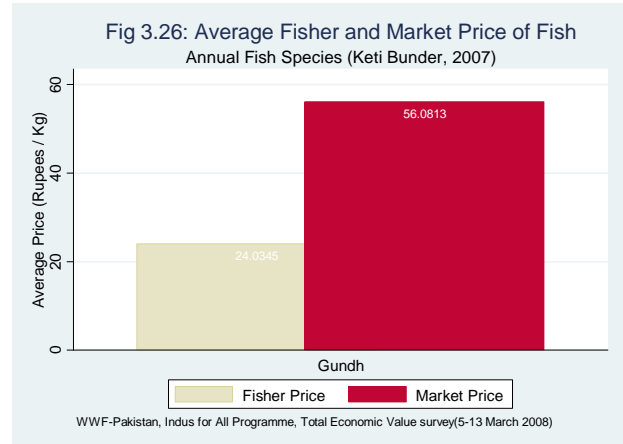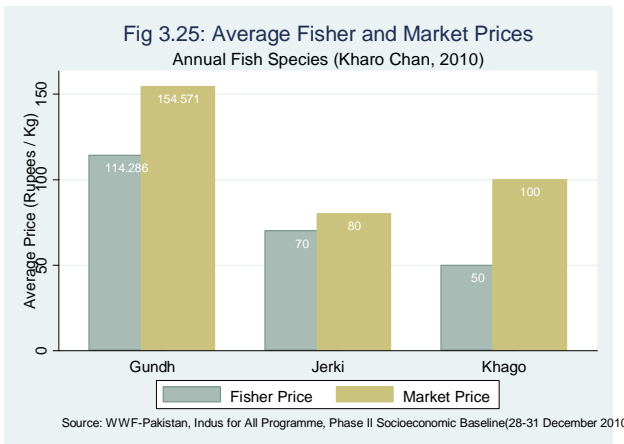
3.4.1.5 Fish Quantities and Basis for Estimated Total Biomass Calculation (Tables 3.2 and 3.3):

Quantities of seasonal and all-year round fish catch are summarized here for the average household, and in total for the population of villages included in the sampling frame. In both tables, the 2nd column shows the number of households which reported catching a particular fish type, and is the number of households over which the monthly mean was calculated. The last column in both tables, the population total catch, is calculated from all sampled households.

The figures provided in both tables can help augment the understanding of sustainable fisheries at Kharo Chan. As a clear sampling methodology was used, the estimates of totals can be used as estimates of the total biomass being extracted from the fishery. For a proper biomass calculation, the principal assumption that would need to be reviewed is that the

recorded values are not systematically skewed upwards or downwards, and population weights for upward aggregation to the sample total need to be adjusted.

Table 3.2. Seasonal Fish: Estimated Mean Monthly Household Catch, and Population Total Catch (Kgs)

Fish	Households	Monthly Household Mean	TOTAL
Paplet	4	510 (163.61)	2040 (327.21)
Soaa	1	500 (-)	500 (-)
Jellyfish	1	100 (-)	100 (-)

Note: standard errors in parentheses; number of households with catch > 0 used to calculate mean

For seasonal fish (above), quantities are presented in descending order by number of households reporting catch. As with the Programme's Keti Bunder survey three years earlier, Paplet appears high in terms of its prevalence in the waters of the fishery. Unlike Keti Bunder, it is worth mentioning that Soaa receives only one observation in our sample, making this a point worth investigating with reference to possible inferences on geographic prevalence and stock dynamics, among others.

Table 3.3. Annual Fish: Estimated Mean Monthly Household Catch, and Population Total Catch (Kgs)

Fish	Households	Monthly Household Mean	TOTAL
Chodi	42	230 (41.95)	9,687 (271.90)
Crab	37	204.41 (57.13)	7,563 (347.54)
Goli	36	573.44 (211.23)	20,644 (1267.41)
Dangri	26	54.15 (10.31)	1,408 (52.59)
Mushko	19	721.05 (314.16)	13,700 (1369.41)
Khaga	15	119.4 (78.08)	1,791 (302.40)
Gundh	7	580.57 (273.48)	4,064 (723.55)
Danthi	5	77.6 (44.58)	388 (99.69)
Shrimp	4	15.25 (3.09)	61 (6.18)

Note: standard errors in parentheses; number of households with catch > 0 used to calculate mean

Among annual fish (above), several interesting points emerge. Firstly, Gundh is not nearly as prevalent as it is at Keti Bunder, receiving a sample coverage of 9% in Kharo Chan as compared to 77% at Keti Bunder. With sample percentages bracketed, the highest prevalence spots are occupied by Chodi (55%), Crab (48%), and Goli (47%). Crab and Shrimp of course uses different techniques, and relatively smaller quantities; the largest quantity fished is that for Goli.

The population totals, shown in column 4 take account of average catch and the numbers of households catching a particular fish.

3.4.1.6 Boat Ownership (Fig 3.27):

With the exception of fishers at Essa Balani, Jamoot Chuta Khaskhali, and Haji Hameer Memon villages, where ownership of boats is reported at two for 3 persons, 19% of our sample owns one boat, while 79% does not own boats (compared to 56% and 35%, respectively, for Keti Bunder, based on the Programme's TEV survey of 2008). Thus Kharo Chan fishers' livelihoods, as compared to their counterparts at Keti Bunder, do not benefit from stronger fixed asset ownership, suggesting possibly a less entrenched reliance on biomass extraction at the fishery and a reduced ability to secure fish quantities for a given level of effort.

Fig 3.27: Kharo Chan: Boat Ownership

Source: WWF-Pakistan, Indus for All Programme, Phase II Socioeconomic Baseline (28-31 December 2010)
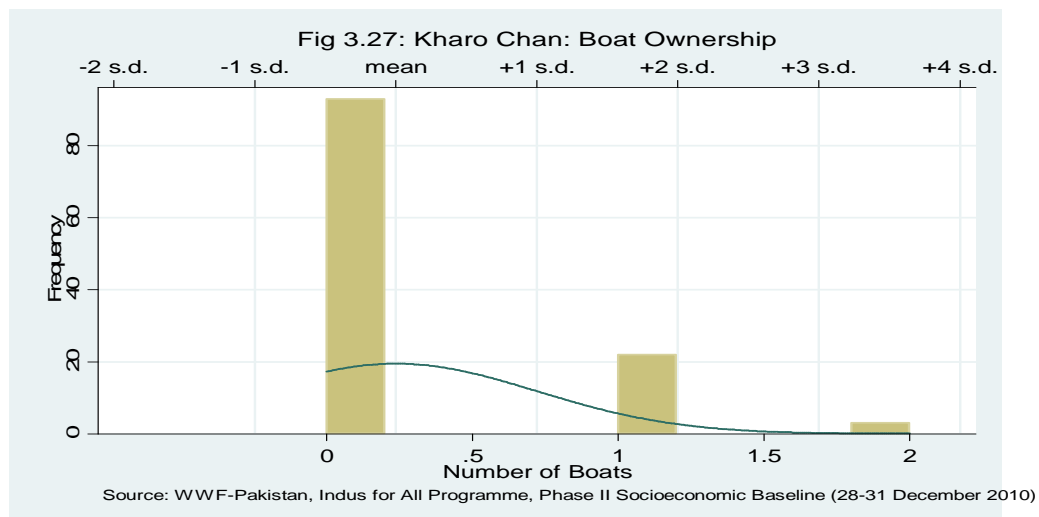
(Our histogram in Fig 3.27 is overlaid by a normal density curve of equivalent mean and standard deviation: as ownership is not regrouped at high frequencies across 1 or more boats, the curve is right-skewed).

3.4.2   Agriculture:

From within our sample, two villages were engaged in agriculture, namely village Babiyo (Deh Babiyo) and village Haji Hameer Memon (Deh Bit Mehar). Our sample of growers shows the following profile in terms of land ownership categories, with percentages of those sampled bracketed: landlord (56%), tenant (32%), and landlord-cum-tenant (12%). The mean value of land per hectare, as reported by respondents is approximately PKR 70,029 per acre. The mean area in acres devoted to crop types is selected to highlight the importance of cash crops versus fruits and vegetables (Fig 3.28 below).

Note that the "other" category in Fig 3.28 refers to maize. This is grown by a single farmer in Haji Hameer Memon. The mean area, measured in acres (1 acre = 0.405 hectares), shows cash crops to occupy larger lots of land, as expected (15-30 acres, with the exception of wheat). There are 7 types of crops grown, with fruits and vegetables grown over 15 acres or less on average within our sample.

In descending order, the most prevalent crop types grown are (percentages from the total number of growers in our sample are bracketed): wheat (54%), pan (17%), rice (14%), ribbed gourd (6%), bananas (3%), cotton (1%) and maize (1%). For bananas, the relevant production volume measurement is 1 ton (=28 mounds). One grower reported that over 1 year on a 7 acre plot of land they produced 14 vehicles worth that carried 2 tons of bananas in total.

Fig 3.28: Crops and Area Planted
Kharo Chan (2010)

Source: WWF-Pakistan, Indus for All Programme, Phase II Socioeconomic Baseline(28-31 December 2010)
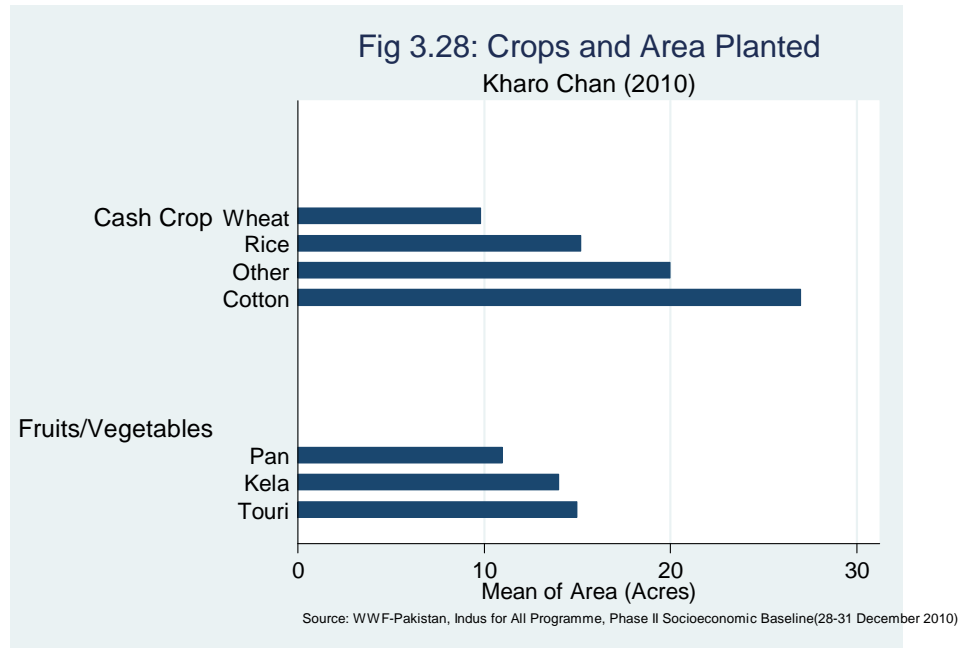
3.4.3   Wood and NTFPs:

Unlike Keti Bunder, where at least a handful of respondents in WWF-P's 2007 survey reported collection of honey, the sample at Kharo Chan did not report NTFP collection. However, with the exception of Sanhri, Haji Qadir Bux, and Essa Baloch, 35% of our sample reported collecting and selling Devi[2]. The monthly average volume collected per household is 57kgs, or just over a mound, while the average unit price fetched by households is PKR 200.

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[2] Devi is the common name for Prosopis Juliflora.

3.5   Community Priorities, Challenges, and Organizational Status:

Community priorities at Kharo Chan are reported by village in Fig 3.29 (below). Water supply is nearly present at all villages, and inland agricultural villages do tally with our expectations in expressing a demand for road construction.
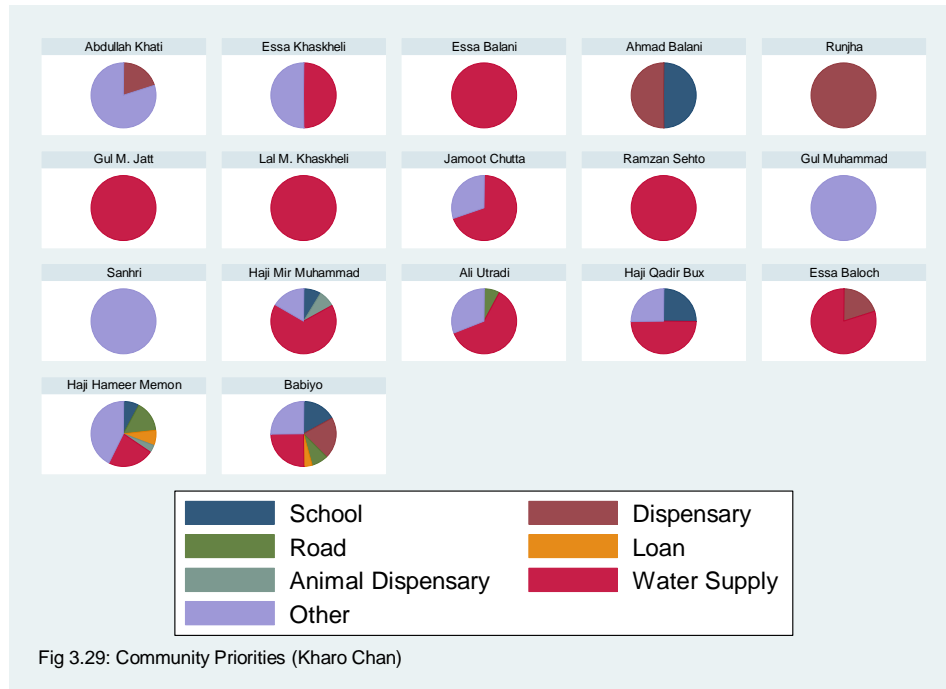

Fig 3.29: Community Priorities (Kharo Chan)

Community challenges at Kharo Chan are reported by village in Fig 3.30 (below). From a climate change adaptation perspective, village-specific information on drought and flood challenges is noteworthy. There are clearly tensions between villagers and local authorities at Haji Qadir Bux and Haji Hameer Memon villages.
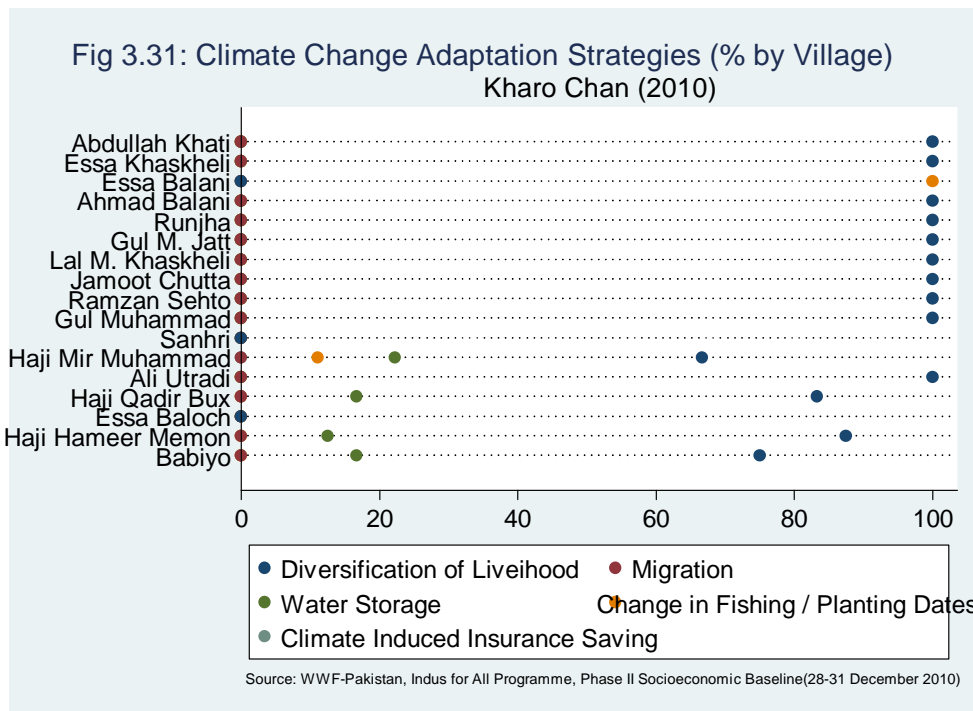
Fig 3.30: Community Challenges (Kharo Chan)
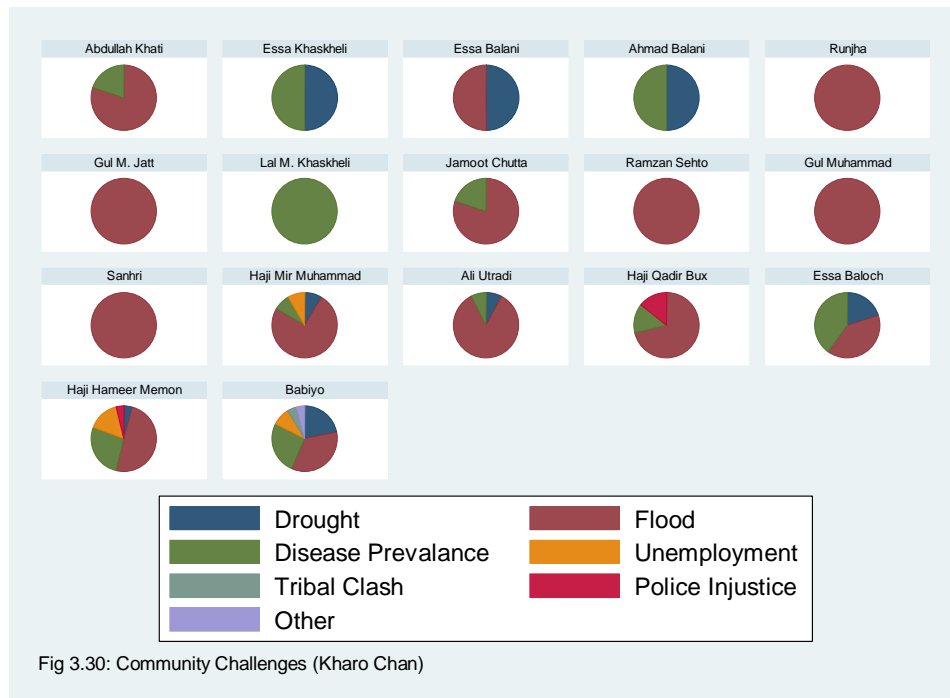
3.6   Climate Change Adaptation and the Poverty-Environment Nexus:

In the case of Kharo Chan, "climate change adaptation" refers to averting and mitigating actions required by vulnerable and resource dependent fisher and farmer communities. The actions would counter weather pattern variability that is fast being recognized as a long-term trend emerging for the Arabian Sea. In particular, South Asia is becoming more arid during dry seasons and wetter during monsoons, with impacts already experienced on crop yields, among others (Mustafa and Wrathall, 2011 and Salman, 2010).

Climate variability can be deduced from the doubling of exceptionally heavy monsoons over India in the last 50 years, with concomitant decreases in moderate and weak precipitation (Goswami et al., 2006; Pal and Al-Tabbaa, 2010). Arabian Sea data from 1880s onwards reveals a threefold increase of severe cyclonic events in intense cyclone months in past decades (Singh, 2010). In the last 15 years alone considerable low pressure cyclonic events have struck Pakistan. Of similar orders of magnitude to those of 2010, these occurred in 1993, 1999, 2004 and 2007, with other lesser systems reported in 1998 and 2001 (ibid). The emergence of atmospheric brown clouds as witnessed over India for example (Ramanathan et al, 2008) are expected to aggravate recent and dramatic food price rises and the consequent challenge among vulnerable populations.

It is hoped that the village-level observations collected at Kharo Chan provide preliminary insights into effective fishers' and farmers' adaptation strategies (see Fig 3.31). These would be of interest to a range of stakeholders, even outside Pakistan as such observations are not available from the aggregate nature of a majority of studies that estimate climate change impacts on food production at country, regional, and global scales, e.g. Stern (2007). We note the data reported here is in the nature of a reconnaissance survey, since quantitative research on adaptation strategies requires, among others: (i) a sampling strategy ensuring sufficient coverage of adapters and non-
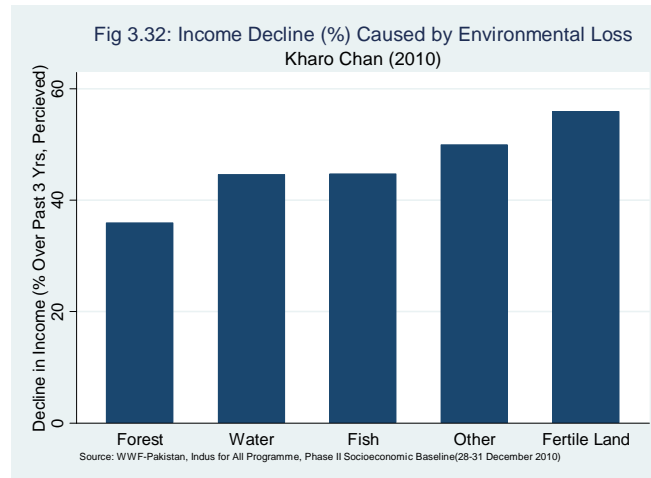
adapters; (ii) data on rainfall and temperatures, with methods to overcome difficulties of reliance on single meteorological stations; (iii) data on production and assets, market integration (e.g. credit and insurance), and institutional (e.g. property rights) and demographic characteristics; (iv) data to assess determinants of and constraints to adaptation; and, (v) observations on livelihoods and well-being explicitly linked to adaptation already undertaken in response to climate impacts. This is beyond the scope of the present study. Work of this nature, with a focus on food security, will commence however in March 2012 under a 3-year WWF-LUMS project entitled "Climate Change Adaptation, Water, and Food Security in Pakistan" (CCAWFS).

Fig 3.31: Climate Change Adaptation Strategies (% by Village)
Kharo Chan (2010)

Legend:
- Diversification of Liveihood
- Migration
- Water Storage
- Change in Fishing / Planting Dates
- Climate Induced Insurance Saving

Source: WWF-Pakistan, Indus for All Programme, Phase II Socioeconomic Baseline(28-31 December 2010)

In Fig 3.31 above we note that changed dates, be they for sowing or fishing expeditions, are attributed by households at Haji Mir Mohammed and Essa Balani as being undertaken in response to climate variability and / or systematic changes in precipitation and aridity in dry seasons that may amount to climatic change. The stock reaction for diversification of livelihoods at numerous villages, in the absence of other strategies, appears suspect and can possibly be associated with an "anchoring problem" (the first option read out by enumerators among the 6 options, of which "other" was a possibility, may have induced early commitment to that reply without due consideration of all options). Water storage reported at 4 villages, where there is variability in the sense of other responses, is not suspect in this fashion and entirely plausible. This anchoring problem was successfully tackled in surveys conducted at Manchar, Nara, and Khebrani shortly after the December 2010 Kharo Chan survey. The enumerators randomized the order of their questions. As the same set of enumerators undertook the Jiwani and Keti Bunder surveys, the data for these is free of anchoring problems (see Fig 4.15 and Fig 5.17).

The present baseline examines one aspect of the "poverty-environment nexus", namely households' own perceptions of a percentage income decline over the past 3 years due to natural resource degradation (see Fig 3.32

below). It stands to reason that loss of fertile land may have caused close to a 60% decline in income, e.g., a Mr. Ahmad, son of Juman Memon, at village Babiyo reported a (temporary) loss of 30 acres of cultivable land due to the 2010 floods.

Fig 3.32: Income Decline (%) Caused by Environmental Loss Kharo Chan (2010)

Source: WWF-Pakistan, Indus for All Programme, Phase II Socioeconomic Baseline(28-31 December 2010)
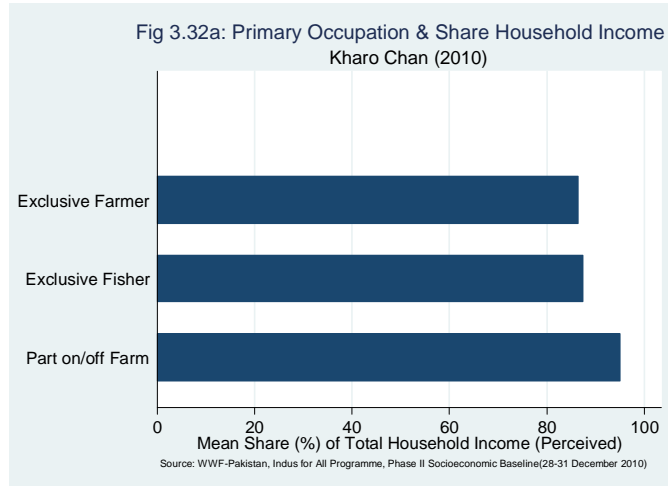
(It is important to remember that comparison on the y-axis percentage measure across flora and fauna categories represented by vertical bars would be incorrect. In particular, each vertical bar measures the mean value obtained only for those who responded for any given natural resource category.)

When asked if communities were engaged in natural resource conservation work, respondents in the following villages answered in the affirmative: Jamoot Chuta Khaskheli, Haji Mir Mohammad, Haji Qadir Bux, Haji Hameer Memon and Babiyo. This points to some existing level of environmental sensitivity and awareness.

The term "poverty-environment nexus" refers to the action of poverty is a causal mechanism that transforms the true underlying causes of environmental degradation into actions that degrade the environment, and vice versa, i.e., how declining real income tends to exacerbate due to increased environmental degradation. WWF-P's Indus for All Programme provided empirical evidence in 2009 on whether and how, and through which specific linkages this occurred at Keti Bunder coastal ecosystem, Keenjhar lake, Pai forest, and Chotiari wetlands complex (see the 2009 PE study at: http://www.foreverindus.org/ec_pe_indicators.php). For the 2009 study, the dataset used to support or oppose poverty-environment linkages and to develop poverty-environment indicators comprises cross-sectional (but also time-series) observations on changes in levels of income and biodiversity abundance. An example of a physical observation in WWF-P's time-series dataset is GIS satellite imagery showing changes in forest cover alongside named villages. Household responses on perceived changes in forest density and cover form part of the cross-sectional dataset. The methodology used to establish linkages and indicators, which lies beyond the scope of the present baseline study, involved application of canonical correlation and multivariate regression analysis, among other empirical analysis techniques, to support or refute hypothesized relationships (see WWF-P's 2009 PE manual for details on methodology: http://www.foreverindus.org/ec_pe_manual.php).

Linked to Fig 3.32 above, is households' perception of the share of their primary occupation in total household income (Fig 3.32a). This shows a high dependence on natural resource, i.e., stocks of fish and/or fertile soil.

Fig 3.32a: Primary Occupation & Share Household Income
Kharo Chan (2010)

Mean Share (%) of Total Household Income (Perceived)

Source: WWF-Pakistan, Indus for All Programme, Phase II Socioeconomic Baseline(28-31 December 2010)

3.7   Women's livelihoods, health, and access to facilities:

From our total sample size, 11 % of questionnaires were administered to female respondents in the absence of male heads of household. Fig 3.33 shows that the dominant skills already possessed and applied by women are limited to sewing and embroidery, with the former limited to 10% of our female sample. In fact, when asked what their primary occupation is, about 90% responded embroidery which earns them PKR 620 per month on average, noting that several months of the year may involve non-activity and lack of sales. (It is understood that women's primary occupation can to a significant extent involve assisting with tasks related to agriculture and fishing).

Fig 3.33: Female Vocational Skills
Kharo Chan

Embroidery   Sewing

Source: WWF-Pakistan, Indus for All Programme, Phase II Socioeconomic Baseline(28-31 December 2010)
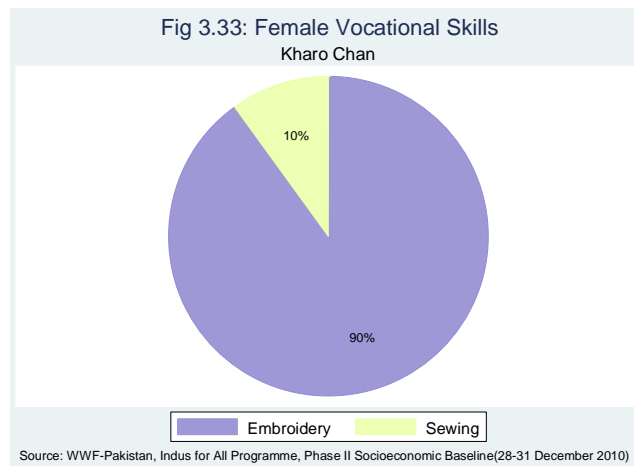
All female respondents in our sample answered that they have Union Council membership but are otherwise not members of a community organization or an NGO.

Female respondents were asked about information sources (see Fig 3.34 below). This can be useful information in the context of disseminating early warning information about climate change or other dangers such as cyclones. The three sources shown in Fig 3.34 add up to a 100%, revealing that radio is only marginally more widespread as an information source than word of mouth.

Fig 3.34: Information Sources
Kharo Chan (2010)

Source: WWF-Pakistan, Indus for All Programme, Phase II Socioeconomic Baseline(28-31 December 2010)
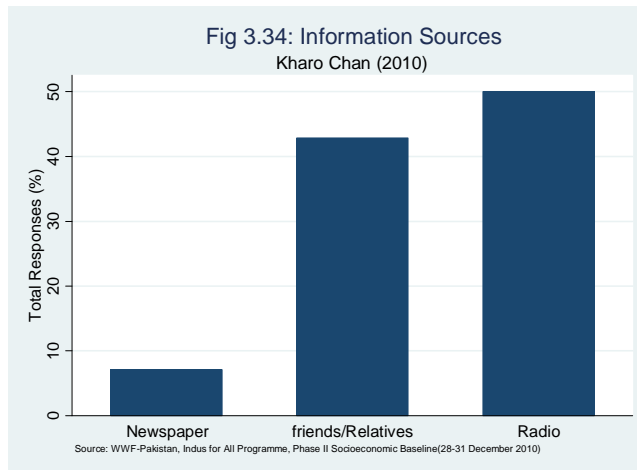
Only half of our sample was illiterate (see Fig 3.35), with a share of 30% with primary schooling.

Fig 3.35 Female Educational Status
Kharo Chan

Source: WWF-Pakistan, Indus for All Programme, Phase II Socioeconomic Baseline(28-31 December 2010)

An European Union Funded World Wide Fund For Nature Pakistan Project
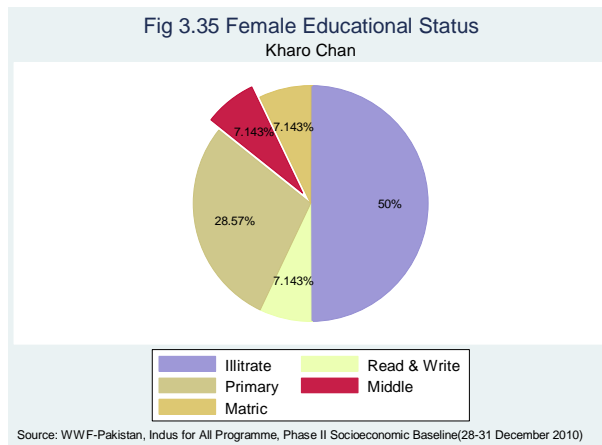
4. Keti Bunder

4.1   Summary Profile of Keti Bunder:

Coastal districts of Sindh with forecasted 2011 population bracketed are Thatta (1,287,271), Badin (592,293) and Karachi (17,770,000). Even if these coastal districts possess great natural resource wealth, as is the case of Badin which is responsible for about 40% of Pakistan's total crude oil production, human development indices reveal it to be among the poorest nationwide. Proximity to Karachi has not helped Keti Bunder or Kharo Chan, nor has it helped other coastal settlements in Badin, to capitalize on demand from this port city. The reasons behind this relate in no small part to the high variance characterizing fisher and farmer prices from market prices, something that is detailed in sections 3.4.1 (Kharo Chan) and 4.3.1 (Keti Bunder) of this socioeconomic baseline report. A lack of public finances, post 2010 floods, will delay the already uncertain construction of "Zulfiqarabad" port and tourist city which could hold hope of creating alternative livelihood opportunities for those households willing and able to out-migrate permanently from Keti Bunder. Zulfiqarabad is destined for the coastal belt and adjoining areas of Jati, Shah Bunder, Keti Bunder and Kharo Chan, and intended to bring economic uplift and ease pressure on Karachi.

For Kharo Chan and Keti Bunder, the absence of freshwater flows to the delta of the Indus has ensured that there is virtually no opportunity for exclusive fishers to diversify into agriculture. In particular, insufficient environmental flows has caused diminished arrivals of silt quantities, sea intrusion that rendered agricultural land waterlogged and saline, and a decline in commercially important species of fish dependent on freshwater. While interprovincial accords had agreed annual flows of 10 MAF of freshwater flow below Kotri, the amounts recorded are far below this amount and a far cry from historical flows that numbered 150 MAF per annum. Compromised environmental flows -- which the CCAP intends to study in order to provide a sound basis for political and administrative actions to increase flows -- will continue to affect the viability of mangrove populations (even as a plantation Guinness World Record was set in 2010). Mangroves and their associated tidal flats are important to coastal communities for a number of reasons, including: (a) they act as a natural barrier against sea level rise; (b) they provide a habitat for crabs, shrimp, oysters and other species; (c) they are used extensively for fuel wood, fodder, and timber. Mangrove cover in 2011 is down to about 200,000 ha along the entire Sindh coast.

Keti Bunder lies in the Indus Delta which occupies an area of about 600,000 ha, consisting of creeks, mudflats and mangrove forests between the Rann of Kutch in the south and Karachi in the north. The estimated 2011 population of Keti Bunder is 30,766, with an annual average population growth level of 2.2%, and with an average household size of about 6 persons. Poverty is high, with our 2011 estimate showing 43% of our sampled households falling below the poverty line (see section 3.2.2 above). Migratory trends are examined authoritatively by the World Bank's 2005 "Socioeconomic Study and Proposal for Livelihood Improvements: Badin and Thatta Districts, Sindh, Pakistan", and in our baseline for 2011 we find migrations to be most significant at Tippan (about 25% of all reporting households), followed by Keti Bunder, Haji Moosa Jat, Bhoori, and Mero Dablo. We did not examine in-

migration (associated with marriage, business and transfer) but found permanent out-migration of entire families to be caused by cyclones, and seasonal out-migration (15 days a month) leaving 2-3 elderly household members behind to be associated with travel to Sajawal and Gharo for rice harvests, fishing, daily wage labor. The relocation type out-migration is caused often by lack of health facilities and drinking water, as per World Bank (2005)'s findings. In what follows, starting in section 4.2 and ending with section 4.6, livelihood indicators besides income, community priorities / challenges / organizational status, climate change and the poverty-environment nexus, and women's livelihoods, health and access to facilities are discussed in detail for Keti Bunder.

4.2   Livelihoods Indicators:

As regards savings, as per section 3.3, we estimate a savings ratio, i.e., net household savings divided by net income. Keti Bunder's ratio lies a little above 30%. This is higher than Kharo Chan. Section 3.3 (above) discusses the significance of savings ratios in Pakistan's rural population, reviews the available literature and describes typical sources of savings.

As concerns loans, 53% of our sample reports receiving loans, whose average size is PKR 55,139, of which the majority was sourced from middlemen (78%), followed by relatives (20%). From our sample, 60% or the majority reported paying monthly interest rates between 20%-50%. Most monthly installments ranged from PKR 100 to PKR 2,000. Loans were mostly taken 1 year ago, with regularity of payment reported by as many as 63%.

As concerns land ownership, 10% of our sample owns between 1 – 300 acres of land.

Livestock ownership is reported in table 4.1 (below). Only about 20% of our sample owns any livestock. As with Kharo Chan, ownership is a subsistence activity as is borne out by animal sales which totaled 7 across all households surveyed and all animal types.

Table 4.1. Livestock: Estimated Mean (Nos.)

Livestock Type	Households	Monthly Household Mean	TOTAL
Cow	15	2.46 (1.41)	37 (5.45)
Buffalo	16	1.7 (1.53)	27 (6.14)
Goat	5	1.6 (0.89)	8 (2.00)
Hen	4	2.25 (0.50)	9 (1.00)

Note: Sampled households reported no ownership of other animals (Standard errors in parentheses)

Ownership of electronic appliances is limited to a single respondent reporting to own a generator at Village Keti Bunder. There is no ownership of agricultural machinery such as ploughs, pumps or tractors. As many as 36% of our sample own mobile handsets. Vehicle ownership is reported for a single respondent at village Keti Bunder. This category does not include two-wheelers.

Migration Patterns at Keti Bunder are restricted to 6% of all households. We report all the village names concerned to help CCAP examine reasons behind migration (e.g., flood-related) and aspects of vulnerability (e.g., food insecurity relating to older persons being left behind in concerned households), among others. The concerned villages, in descending order from highest reported shares to lowest, are: Keti Bunder, Takar Karyu, Tippan, Mero Dablo.

Monthly water charges paid by Keti Bunder residents are concentrated for the most part at PKR 500-1000 per month (representing just over 40% of our sample). There is approximately 50% of the sample paying higher amounts in about equal parts for the PKR 1,000-1,500, PKR 1,500-2,000 and above PKR 2,000 categories.

Fig 4.1: Monthly Water Charge
Keti Bunder and Jiwani (2011)

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)
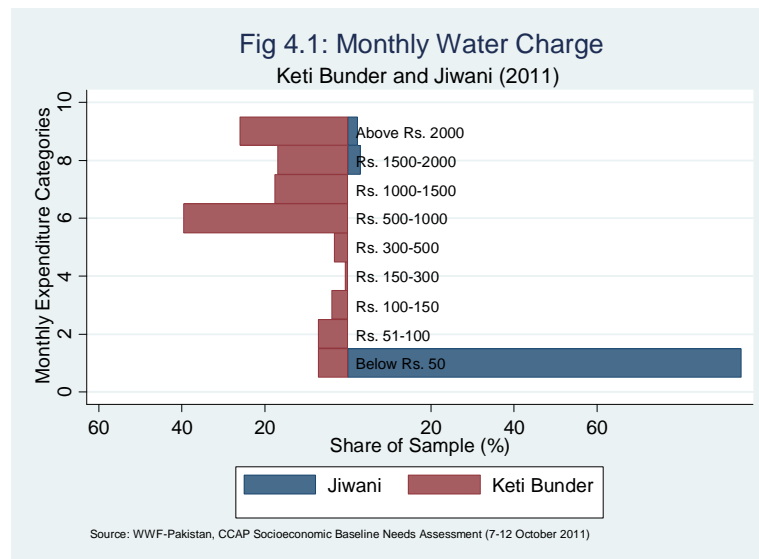
Sources for outdoor water (per cent of sample bracketed) are: storage tanks (47%), hand pumps (15%), and wells (8%).

The educational status of Keti Bunder households is given in Fig 4.2 below. Female illiteracy is 97% (see Fig 4.2.1 below), such that the male-female illiteracy ratio is 0.82. About 1% reported matric. There is 80% illiteracy at Keti Bunder, with barely any matric level schooling. Of the total sampled households, 50% reported having no access to educational facilities at all. Among those with access, only 2% reported availability of middle level education facilities.

Fig 4.2 Educational Status
Keti Bunder

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)
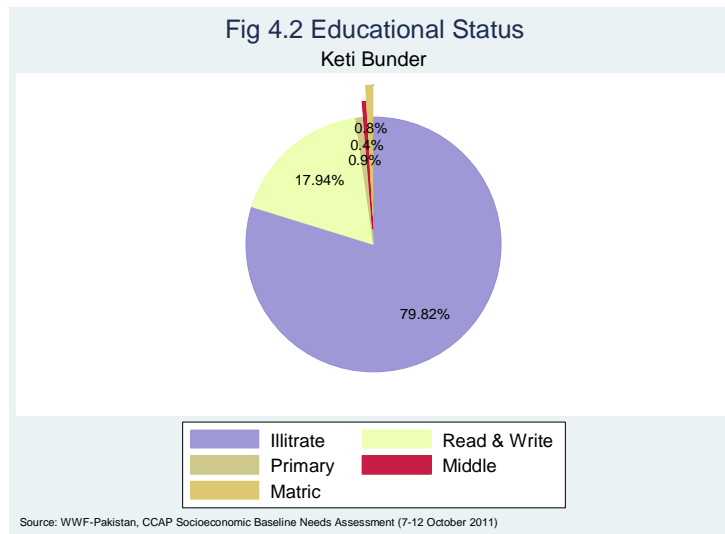
Reported availability of health facilities is given by village in Fig 4.3.Non-availability of health facilities is heavily weighted in any vulnerability score sheet. In this regard, CCAP interventions (and those of its stakeholders) would need to focus on villages Mahmood Dablo, Haji Mamu, Tayab Jatt, Haji Sheedu, Kangri, Haji Moosa Jatt, and Bhoori where there is reportedly no access to facilities at all.

Fig 4.3: Health Facilities
Keti Bunder (2011)

Source: WWF-P, CCAP Socioeconomic Baseline Needs Assessment (7-12 Oct 2011)
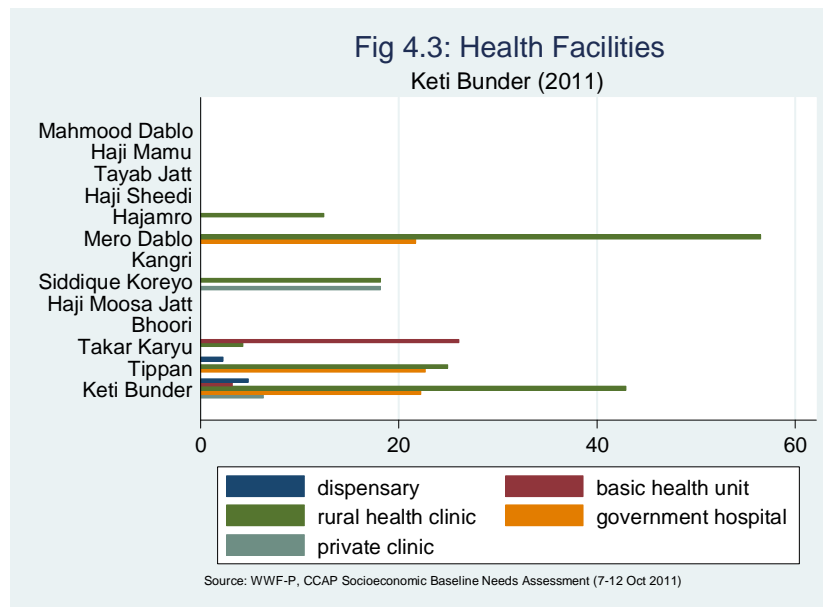
There were several missing responses (44%), referring no doubt to the absence of facilities reachable within a day. The average one-way time to reach a health facility is 30min for the half of the sample with access.

Fig. 4.4 (below) shows disease prevalence by village (diseases not reported are regrouped along the vertical axis, the percentage of responses to disease types are shown on the horizontal axis).Diarrhea is the most common complaint among villages in our sample, where it is high in villages Keti Bunder, Bhoori, Haji Moosa Jat, and Siddique Koreyo, with

reporting levels of 20-30% of all households in each of these villages. It is highest at villages Haji Mamu and Tayyab Jat, where over half of all villages report having diarrhea. Skin and eye diseases are the next most prevalent complaints, with levels of the former lying in the 20-30% reporting levels at villages Tayyab Jat, Hajamro, Haji Sheedi and Takar Karyu. Eye diseases are reported in Keti Bunder, Tippan, Takkar Karyu, Bhoori, and Siddique Koreyo. WWF-P has photographs of eye and skin diseases, showing how severe and debilitating these conditions can be.

Fig 4.4: Disease Prevalence (% by Village)
Keti Bunder (2011)

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)

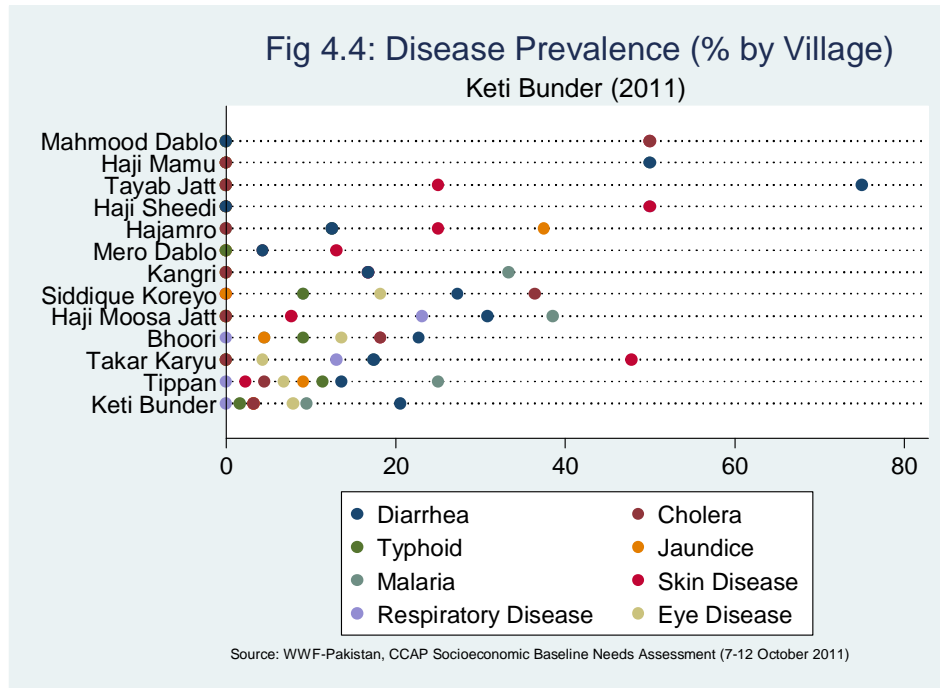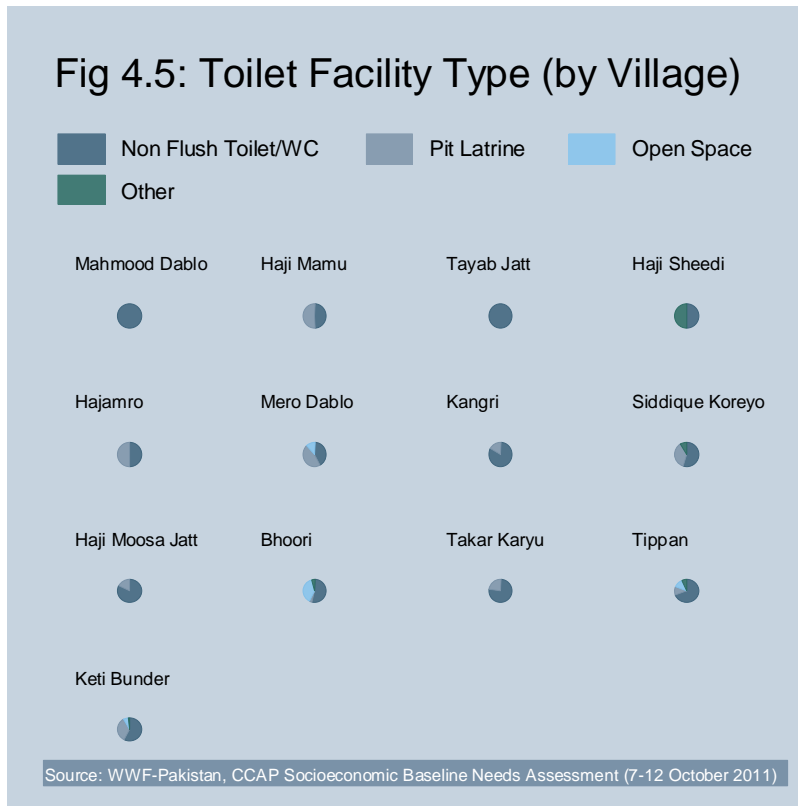Fig 4.5 (below) provides village wise information on types of toilet facilities. As with Kharo Chan, urinating and defecating in open spaces is the dominant practice (we established that "non-flush toilet/WC" is synonymous with "open space" after consulting enumerators). Pit latrines are reported in significant percentages in most villages except Tayab Jatt, Haji Sheedi, Bhoori, and Takar Karyu.

Fig 4.5: Toilet Facility Type (by Village)

Legend:
- Non Flush Toilet/WC
- Pit Latrine
- Open Space
- Other

Mahmood Dablo Haji Mamu Tayab Jatt Haji Sheedi

Hajamro Mero Dablo Kangri Siddique Koreyo

Haji Moosa Jatt Bhoori Takar Karyu Tippan

Keti Bunder

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)

As regards veterinary facilities, 10% of our sample reported having access to a veterinary hospital. Reporting villages, i.e., ones concerned with use of veterinary facilities, include villages Siddique Koreyo, Haji Mamu, Haji Moosa Jatt, and Keti Bunder.

4.3   Livelihoods

4.3.1   Fishing

4.3.1.1 Seasonal fish (Fig 4.6a and Fig 4.6b):

At Keti Bunder, variation between fisher and market prices for seasonal fish species ranges between 37-182% in 2011 (a marginal improvement from 2007 when the variation was 115-202%). Variation is highest for jellyfish. Soaa market prices have risen by 355% in four years to 2011. This suggests analysis over and above a simple comparison of average unit prices is needed to estimate a change in biomass for this species.

Fig 4.6a: Average Fisher and Market Price of Fish
Seasonal Fish Species (Keti Bunder, 2007)

WWF-Pakistan, Indus for All Programme, Total Economic Value survey (5-13 March 2008)

Fig 4.6b: Average Fisher and Market Prices
Seasonal Fish Species (Keti Bunder, 2011)

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)
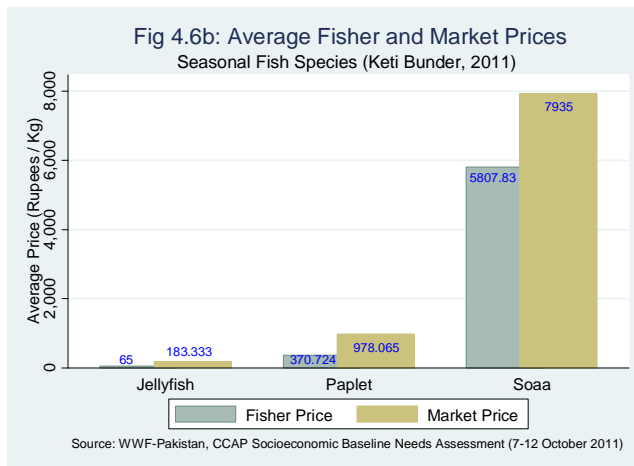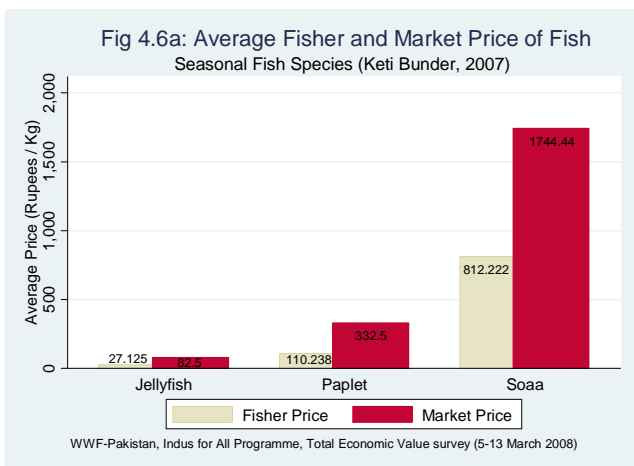
4.3.1.2 Annual fish (Fig 4.7 and Fig 4.8):

Fig 4.7a: Average Fisher and Market Price of Fish
Annual Fish Species (Keti Bunder, 2007)

WWF-Pakistan, Indus for All Programme, Total Economic Value survey(5-13 March 2008)

Fig 4.7: Average Fisher and Market Prices
Annual Fish Species (Keti Bunder, 2011)

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)

Fig 4.8a: Average Fisher and Market Price of Fish
Annual Fish Species (Keti Bunder, 2007)

WWF-Pakistan, Indus for All Programme, Total Economic Value survey(5-13 March 2008)

Fig 4.8: Average Fisher and Market Prices
Annual Fish Species (Keti Bunder, 2011)

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)

Disparity between fisher and market prices for annual species, which ranges from 115-175% is represented in Figs 4.8 (largely unchanged from 122-197% which was its level in 2007). The highest variation is for Dangri, as it was for jellyfish among seasonal species. Annual species are also shown in fig 4.7, where market and fisher price variation

is at 26-130%, with 36% relating to crab prices where middlemen appear to have a smaller role to play compared to 2007 when this variation for crabs was 150%. In 2007, variation was generally higher across the board, ranging from 147% for Chodi and reaching 256% for shrimp (in 2011 the variation for shrimp is 130%).

4.3.1.3 Annual fish (Fig 4.9 and Fig 4.10):

Fig 4.9: Average Fisher and Market Prices
Annual Fish Species (Keti Bunder, 2011)
Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)

Fig 4.10: Average Fisher and Market Prices
Annual Fish Species (Keti Bunder, 2011)
Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)
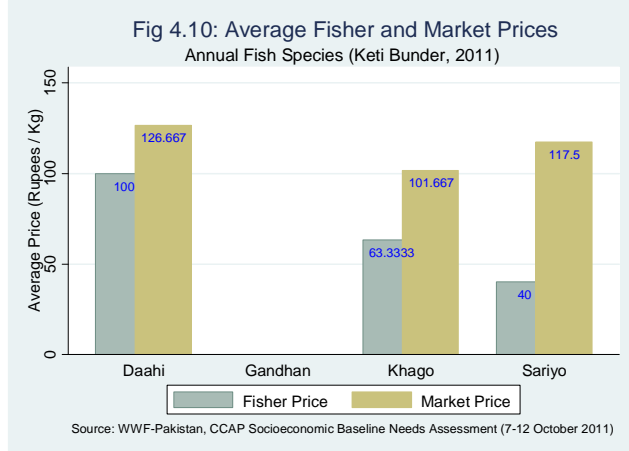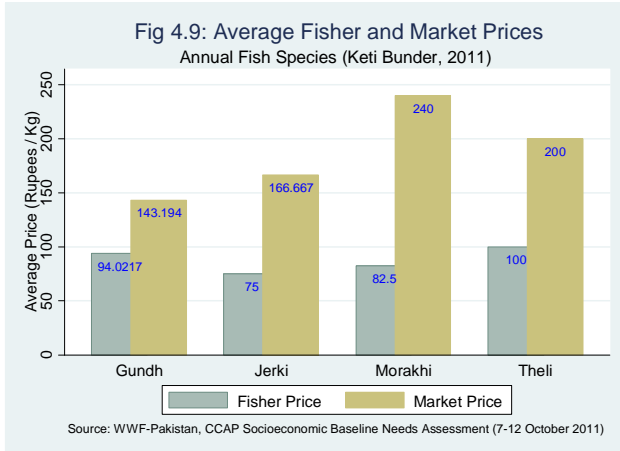
Disparity between fisher and market prices is shown for a further 10 annual species in Fig 4.9, Fig 4.10 and fig 4.11, where it is highest for morakhi and sariyo at 193% for both species and least for goj at 15%.

Fig 4.11: Average Fisher and Market Prices
Annual Fish Species (Keti Bunder, 2011)
Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)
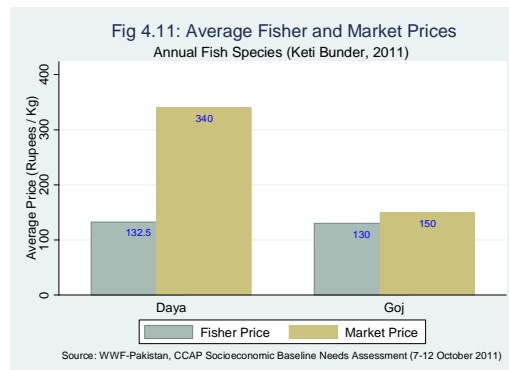
Table 4.2. Annual Fish: Average 'Fisher' and Market Prices (Rupees/ kgs)

Fish	'Fisher' Price	Market Price
Shrimp	72.2 (4.2)	250.3 (20.1)
Chodi	35.5 (6.8)	86.2 (12.2)
Crab	50.6 (5.4)	130 (22.2)

Paplet	**93.3** (-)	**375** (-)
Mushko	**45.2** (11.9)	**128.8** (25.1)
Dangri	**84.5** (13.3)	**436.2** (130.4)
Goli	**49.9** (13.9)	**149.4** (24.8)
Khaga	**62.4** (11.5)	**131.5** (34.8)
Danthi	**52** (5.2)	**170.8** (20.7)
Gundh	**26.3** (11.5)	**60.1** (20.9)
Other	**33.6** (-)	**130.3** (-)
Standard errors in parentheses		
Number of Hhlds with catch > 0 used to calculate mean		

Source: WWF Pakistan, Indus For All Programme, Total Economic Value survey (5-13 March 2008)

4.3.1.4 Fish Quantities and Basis for Estimated Total Biomass Calculation (Tables 4.2 and 4.3):

Quantities caught for all sampled households are summarized here, for seasonal (Table 4.2) and all-year round fish (Table 4.3). As discussed in section 3.4.1.5 above the information presented here is not a completed biomass calculation, which would require at least another step, namely assignment of population weights for upward aggregation to the sample total, as well as verification to ensure that the values are not systematically skewed upwards or downwards.

Table 4.2. Seasonal Fish: Estimated Mean Monthly Household Catch, and Population Total Catch (Kgs)

Fish	Households	Monthly Household Mean	TOTAL
Soaa	22	172 (418.38)	3774 (1962.4)
Paplet	71	151.22 (277.99)	10737 (2342.39)
Mangra	28	196.21 (566.6)	5494 (2998.17)
Jellyfish	1	130 (-)	130 (-)

Note: standard errors in parentheses; number of households with catch > 0 used to calculate mean

Table 4.3. Annual Fish: Estimated Mean Monthly Household Catch, and Population Total Catch (Kgs)

Fish	Households	Monthly Household Mean	TOTAL
Shrimp	16	217.5 (404.89)	480 (1619.56)
Chodi	96	134.41 (238.3)	12904 (2334.9)
Crab	24	323.95 (805.7)	7775 (3947.17)
Mushko	28	222.64 (321.15)	6234 (1699.41)
Dangri	22	59.63 (43.48)	1312 (203.96)
Goli	58	84.48 (105.49)	4900 (803)
Khaga	13	234.76 (357.78)	3052 (1290.01)
Danthi	25	100.52 (123.39)	2513 (616.95)
Gundh	32	2710.62 (606.93)	86740 (34336.71)
Theli	2	70 (14.14)	140 (20)
Murakhi	2	33 (4.24)	66 (06)
Jerki	4	32.5 (12.58)	130 (25.16)
Daahi	2	107.5 (144.95)	215 (205)
Sariyo	1	100 (-)	100 (-)
Gandan	1	80 (-)	80 (-)
Khago	5	164.8 (195.7)	824 (437.61)
Daya	1	740 (-)	740 (-)

Note: standard errors in parentheses; number of households with catch > 0 used to calculate mean

### 3.3.1.5 Boat ownership (Fig 4.12a):

At village Tippan single boat ownership is reported by 19 households, while ownership of two or more boats is reported by 9 households. The second highest concentration of boat ownership is at village Keti Bunder. Boat ownership was reported for all villages in our sample.

Fig 4.12a: Keti Bunder (2011): Boat Ownership
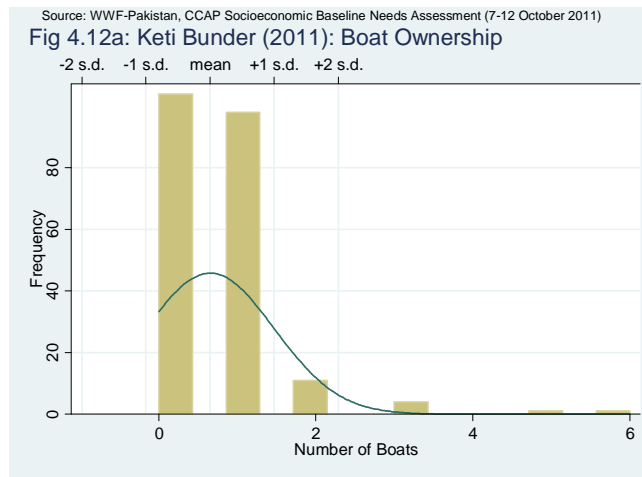
(Our histogram in Fig 4.12a is overlaid by a normal density curve of equivalent mean and standard deviation: ownership is not regrouped at high frequencies across 1 or more boats, the curve is right-skewed).

4.3.2 Agriculture:

Approximately 10% of our sample is farmers. Among them, 45% fall in the sharecroppers/lessees category, while 29% own their own land (see Fig 4.12b below).

Fig 4.12b: Tenancy Status
Keti Bunder (2011)
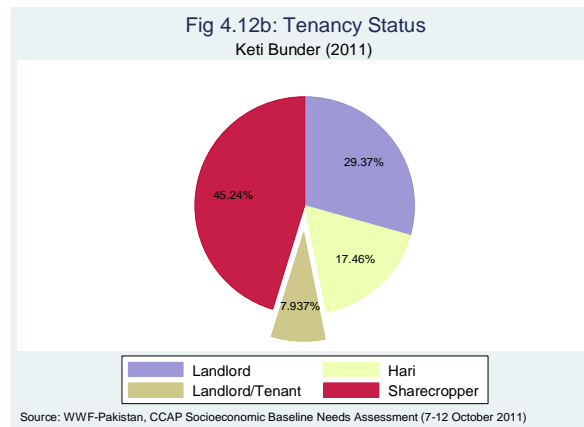
4.3.3 Wood and NTFPs:

As regards NTFPs collection, no households reported any products collected.

Data on wood collection and transaction of wood products is limited and insufficiently reliable to use.

4.4 Community Priorities, Challenges and Organizational Status:

As regards the organizational status of households at Keti Bunder, 25% in our sample are CBO members, covering all villages excepting Tayyab Jat and Mahmood Dablo.

Ongoing NGO or governmental construction projects by village are as follows (reporting village names bracketed): education projects (Mero Dablo, Keti Bunder, Tippan, Takkar Karyu, Haji Moosa Jat, Siddique Koreyo, and Bhoori); health projects (Haji Moosa Jat and Bhoori), road works (Haji Moosa Jat, Bhoori, and Keti Bunder), water supply construction work (Mero Dablo and Siddique Koreyo).

Community priorities at Keti Bunder are reported by village in Fig 4.13 (below). With the exception of Haji Mamu, school construction / availability occupies a large share of overall responses. Water supply is an issue at all villages excepting Haji Sheedi, Hajamro, Kangri, and Bhoori. Dispensaries as a priority in 7 out of 11 of sampled villages, with very high need in Bhoori, Kangri and Haji Moosa Jatt. There are pronounced issues relating to loans at Hajamro and Kangri villages, judging by the share of households in either villages reporting this issue. Road construction is a major need in Haji Sheedi, Hajamro, Haji Moosa Jatt, and Siddique Koreyo.
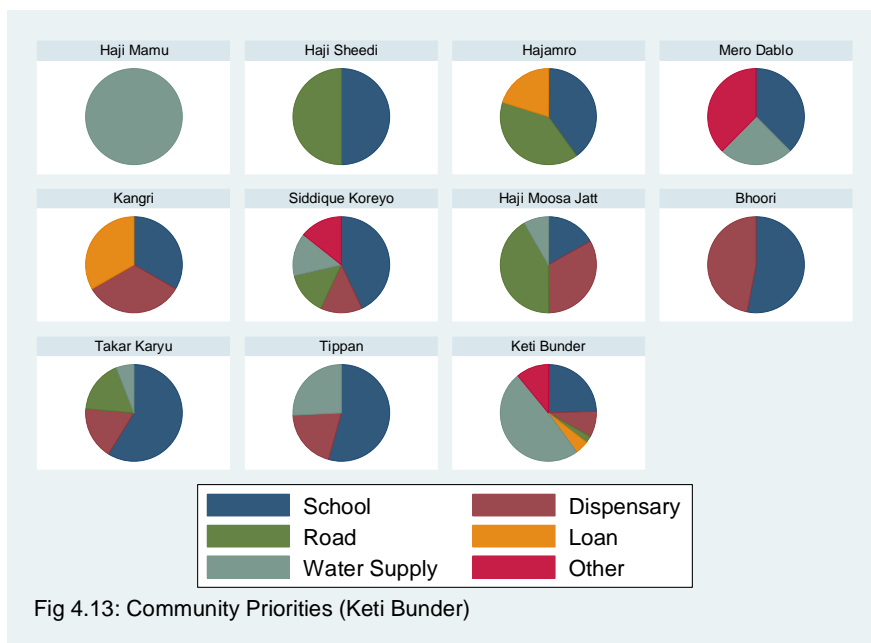
Fig 4.13: Community Priorities (Keti Bunder)

Community challenges at Keti Bunder are reported by village in Fig 4.13 (below). Besides the expected high number of responses relating to floods in the immediate aftermath of this national disaster, the CCAP should take note of a significant number of villages reporting unemployment and disease prevalence.
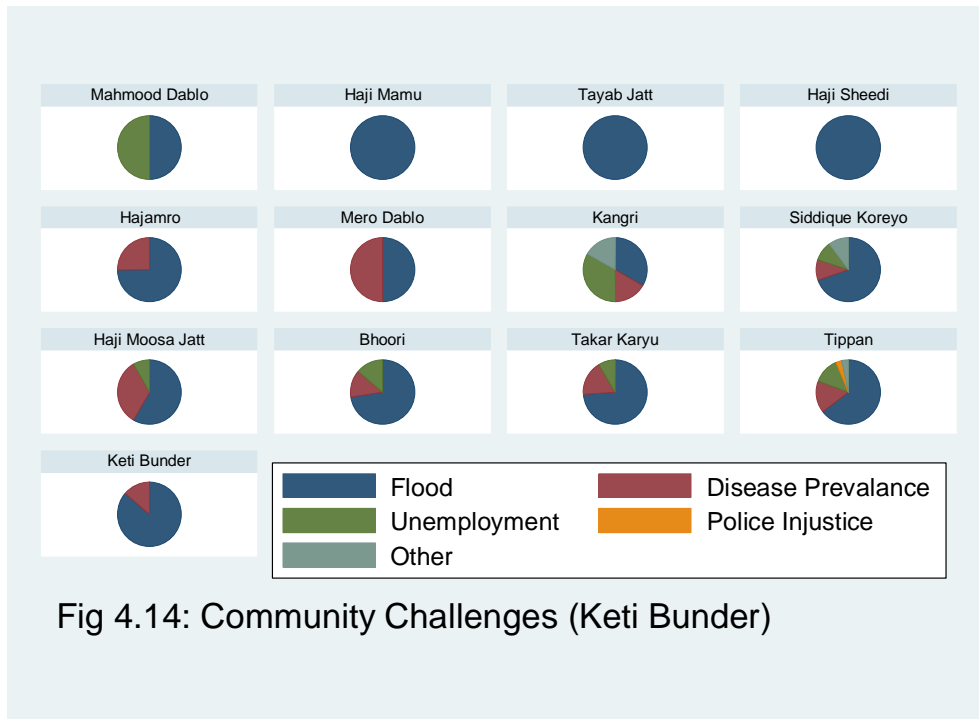
Fig 4.14: Community Challenges (Keti Bunder)

4.5 Climate Change Adaptation and the Poverty-Environment Nexus:

For a discussion of the distinction between climate variability and change, expressions of such change in Pakistan, and impacts experienced, including in coastal areas, see section 3.6 above.

Fig 4.15: CC Adaptation Strategies (% by Village)
Keti Bunder (2011)
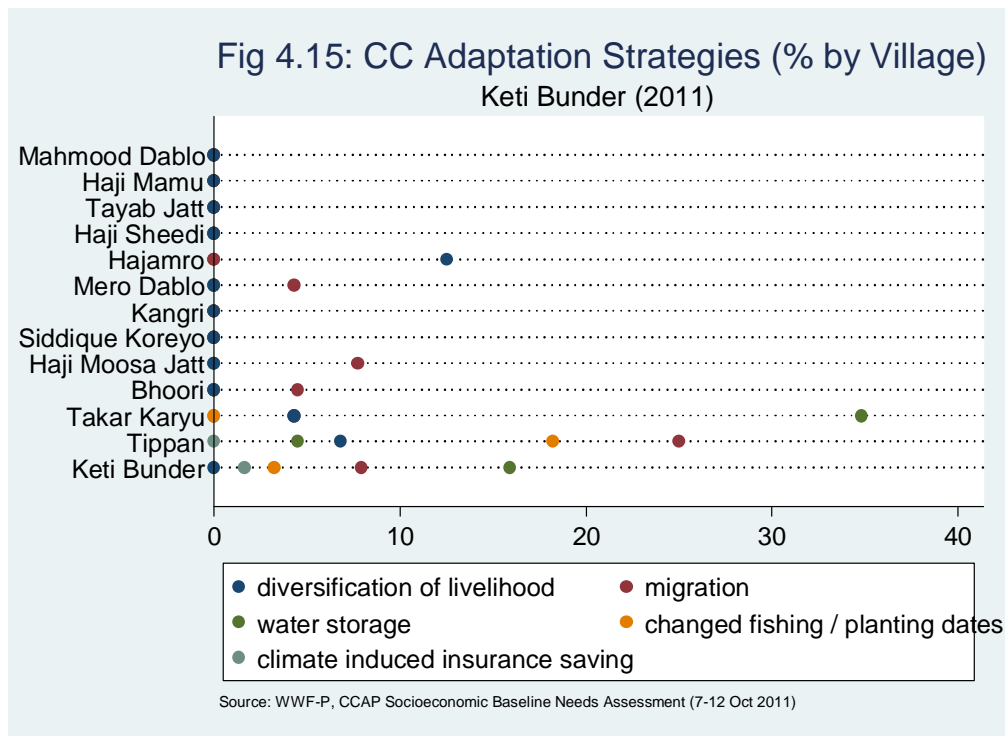
Source: WWF-P, CCAP Socioeconomic Baseline Needs Assessment (7-12 Oct 2011)

In Fig 4.15 above we first note that no adaptation strategies are reported at about half of the sampled villages, namely Mahmood Dablo, Haji Mamu, Tayyab Jat, Haji Sheedi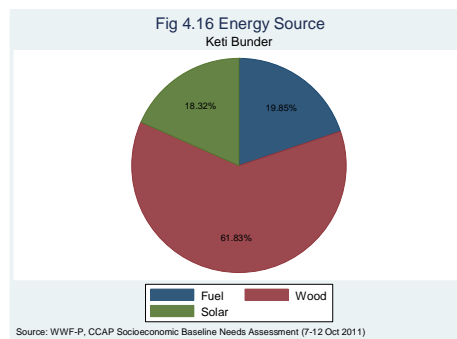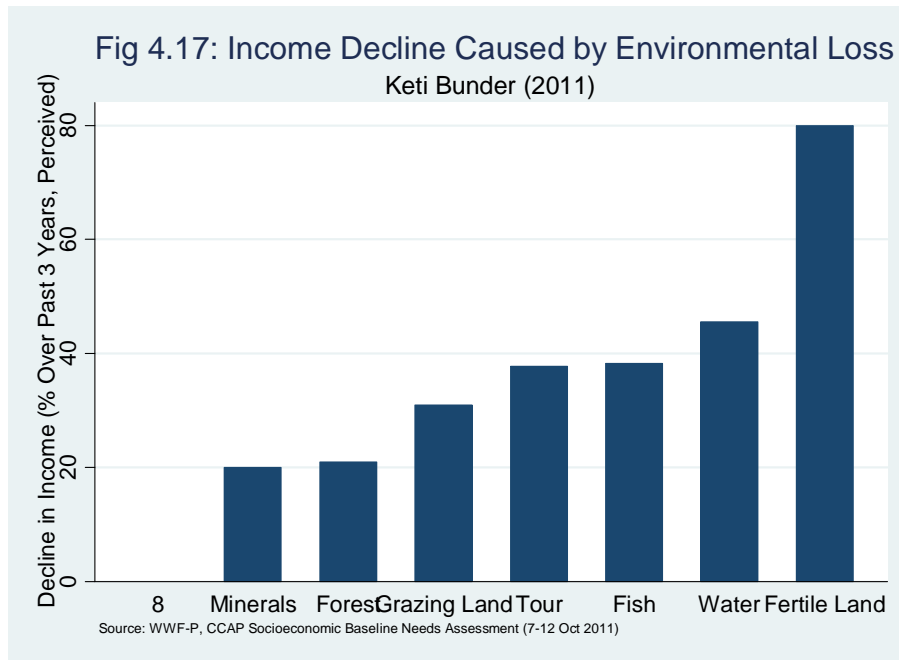, Kangri, and Siddique Koreyo villages. This itself is worthy of further investigation by the CCAP. Second, we note a high number of migrations reported in Tippan (about 25% of all reporting households). There is significant migration also in Keti Bunder, Haji Moosa Jat, Bhoori, and Mero Dablo (above 5% of reporting households in each case). While water storage may not necessarily be a response to recent climate variability, changed fishing dates reported at Tippan and Keti Bunder warrant further investigation.

While there is no detailed data on wood collection and/or enterprise based on wood processing and sale, we see that just over 60% of reporting households rely on wood for their cooking and other energy requirements (see Fig 4.16). As many as 20% of households in our sample rely on fuel; this is perhaps mainly for running fishing boats. From 2008-2011, under WWF-P's Indus for All Programme, households in villages at Keti Bunder have received 11 centralized solar units, 15 household solar units, 8 biogas units, and 2 hybrid systems. This reliance on alternative energy is reflected in the 18% of sampled households reporting use of solar energy.

Fig 4.16 Energy Source
Keti Bunder

18.32% 19.85%

61.83%

Fuel   Wood
Solar

Source: WWF-P, CCAP Socioeconomic Baseline Needs Assessment (7-12 Oct 2011)

Keti Bunder villages have reported their perception of percentage income declines over the past 3 years due to natural resource degradation (see Fig 4.17 below). Water and fertile land show highest mean income declines, in excess of 40% and 80%, respectively. This underlines how difficult it is for fishers to diversify into agricultural activities in areas adjacent to the creeks where most live. Degradation in fish stock is a big concern for communities that are almost exclusively dependent on fishing for their livelihoods (nearly 40%).

Fig 4.17: Income Decline Caused by Environmental Loss
Keti Bunder (2011)

Source: WWF-P, CCAP Socioeconomic Baseline Needs Assessment (7-12 Oct 2011)

(It is important to remember that comparison on the y-axis percentage measure across flora and fauna categories represented by vertical bars would be incorrect. In particular, each vertical bar measures the mean value obtained only for those who responded for any given natural resource category.)

When asked if communities were engaged in natural resource conservation work, 14% of our sample replied in the affirmative. This suggests a not insignificant number of households with existing environmental awareness and experience of community actions in this sphere. The villages and households in question should be noted by CCAP when designing its interventions, for which purpose the database produced by this baseline can be easily queried.

4.6 Women's livelihoods, health, and access to facilities:

At Keti Bunder 23% of the total sample was female respondents. Female enumerators interviewed female respondents in the absence of male heads of household to obtain candid responses. Rilly making is the major vocational skill and means of supplementing household income (see Fig 4.20), earning women approximately PKR 700 per month on average. As stated before, this figure cannot be interpreted to hold for all months of the year as demand is not constant nor is there a supply chain arrangement.
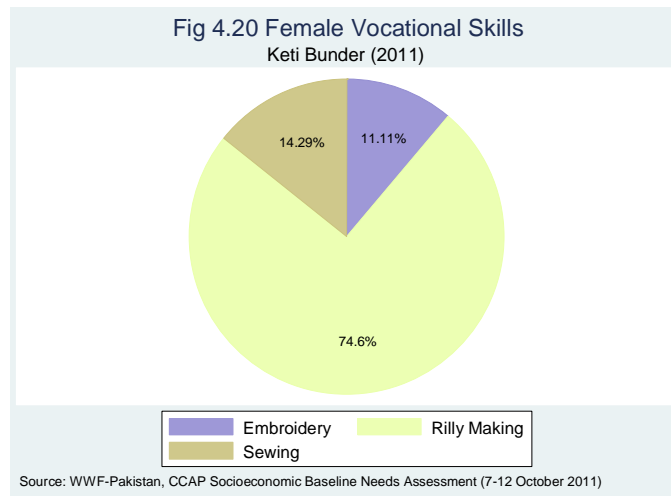
Fig 4.20 Female Vocational Skills
Keti Bunder (2011)

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)

There is extremely high female illiteracy at Keti Bunder, reported at 97% for 2011. As there is an absence of any significant investment in education facilities in the past 4 years, there is little chance of a forward movement from the 2007 baseline recorded at the time by the Indus for All Programme.

Fig 4.21 Educational Status Females
Keti Bunder (2011)

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)
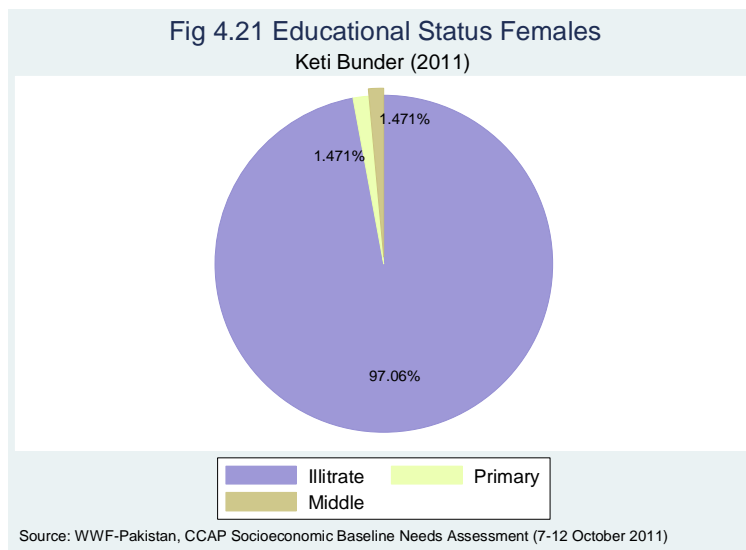
As regards sources of information, nearly 70% of women report that information is obtained through mobile phones. This may not reflect the percentage share of women owning mobile handsets. Radio is mentioned by at least 10% of the sample. The other sources of information mentioned in Fig 4.22 can be a useful guide in designing early warning systems to help with disaster preparedness, in convincing stakeholders to contribute investments in the right technologies for prevention or information broadcasts to assist the coastal fisher and farming community to adapt appropriately to climate variability.

Fig 4.22: Information Sources
Keti Bunder (2011)

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)
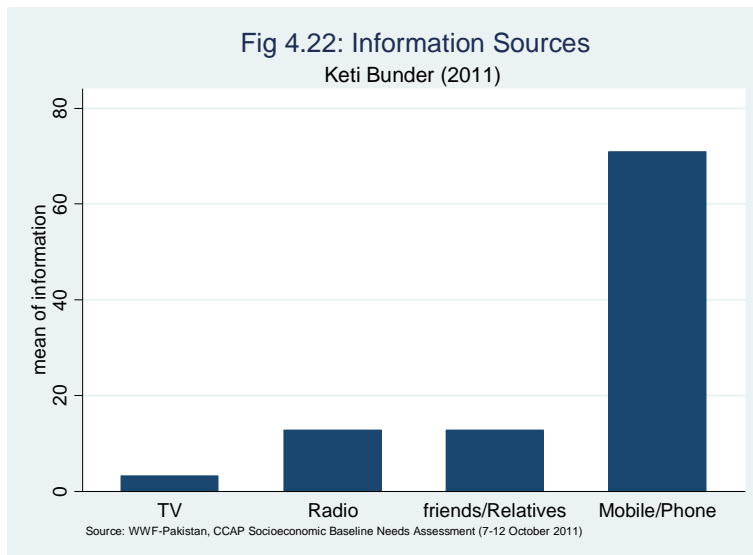
5. Jiwani

5.1   Summary Profile of Jiwani:

About one fourth of Pakistan's total fish catch is produced in Gwadar district along its 600 km long coastline. Jiwani is one of Gwadar's four tehsils, along with Gwadar, Pasni, Ormara (there is also Suntsar which is a sub-tehsil). According to UNDP's district-level Human Development Index categorization of 2005 (the last such one for Pakistan) no district of Pakistan emerges in the high category (above 0.8), while Gwadar is among 10 districts falling into the low category (below 0.5), of which 3 are from Khaiber Pakhtunkhwa, and 7 from Balochistan[3].

Fig 5.1a: Satellite Image of Jiwani village settlements

Source: Pakistan Wetlands Programme, 2011

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[3] The HDI has three sub-indices for health, educational attainment, and income. The methods used to estimate such factors as real GDP per capita for Gwadar in the absence of district-level GDP time series, e.g., cash value of crop output and manufacturing value added, are not without contention. At the country-level, Thatta district's HDI rank is 64 out of 91.

Jiwani has an estimated 2011 population of 19,000 and has diverse habitat types including freshwater, desert, marine, tropical thorn forests, mangroves, and scrub zone. Along the bay which penetrates 30km inland, mangroves are found in clumps among barrier bars, islets, mudflats and tidal lagoons. *Avicennia Marina* mangroves are found along the west of the bay. It is unsurprising that WWF has a Conservation and Information Centre at Jiwani as the area supports marine turtles (both Olive Ridley and Green turtles), marine mammals, marsh crocodile, and a variety of birds and is one of 19 Ramsar sites in Pakistan (declared on 10.5.01). Oil tankers that clean bilge and tanks as they pass through Gwadar's Exclusive Economic Zone (EEZ) are a source of oil pollution to Jiwani's coastline. According to IUCN (2007), the annual shipping vessel throughput through this EEZ is at least 11,000 ships of around 12,000 million tones deadweight and 2,500 tankers carrying 33 million tons of oil.

In terms of climactic conditions, Jiwani is known not to have a regular pattern of rainfall, from well beyond 10 years ago. For example, in 1993 total annual rainfall at Jiwani was 27 mm, rising to 110.6 mm in 1994, and peaking at 113 mm for the month of December 1995 alone. That is, in a single month, December 1995 rainfall exceeded total annual precipitation for 1994 as a whole.

5.2 Livelihoods Indicators:

Jiwani's savings ratio, i.e., net household savings divided by net income, could not be calculated. In particular, the aggregate expenditure data in our database shows low and unlikely levels of consumption. This may be because of underreporting by respondents. According to PWP (2011), based on relative outflows of monthly expenditures, savings are lowest at villages Okar and Jiwani. Average net monthly savings of households, according to the study, lies between PKR 500 and PKR 30,595.

Only 10% of sampled households at Jiwani reported receiving loans, with an average loan size of PKR 13,800. Both the average loan size as well as the number of households availing loans is significantly smaller than for Keti Bunder or Kharo Chan. Only one household reported borrowing from a bank. Borrowing typically is from relatives and/or middlemen (8%). As only a handful of households reported payment of interest, we may assume there is a very informal system in place. Payment of monthly installments ranges from PKR 200 to PKR 10,000. About 39% of the sample claim regularly payment of installments. The majority of loans were initiated in 2011.

With respect to land ownership, not a single respondent reported owning any land. Clearly, PWP (2011) found land ownership in their survey including agricultural land ownership (see section 5.4.1 below).

Livestock ownership is reported in table 5.1 (below) and is remarkable for the large numbers of cows, buffaloes and goats. According to PWP (2011) goats are sold for PKR 5,000 each. Households at Panwan, Jiwani, and Gunz, according to the study, pay shepherds PKR 30-60 to have their goats grazed.
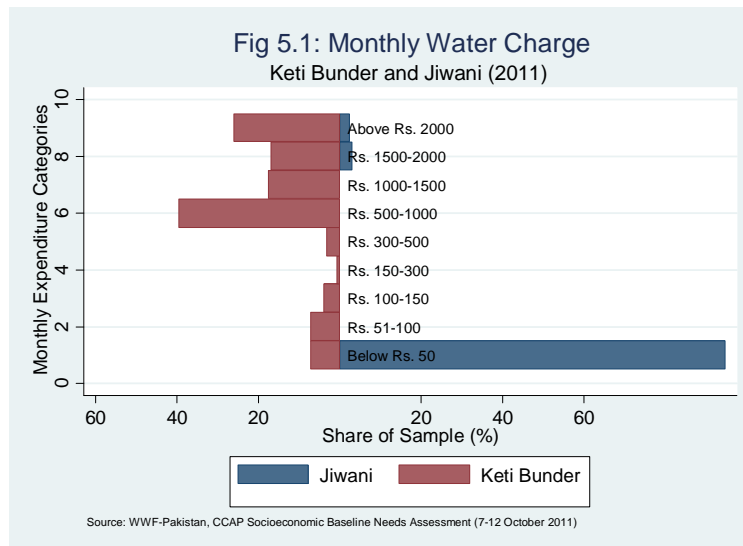
Table 5.1. Livestock: Estimated Mean (Nos.)

Livestock Type	Households	Monthly Household Mean	TOTAL
Cow	6	3.67 (1.50)	22 (3.69)
Buffalo	1	1 (0.0)	1 (0.0)
Sheep	6	3.33 (3.44)	20 (8.43)
Goat	163	4.20 (3.33)	686 (42.54)
Camel	9	2.33 (0.86)	21 (2.6)
Horse	1	2 (0.0)	2 (0.0)
Asses	21	1.86 (0.91)	39 (4.17)
Hen	63	3.17 (2.47)	200 (19.62)

Note: Sampled households reported no ownership of other animals. (Standard errors in parentheses)

Agricultural machinery ownership covers a tractor each in the case of two households (villages Gunz and Robar), one household owning a plough (village Panwan), and no household owning a pump. Among electrical appliances, television ownership is reported in all villages except Shaabad Bazar, Dar Musali, Nok Dirr. The highest ownership is 75% of households at Guathri Bazar, and the lowest at Okar with 33% of sampled households owning televisions. As much as 82% of the sample own mobile handsets, with half of these households owning more than a single handset. Mechanized transportation of any type, including vehicles or motorcycles is reported by 44% of all households.

Migration Patterns are revealed to be highest at village Shaabad Bazar (all households reporting temporary migration). This is corroborated by PWP (2011) who also found all reporting households at Shaabad Bazar to have migrant members (in the case of PWP, the sample was only 2 households, as against 19 in the present study). PWP also notes migration in 13% of its sample for Panwan. Migration of any type is reported by 10% of all 576 households sampled in Jiwani in the present study.

Monthly water charges paid by Jiwani households are provided in Fig 5.1 (below) where they are compared to Keti Bunder (the comparison to Kharo Chan is provided in 3.14 above). At Jiwani, well over 90% of those sampled pay below PKR 50 per month.

Fig 5.1: Monthly Water Charge
Keti Bunder and Jiwani (2011)

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)

Water has been supplied in Gunz, Panwan, Bundri, and Jiwani. Still 78% of our whole sample of 261 households has to purchase water or extract it from wells (4% of our sample).

The educational status of inhabitants at Jiwani is shown in Fig 5.2 below. Illiteracy is not as high here as it is at Keti Bunder and Kharo Chan, 14% compared to 80% and 66%, respectively. The male to female illiteracy ratio is 0.15, i.e., 14% illiterate males compared to 90% illiterate females. According to PWP (2011), literacy is below 45% in villages Panwan, Bandri, Jiwani, and Gunz and is 62% in Dirr Nokabad. Also, there are no education facilities at Dirr Nokabad and Daran. As regards state primary schools, these number 1 at Panwan (coeducational) and 1 Jiwani (coeducational), 2 at Okar (separate for boys and girls), 2 at Shayabad (separate for boys and girls), 1 and Bandri (boys only), and 1 at Gunz (boys only). As regards sate middle schools, these number 1 at Jiwani (coeducational), 1 at Panwan (coeducational, but it is still under construction), and 1 at Gunz (boys only). Girls at Gunz study at a single private primary school.

Fig 5.2 Educational Status
Jiwani (2011)

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)
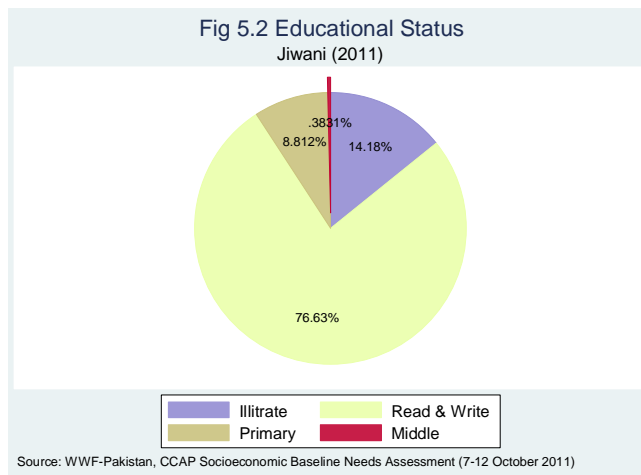
Reported availability of health facilities at Jiwani is given by village in Fig 5.3. Government hospitals are present at Bandari, Kohsar, Kargoshi, and Panwan villages only.

Fig 5.3: Health Facilities
Jiwani (2011)

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)
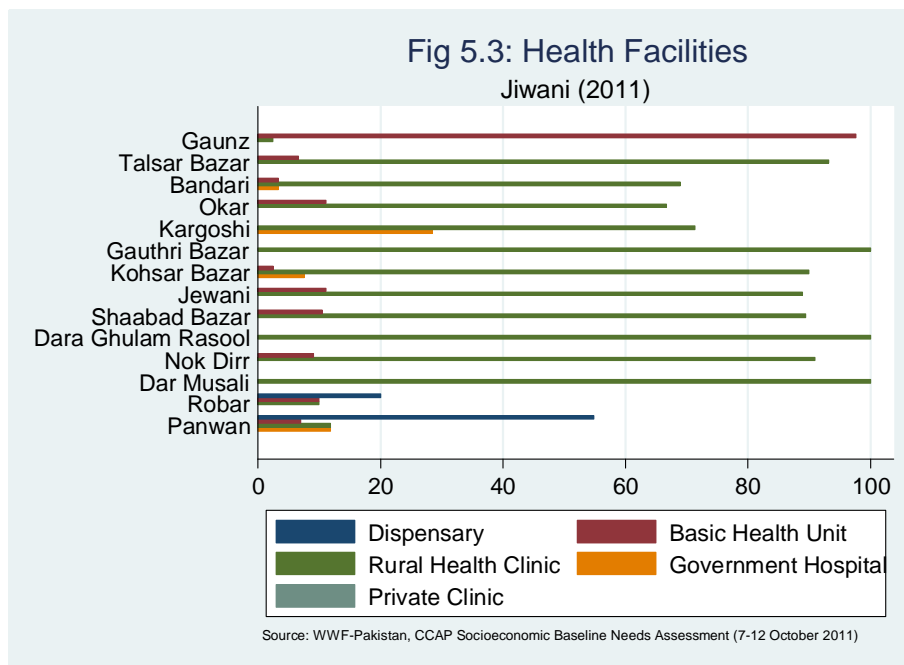
Fig. 5.4 (below) shows disease prevalence by village (diseases not reported are regrouped along the vertical axis, the percentage of responses to disease types are shown on the horizontal axis). Malaria and Diarrhea are remarkably present in most villages, at levels exceeding 30% of all reporting households in most cases. Typhoid is reported in six villages, but is almost certainly an underestimate. For example, according to PWP (2011) 7% of all sampled households at Panwan reported typhoid, while none reported it in our survey.

Fig 5.4: Disease Prevalence (% by Village)
Jiwani (2011)

Source: WWF-P, CCAP Socioeconomic Baseline Needs Assessment (7-12 Oct 2011)
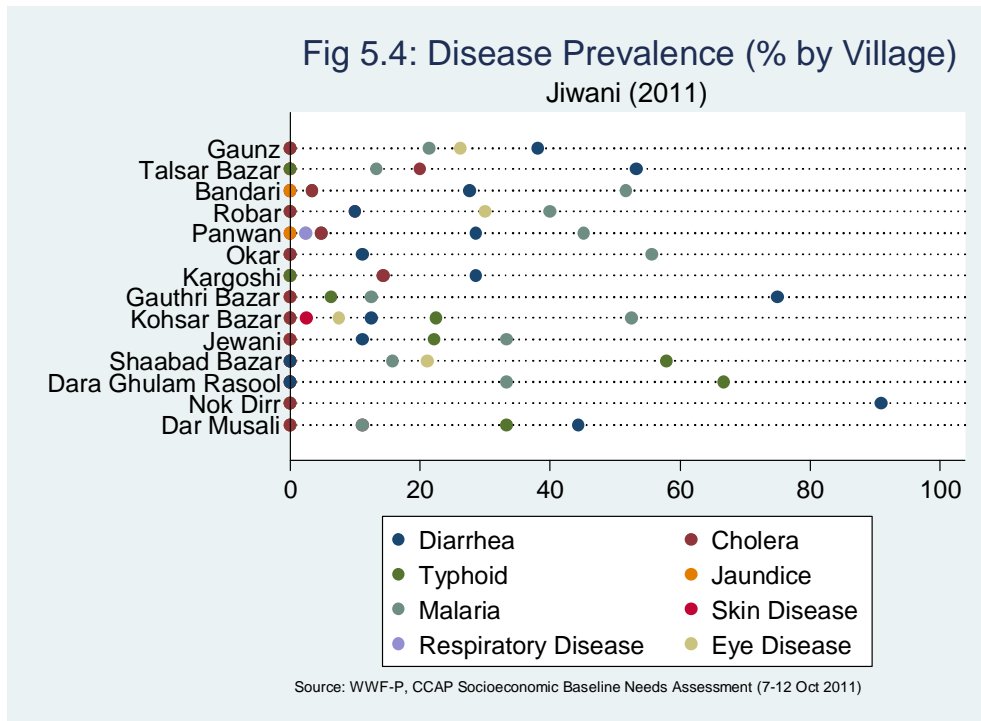
Fig 5.5 (below) provides village wise information on types of toilet facilities, showing pit latrine use across the board in a high percentage. Open space use is reported in 8 villages, with highest reported use in Robar and Dar Musali.

Fig 5.5: Toilet Facility Type by Village (Jiwani 2011)

Source: WWF-P, CCAP Socioeconomic Baseline Needs Assessment (7-12 Oct 2011)
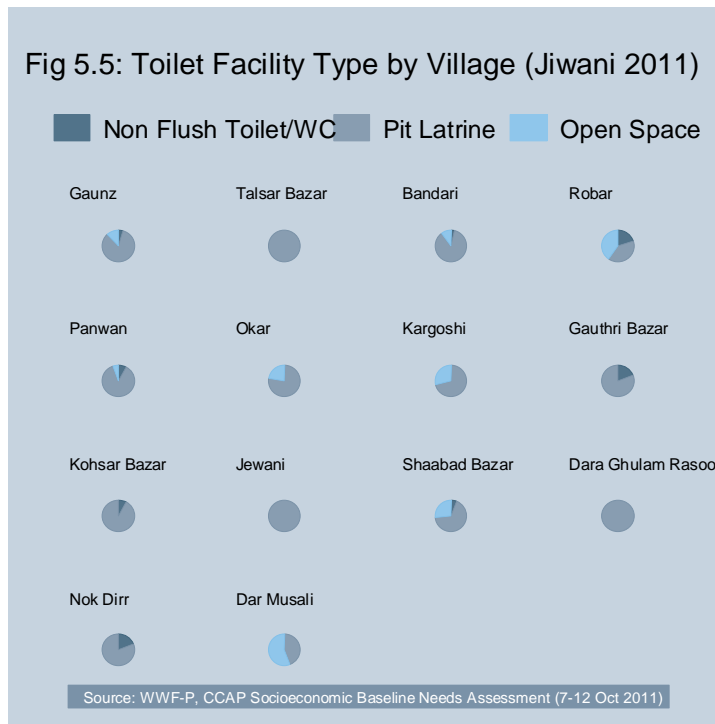
As regards veterinary facilities, 1% of our sample reported having access to a veterinary hospital (Fig 5.6). Local health workers are the foremost source relied upon by livestock owners.

Fig 5.6 Veterinary Facilities
Jiwani (2011)

- .9434% Veterinary Hospital
- 16.04% Other
- 83.02% Local Health Worker

Source: WWF-P, CCAP Socioeconomic Baseline Needs Assessment (7-12 Oct 2011)
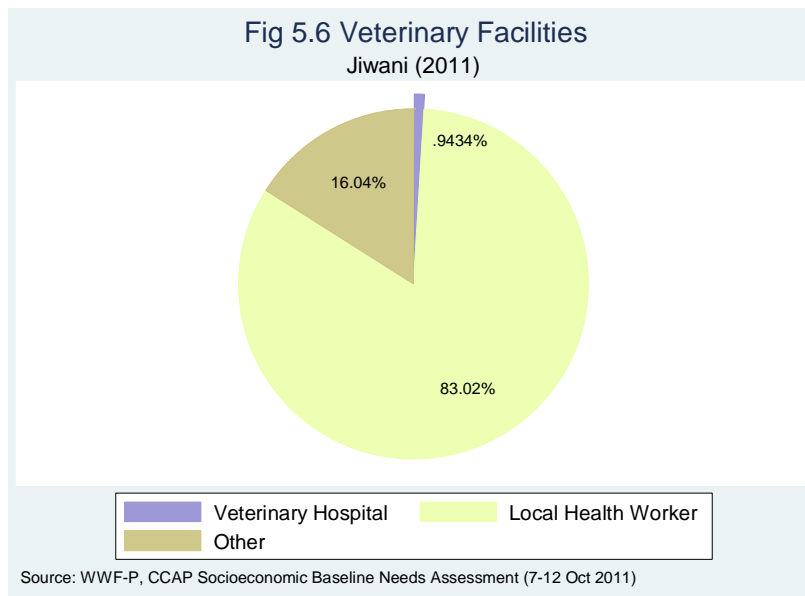
5.3   Livelihoods

5.3.1   Fishing

5.3.1.1 Seasonal fish (Figs 5.7a, 5.7b, 5.7c, 5.7d, and 5.7e):

At Jiwani, variation between fisher and market prices ranges between 30-60%, with Paplet prices generally fetching less than at Kharo Chan. From among seasonal fish species, the most commercially important varieties are Soleeg, Aspedtigelm, Mushko, Kumpoo, Gore, and Gaddir. These species fetch between approximately PKR 200-900 in the market.

Fig 5.7a: Average Fisher and Market Prices
Seasonal Fish Species (Jiwani, 2011)

	Fisher Price	Market Price
Jaira	528.929	625.366
Jelly Fish	540	570
Soleeg	914.516	959.677
Sorroo	249.474	306.842

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)

Fig 5.7b: Average Fisher and Market Prices
Seasonal Fish Species (Jiwani, 2011)

	Fisher Price	Market Price
Aspedtigelm	787.407	874.231
Chancho	115.714	155
Muss	365	537.222
Sahetigelm	162.5	182.917

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)

Fig 5.7c: Average Fisher and Market Prices
Seasonal Fish Species (Jiwani, 2011)

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)

Fig 5.7d: Average Fisher and Market Prices
Seasonal Fish Species (Jiwani, 2011)

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)

Fig 5.7e: Average Fisher and Market Prices
Seasonal Fish Species (Jiwani, 2011)

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)

5.3.1.2 Annual fish (Figs 5.8, 5.9, and 5.10):

Among annual fish, the most commercially important species are Ahur, Kund, Pagaas, and Seem. These species fetch between PKR 150-370 in the market.

Fig 5.8: Average Fisher and Market Prices
Annual Fish Species (Jiwani, 2011)

Fig 5.9: Average Fisher and Market Prices
Annual Fish Species (Jiwani, 2011)

Fig 5.10: Average Fisher and Market Prices
Annual Fish Species (Jiwani, 2011)
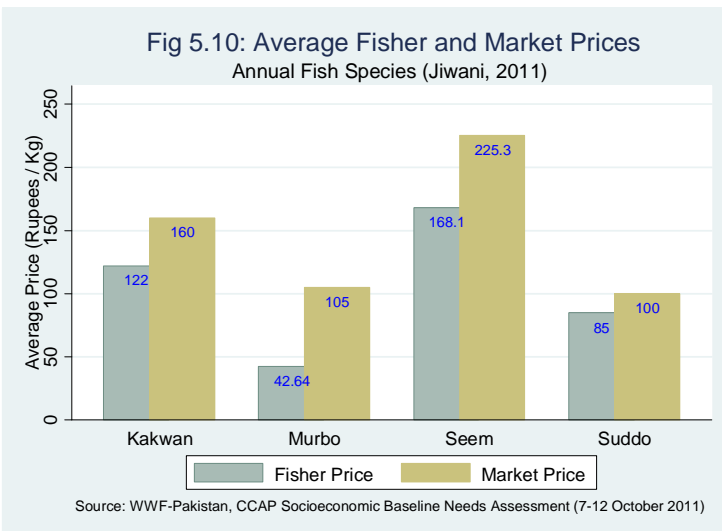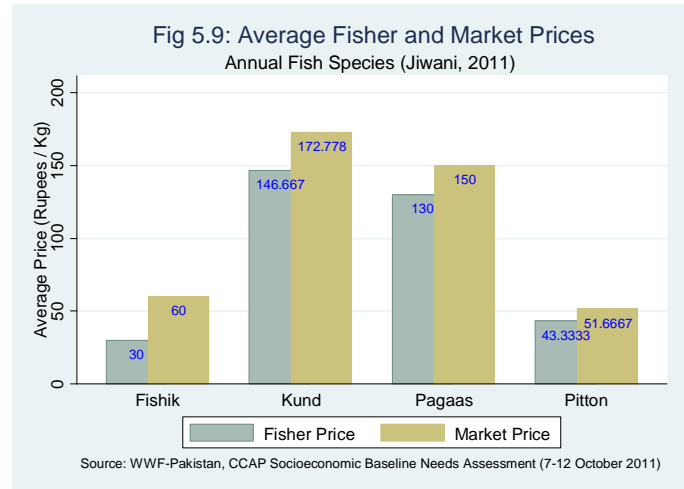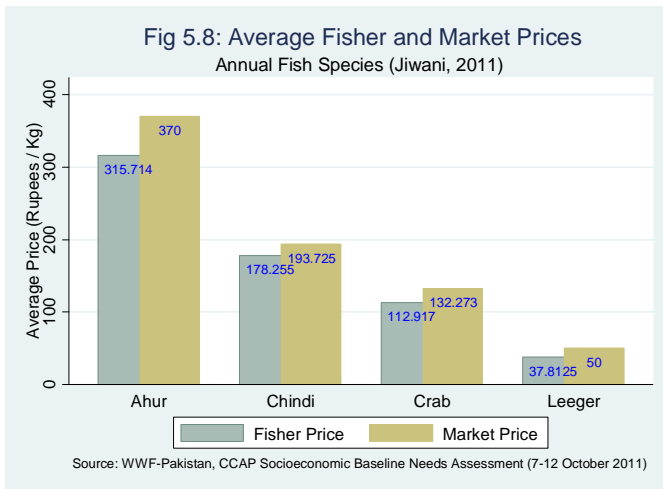
5.3.1.3 Fish Quantities and Basis for Estimated Total Biomass Calculation (Tables 5.2 and 5.3):

Quantities of fish caught by all households in our sample are provided here for seasonal fish (Table 5.2) and all-year round fish (Table 5.3). As discussed in sections 3.4.1.5 and 4.3.1.4 (above) the information presented here is not a completed biomass calculation, which would require assignment of population weights for upward aggregation to the sample total, as well as verifications on upwards or downwards biases on values.

Table 5.2. Seasonal Fish: Estimated Mean Monthly Household Catch, and Population Total Catch (Kgs)

| Fish	Households	Monthly Household Mean	TOTAL
Soleeg,Kir (Large Croakers)	32	755.93 (552.22)	24190 (3123.86)
Sorroo (King Soldier bream)	17	496.29 (408.25)	8437 (1683.26)
Jaira, Madag (Tigers, Shrimps)	82	663.59 (692.96)	54415 (6275.1)
Jellyfish	4	325 (167.82)	1300 (335.65)
AspedTigelm (WhitePomfret)	25	1297.6 (3913.24)	32004 (19566.18)
SaheTigelm (Black Pomfret)	10	432.16 (444.97)	4326 (1407.12)
Muss (Cuttle Fish)	35	636.22 (407.19)	22268 (2409.01)
Chancho (Grouper)	7	661.242 (503.86)	4630 (1333.10)
Pashanth (wolf herring)	5	3146 (5524.56)	15730 (12353.3)
Kumpoo (Grunts)	15	684.66 (771.14)	10270 (2986.64)
Mushko (Small Croakers)	35	895.48 (755)	31342 (4468)
Galloo (Cat Fish)	7	810 (1018)	5670 (2693.38)
Kalloo (Eel)	3	460 (304.46)	1380 (527.35)
Amdos (Marlin)	4	1541 (1025.36)	6164 (2050.72)
Gaddir (Emperors)	6	397.33 (282.4)	2384 (691.75)
Gore (Spanish Mackerel)	14	381 (354.12)	5334 (1325.01)
Saram (Queen Fish)	12	505.83 (423.33)	6070 (1466.45)
Khail (Guitar Fish)	1	20000 (-)	20000 (-)

Note: standard errors in parentheses; number of households with catch > 0 used to calculate mean

Table 5.3. Annual Fish: Estimated Mean Monthly Household Catch, and Population Total Catch (Kgs)

Fish	Households	Monthly Household Mean	TOTAL
Leeger (Sardine)	16	2150 (1791.55)	34400 (7166.20)
Ahur (Tonna fish)	7	359.85 (528.07)	2519 (1397.14)
(Tagguss) Crab	11	640.90 (552.65)	7050 (1832.95)
Chindi(Ribbon Fish)	47	1216.25 (1819.6)	57164 (12474.7)
Fishik (Bambol small Shark)	1	2600 (-)	2600 (-)
Pagaas(Large Shark, Shark)	1	2400 (-)	2400 (-)
Kund(Barracudas)	7	934.85 (876.58)	6544 (2319.22)
Pitton(Rays)	13	1315.38 (1458.74)	17100 (5259.58)
Murbo(Mullets)	24	208.58 (573.58)	5006 (2809.97)
Suddo (Saw Fish)	1	650 (-)	650 (-)
Kakawan, Sonam, Galbat (Trevallies)	5	640 (403.73)	3200 (902.77)
Seem, Bangra, Kallath (Indian Mackerels)	261	692.26 (3807.8)	180680 (65517.27)

Note: standard errors in parentheses; number of households with catch > 0 used to calculate mean

Fish production is constant at about 1,200 metric tons per month (see Fig 5.11 below), with raw data on volumes also from the Fisheries Department as reported in PWP (2011) suggesting that average unit prices have remained at PKR 42 / kg for both 2009 and 2010. For the months of June-August average unit prices understandably rise.

Fig 5.11: Monthly Fish Production at Jiwani for 2009-10
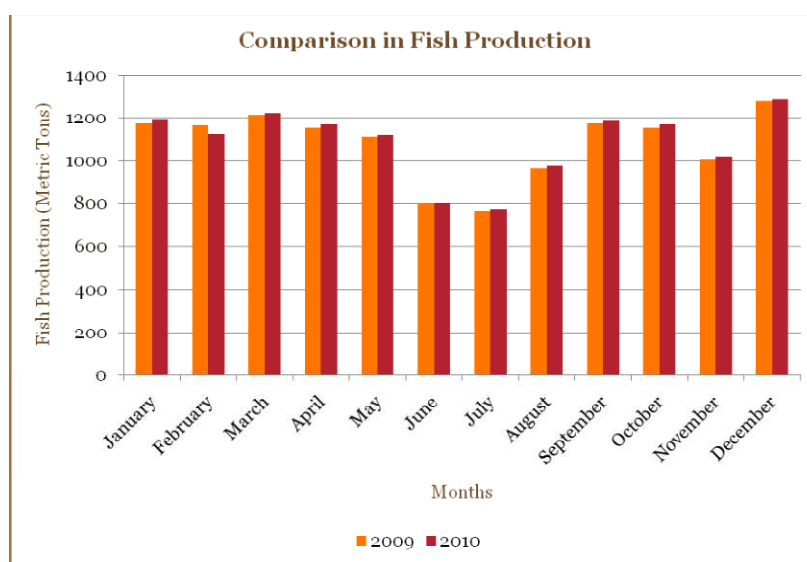
Source: Pakistan Wetlands Programme (2011) – drawn from Fisheries Department data.

5.4.1 Agriculture:

Due to low rainfall throughout the year, according to PWP (2011) very few households are engaged in agriculture. They found only 3 households at Pawan, Okar, and Gunz owning agricultural land between 3-12 acres and growing lentils or water melon. Examples of other barani crops grown at Jiwani are sorghum. As we classify fishing under agriculture, this section on agriculture reports boat ownership.

In 2010 there were a total of 518 boats operated at Jiwani, of which 296 were motorized and the remainder were mechanized. This represents a 6% increase over 2009 as can be seen in table 5.12 below.
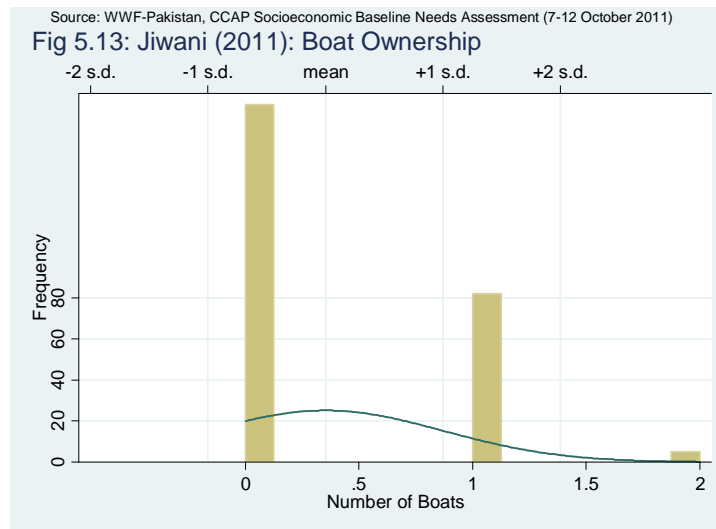
Fig 5.12: Fishing Craft Numbers at Jiwani in 2009-10

Boat Type	Boat Capacity (Ton)	Number	
		2009	2010
Mechanised boat fitted with inboard engine	5 – 20	75	79
	21 – 35	13	19
	36 – 50	15	15
	51 – 65	21	21
	66 – 80	24	26
	81 and above	51	62
Motorised boat fitted with outboard engine	1	123	126
	1 – 5	156	159
	6 – 15	11	11
	16 and above	0	0
Total	**all**	**489**	**518**

Source: Pakistan Wetlands Programme (2011) – drawn from Fisheries Department data.

The number of fishers corresponding to the 2010 boat figure of 518 is 5,270 fishers, including fulltime (4,430), part time (590), and occasional fishers (250).

At Gunz, single boat ownership is reported by 22 households, ownership of two boats is reported by 3 households. This is the highest boat owning village in our sample. The second highest is a tie between Bandri and Kohsar Bazaar, where – for both villages -- single boat ownership is 11, while ownership of two boats is reported by a single household.

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)

Fig 5.13: Jiwani (2011): Boat Ownership

(Our histogram in Fig 5.11 is overlaid by a normal density curve of equivalent mean and standard deviation: ownership is not regrouped at high frequencies across 1 or more boats, the curve is right-skewed).

5.4.2 Wood and NTFPs:

Wood collection is ubiquitous across the board for those sampled in our study. According to PWP (2011), gas cylinder ownership is reported by 27%, 33%, and 10% of sampled households at Panwan, Jiwani, and Gunz, respectively. These coincidentally are also villages who report purchases of fuel wood instead of collection only.

According to PWP (2011), 9 households at Jiwani, Gunz, Daran, Bandri, Shayabad, Okar, and Pawan are engaged in honey collection. It is collected twice a year at amounts ranging from 0.5-4 liters for home medicinal purposes only. Among NTFPs, Darhant and Danich plants are used as medicine for coughs and colds.

5.5 Community Priorities, Challenges and Organizational Status:

As regards the organizational status of households at Jiwani, we note that 10% of our sample are CBO members, covering villages Panwan, Gunz, Talsar Bazar, Bandri, Robar, Jiwani, Kosar Bazar, Dera Ghulam Rasool. An established CBO is the Jiwani Educational Development Society (JEDS), which is currently working on human rights, environment, marine life, health, and education. Its association with WWF-P (via the PWP) dates back to 2007.

We note here ongoing NGO or governmental projects. IUCN has an ongoing "Balochistan Partnership for Sustainable Development (BPSD)" project in Gwadar district, along with five other districts with the aim of environmental governance, of facilitating integrated water, coastal and marine resource management, and enhancing stakeholder capacity to assist sustainable development. Under the BPSD, a District Development Vision devised in 2007 is now being implemented, while activities such as mangrove plantation, alternate livelihood development (e.g., catch culturing at Jiwani and Gunz), youth capacity building, and dry forestation for sand dune stabilization.

Education projects were reported in villages Gunz, Bandri, and Panwan. Health projects for their part are reported in villages Bandri, Robar, Panwan, Dar Moosali. Road works were reported in Gunz, Panwan, Gauthri Bazar, Kosar Bazar, Shaabad Bazar, and Nok Dirr. Water supply projects are ongoing at Gunz, Robar, Shaabad Bazar, and Nok Dirr.

Community priorities at Jiwani are reported by village in Fig 5.15 (below). Dispensaries are a major priority at all villages except at Dara Ghulam Rasool, most acutely at Bandri, Robar, Okar, and Jiwani. The second highest priority is schools and roads, with roads demanded by over 50% of households at Gauthri Bazar and schools reported as a priority by 70% or more in Dara Ghulam Rasool and Nok Dirr.

Fig 5.15: Community Priorities (Jiwani)
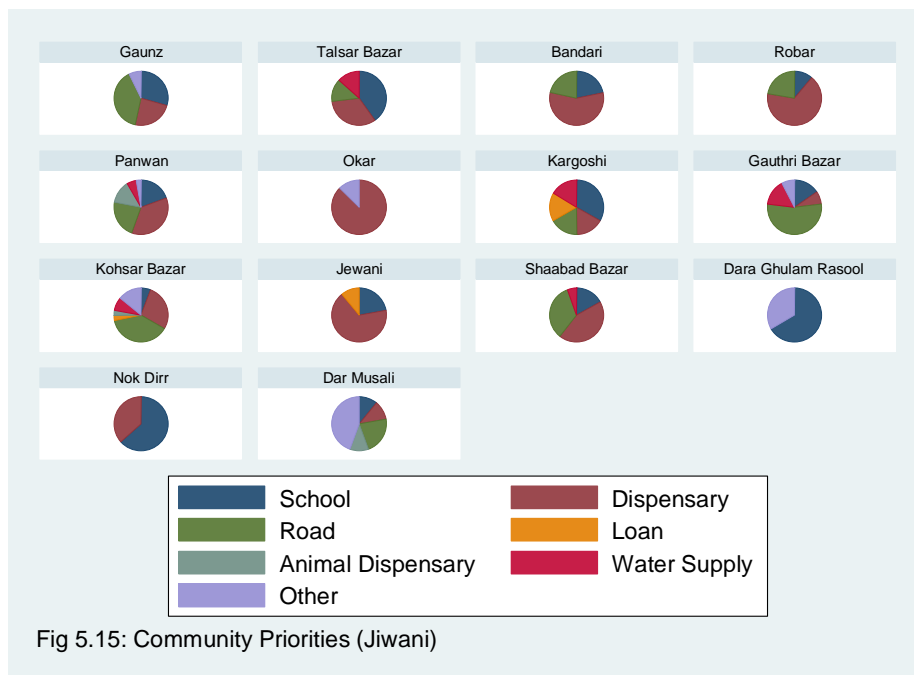
As regards community priorities, through an exercise carried out by PWP (2011), top priorities listed in descending order of importance were: controlling oil pollution, preventing illegal fishing by locals and trawlers, developing a plan for solid waste disposal, and land erosion.

Community challenges at Jiwani are reported by village in Fig 5.16 (below). Unemployment is present in exceptionally large shares for villages Khargoshi and Panwan. Severely flood affected villages would appear to be Shaabad Bazar, Dar Musali, Kohsar Bazar, Talsar Bazar, and Gunz.

Fig 5.16: Community Challenges (Jiwani)
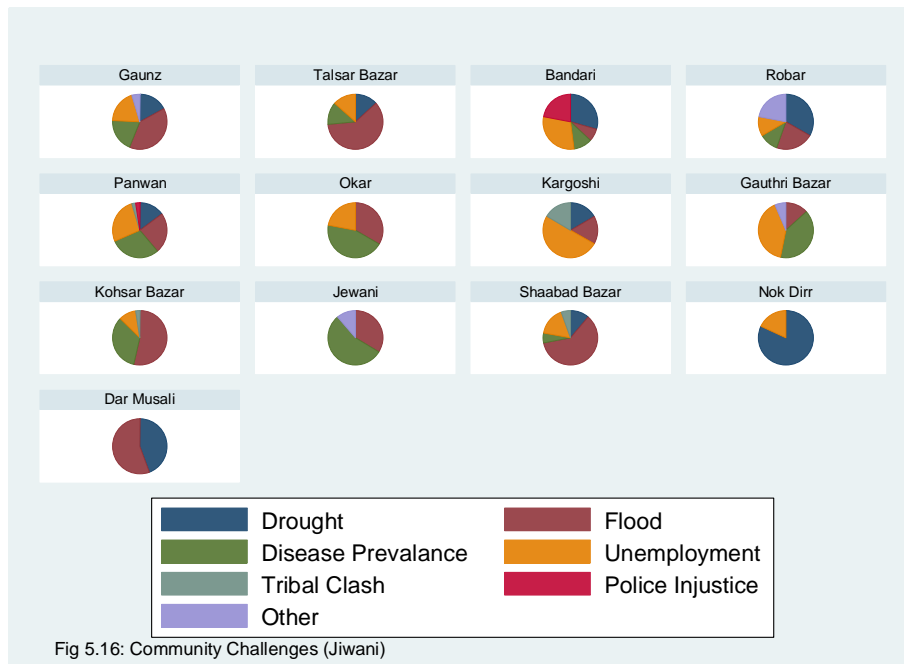
According to PWP (2011), major challenges also include low law enforcement, bribery and corruption, middlemen capture of margins before products reach markets, lack of control over illegal activities, and a high demand and subsequent pressure on poorly managed natural resource stocks.

5.6 Climate Change Adaptation and the Poverty-Environment Nexus:

Household responses on adaptation strategies at Jiwani in response to climate variability / change are given in Fig 5.17 (below). Water storage is evident in high proportions, i.e. above 20% or more, for villages Robar, Khargoshi, and Dara Ghulam Rasool. There is significant diversification of livelihoods evident in villages Dar Moosali, Dara Ghulam Rasool, and Talsa Bazar.

Migration, a manner of last resort in terms of adjustment to climate variability, is evident over 30% of households at Robar and at nearly 60% of households in Shaabad Bazar.

Fig 5.17: CC Adaptation Strategies (% by Village)
Jiwani (2011)

Source: WWF-P, CCAP Socioeconomic Baseline Needs Assessment (7-12 Oct 2011)
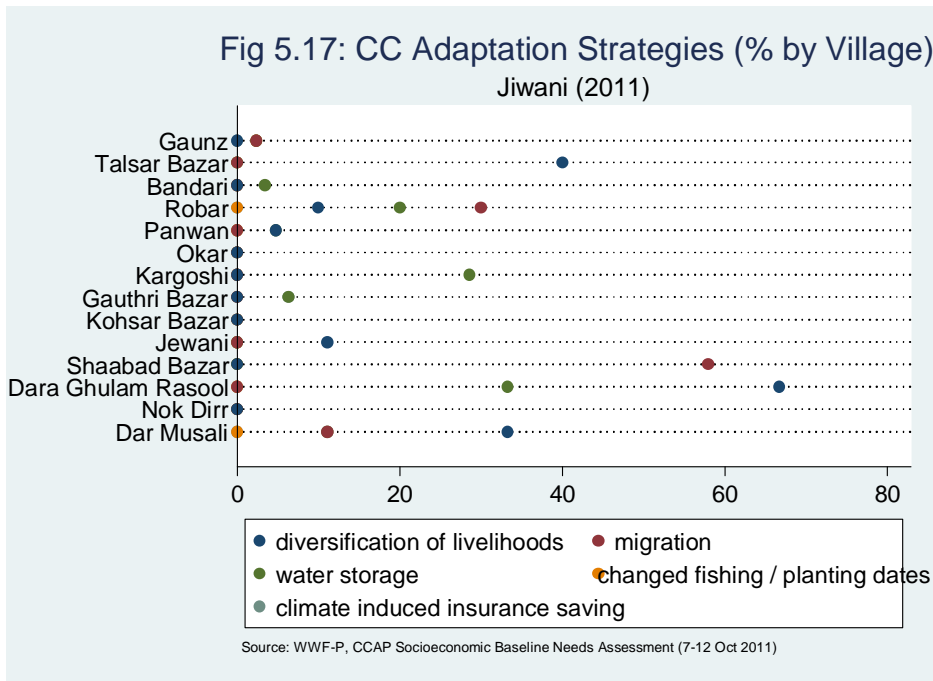
Jiwani households' perception of income decline as a percentage of total yearly income over the past 3 years due to natural resource degradation is given in Fig 5.18 below. Where a perceived income decline from degradation of forests is concerned, on average the 22 responding households in this case perceived 60% of their income to have fallen as a direct result of deforestation. Water degradation was reported as a cause behind falling income by 38 households or 15% of our total sample of 261 households.
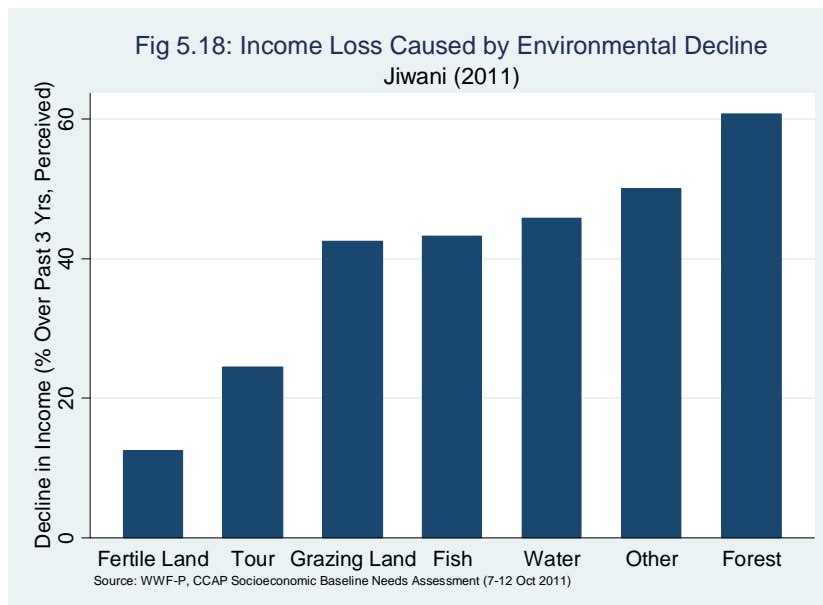
Fig 5.18: Income Loss Caused by Environmental Decline
Jiwani (2011)

Source: WWF-P, CCAP Socioeconomic Baseline Needs Assessment (7-12 Oct 2011)
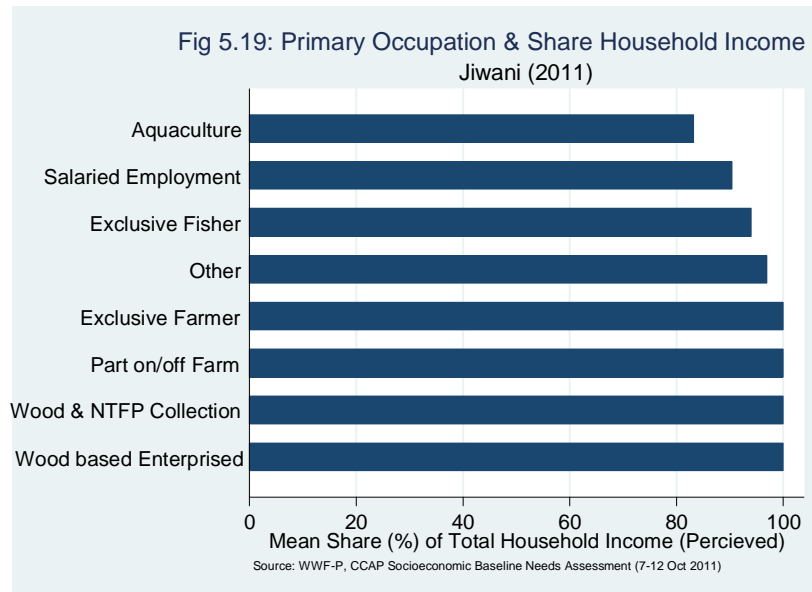
(It is important to remember that comparison on the y-axis percentage measure across flora and fauna categories represented by vertical bars would be incorrect. In particular, each vertical bar measures the mean value obtained only for those who responded for any given natural resource category.)

When asked if communities were engaged in natural resource conservation work, only 14% of our sample responded in the affirmative. This signals much work ahead on environmental awareness building.

Section 3.6 above supplies theoretical definitions of poverty-environment linkages and web links to WWF-P's 2009 empirical work in this area, including an indicators and linkages study, a poverty-environment manual, but also policy mainstreaming of poverty-environment indicators into Pakistan's long term economic and social plans.

Linked to Fig 5.18 above, is Fig 5.19 (below) which shows households' perception of the share of their primary occupation in total household income. Besides the "aquaculture" category, for all other categories, dependence is well above 90% (share of primary occupation in total income).

Fig 5.19: Primary Occupation & Share Household Income
Jiwani (2011)

Mean Share (%) of Total Household Income (Percieved)
Source: WWF-P, CCAP Socioeconomic Baseline Needs Assessment (7-12 Oct 2011)

5.7 Women's livelihoods, health, and access to facilities:

From our total sample size, 58 % of questionnaires were administered to female respondents. Fig 5.20 shows sewing is the principal source of earnings from women as well as their main skill set. The second highest shares of skills are for hat making and embroidery, in about equal amounts. On average, income earned from any livelihood occupation, from among the 17% of sampled women who reported earnings, is approximately PKR 5,030 per month.

Fig 5.20 Female Vocational Skills
Jiwani (2011)

3.065%

21.46%

45.98%

27.97%

1.533%

- Embroidery
- Rilly Making
- Other
- Hat Making
- Sewing

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)
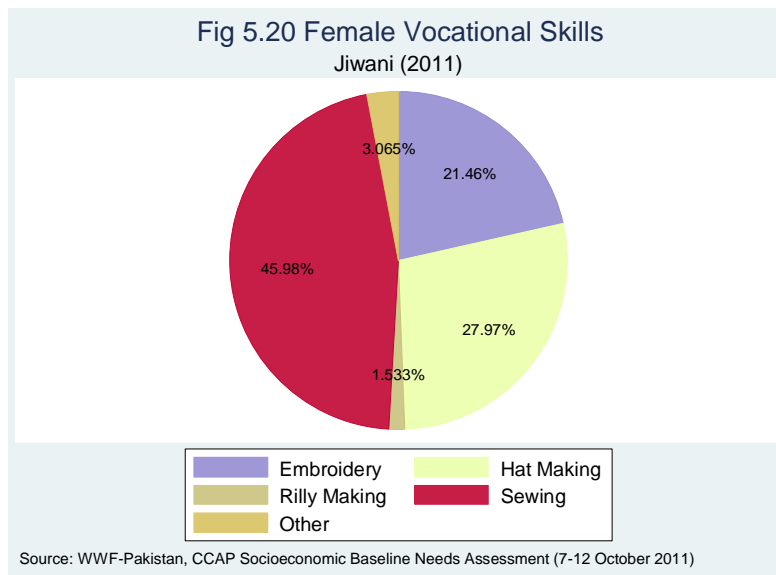
Only 10% of our sample claimed Union Council membership or membership of a community organization or an NGO. Overall, 2% of our sample is members of NGOs (in Gunz and Talsar Bazar), 1% of the sample are members of a local body (in villages Khargoshi, Gwatri Bazar, and Jiwani), 1% of the sample are engaged in collective community activities of any kind, while 5% engage in entertainment/cultural activities.

Female respondents were asked about information sources (see Fig 5.21 below). We note reliance on mobile phones for information sources, something that is altogether absent in the case of Kharo Chan but reported as an information source by over 60% of interviewed female households at Keti Bunder.

Fig 5.21: Information Sources
Jiwani (2011)

Source: WWF-Pakistan, CCAP Socioeconomic Baseline Needs Assessment (7-12 October 2011)
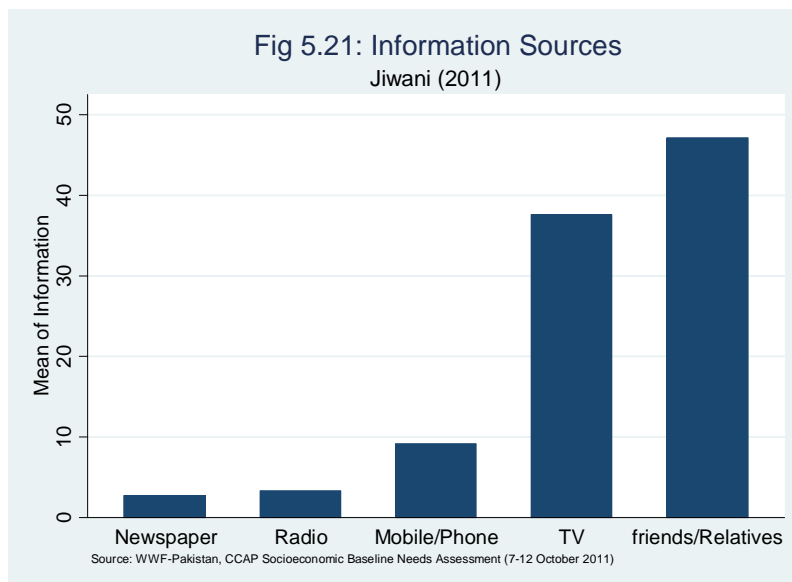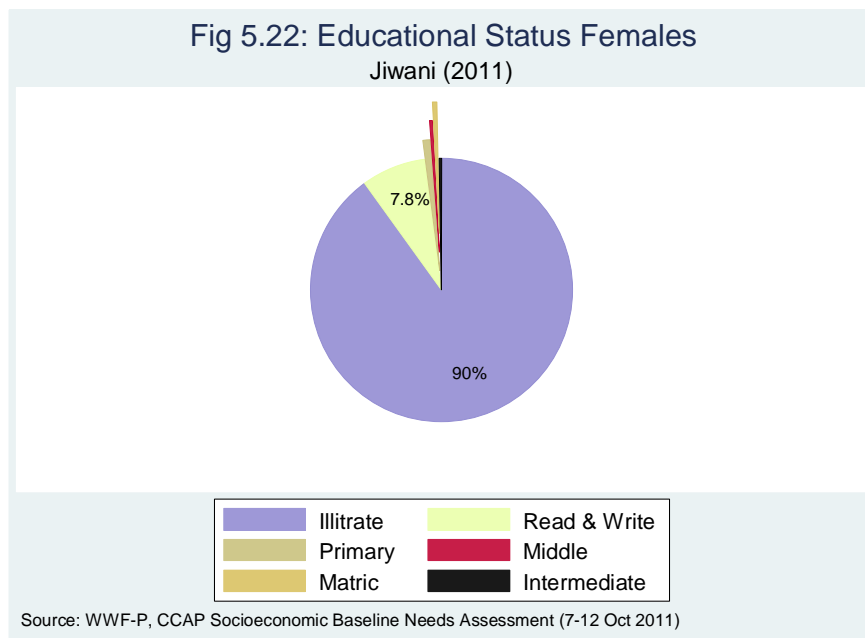
In the case of Jiwani, PWP (2011) has collected detailed information on mobile ownership (see table 5.6 below) and finds that the majority of their sampled households owned mobiles, with mobile connection penetration lowest at Bandri and Dir Nokabad villages.

Fig 5.6: Telecommunication facilities at Jiwani in 2011

Village	Number of HHs Sample		Percentage of HHs (%)		Estimated Number of HHs in village	
	Telephone	Mobile	Telephone	Mobile	Telephone	Mobile
Dirr Nokabad	0	2	0%	40%	0	7
Panwan	0	13	0%	87%	0	260
Owkar	0	5	0%	100%	-	-
Bandri	8	2	80%	20%	160	40
Shayabad	0	2	0%	100%	-	-
Jiwani	2	14	13%	93%	-	-
Daran	0	1	0%	100%	0	2
Gunz	0	17	0%	85%	0	340

Source: Pakistan Wetlands Programme (2011), field survey of January 2011.

About 90% of all respondents in the sample are illiterate (see Fig 5.22). Contraceptive use in our sample is adopted by only 6% of our sample.

Fig 5.22: Educational Status Females
Jiwani (2011)

Legend: Illitrate, Read & Write, Primary, Middle, Matric, Intermediate

Source: WWF-P, CCAP Socioeconomic Baseline Needs Assessment (7-12 Oct 2011)

As many as 41% of our sample report use of a private doctor, while 44% responded that they consult with public doctors for all types of treatment. All villages without exception report consultations with public/private doctors.

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Annex I: Sampling Frame and Stratified Cluster Sample for Keti Bunder and Jiwani (see section 2.1 above)

Table 2.1.1 Sampling Frame and Startified Cluster Sample for Keti Bunder

Village Name	No Of HH	Population	Strata	Villages	Total Sampled
Berim	16	104	2	0	0
M Yousif Dablo	13	85	1	1	**2**
Kangri	35	227	2	1	**6**
Phirt	40	260	2	0	0
Siddique Keriyo	30	195	2	1	11
Tippun	100	650	2	1	44
Haji Sheedi Dablo	10	65	1	1	**2**
Hajamro	25	162	2	1	**8**
Haji Mamu	10	65	1	1	**2**
Missri Rajero	12	78	1	0	0
Bhoori	400	2600	2	2	24
Meerano Jat	30	195	2	0	0
Cheerh Dablo	30	195	2	0	0
Keti Bunder	400	2600	2	2	**62**
Guli Sholani	5	32	1	0	0
Haji Ali Khan Jat	30	195	2	0	0
Tayyab Jatt	12	78	1	1	**4**
Ramzan Lakhio	10	65	1	0	0
Haji Moosa Jatt	30	195	2	1	**13**
Haroon Lakhio	6	39	1	0	0
Takir / Kharyo	100	650	2	1	**22**
Gul Hassan Jat	10	65	1	0	0
Ali Dablo	12	78	1	0	0
Meero Dablo	40	65	1	0	**23**
	1406	8943	-	14	223

* Note: Of the total sampled of 291, there were 223 male heads of household and 68 females interviewed; finally sampled villages are bolded

Table 2.1.2 Sampling Frame and Startified Cluster Sample for Jiwani

Village Name	No Of HH	Population	Strata	Villages	Total Sampled
Kargoshi	118	767	2	1	7
Kohsar Bazar	262	1703	2	1	97
Shahzadabad Bazaar I	188	1222	1	0	19
Dar Musali	120	780	1	1	30
Shahzadabad Bazaar II	853	5545	1	0	0
Bandri	179	1164	2	1	69
Okar	82	533	2	1	15
Talsar	222	1443	2	1	25
gwathri bazar	160	1040	1	0	0
Panwan	412	2678	2	1	103
Riasani	667	4336	1	0	20
Nok Dir	100	650	1	1	11
Ganz	399	2594	2	1	89
Gothri	200	1300	2	1	28
Jiwani	250	1625	2	1	44
Derr lagoon	22	143	1	0	0
Derr panwan	27	176	1	0	0
Robar	300	1950	2	1	35
Bandi	4	26	1	0	0
Darran	4	26	1	0	0

* Note: Of the total sampled of 576, there were 244 male heads of household and 332 females interviewed; finally sampled villages are bolded

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