PROPOSAL for a Basin Focal Project

Proposal Number: 60

River Basin: Indus-Ganges

Project Duration: Target Commence Date: Finish Date:

Validity Period: the proposal is valid for implementation until a starting date of (month/year). August, 2008

Opening of Financial submissions: Do you wish to be present at the public opening of the financial submissions (this will be undertaken in Sri Lanka) NO

1. PROJECT TEAM See Attachment 1

2 METHODOLOGY FOR THE 6 WORKPACKAGES

2.1 Project Overview (500 words) *(describe how your proposed work plan achieves the outputs required by the BFP methodology guidelines. This section will be lifted onto the CPWF web page if your proposal is approved for support.*

Indo-Gangetic basin, one of the world's most populous, has emerged during the past 40 years into an intricate mosaic of interactions between man and nature, poverty and prosperity, problems and possibilities. Galloping expansion in agricultural water use is a common theme across these interactions. The goal of the Project is to conduct basin-wide analysis of conditions, constraints and opportunities for improving agricultural water productivity and alleviate poverty through high potential interventions. This goal shall be accomplished through rigorous analysis and mapping of water availability and access, poverty, and productivity of water and identifying technological, social and policy interventions in different parts of the Indo-Gangetic basin.

There are a number of notable challenges, particularly the scale (see Figure 1) and heterogeneity of the sub-basins, the complexity of the undertaking, the significant data limitations, and the time and resources available. The transboundary nature of this basin further complicates the situation. Given the above, the core team presented, including the partners, is already in place and shall strive to implement the project efficiently and in a timely manner. Most individuals are located within the basin, already involved with relevant CP projects, and working on major elements of relevance to the work packages. Furthermore, IWMI has on-going functioning partnerships with all the partner institutions, including current MoUs. IWMI has significant opportunities to exploit synergies with other CP Projects in the basin, viz., Groundwater Governance (CP 42) and National River Linking Project (CP48)

During the first phase of the project each work-package will consider the entire basin to the extent the data, information and resources will allow. At the outset, we propose to categorize the basin broadly into Upper Catchments (UC), Western Indo Gangetic Plains (WIGP) and the Eastern Gangetic Plains (EGP) (Figure 2). During the first phase, the core team in conjunction with key stakeholders, including the CPWF, will determine specific sites or sub-basins for the detailed analysis in Phase 2. The team has a preference for the Rechna Doab in the WIGP because of its relevance to the overall basin, the long-term experience of a number of the team in this sub-basin, and the accumulated data sets. Also, the sites presently used in the CP 23 project (Resource Management for Sustainable Livelihoods) in India and Nepal will be considered as at least part of the area to be examined in the Upper Catchments. Finally, a third site should be in the lower EGP and include areas with a potential for aquaculture development.

It is imperative that the second phase of the project be carefully executed, which will require that the above core team conduct the rapid assessment and design the second phase. In the second phase other individuals from the partner institutions will be included with very specific terms of references and, where appropriate, contracts, to ensure that the necessary outputs are generated. The core team will also ensure that the work-packages are implemented and integrated (see Figure 3), and the results synthesized.

2.2 Work packages

Please note that the questions appearing against each work package activity are tentative questions to orient you to the key BFP issues. You are free to add other comments that may cover any innovative aspects of your proposal.

Work Package 1: Water Poverty Analysis

- Approach and activities to review of literature – What approach to literature review, and other measures, do you intend to use to determine the past and present status of poverty in different parts of the basin? What data will you use to determine the extent to which water availability and use and agricultural production the main determinants of poverty in different parts of the basin?

Access to water is central for the livelihoods of the rural poor and the interventions to alleviate water-dependent rural poverty need to take into account some basic facts:
 Spatial distribution of poverty clusters.
 Water, supplied for irrigation, domestic, industrial and ecological use, is a livelihood asset only when complemented by human skills, capital, physical infrastructure and markets.
 Existence of water-poverty-gender nexus.
 The fluidity of water determines an inter-dependent use and increased access in one location could adversely impact its availability in another location.

Figure 3. Broad agro-ecological/geographical regions of the Indo-Ganges

Effective water-related poverty alleviation initiatives require high-resolution sub-national poverty information at a river basin level. We will review and analyze the existing poverty and water-poverty-gender information in order to bridge the gap/s

between aggregate and specific analyses of poverty; illustrate the links between inter-sectoral uses of water and links between water and other determinants of poverty.

The literature review will include:

a) Sub-national poverty estimates: The focus here is on the existing methodologies and their comparability for generating sub-national poverty maps for the IGB countries [World Bank's PovertyNet, UNEP/GRID-Arendal Poverty Mapping Net (www.povertymap.net), FAO's FIVIMS(www.fivims.org), CGIAR center's Poverty Mapping studies, US Census Bureau's poverty maps (www.census.gov), and IWMI's on going water-poverty studies].

b) Coping mechanisms under water stress: The focus here is on the coping mechanisms of the poor, with an especial emphasis of the women, under water stress conditions in the IGB.

c) Linkages with water and non-water related factors with poverty and gender: There are many studies analyzing the linkages of rural poverty and gender equality and the access to and availability of water. All relevant material on the sub-theme shall be collated for better understanding the linkages.

- Approach and activities to analysis of methodology – What conceptual framework will be used to assess poverty at community, sub-basin and basin levels? What primary and secondary data will be needed, how will it be obtained and analyzed?

The water-poverty analyses investigate how the access to water, the other non-water related factors (demography, social and economic systems and infrastructure, policies and institutions, and technology) and their interactions contribute to poverty alleviation in both agrarian and non-agrarian water-dependent livelihoods. Our analysis consists of the following stages:

First, using small area estimation techniques we generate spatially disaggregated poverty statistics with sufficiently high resolution within a river basin. We use spatial autocorrelation techniques to identify the spatial dependencies of neighboring units.

Second, using spatial econometric techniques, we assess the extent to which agriculture [and non-agrarian] production and other physical factors contribute to the spatial variability or clustering of poverty and gender inequality in the IGB.

Third, we identify spatial clusters of the rural poor whose poverty and livelihood insecurity is determined by availability of and access to water for agriculture and other water-dependent non-agrarian livelihoods.

Fourth, using Sustainable Livelihoods framework we conduct case studies in 2-3 poverty hot spots to assess the water-poverty-gender nexus, and the coping mechanisms.

The outputs of the above analyses show:

1) a series of high resolution sub-national poverty maps of spatial variation and clustering of poverty.
2) how variable agrarian and non-agrarian output levels in different agriculture-dependent populations influence the incidence and also the clustering of poverty and gender inequality?
3) how access to water is a constraint or an opportunity for increasing agrarian as well as non-agrarian water-dependent productivity, intensity and gender equality?

Sources for the data include Population census, Agriculture census, National Sample Survey estimates, Income and Expenditure Surveys, Statistical abstracts and Agriculture brief of different states, IWMI Data-Storehouse-Pathway, and site-specific poverty research data.

- Approach and activities to information packages – How will the information generated be packaged into specific outputs? How will it be disseminated and/or used in the other work packages?

The water poverty analyses outputs will be made available in issue papers, synthesis reports in MS Word files and graphical and tabular form in a GIS in the CPWF, IGB-BFP web sites and in the IDIS database, and also distributed to the different stakeholders at the state or district level.

Outputs of the water poverty analyses, especially the poverty maps, can be used by;

1). The Water Productivity package for identifying the location specific factors to increase water productivity and decrease poverty.
2) The Water Availability and Access package for assessing the implications of increased water availability and access in the up-stream sub-basins on the water availability on the down-stream basins.
3). The Institutional Analysis package for assessing the efficiency of the existing institutional and policy instruments for alleviating poverty targets at different locations in the basins, and
4). The Intervention Analysis package for developing geographically targeted interventions to alleviate poverty.

- Comments on the expected effectiveness of your approaches to reach the required outputs.

Mapping water poverty, identifying poverty clusters and reasoning for spatial clustering are the most effective approaches suggested in this work package. They help identify geographically targeted interventions for alleviating poverty. Our approach to reaching the required outputs is outlined in the following table. Our multi-disciplinary team, Upali and Samad in India, Alan in Bangladesh, Hakim in Pakistan and Dhruba in Nepal, will lead and coordinate water-poverty-gender studies in the IGB countries. Efforts are

already underway by IWMI and Indian partners to analyze the spatial and temporal dynamics of poverty and their linkages to food security and access to water in the Krishna basin in India, and expanding the scope of the tested methodology to encompass the increased complexity of larger basins.

Table 1: Schedule for Outputs

Work Package 2: Analysis of Water Availability and Access

- Approach and activities to review of literature – Based on the available literature how will you analyze whether water availability and access vary temporally and spatially in different parts of the basin? How will you analyze which are the water scarce areas and what are the factors contributing to water scarcity in these areas?

The Indo-Gangetic basin (IGB) is effectively represented by two major river basins –the Indus and the Ganges. The IGB drains an area of 255 million ha and spans over Bangladesh, India, Nepal and Pakistan. It is one of the world's largest and most populated river basins, with over 740 million people. The water related issues of the basin are both due to high and low flows. A number of literature sources will be reviewed to identify gaps in previous water resources asessments in the IGB. The sources are likely to be different for the Indus and Ganges, but will include a number of grey Reports from responsible agencies (like WAPDA in Pakistan, and CWC in India), internet sources (e.g. http://www.waterinfo.net.pk , http://www.dhm.gov.np) and previous formally published sources (e.g. Amarasinghe et al, 2005).

In this work package, water supply and water demand/consumption, will be quantified over space and time. The water supply side incorporates the distribution of water resources as well as a more detailed analysis of the primary physical components of the hydrologic cycle inclusive of atmospheric, surface and subsurface processes. The demand side incorporates water use and abstractions from multiple use i.e. agriculture, irrigation, aquaculture, industry, domestic/urban use and hydropower. Thus providing a holistic basis to look at effective water management at the basin level. The next section outlines the approaches that will be applied in the analysis.

- Approach and activities to rapid assessment of status and trends – How will you carry out a rapid assessment of the status and trends of water availability and access in different parts of the basin? Do you know what data is available for such an analysis, and how will you access it? What hydrological modeling tools do you propose to use in assessing water availability for parts of the basin where data is not available?

1. The first task will be to inventory available secondary data and research findings from the basin. This includes data on supply side i.e. climate, stream flow and groundwater resources, and the demand side such as water use patterns, water withdrawals from

agriculture, and non-agricultural uses.
i. Recent river flow data for Indus (India side) and Ganges are unlikely to be available from Indian sources. This limits the analysis. However; data up until 1980 are available from Internet sources such as:
http://www-eosdis.ornl.gov/;
http://dss.ucar.edu/catalogs/ranges/range550.html;
http://webworld.unesco.org/water/ihp/db/shiklomanov/index.shtml
http://grdc.bafg.de/servlet/is/Entry.987.Display/
ii. Additional data from India will be available from the on-going CPWF project on Interlinking of River Basins including recently completed reports on water use in Indian basins.
iii. The data for Indus (Pakistan side) may be obtained from our Pakistan partners WAPDA (Lahore).
iv. With over 18 years of experience in the Indus, IWMI has gathered knowledge and good primary data at various levels (farm to primary canal) and for various systems (sub-basins).
v. Local agencies in Nepal (http://www.dhm.gov.np) and Bangladesh (http://www.iwmbd.org/) will also be able to provide up-stream and down-stream data and information, recognizing that time series data is limited in Nepal.
vi. Lacking data especially from India. IWMI has a global hydrological datasets of flow time series, generated by two different global models. These datasets will be calibrated against available gauged points to justify their use for un-gauged sites and assess the accuracy of the models. A combination of observed data, global simulated flow data, global data on rainfall, water use data etc will ensure the most reliable and detailed representation of flow characteristics, even where data is limited.

2. Water availability will be calculated at sub-basin outlet points of the IGB. A detailed methodology is provided in the following sections.

- Approach and activities to water assessment and accounting at basin level – What water assessment and accounting framework do you propose to use at local, sub-basin and basin levels? How will you take into account the temporal variability? What data and analytical tools will be used?

Basin Scale Analysis:
i. The IGB will be divided into major sub-basins using tanalys.exe (Schulla, 1999), a watershed delineation tool. The sub-basin outlet points will be on major tributaries where hydrological gauge station data may be available or generated.
ii. IWMI has developed methodologies and conducted studies for assessing the water availability and its access, including the water accounting approach (Molden, 1997). Amarasinge et al. (2005) have done an analysis of the spatial variability of water supply and demand at the river-basin scale for river basins in India using statistics published by the Central Water Commission (CWC, 2002). Water withdrawals are calculated based on calculated irrigation estimates and estimates for the domestic and industrial sectors.
iii. IWMI has demonstrated its abilities to use satellite images to assess agricultural water use at river basin scale (Bastiaanssen et al., 2002; Scott et al. 2003; Ahmad, et

al.,2005; 2006). In this study, we propose to use cloud free MODIS images to assess agricultural water use in Indus and Ganges basin
iv. Water withdrawals for irrigation, domestic and industrial sector will be calculated using the same methodology as in Amarasinghe et al. (2005). These will be incorporated into a mass balance model (eg. Mike Basin). The model will be used to determine water availability for the delineated sub-basins.
v. Historical time series flow data will be used where data is available. However, where there is no available data, the rainfall-runoff model built into Mike Basin will be used to calculate flows.
vi. The existing pragmatic approaches (applicable in data-poor regions) for data transfer between basins (e.g. Smakhtin 2001), supported by user-friendly software packages (e.g. SPATSIM) will be used to generate flow records at un-gauged locations in both basins.
vii. The mass balance model will be used to examine water allocation options.

- Approach and activities to information on water availability – What information on water availability and access will be generated? How will it be packaged for use in other work packages and for dissemination?

Sub-basin Scale Analysis:
i. At the sub-basin scale, two or three representative smaller sub-basins - one in the Indus and one in the Ganges will be chosen for detailed analysis.
ii. For groundwater information on the development of tube wells is available, however, the quality of water is contributing to soil degradation especially in the Indus. CSSRI, Karnal in India and WAPDA in Pakistan, both represented on the core team will provide important expertise.
iii. Water allocations with regards to interventions (Work package 5) will be assessed.

Figure 4. Finger diagram prepared for the water transfer study in Indrawati River Basin (a tributary of the Ganges) in Nepal by the Department of Irrigation with assistance from IWMI.

1. Water availability in relation to water demands will be determined for each sub-basin outlet point.
2. Scenarios with future projections of water use as well as alternative water allocation schemes will be analyzed.
3. Environmental flow requirement will be incorporated into recommended water allocation schemes.
4. Outputs from this work package will be used in many of the other work packages and especially to calculate water productivity at both basin and sub-basin scales.

The outputs from this work package include:
i. Monthly and annual water balance calculations using the mass balance model for sub-basin outlet points.
ii. Flow duration curves i.e. a measure of flow variability at the outlets of sub-basins.
iii. Maps of various flow characteristics (at high and low flows) at sub-basin outlet

points.
iv. Estimates of environmental flows at major sub-basins.
v. Maps of various drought characteristics (meteorological, hydrological and other types of drought).
vi. Maps of actual evapotranspiration and precipitation from remote sensing images and geo-statistical techniques.
vii. Maps showing the spatial and seasonal variation in irrigation/agricultural water use performance using geo-information techniques.

- Comments on the expected effectiveness of your approaches to reach the required outputs.

The approaches and methods outlined in this work package reflect the goals and limitations of this project. The described components of the methodology are robust enough to have a fairly good quantification (and their spatial and temporal variation) of the surface and groundwater resources including the saline and sodic water resources in parts of the Indus basin. Due to some data limitations and the short life span of the project, a more rigorous methodology cannot be utilized. However; there is a need for quick assessments documenting spatial and temporal water availability and use since quantification of water availability provides the basis for water resource management. The suggested methodology is capable of achieving the stated objectives. The team shall comprise Peter McCornick (Project leader), Alok Sikka (Basin coordinator), Hakeem Khan and Mehboob Alam(Pakistan), Bharat Sharma, Dipak Sarkar and DK Sharma (India) , Luna Bharati (Nepal) and Mobin Ahmed for overall collation, model verification and analytical studies. Dr. Bharati also has special expertise for estimating environmental flows at sub-basin and basin level.

Work Package 3: Analysis of Agricultural Water Productivity

- Approach and activities to review of literature – What approach to literature review, and other measures, do you intend to use to determine the main agricultural production systems in the basins? What data is available to determine yields of producers and how water limits the attainment of higher yields? How will you determine what is known about agricultural water productivity in different parts of the basin?

The literature review will include international and references specific to the IG basin. It will utilize the work done by IWMI on the concept, methodology, tools and other aspects of water productivity in agriculture (Kijne, Barker and Molden, 2003; Bastiaanssen, Ahmad and Tahir, 2003; Ahmad, Masih and Turral, 2004; Hussain et al. 2007; Ahmad et al. 2007). Web searches, critical reviews and synthesis by the national partners; water vision documents by the national / state governments, international agencies; reports of the regional and national projects on water assessment and productivity improvement in different sectors shall be collated and synthesized to have

an updated knowledge and identification of knowledge gaps. Extensive information on the subject is available with IWMI Headquarters and IG Basin specific information with IWMI offices in the basins (New Delhi, Lahore, Kathmandu, Basin Unit- Patna) and the partner organizations.

Determination of the main agricultural production systems will be undertaken, including the dominant rice-wheat system, and other cereals, pulses, oilseeds, vegetables and fruit based systems. Also, those based on multiple uses of water and multi-enterprise farming systems involving crops, horticulture, livestock and fisheries, which are growing in importance. The IWMI global irrigated area maps (already developed for the IGB) and land use/cover maps will be used in conjunction with cropping system atlases, secondary agricultural statistics and production system maps, livelihood data and forestry/agro-forestry maps for identification of the main production systems. These systems will be ranked based on their area and associated dependent rural population.

Time series data of yields for important crops and inputs used is available from district/state and national level statistics. This will be supplemented gathering information from selected sub-basins on previously conducted research and reporting. The pertinent information and knowledge on the relevant multi-location projects on agricultural water management will be gathered and reviewed.

- Approach and activities to rapid assessment of status and trends – How do you propose to carry out a rapid assessment of the status and trends of water productivity of the main agricultural production systems in the basin? What indicators of water productivity will you generate and why? What data and analytical tools will you use?

For this basin scale analysis and mapping, we mainly intend to use time series satellite images and secondary datasets on gross value or gross margin of major cropping systems, fisheries and livestock and water accounting (results of work package 2) at district/large sub-basins scale. The following indicators of water productivity will be generated.

Table 2. Indicators of productivity and value of water.

Both physical and economic water productivity indicators will be used to understand the status and trends in water productivity within the basin using the indicators below. For comparing the productivity of different/major farming systems (including livestock and fisheries), the economic water productivity indicators will be used.

Depending on the analysis and findings of Phase 1, in Phase 2 the intention is to undertake sub-basin analysis for the representative sub-basins in the Indus and the Ganges basin chosen in work package 2, will be used. For in-depth analysis and understanding of field scale processes, we propose to use physically based agro-hydrological models such as SWAP and DSSAT at selected locations to understand impact of different irrigation and agronomic practices on productivity. We also propose

to conduct questionnaire survey in selected sub-basin to develop production functions for all major enterprises (as being carried out in Karkheh River Basin). Finally, using the results of water accounting or estimates of water consumption from hydrological and remote sensing modeling under work package 2, secondary agricultural statistics can be used to determine water productivity at different scales in different areas.

- Approach and activities to identification of areas – How will you select the areas to carry out detailed analysis – i.e. sub-basins within a basin and study communities within a sub-basin?

The Indo-Gangetic Basin is actually an amalgam of Indus Basin (with parts in India and Pakistan) and Ganges Basin (parts in India, Nepal and Bangladesh). The conditions are extremely heterogeneous. It is necessary to assess potential and actual productivity separately in representative areas, and at this stage it is anticipated, as with for the overall project, at least three areas, one in the Upper Catchments (Himalayan region), one in the Western Indo-Gangetic Plains (WIGP) and one in the Eastern Indo-Gangetic plains (EIGP). UC has high potential for horticulture, cold-water fisheries, and livestock for meat and wool and high value agriculture but has witnessed only low agricultural productivity. WIGP is considered the cradle of the Green Revolution in the region but is now seriously constrained with the second-generation problems of declining water tables, soil and water salinity and water logging in canal commands. EIGP has the largest gap between potential and actual productivity due to a variety of technological, economic, and social, infrastructure and institutional bottlenecks.

Important characteristics, problems and limitations of UC, WIGP and EIGP shall be studied in greater detail to identify the representative sub-basins. Based on these characterizations, input from various partners, including the CPWF, and other relevant factors, suitable areas or sub-basins will be finalized early in Phase 1 of the project. The Rechna Doab in the Indus is of particular interest as a suitable area for detailed study. Also, the sites presently used in the CP 23 project (Resource Management for Sustainable Livelihoods) in India and Nepal will be considered as at least part of the area to be examined in the Upper Catchments.

- Approach and activities to identification of impacts – How will you assess the impacts (a) of water availability and access on water productivity; (b) of agricultural production system on water productivity; and (c) of water productivity on water availability for non-agricultural uses?

Detailed water productivity analysis, as described in the previous section, will help to establish linkages between water availability and access on water productivity. Comparison of water productivity with water balance result will provide useful information about the sustainable use of water resources and the most productive cropping/farming systems in the basin. This will also help to evaluate the impacts of different water management (resource conservation or water saving technologies) strategies and water allocation scenarios on productivity and water availability for non-agricultural uses.

- Approach and activities to information packages - How will water productivity information generated be packaged into specific outputs and how will it be disseminated and/or used in the other work packages?

The database, results, reports and maps generated from this work package will be shared during quarterly joint progress meeting with other team members. Stakeholder workshop will be conducted to involve and get feedback from key stakeholders in IG river basin.

After finalizing the results will be shared and all inventories of data and literature that will be made available through the CP (e.g. source references; grey literature; presentations; internal task reports), as far as is possible through IDIS and the IWMI-DSP (for map and remote sensing products). The IG BFP expects considerable support from the IDIS team in cleaning and entering collected data into IDIS for retrieval

- Comments on the expected effectiveness of your approaches to reach the required outputs.

For the successful implementation of this project, we have brought together a well-balanced interdisciplinary team, including soil and water experts, socio-economists, agronomists, RS & GIS experts, simulation modelers and communication advisors. The project shall strive to project water productivity at various scales and for major cropping and farming systems in the basin. From NARES, all leading land and water research organizations involved in IG BFP are part of this project in different capacities. While these agencies will be helping IWMI to execute this component with data and other technical support, it will be equally beneficial for them to build their capacity for basin level analysis and quick uptake of the results. The team shall be lead by Mobin Ahmed and Peter McCornick with country specific contributions from Alan Brook (Bangladesh), Hakeem Khan, Mehboob Alam (Pakistan), Bharat Sharma, Dipak Sarkar, DK Sharma, MJ Kaledhonkar (India) and overall support for collation by Alok Sikka.

Work Package 4: Institutional Analysis

- Approach and activities to review of literature – What approach to literature review, and other measures, do you intend to use to determine the main institutional factors that shape the way water is developed, allocated and used in different parts of the basin? How will you identify the main organizations that address water, food and environment issues and which ones will play different roles in the generation, dissemination and applications of the study findings?

The project will adopt a broad view of "institutions" to encompass not only water-related policies, laws and administrative structures but also informal water institutions such as water user organizations, water markets and civil society organizations working

in the water resource sector. The literature review will be undertaken at four levels:

[a] Literature review on water and society: IGB displays some striking uniformities and regularities in its hydro-geologic patterns but vast variations in the socio-economic and political dynamic of its basin states;

[b] Generic literature on water institutions: Global literature on institutional interventions in regional water economies—such as the IWRM paradigm-- will be collected and reviewed. The scope of this particular exercise will go beyond the IGB and encompass institutional innovations tried elsewhere in the world.

[c] Literature on region-specific water institutions: At the third level, empirical literature, consultant reports, project documents, government policies and draft laws, independent studies undertaken within the basin states will be compiled and reviewed to evolve an understanding of existing water policy, water laws and water administration at the IGB.

[d] Literature on Informal Institutions: At the fourth level, the attempt will be to review available literature on vibrant informal institutions for water provision that proliferate within IGB. IWMI has been a significant contributor to some of this literature in recent years. The analysis of these informal institutions is crucial because these grass-roots institutions provide the bedrock on which institutional reforms will eventually have to rest.

The phase I output of literature survey will provide a literature overview of water institution and policy issues in IGB's basin states.

- Approach and activities to rapid assessment of status and trends – How do you propose to carry out a rapid assessment of status and trends of policy and institutional changes and their influence on water development, allocation, use and productivity in different parts of the basin?

Strong complementarities are expected between this basin focal project and IWMI's ongoing Challenge Program project (No 42) on "Groundwater Governance in Indo-Gangetic and Yellow River basins". This project is in the process of evolving a rapid assessment methodology for hydro-institutional mapping to be used by participants as a learning-cum-research tool during field research as part of its Winter School on Groundwater Governance. It is proposed to develop this tool further in the BFP so that it can be used for broader institutional analysis for a regional water economy. The tool covers three broad overlapping perspectives; (a) resource perspective; (b) socio-ecology perspective and (c) policy-institutional perspective.

For the purposes of institutional analysis, carefully chosen 'localities' will be the units of analysis. A 'locality' is viewed as the microcosm of a regional water economy, and can cover a block, tehsil or sub-district. In this case the selection of the 'localities' will be done in coordination with the other work-packages presented in this proposal,

specifically the relevant areas for detailed study and/or the sub-basins. It is proposed that rapid participatory assessments are undertaken at 2-3 localities across the IGB (depending upon the resources available) to develop a preliminary overview of the status and trends of policy and institutional changes and their influence on water development; allocation, use and productivity in different parts of the basin. The synthesis of these rapid assessments will contribute to a preliminary Situation Analysis Report deliverable at the end of month 12 of the project life.

- Approach and activities to detailed assessments – How do you propose to carry out the detailed assessment? What primary and secondary data will be assembled and how will they be analyzed?

Even before the end of month 12, detailed assessments in selected localities will have begun. Rapid participatory assessment will become the basis for detailed assessment of water institutions and policies to deepen as well as broaden the insights and learning generated from the rapid assessments. A common set of research instruments will be developed from the relevant broad issues and questions, which include:

• Understanding of the locality's hydrology and hydro-geology
• The pattern of agricultural water use in the locality and how it came to this
• Configuration of infrastructure for agricultural water management
• Available instruments for managing agricultural water use
• Economics of water use in agriculture
• Effect of irrigated agriculture on the local society
• Determination of the uncompensated third-part effects of agricultural water use
• Options for making irrigated agriculture sustainable
• Institutional arrangements for agricultural water management
• Government regulations and policies for agricultural water management

These instruments will be used to examine the study localities in detail, drawing on the information developed in the other work packages. The methodology to be used will include focus group discussions with key stakeholder groups, discussions with senior and middle level functionaries in government as well as NGOs, small-scale surveys where needed, perusal of project documents, interaction with domestic and international financial institutions. Information so compiled will be used to develop "locality case studies (LCS)" for each of the sites identified.

- Approach and activities to identification of institutional changes – How do you propose to find out what policies and institutional changes would be required to increase water productivity in ways that alleviate poverty and release water from agriculture for use by the environment and other sectors of the economy?

Each locality case study will focus on analyzing the two-stage causal relationship (Figure 5). At the first stage, the attempt will be to identify and highlight pathways through which water policies and institutions influence water development, allocation and use. At the second stage, the attempt will be to analyze the impact of the pattern of

water development, allocation, and use on water productivity, poverty and environment.

Figure 5. Impact of Institutions and Policies on Poverty, Productivity and Environment

A synthesis of "locality case studies" from 2-3 sites across the basin will provide a rich analysis and description of the 2 stage causal relationship between water institutions and policy and their impact on poverty, productivity and environment. We expect that this analysis will yield a shelf of "change propositions" of the "if …. then …." type.

- Approach and activities to information packages – What institutional information will be generated and how will it be packaged and disseminated and/or used in the other work packages?

Key outputs, information packages and the time frame are outlined in Table 1. The table also suggests likely audiences for whom different information packages may have special appeal. The synthesis of locality case studies will have a direct impact on intervention analysis. All the information products proposed will be discussed and validated towards the last quarter of the BFP.

Table 3. Key outputs, information packages and timeframe for the institutional work-package

- Comments on the expected effectiveness of your approaches to reach the required outputs.

The institutional analysis component of this project will benefit greatly by synergizing the other work-packages and with IWMI CP project (# 42) on groundwater governance in IGP and YRB, and also with the extensive institutional experience in the IGB in the team. This is especially so because of opportunity for collaboration for field research as well as for developing local partnerships. A good deal of locality – specific research generated by the BFP will also provide valuable teaching material for the Winter School on Groundwater Governance operated by CP-42. By the same token, much material and learning by winter school participants in course of their field research will be an input to locality case studies. The project will also be able to build on the institutional related work conducted under CP 47, the Assessment of the National River Linking Project.

As resources allow, the locality case study will be supervised and developed by an IWMI researcher, the project will partner with local researchers, NGOs and Universities to carry out investigations. The team shall be lead by Tushaar Shah with valuable support from Madar Samad, Aditi Mukherji, Dhruba Pant and Mokhlesur Rahman.

Work Package 5: Intervention Analysis

- Approach and activities to review of literature – What approach to literature review and other measure are you intending to use to determine the high potential interventions for increasing water productivity for poverty alleviation in different parts of the basin? How will you identify what has been tried in the basin and why it succeeded or failed?

There have been a wide variety of relevant interventions tried throughout the IGB with varying degrees of success. For example the extensive work done with farming systems research, water management, watershed management, multiple water use systems and the more recent work on resources conserving technologies. It is an important aspect of this project to gather and critically review the pertinent information on these interventions including determining the nature of the intervention, where was it applied, how well did it work, how was it adopted, and where else it might work. We also need to determine their relationship to water.

The literature review will include a review of experiences on relevant interventions and their implementation process. This will be done for experiences within the basin and elsewhere. Literature surveys including abstracts, papers, proceedings of workshops, IG Basin Profile, Kick-off Workshop and Gap Analysis organized by CPWF-IGB Basin Unit, policy briefs, planning documents of governments, newspaper reports and web sites will be undertaken to obtain information on the technological, management, social, policy and institutional interventions undertaken in the past, on-going and proposed in different parts of the basin.

Review, analysis and synthesis of various Action Plans/Reports of the completed and ongoing projects such as watershed/ catchments management, Command Area Development, Integrated Basin Management , Agricultural Water Management, and Livelihood Improvement will be done for interventions analysis. Information and experiences available through collaborative studies with NGOs and development agencies will also be gathered, reviewed and synthesized, and organized into an appropriate framework.

The output from the literature review, and subsequent assessment of the interventions, will be organized relative to the broad agro-ecological zones and sub-basins, also considering the relative water availability, the social and institutional context, and drawing on the information already available and gathered in the other work packages.

- Approach and activities to detailed assessments – How do you propose to carry out detailed assessment of potential interventions? How will the feasible options for different parts of the basin be arrived at? What qualitative and quantitative assessments will be carried out? What are the sources of secondary data and what primary data will be collected and at what resolution? How will the data be analyzed?

Many interventions have been tried in various parts of the basin to overcome local constraints and provide opportunities for increased production (Figure 6). The

information and relevant experience with these will be gathered as part of this work package. In addition, three representative areas or sub-basins will be selected, for further detailed investigations.

Figure 6. Overview of constraints and opportunities for increasing productivity in the IGB.

Assessment of interventions would be made based on the information derived from secondary sources such as benchmark surveys, and impact evaluation studies conducted by development agencies, NGOs, donors and research institutes. Information and data would be collected at the field, watershed and irrigation system levels depending upon the type of interventions keeping in view of the soil-water- crop-climate-human resource matrix. Assessment of main reasons behind success/failure of interventions will be examined to identify major interventions and their enabling conditions leading to enhanced water productivity.

Experienced multi-disciplinary groups, including team members, field practitioners and end users will be formed to brain storm the merits and constraints of each prioritized intervention. Where appropriate, sub-sets of these groups will conduct visits to meet with informed stakeholders to gather relevant information on the application of interventions and their impact.

Ex-ante evaluation of technologies, implementation process, social, institutional and policy interventions/ strategies will be done based on their findings, performance in terms of productivity, cost effectiveness, profitability, environmental sustainability and social acceptability and the strategic interventions will be selected. Geographic extrapolation domain analysis of selected potential interventions/outputs will also be attempted to analyze where else in the basin these match agro-ecological and other mappable conditions. Potential interventions will be classified and short listed for the selected areas or sub-basins and also with respect to their relative effectiveness.

- Approach and activities to assessment of high potential intervention scenarios – What level of stake holder consultation is envisaged and how will it be undertaken? How will the potential (hydrologic, social, economic and environmental) impacts of the high potential interventions for different parts of the basin assessed? What interventions scenarios will be assesses and how?

From the classification and ranking described above, high potential interventions will be identified. Following this, it is envisaged to involve primary and secondary level target institutions for stakeholder consultations. Primary level stakeholders or target institutions would include farmers, local community, civil societies and field functionaries while secondary level stakeholders would be State Department officials, policy makers, managers, financial institutions etc.

Consultation would first be held separately with both the groups of stakeholders to discuss pros and cons, limitations, constraints and impacts of high potential

interventions and get their feed back for its prospects of implementation, shortcomings, improvements and the possible extent of application of various interventions under different scenarios (e.g. with or without incentives, level of support needed, degree of water scarcity etc.). Sub-basin wise information generated on water availability in response to water demand and scenarios with future projections of water use from Work package 2 will be used towards this end.

Potential impacts of some promising interventions on hydrologic, socio-economic and environmental aspects have been evaluated in a few watershed programs, command area evaluation and on- farm water management studies, management of salt affected areas and drought prone area development programs, and results from these works would be utilized as a starting point to get a feel of the level of impact and also help in building scenarios.

To determine the likely impact of the proposed interventions at the sub-basin and basin scale, the activity will be closely integrated with the activities of the other work packages, particularly the water availability.. Projections will be made about improved productivity, profitability, income and employment generation through optimization models and decision support tools. The scenarios of improvement in productivity and profitability at suitable locations after implementation of proposed potential interventions will be generated.

- Approach and activities to description of impact pathways – How will the problem and objective trees be generated? How will the problem and objective tree be used to assess which organizations should be involved and what role they should play? What strategies will be used to increases the changes of having an early impact?

It is essential that the project develop a clear understanding of the necessary impact pathways, including evolving a network of actors that will lead to defined intermediate outcomes and eventual impacts. The project will develop a strategy for including the partners who will implement the results of the project, and who as yet are members of the core implementing team. To this end, the impact pathway activity will include the development of a project problem tree, and generation of an "Objective Tree"

In phase 1 of the project the team will discuss the key problems, constraints and associated causes in the basin with relevant stakeholders (users, field functionaries, policy makers), and from these interactions generate a 'Problem Tree'. Following the completion of the Problem Tree for the BFP, and in consultation with stakeholders, an Objective Tree will be developed that will clearly demonstrate to the various partners the pathway for the project to reach its overall goal.

The above described "trees" clarify the project rationale and interventions required in terms of accomplishing the overall goals of achieving higher water productivity and improved livelihoods. This will also be used to guide the scaling out and up of the project outputs into outcomes, demonstrate eventual impact by involving actor-focused networks and identifying actors to develop the project outputs, and the actors to scale-

out and scale-up the outputs after the end of the project.

Strategies to have early impact would be evolved to include organizing sensitization workshops/ Round Tables for policy makers, publishing policy briefs, media coverage and capacity building of NARES and other actors for scaling up the project outputs.

- Comments on the expected effectiveness of your approaches to reach the required outputs.

Drawing on the considerable experience of the team and its network of partners and contacts in the IGB, the project will be able to effectively access the existing knowledge base on the relevant interventions. The approach we intend to take will be realistic, balanced and based on scientific and logical principles with extractive analysis of information and synthesis based on secondary information and informed opinions of key stakeholders. Our team has considerable expertise in planning, designing, implementing, monitoring and impact evaluation of technological, social, policy and institutional interventions in different agro-ecoregions/sub-basins of the Indo-Gangetic basin.

By integrating with the other work-packages (particularly packages 1, 2, 3 & 4) in this project the targeting of appropriate areas for detailed study will be more effective, and determination of these interventions in securing the targeted outputs and impact on the wider scale can be effectively assessed.

The team will use a combination of approaches and methods including stakeholder responses and empirical evidence, modeling, optimization, statistical, and other analytical tools. GIS could be very useful for the intervention mapping and upscaling. From this, the interventions will be classified and prioritized with regards to their relative potential for improving productivity and addressing poverty. The inclusion of stakeholder input and feedback at key stages throughout this process will greatly strengthen the relevance and rigor of the analysis and outputs. Interacting with key stakeholder representatives within the basins, and sub-basins/detailed study areas, the knowledge gathered and the overall intervention analysis will be confirmed and adjusted as necessary. The team shall be lead by Alok (Basin coordinator) with country specific support from Alan, Rahman (Bangladesh), Hakeem (Pakistan), Dhruba (Nepal), Sharma , Dipak , Kaledhonkar (India) and overall collation by Peter and Bharat.

Work Package 6: Development and application of the knowledge base

- Approach and activities to spatial data base development – What datasets will be needed and how will the data be acquired?

issues' exercise for water poverty, water availability and access, agricultural water

productivity and selection of appropriate interventions for improving these indicators in the basin. The project will draw upon the existing datasets related to population census, water resources (surface and groundwater), agriculture census (including animal and fisheries) and crop cutting data, land use and land tenure data, HDI reports, economic surveys and national sampling survey reports on different issues (poverty, productivity, infrastructure etc.), vision documents of different ministries and states and reports of the planning commission. Fortunately, IG basin countries (India, Pakistan, Bangladesh and Nepal) have well institutionalized systems of data collection and dissemination (except for transboundary river flow data) and long time series data are available on request (at free/nominal cost) and also on the specific websites. For certain specific parameters where information is already not available, the same shall be generated using small area estimation methods. Valuable information generated by IWMI GIS/ RS Unit, Data Storehouse Pathway, Integrated Database Information System (IDIS), Irrigated Area Mapping, Climate Atlas, IG Basin Coordinating Unit, Rice-Wheat Consortium of IG basin and data sets available with other national and international partners shall also be extensively utilized for development of a sufficiently disaggregated spatial database for the IG Basin.

Figure 7. Monthly rainfall stations in the IGB (IDIS)

- Approach and activities to discussion and exchange of data – What valuable data sets does your team offer based on the past work in the basin?

The data sets collected/ acquired from different sources shall be cleaned, collated, verified to some extent and put under an intelligent data management system (tables, trends, graphs, links etc.) A metadata set shall also be developed for undertaking the macro-analysis and understanding of the basin/ country level picture. The initial dataset shall be shared with all the team members/ stakeholders and discussed for any discrepancies, inclusion of additional parameters and presentation formats/ templates. The datasets so developed shall be made available to all the stakeholders through a dedicated project/ shared web-portal and other means of communication.

IWMI (Headquarters and its New Delhi, Hyderabad, Kathmandu and Lahore offices) and its national (ICAR, PARC, NARC, BARC) and international partners (Worldfish Center), IG Basin Coordinating Unit has in the past developed several relevant datasets. These will be compiled early in Phase 1. All India district wise dataset on important parameters related to agriculture, climate, water resources and land tenure and basin wise water resources has recently been developed by IWMI, New Delhi. Remote sensing based irrigated area map of the region (with several subclasses) has also been developed by IWMI RS/GIS unit. Similar datasets are also available with IWMI, Nepal and Pakistan offices. Worldfish Centre at Dhaka has relevant information and data sets for Bangladesh.

- Approach and activities to knowledge sharing processes – How do you propose to share knowledge and experiences among the members of your team and among basin focal projects?

Synthesized knowledge available and new knowledge developed during the project shall be shared with all the team members of this project and the communities working in other BFPs. Besides the regular outputs (project reports, publications, conference papers etc.), special efforts shall be made to share the tools and methods used in different studies, process documentation and feedback from the stakeholders. IWMI, and now in collaboration with WorldFish, has been pioneering the use of several innovative knowledge sharing ideas such as organizing Knowledge Fairs (physical and virtual), media coverage, publication of policy briefs, discussion forums etc. These have been found to be successful and cost effective ways of reaching multi-stakeholders dispersed under vast geographical locations and the same shall be utilized for knowledge sharing under this project.

- Approach and activities to engagement with the CPWF community of practice – To what extent do you expect to engage the community of practice and what are they likely to contribute and how will this contribute to achieving the desired outcomes earlier.

CPWF has an already established community in the IG basin through on-going implementation of competitive grant projects (3 lead centers, 5 collaborating centers), small grant projects (3 projects) and IG Basin coordinating Unit. The Project Leader is also the Director for IWMI Asia Region and has first hand knowledge and frequent interaction with other CP projects in Iran (Karkheh), Central Asia and Southeast Asia. Information on research tools, database management, and identification of appropriate interventions developed under these projects shall be available to the project and help in faster achieving the outcomes. Information and experiences available with IG Basin Coordinator shall be used for refining the different study components. The Basin Coordinator will lead the interventions analysis work package and is a member in two other work packages. The opportunities presented by the five CPWF workshops scheduled during the project period shall be utilized for knowledge sharing with the CPWF/ BFP community.

Members of the core team are actively participating in six of the eight first-call Challenge Program projects in the IGB. These are:
- CP 10 - Coastal resources manag. for improving livelihoods (WorldFish & IWMI)
- CP 34 – Improved fisheries in tropical reservoirs (ICAR & WorldFish)
- CP 35 – Community based fish culture (WorldFish)
- CP 42 - Groundwater governance in the IGB & YRB (IWMI)
- CP 23 - Resource management for sustainable livelihoods (IWMI), and
- CP 48 - Strategic analysis of India's river linking project (IWMI)

- Approach and activities to processes and tools to support investment – What processes, tools and information do you propose to make available to basin stakeholders to support their investment decisions?

Poverty reduction through improved agricultural and water management practices in the

rural areas continue to be the main development paradigm in the Indus-Gangetic region. Public and private agencies make major investments through programs like Command Area Development, Food for Work Program, Rural Employment Guarantee Scheme, Watershed Development Programs, Agro-Processing and Rural Infrastructure Schemes, Drinking Water Missions, Community Information Networks etc. The underlying approach in all these programs is to reach the most disadvantaged sections of the society, ensure food (including water) security, enhance livelihood options, alleviate the degradation of natural resources and environment and improve productivity at all levels. The project shall develop tools, processes and information for making well informed decisions for investments for the farmers, landless rural populations, development agencies/ institutions at various levels, non-governmental organizations, private sector industries and institutions, researchers and policy planners and the donor agencies. The following tools and outputs from the project shall be helpful:

• Methods and tools for poverty mapping.
• Water poverty analysis for the Indus-Gangetic for precise targeting of the investments.
• Identification of water scarce areas and areas facing water quality problems for making investments in water resource development and better management.
• Tools and methodologies for assessing agricultural water productivity under multiple water use systems including water use by livestock and fisheries.
• Identification of the sectors and regions with sub-optimal agricultural water productivity and set of options for improving agricultural water productivity.
• Prioritized list of the most promising interventions in different parts of the IG basin for reducing poverty and improving access, availability and productivity of water resources. This information shall be most suitable for making investment decisions by stakeholders at different levels.

- Approach and activities to impact analysis – How will you assess the outcomes and early impacts of your work?

The project will develop and implement a structured project impact pathway model as described in work-package 5 above through the construction of a project problem tree, timelines, vision of success and network maps. The different parameters of impact pathway model shall be suitably quantified to have an objective view of the project impacts. Suitable strategies shall also be put in place to scale out and scale up the project outputs to ensure an early impact of the project.

Furthermore, as part of our standard project management system, IWMI has an impact (outcome) typology. This typology, while recognizing that our projects and programs must aim to have a lasting and global impact on water and land management for the benefits of food production, livelihoods and nature, that focus of the projects is on intermediary impact that the institute and our partners can reasonably anticipate, track and measure. The intermediary impacts include raised awareness of new research; application of new knowledge; employment of new tools, techniques and technologies; employment of improved policies and institution; enhanced capacity; strengthened partnerships; and improved livelihoods within project boundaries. For each of these

intermediary impacts we determine the vehicle for impact, the indicator and measurement tool.

Table 4. Illustrative outputs to impacts – drawn from IWMI MTP #8

- Comments on the expected effectiveness of your approaches to reach the required outputs.

The proposed approaches for different components of this package will be attaining the required outputs and achieving the expected impacts. The salient features of the approaches include the following:

• Development of an intelligent and spatially disaggregated spatial database by drawing upon the available datasets with project partners and IWMI Data Storehouse Pathway (DSP) and construction of a set of metadata for the basin.
• Protocol and suitable tools for easy and quick exchange of data with Project team members, CPWF/ BFP community and other stakeholders.
• Special efforts for sharing the tools and methodologies for different studies and adoption of innovative techniques for knowledge sharing developed by ICT and Knowledge Management Group.
• Sustained interactions with already established CPWF community of practice in the basin (11 projects), other eco-regional initiatives and IG Basin Coordinating Unit.
• Investment decision support tools for farmers, development agencies, NGOs, private sector partners, researchers and policy planners and the donors.
• Multi-pronged approach for feedback and impact analysis and specially designed activities for creating an early impact at various levels.
Bharat Sharma shall lead the team with support from Alan, Mokhlesur (Bangladesh), Hakeem (Pakistan), Dhruba (Nepal), Aditi, Samad (India) and overall collation and guidance by Peter (Project Leader).

3 INSTITUTIONS AND PROJECT TEAM

3.1 See Attachment 3 Partnership Matrix

3.2 Explain your methods for fostering innovation and cooperation within your team, and their abilities to cooperate with other BFP teams to exchange ideas. (300 words)

The core team presented in this proposal already functions in a close network with many of the key persons in the basin, and collectively is recognized for the innovative aspects of the work they are implementing. The team leader is presently responsible for ensuring the coordination of the IWMI offices within South Asia, and has facilitated high level of integration between the relevant staff members. In addition, other team members (Tushaar Shah, Bharat Sharma and Upali Amarasinghe) lead large projects in the region. Most recently, IWMI and WorldFish have moved to integrate their programs, with an alliance between the two institutions.

This is a very experienced, dynamic and multi-disciplinary team with an appetite for excellence, cooperation and partnership building. Utilizing this above described team, with mentoring and coordination from the more senior members, the team will be actively encouraged to develop innovative approaches to meet the challenges presented by the project. Specific areas where the team will foster innovation include:

• A framework for Institution and Policy Analysis based on 'locality case studies' as microcosm of a regional water economy and studies on impact of water development, allocation, and use on water productivity, poverty and environment is very innovative.
• The selection of innovative and impact making interventions is based on analysis of past experiences, ingenuity of the researchers and continued cooperation of the key stakeholders in the formal and informal sectors.
• Knowledge base of the project shall draw extensively from IWMI's community of 'Knowledge Management' and best practices/ protocols developed under IWMI's Data Storehouse Pathway.

With regards to the other Basin Focal Projects, one of our team members is already on one of the other BFPs (Karkeh). In addition, a number of our team members have first hand experience in the other relevant basins in Asia and Africa.

3.3 Please describe your approach to ensure participation of, and linkage between, national, regional, and international institutions in the river basin you intend to work in. (300 words)

The members of the team are actively engaged with the key partners in each of the four countries within the IG Basins, and with regional organizations. IWMI, along with World Fish, is uniquely positioned to affect regional participation and communication given our presence, but also that we are organized around these same four countries and the team leader of the project has managerial responsibilities for the same. IWMI has already well positioned effective and institutionalized working arrangements with the national governments/ major research bodies in the region. IWMI has an established and comprehensive list of the collaborating partners in the region and plays a crucial role in improving their capacity in critical areas of expertise.

IWMI has Memorandum of Understandings and ongoing partnerships with a number of apex organizations in the region, viz., Indian Council of Agricultural Research and Ministry of Water resources of the Government of India; Ministry of agriculture/ Water Resources and Pakistan agricultural research Council of the Government of Pakistan; Department of Irrigation of the Government of Nepal; and an established partnership alliance with the Worldfish Center and its offices in Bangladesh. In addition, the core partners have extensive networks of NGOs with which they are implementing activities in the region. The IWMI-Tata project alone includes a number of NGOs active in implementing water related interventions in the basin. Finally, IWMI is an active member of the Network of Asian River Basin Organization (NARBO).

These alliances and partnerships provide working access to all professional institutes, on-going projects and human resources and extensive intellectual resources available with these apex organizations and their attached offices.

For drawing upon the vast intellectual resources, databases, completed studies and ongoing initiatives of these partners, IWMI shall put in place an Advisory Committee to provide broad perspectives and a Project Core Committee to secure a responsive partnership, effective monitoring and timely implementation of the various Project activities.

3.4 Basin Coordinator: explain the role(s) of the basin coordinator.

The basin coordinator will be essential for the overall guidance of the project, interaction with partners in the basins, and coordination with the on-going CPWF projects being implemented in the basin. He will also provide access to different reports, evaluation studies and databases developed for the IG basin. His insights are crucial to the overall understanding of the basin, the constraints and potential opportunities for improvement of water and land productivity and alleviation of poverty. The coordinator will facilitate the development of the right kind of partnerships, access to the critical resources and the provision of socio-political-cultural context to the project activities and potential interventions.

As a professional researcher, he has also expressed his willingness to be a member of the team. Will lead the work package in interventions and play a substantive role in a number of the others. He already works closely with IWMI in India and Nepal.

3.5 Capacity Building: explain the capacity building elements that you have identified as part of your work plan.

Despite the focused nature of this project and need to ensure that efforts are targeted towards producing the specific outputs, it does allow for substantive capacity building. Fundamentally the core team is comprised of personnel while from different institutions, have already been working together, and this project affords a major opportunity to better integrate this partnership network. Given the transboundary nature of the project, it will actively foster the synergies between the researchers participating in the project especially with regards to the methodologies and information relevant to the six work packages, including the opportunities to share knowledge on appropriate interventions on policies and technologies.As part of the implementation of this project IWMI's major comparative advantage in the effective implementation of multi-disciplinary and integrated research will be a specific area of continuing capacity building. In IWMI's program in India and Pakistan, this has been a particular area of impact.

The project will include PhD students from the relevant countries, and will involve at

least two post-docs from the region. It is anticipated that one or more of the PhD students will be supervised in coordination with partner universities within the basin. One University in Nepal has already indicated a strong interest in doing this. A specific capacity building and training work plan will be developed as part of the inception phase of the project. The specific areas for which the Project shall make special efforts towards capacity building of its partners and partner institutions include:

1. Water and Poverty Mapping at sub-basin and basin level.
2. Water Accounting and Water Productivity Analysis
3. Intervention Prioritization and Impact Assessment
4. Groundwater Governance
5. Database Storehouse and Management Systems

4 RESPONSE TO REVIEWER COMMENTS ON YOUR EXPRESSION OF INTEREST

The invitation to develop a full proposal identified some negative factors of the EOI that required adjustment. Please list below the factors and explain how you have addressed the comments in your full proposal. Please add boxes as necessary.

1 ((Need for clear methodologies, especially with Work package 5)

Methodologies have been succinctly presented for each of the six work packages in this proposal, to the extent that space allocations would allow. Specific attention has been made to provide a clear methodology for Work package 5.

2 (Pakistan component is weak in some work packages)

The Pakistan aspects have been addressed in the work packages.

3 (Need to map the individuals into the work packages)

Specific efforts of individual researchers have been included in the work packages

5 FINAL COMMENTS

The intent of this section is to enable you to pull together the most convincing aspects of your proposal that you would like to convey to the assessment panel members. (300 words)

The core team is a very experienced multi-disciplinary, multi-cultural and dynamic team of partners mostly located in the Indo-Gangetic basin and already implementing impact-making research on topics specifically relevant to the work packages in this project. IWMI has current MoUs with all the partner institutions. The core team is backstopped by the extensive pool of expertise in the key research areas, knowledge management and database management, with an extensive data and knowledge base already in place both within IWMI and within the other partners. In addition, the team has a rich and evolving functioning network of partners of NARES, NGO, Universities and other relevant institutions within and outside the basin.

Team members are either leading or part of on-going Challenge Program on Water and Food projects, including those in the IGB and in one of the other BFP projects. Of the 8 on-going CP projects in the basin, six have one or more of the partners on this team included.

The team will utilize innovative and cutting edge methodologies to deliver on the outputs in the projects including the water accounting concepts pioneered by IWMI, and an

innovative approach to studying the regional water institutions through 'locality case studies' and its scaling-up and scaling-out. Also, given the extensive hands-on experience of the team on poverty, livelihoods, productivity and institutions and policy analysis in the basin, the project will be able to produce tools, potential interventions, investment opportunities and policy changes for the most disadvantaged target groups/ communities/sectors and thus create an early impact.