



Work-in-Progress: Not for Quotation

Title: Rigorous Impact Evaluation of Punjab Rural/Community Water Supply and Sanitation Sector Projects in Pakistan

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I. Introduction

1. The International community is increasingly seeking development institutions to demonstrate development effectiveness, including doing more rigorous impact evaluation and adopting managing for development results. The Asian Development Bank (ADB) is no exception. The role of evaluation in this context is to assess results in a credible and independent fashion, contribute to learning and accountability, and provide the basis for effective policy decisions and program improvement (Network of Networks on Impact Evaluation draft statement on impact evaluation, February 2008). The community wants to ensure that development resources generated by tax payers are invested on programs and projects that work and, as a result, more effort is required in demonstrating impact on the ground. However, demonstrating development impact is a rigorous time-consuming and resource-demanding exercise. The Center for Global Development report highlights that there is an evaluation gap because measurement of impact is rare.¹ The report states that in absence of verifiable impact measures, program designers benefit little from accrued experience about what works, and developing country governments and their donor partners have little basis upon which to defend the wisdom of their investment or make adjustment. As a result, policy makers are faced with dilemma in allocating resources; and, even more so, for the improvement of rural areas.

2. The recent emphasis on accountability and results-based management has stimulated interest in evaluating not just the process, outputs and outcomes of development programs; but also their impact (ultimate effect) on people's lives. Impact evaluations go beyond documenting change to assess the effects of interventions on individual households, institutions, and the environment, relative to what would have happened without them, thereby establishing the counterfactual.² World Bank views it as a policy tool that helps discern the causal impact of a project or a policy initiative. Impact evaluation techniques compare the impact on the beneficiaries of a certain policy intervention or project with a counterfactual group that has not been exposed to the same intervention or project. The results from impact evaluations can help inform policy makers on where to allocate scarce resources and can also provide evidence on whether current policies are working or not.³ This rigorous approach to evaluation is

¹ CGD. 2006. *When Will We Learn: Improving Lives Through Impact Evaluation. Report of the Evaluation Gap Working Group.* Washington, D.C.

² Available: <http://www.gsdr.org/go/topic-guides/monitoring-and-evaluation/impact-evaluation>

³ Available: <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTPOVERTY/EXTISPMA/0,,menuPK:384339~pagePK:162100~piPK:159310~theSitePK:384329,00.html#whatis>

increasingly advocated as the only reliable way to develop an evidence base of what works, and what doesn't, in development.⁴

3. At ADB, while the Operations Evaluation Department (OED) reports have continued to focus on relevance, effectiveness, efficiency, sustainability, and likely impacts at the project, sector, and country levels; establishing the relationship between causality and impact has not, until recently, been systematically addressed.⁵ The Report is based on rigorous impact evaluation methodology, and it addresses attribution issue. As such studies are time- and resource-demanding, OED is committed to conducting one rigorous impact evaluation annually. The *Punjab Rural/Community Water Supply and Sanitation Sector Projects* (PRWSSP and PCWSSP) in Pakistan will be the subject of OED's second rigorous impact evaluation in its 2008 Work Program. The PRWSSP provided support for the: (i) construction of water supply and drainage schemes, (ii) hygiene education program, and (iii) institutional strengthening; and covered seven districts of Punjab on a pilot basis. The scope of PRWSSP was expanded in 30 of the 35 districts of Punjab in PCWSSP, with an additional fourth area of support for social uplift and poverty eradication program. The construction of water supply and drainage schemes in PCWSSP also included both gravity and pump-based schemes, as well as rainwater harvesting schemes. Reportedly, PCWSSP had more intensive community participation in the design, implementation and management of schemes compared to PRWSSP. Basic project data for PRWSSP and PCWSSP are provided in Appendixes 1 and 2.

4. ADB's strategy for the water supply and sanitation (WSS) subsector is shaped by the International Conference on Water and Environment (1992); the World Bank/United Nations Development Program International Conference on Water Utilities (1992), and the evaluation of 20 years of World Bank-funded Water Supply Projects (1992); the findings of the Water Utilities Data Book for the Asian and Pacific Region (1992); and the post evaluation of ADB water supply projects.⁶ The rural WSS subsector lays strong emphasis on community-based approach. "Basic human rights and environmental renewal" is one of the four elements of ADB's water strategy.⁷ The Strategy states that the three main problems facing the water sector are (i) financial sustainability, (ii) water resource availability, and (iii) equitable access; and it seeks long-term planning. The strategy notes that water rights for domestic and industrial water supplies should be secured for at least 50 years, and tariffs need to be set to reflect the financial costs (and preferably the economic costs) of water. Distortions in tariffs, where one part of a community cross-subsidizes another, need to be smoothed out, and all schemes should make adequate supplies available in poor areas. The poor can, and are willing, to pay for water. In rural areas, special efforts are needed to reduce the distance to water supplies, wherever possible, and to encourage conservation approaches, such as rainwater harvesting. It also considers that complementary education in hygiene is essential to derive the full health benefits of improvements in infrastructure.

5. In 2006, an independent expert panel conducted a comprehensive review of ADB's Water Policy implementation, and noted that the Policy promotes efficiency to ensure quality, access and affordability, and sustainability in water service delivery for domestic, industrial, and

⁴ OED conducted its first rigorous impact evaluation in 2007, and analyzed the effect of microfinance on poor rural households and the status of women.

⁵ ADB. 2007. *Special Evaluation Study on the Effects of Microfinance on Rural Poor Households and the Status of Women*. Manila.

⁶ ADB. 1994. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to Pakistan for the Punjab Rural Water Supply and Sanitation Sector Project*: para. 23. Manila.

⁷ Available: http://www.adb.org/documents/reports/water/basic_human.asp

agricultural use.⁸ The review noted moderate progress to increase coverage of domestic water service delivery in both rural and urban areas in the developing member countries (DMCs). However, it did not find empirical evidence to suggest that poor people necessarily benefit from such increases in coverage. The review further stated, “ADB’s Water Policy does not provide a clearly formulated and strong focus on operation and maintenance (O&M), or energetically promote the evaluation and use of alternative technologies where appropriate. These key factors are critical to ensure affordable and equitable services, and inherently linked to efficiency and cost-effectiveness in water service delivery.” The panel provided five recommendations to ADB,⁹ namely, (i) increase ADB’s commitments, and develop ADB’s capacity; (ii) develop long-term partnerships with DMC stakeholders and donors; (iii) focus the implementation of integrated river basin management on stakeholder needs and ownership; (iv) promote “business unusual;”¹⁰ and (v) improve processes to ensure effective policy implementation. ADB supports the general thrust of the panel’s report. In particular, ADB’s vision in the water sector is in line with the three key messages of the panel: (i) water, as a resource and as a service, is a key driver to change and development in the Asia and Pacific region; (ii) ADB, in its water investments, should continuously balance its dual roles as a development institution and as a bank; and (iii) ADB, and its DMCs, should significantly increase its investments in water as a service and as a resource.

6. **Overview of ADB Operations in WSS.** ADB began its first assistance to the WSS¹¹ subsector in 1968. Between 1968 and 2007, ADB approved: (i) 120 loans (99 urban and 21 rural WSS) for 112 projects (\$4 billion), (ii) 6 grants (\$20.7 million), and (iii) 184 technical assistance (TA) projects.¹² Altogether, 26 countries availed ADB assistance. The Philippines, People’s Republic of China, Indonesia, Thailand, and Korea were the top five recipients. The loan amount includes 66 loans (\$2.41 billion or 59%) funded from ordinary capital resources, and 54 loans (\$1.59 billion or 41%) from the concessional Asian Development Fund. The loan amount included four private sector loans (\$107.5 million). Appendix 3 shows further details.

7. The support for urban WSS has dominated ADB water and sanitation portfolio (86%). The assistance for rural WSS commenced in 1977 (Appendices 3, 4, and 5). In addition, several urban and rural infrastructure projects provided assistance for WSS. Between 1990 and 2007, ADB has supported 14 rural WSS projects (17 loans of \$600 million) in nine countries. In addition, 11 countries have received \$9.9 million in TA for 22 projects. These projects have supported: (i) construction or rehabilitation of WSS facilities, (ii) health and hygiene awareness

⁸ ADB. 2006. *Water for All: Translating Policy Into Action*. The Review Panel’s Final Report and Recommendation: para. 34–44, p. 16–18. Manila.

⁹ Available: <http://www.adb.org/Water/Policy/panel-report.asp#a3>

¹⁰ Promoting “Business Unusual” implies Leveraging innovations to increase access, affordability, efficiency, and cost-effectiveness, including nuanced guidance on subsidy use, promoting public-private partnerships, alternative financing modalities under innovation and efficiency initiative, robust O&M arrangements, and scaling up of alternative technologies.

¹¹ The WSS subsector falls under water supply and sanitation and waste management sector, which as of 2007 accounts for 5.3% (\$6.8 billion) of total ADB loans. Besides WSS, the sector comprises integrated (1.04% or \$1.35 billion), and waste management subsectors (1.06% or \$1.06 billion), representing 2.1% of total ADB loans. For the purpose of this study, discussions are limited to the WSS subsector only.

¹² The sources of TA funds have included ADB’s internal resources (41.4%), Japan Special Fund (45.6%), and other sources (13%), including bilateral agencies and United Nations Development Program. Of the 184 TAs, 109 (59%) were classified as project preparatory (\$43.3 million) and 75 were advisory (\$33.4 million). Nepal, Indonesia and the Philippines are the top TA recipients among DMCs, accounting for 33% of total WSS TAs. The most number of TAs approved were in 1993 (12) and 2006 (11). In addition, ADB also funded 15 regional TA projects (\$12.2 million).

raising, (iii) institutional capacity building, and/or (iv) access to microcredit for income-generating activities. Appendices 4 and 5 provide a list of projects and TAs approved for ADB assistance in the rural WSS subsector.

8. OED evaluation studies have highlighted a number of lessons from ADB WSS operations in several DMCs. Active participation of stakeholders in all stages of project cycle, demand-driven selection of feasible and cost-effective schemes, integration of water supply and sanitation in WSS schemes, effective mechanism for water use fee collection, community management, O&M of WSS schemes, sensitivity to ethnic and cultural norms and water quality monitoring and treatment, and the source and/or point of consumption appear prominent and are useful for future WSS project designs and implementation. In addition, cost recovery, sustainable financing mechanism for O&M, enhancing willingness to pay for safe drinking water and sanitation, effective local community organizations (COs) and supporting but capable public institutions are also important considerations in future WSS projects. A list of selected lessons from OED studies are provided in Appendix 6.

II. Rationale for the Study

9. Globally, there are 1.1 billion people without access to safe water supply, and 2.4 billion without adequate sanitation. Of these, around 700 million are without water supply, and 2 billion without adequate sanitation in the Asia and Pacific region. The problem is particularly grave and pressing in the rural areas where 70% of the world's poor reside.¹³ While the emphasis has been on expanding the coverage, in its 2006 review of ADB's Water Policy, an independent expert panel did not find empirical evidence to suggest that poor people necessarily benefit from increases in coverage. ADB's experience in WSS is outlined in Appendix 7. Similarly, in its 2007 thematic evaluation of WSS sector, the European Commission (EC) study noted that in absence of valid impact data, no definitive statement can be made on the role of EC investment in WSS on better health. However, available information pointed to a qualified success that EC investment has made a positive contribution to better health of the target groups. The experience of other agencies in WSS is discussed in Appendix 8. Third, rigorous impact evaluation in water and sanitation sector is rare (Pattanayak, et al., 2007), partly due to multiple impacts.¹⁴

10. Punjab province of Pakistan represents an ideal location to conduct impact evaluation of WSS sector projects. The two sector projects were designed to address basic human needs such as WSS. While PRWSSP was rated partly successful covering seven pilot districts, the PCWSSP is expected to be rated highly successful by the operational department in a much larger area covering 30 districts of Punjab, thereby making this an interesting learning scenario to analyze factors associated with differential performance and impact. In both projects, WSS subprojects were handed over to the local community organizations for O&M. Very little is known about the sustainability of community-managed WSS schemes, particularly with respect to financing modalities.

¹³ ADB. 2006. *Serving the Rural Poor: A Review of Civil Society-Led Initiatives in Rural Water Supply and Sanitation*. Discussion Paper. Manila.

¹⁴ Pattanayak, S.K, C. Poulos, K.M. Wendland, S.R. Patil, J. Yang, R.K. Kwok and C.G. Gorey. 2007. Informing the water and sanitation sector policy: Case study of an impact evaluation study of water, sanitation and hygiene interventions in Maharashtra, India. Research Triangle Institute Working Paper 06_04. The paper cites Bosch, et al.'s work, which classifies impact into four areas: (i) health improvements, (ii) education, (iii) gender and social inclusion, and (iv) income/consumption increases.

11. While the importance of government support for water and sanitation is growing across DMCs, a disproportionate share of ADB's WSS resources is allocated to urban areas (86%). As a result, rural areas tend to be at a comparative disadvantage in attracting resources. The findings of the study is expected to provide a more definitive basis for public policy makers to substantiate or justify increased allocation of resources for rural WSS. Furthermore, in the absence of representative household level baseline data at present, the study will provide basis for constructing panel data for future evaluation so that a more robust impact evaluation can be conducted in the future using double difference method; which accounts for "before and after," and "with and without" conditions. In addition, the study will independently document "good practices" and "best practices" in Punjab's community-led rural WSS schemes so that the learning can be shared with other stakeholders and used as a model for new project designs.

III. Objectives and Scope of the Study

12. The study has six specific objectives. First, the study will (i) develop a set of pragmatic indicators which can be adopted in ADB WSS project designs for monitoring and evaluation purposes; (ii) empirically identify cultural, economic, environmental, institutional, and social factors associated with projects' impact on health, income/consumption, education, gender roles, and other social variables (including unintended ones) using the indicators developed in (i); (iii) develop a household level benchmark for future impact evaluation study based on a panel data; (iv) assess the status of ADB supported WSS schemes, and evaluate capacities of community-based organizations in operating and maintaining the project schemes in a sustainable manner; (v) provide a set of case studies demonstrating good and best practices in rural WSS; and (vi) analyze financing modality for rural WSS service delivery in the context of Pakistan, and discuss possible alternatives that ADB can consider as it moves forward with the Water Financing Program 2006–2010 in the region. The study builds on a comprehensive literature review of WSS impact and aims to evaluate impact of ADB support to two WSS sector projects, PRWSSP and PCWSSP. The study will empirically test the validity of program linkages and expected impact. It will also draw lessons with respect to what works and what does not for future ADB assistance in the rural or community WSS subsector. The conceptual framework of the impact evaluation is discussed in the next section.

13. Punjab province of Pakistan provides an excellent opportunity for analyzing performance and impact of community-led WSS intervention aimed at improving an overall quality of life for people living in rural areas. There are various WSS schemes in Punjab that include traditional wells, ponds, rain harvest, and piped water supply. Some of the schemes are truly traditional and others are constructed by local governments (Tehsil Municipal Authorities [TMAs]), nongovernment organizations, and the provincial government (Public Health Engineering Department [PHED]). The schemes are either new constructions or rehabilitation of older schemes. Some schemes are solely for water supply, while others have sanitation integrated into water supply provisions. The PHED schemes were constructed or rehabilitated with ADB support (PRWSSP and PCWSSP). Reportedly, 335 schemes were constructed in seven pilot districts representing both barani and brackish water areas under PRWSSP, and the lessons from the project implementation were incorporated into the design of PCWSSP leading to the extension of coverage to an additional 23 districts (total of 30 districts). ADB approved the \$43 million PRWSSP loan on 31 January 1995, and it closed on 5 June 2003. The \$50 million PCWSSP loan was approved on 23 January 2003, and closed on 6 December 2007.

14. The evaluation will focus on communities and households served by PRWSSP and PCWSSP, and comparable control communities and households established as counterfactuals. The counterfactual communities and households will be similar to project

communities and households with the exception that these would not have ADB supported schemes. The PRWSSP envisaged benefits were (i) resource cost saving; (ii) time saving in collecting water; (iii) benefits to women; (iv) improved environment; (v) ridding villages of water pondage (mosquito breeding grounds) and bad odor; (vi) providing privacy to women; (vii) significant health benefits to household members; and (viii) improved capacity of the Public Health Engineering Department in WSS, and sustainability of water supply. Similarly, the PCWSSP was expected to: (i) increase household incomes, (ii) save time in fetching water, (iii) improve socioeconomic wellbeing, (iv) eliminate stagnant water bodies, (v) better child care, (vi) regular school attendance of girls, (vii) lower morbidity rates, (viii) reduce infant mortality rates, (ix) reduce incidence of waterborne diseases, and (x) strengthen TMAs by improving their capacity.

IV. Conceptual Framework for the Evaluation Study

15. **Impact at the Household Level.** As stated earlier, a systematic impact analysis of external support for WSS is a relatively new area and only limited analysis have been reported. Available evidence points out that impact analyses have focused on only a selected impact variables such as reduction in the prevalence of diarrhea (Jalan and Ravallion, 2003¹⁵), improved health and time saving (Isham and Kahkonen, 2003¹⁶), child health and income (Pattanayak et al., 2007¹⁷), and willingness to pay (Gunatilake et al., 2007¹⁸). However, qualitative and anecdotal impacts are reported on other aspects, including gender (U.N. 2005;¹⁹ ADB, 2007²⁰).

16. The conceptual framework for this study guided by literature review of WSS impact evaluation and a program theory that links goal, resources, activities, output, outcomes, and impact. While a more complex multidimensional framework of analysis will be desirable, the study design is bound by time and resource constraints. Furthermore, the status of PCWSSP in particular suggests that some of the schemes may not have matured to demonstrate some of the perceived impact (e.g., infant mortality rate reduction). An operational logic model for the study is adapted from Pattanayak et al. (2007) and is presented on page 8. The overarching goal of the two sector projects was to reduce poverty and improve living conditions and quality of life of communities in rural settlements. Both sector projects were hypothesized to have positive health, education, and economic impact. The model assumes that the gender impact is inclusive in all three impact areas. In addition, the study also plans to document any unintended positive or negative impact. The health impact is primarily expected in three ways: (i) reduction in drudgery associated with fetching water, particularly for female members of the household and children; and (ii) reduction in incidence of water borne

¹⁵ Jalan, J. and M. Ravallion. 2003. Does Piped Water Reduce Diarrhea for Children in Rural India? *Journal of Econometrics*: Vol. 112(1), p. 153–173. New Delhi.

¹⁶ Isham, J. and S. Kahkonen. 2002. Institutional Determinants of the Impact of Community-Based Water Services: Evidence from Sri Lanka and India. Middlebury College Economics Discussion Paper No. 02-20. Vermont.

¹⁷ Pattanayak, S.K., C. Poulos, K.M. Wendland, S.R. Patil, J. Yang, R.K. Kwok, and C.G. Corey. 2007. *Informing the water and sanitation sector policy: Case study of an impact evaluation study of water, sanitation and hygiene interventions in Maharashtra, India*. Research Triangle Institute Working Paper 06_04.

¹⁸ Gunatilake, H., J-C. Yang, S. Pattanayak and K.A. Choe. 2007. *Good Practices for Estimating Reliable Willingness-to-Pay Values in the Water Supply and Sanitation Sector*. Manila.

¹⁹ UN. 2005. *A Gender Perspective on Water Resource and Sanitation*. A background paper submitted by Interagency Task Force on Gender and Water, Commission on Sustainable Development, Twelfth Session 14–30 April 2004, United Nations Department of Economic and Social Affairs. New York.

²⁰ ADB. 2007. *Water Supply and Sanitation Issues in Asia. Asian Water Development Water Outlook 2007 Discussion Paper*. Manila.

diseases²¹ (e.g., diarrhea, dysentery, cholera, malaria, typhoid, etc.). The economic impact is likely to stem from an increase in net household income as a result of (i) fewer sick days of household members, (ii) reduced expenditure on health, and (iii) income from activities associated with time freed-up from fetching water. In addition, it is expected that sustainable COs would be able to generate increased amount of resources from within the community for O&M and, hence, would rely less on external support, thereby making the schemes self-sustainable. The education impact is anticipated through (i) decreased drop out, (ii) increased enrolment and retention; and (iii) completion of girls in both primary and secondary schools. The projects are expected to exert positive impact in the community with increased representation of women in the CO management bodies and more time available for childcare.

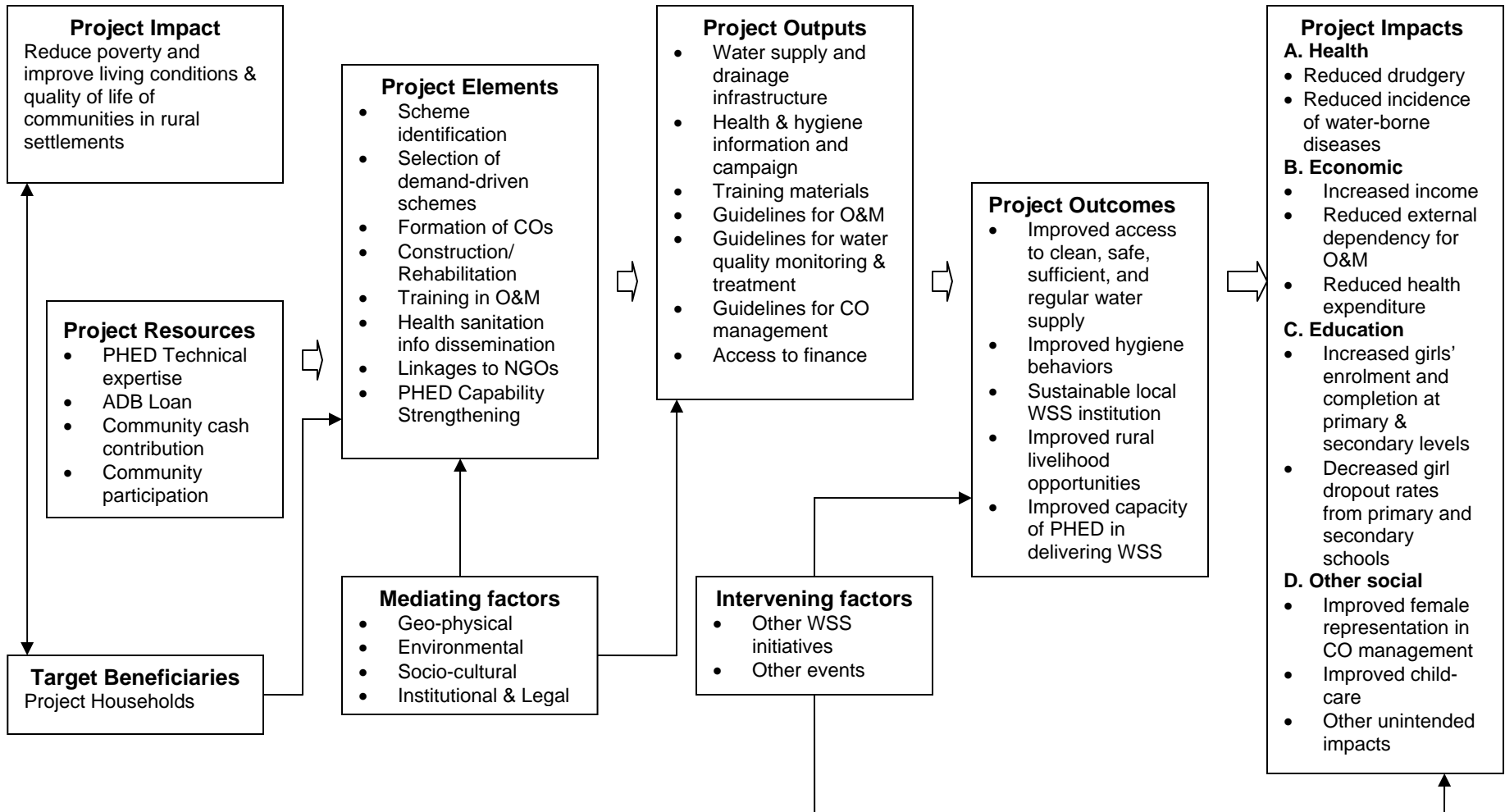
17. The model, based on project information, assumes five key outcomes: (i) improved access to clean, safe, sufficient, and regular water supply; (ii) improved self-sustaining organization and management of water supply system by active participation of household members; (iii) improved hygiene behaviors of local residents, including hand washing, feces disposal, food preparation, and water handling; (iv) improved capacity of PHED in providing quality WSS services; and (v) improved access to livelihood opportunities. These outcomes are assumed to be dependent on six outputs: (i) provision of new or rehabilitated water supply and drainage infrastructure; (ii) health and hygiene information to local residents; (iii) training materials for enhancing performance of COs; (iv) guidelines for O&M; (v) guidelines for water quality monitoring and treatment; and (vi) guidelines for effective community management. The stated outputs are dependent on project interventions based on selection of, and support for, demand-driven WSS schemes, formation of COs, construction and rehabilitation of WSS schemes, training of project staff and community members in O&M of WSS schemes, health and sanitation awareness in the communities, establishing linkages between households in the community and nongovernment organizations for microcredit and skill development, and capacity strengthening of PHED. These project activities are funded by ADB loan, provincial government resources, expertise from the PHED and direct/indirect contributions by the households. In all cases, WSS schemes are handed over by PHED to local COs.

18. The model also depicts the role of external factors either as mediating or intervening factors. The mediating factors can be geo-physical, environmental, socio-cultural, or institutional/legal; and the intervening factors may include events such as regional epidemics, other water/sanitation and health interventions, or other unanticipated events (Pattanayak, et al. 2007).²² An Evaluation Matrix for the study is presented in Appendix 10.

²¹ A list of waterborne diseases is provided in Appendix 9.

²² World Bank. 2006. *A Guide to Water and Sanitation Sector Impact Evaluation*. Appendix II. Washington, D.C.

Operational Logic Model for Evaluating Impact of PRWSSP and PCWSSP



ADB = Asian Development Bank, CO = community organizations, O&M = operation and maintenance, PHED = Public Health Engineering Department, NGO = nongovernment organization, WSS = water supply and sanitation.

19. Since household level baseline data is not available, the household level impact will be measured by computing the difference of the value of the outcomes of interest between the treatment and comparison households, known as single difference method. This can be estimated in several ways. Following Jalan and Ravallion (2001),²³ simple differences between treatment and comparison households such as the following can provide impact estimates:

$$(1) \Delta \bar{y} = \sum_{j=1}^T \omega_j (y_{j1} - \sum_{i=1}^C W_{ij} y_{ij0})$$

Where:

Δy = change in the outcome variable of interest

y_{j1} = treatment outcome indicator

y_{ij0} = i th matched comparison outcome indicator to j^{th} matched household

W_{ij} = weights applied in calculating average of matched outcomes for non-participants

ω_j = sampling weights used to construct the mean input estimates

T = total number of treatment households

C = total number of untreated households

20. A regression-adjusted estimator can also be obtained by estimating a regression run only for the matched comparison group. The impact estimator in this case would be:

$$(2) \Delta \bar{y} = \sum_{j=1}^T w_j \left[(y_{j1} - x_j \hat{\beta}_0) - \sum_{i=1}^C W_{ij} (y_{ij0} - x_i \hat{\beta}_0) \right]$$

Where:

$\hat{\beta}_0$ = OLS estimate for the comparison group sample.

V. Methodology

21. The proposed evaluation will adopt a mixed method approach. Bamberger, et al.²⁴ and White (2008)²⁵ argue that mixed-method evaluation combines the detailed insights and holistic understanding obtained from qualitative research with the ability to generalize to a wider population offered by quantitative data collection. Thus, it allows for a more comprehensive analysis. Mixed-method designs can be employed to strengthen validity, fine-tune sampling and instrumentation, extend the coverage of findings, conduct multi-level analysis and generate new and diverse insights.

22. The study will involve four steps: (i) preparation, (ii) data collection, (iii) data analysis, and (iv) report writing. The preparation step will entail: (i) a comprehensive literature review of evaluation methodologies and impact of water and sanitation projects implemented by selected development partners; (ii) development of detail research methodology, and determination of counterfactuals, sample size, and analytical methods; (iii) identification of indicators, and preparation of qualitative and quantitative data collection instruments; and (iv) pre-testing of

²³ Jalan and Ravallion. 2001. *Does Piped Water Reduce Diarrhea for Children in Rural India?* Working Paper Series 2664. World Bank. Washington, D.C.

²⁴ Bamberger, M., J. Rugh, and L. Mabry. 2006. Mixed-Method Evaluation. *Real World Evaluation: Working Under Budget, Time, Data and Political Constraints*: Chapter 13. Sage Publications. California.

²⁵ White, H. 2008. Of Probit and Participation: The Use of Mixed Methods in Quantitative Impact Evaluation. *Network of Networks on Impact Evaluation Working Paper No. 6*. World Bank. Washington, D.C.

data collection instruments. The data collection step will involve: (i) collection of secondary data at the community level; (ii) conduct of focus group discussions and key informant interviews; (iii) household level data based on face-to-face interviews with responsible household male and female members; (iv) knowledge, attitude, practice (KAP) survey of community members and school children; (v) a technical survey of selected WSS schemes; and (vi) data entry, verification and triangulation, and preparation for data analysis. The data analysis step will require subjecting data to appropriate qualitative and quantitative analysis. The fourth step will involve preparation of draft report based on data analysis and information gathered, peer reviews, inter-departmental reviews, and independent external reviews. Relevance of the ADB assistance in rural WSS will be evaluated on the basis of (i) relevance at the time of project design, in terms of ADB and government policy and strategy; (ii) relevance of project design; and (iii) relevance during implementation. Effectiveness will be assessed in terms of process, as well as implementation arrangements. Cost-effectiveness measure will provide an indication of efficiency. Sustainability will be analyzed based on institutional and financial factors, as well as other enabling environment factors.

23. An initial review of methodological approaches in rigorous impact evaluation literature suggests that the focus group discussions at the community level; key informant interviews with local leaders and knowledgeable persons in the community, including school teachers and health practitioners, would be appropriate qualitative tools for data collection. In addition, recent studies and methodological approaches indicate that a quasi-experimental research design will be appropriate for quantitative analysis (Bamberger and White 2007;²⁶ Pattanayak, et al. 2007; World Bank 2006). Since both PRWSSP and PCWSSP do not have household level baseline data, the evaluation will be limited to “with” and “without” (treatment and comparison group) design (Bamberger, et al. 2006; World Bank 2006; Vaessen and Todd 2007²⁷). Selection biases in such design are inherent but these can be addressed using appropriate econometric techniques. The study will employ propensity score matching technique as well as qualitative limited dependent variable method (logit or probit) for quantitative data analysis. Propensity score matching controls for observable selection bias by ensuring that treatment and control groups are comparable in all aspects except that they have not received intervention. The method calculates probability (propensity score) that participants and nonparticipants would participate in the intervention based on a set of observable characteristics. It is the most common method used to control for selection bias in water and sanitation sector because it is quicker and cheaper to implement than other methods, and is considered scientifically robust.²⁸ The method was employed in the recent OED study²⁹ as well as by Pattanayak, et al. (2007), and is also supported by White, et al. (2007).³⁰

24. Structured questionnaires will be developed to gather household data.³¹ Since rural respondents do not keep records, responses to household surveys will rely on the recall method. At the community level, a set of guiding questions by focus area will be used in all

²⁶ Bamberger, M. and H. White. 2007. Using Strong Evaluation Designs in Developing Countries: Experience and Challenges. *Journal of MultiDisciplinary Evaluation*. Vol 4(8):58–73.

²⁷ Vaessen, J. and D. Todd. 2007. *Methodological challenges in impact evaluation: The Case of the Global Environment Facility*. Discussion paper 2007-01. Institute of Development Policy and Management. University of Antwerp.

²⁸ World Bank. 2006. A Guide to Water and Sanitation Sector Impact Evaluation. *Doing Impact Evaluation No. 4, Poverty Reduction and Economic Management* (p.21). Washington, D.C.

²⁹ ADB. 2007. *Effects of Microfinance on Rural Poor Households and the Status of Women*. Manila. Available: <http://www.adb.org/Documents/SES/REG/SST-REG-2007-19/SST-REG-2007-19.asp>

³⁰ White, H., S. S. Siha and A. Flanagan. 2007. A Review of the state of impact evaluation.

³¹ Structured questionnaires are expected to standardize the information gathering and minimize non-sampling errors.

focus group discussions. Similarly, key informant interviews will be issue-specific and will be guided by open-ended guiding questions. For local schools and community residents, a KAP survey using a structured questionnaire will be developed, and responses will be recorded on a Likert scale. The study will also make use of community and project level data maintained by the COs and the project secretariat, where relevant. Efforts will be made to seek secondary data collected by the TMAs/PHED in both project and control areas. In addition, the evaluation will also document the status and performance of representative WSS schemes supported by ADB, as well as from other resources. Where relevant, the results of the study will be triangulated with findings from the Multiple Cluster Indicator Survey, a study currently conducted by the Government of Punjab and United Nations Children's Fund (UNICEF).³²

A. Data Requirements and Indicators

25. The study will require data at three levels—individual, household, and community. Individual level data will include KAP of health, hygiene and sanitation behavior in adults and children, and water use for domestic purposes. At the household level, data will be collected to reflect socioeconomic well-being of household members and would include household composition by age, gender, education, occupation, health status, water collection and consumption, gender roles and time spent in fetching water, consumption/expenditure patterns, income and household asset structure, and household perception about water quality. At the community level, data will be gathered on community attributes such as coverage of WSS schemes, cohesiveness of COs, membership structure, gender representation, mechanisms for O&M of WSS systems and facilities, water allocation and cost recovery practices, existence and effectiveness of other WSS schemes in the community, and health and sanitation awareness activities. Additional information on extent and quality of support from PHED, after the schemes handover to the COs, will also be collected. The study will also document selected best practices in the project and control areas and highlight key success factors. In addition, efforts will be made to reconstruct pre-project WSS conditions in the communities prior to project intervention. This information will be useful in cross-corroborating the attributes of control communities for valid comparisons between “with” and “without” project scenarios.

26. The study will draw upon existing literature and consult with local stakeholders in defining specific indicators to be used for data collection and analysis. The World Bank³³ provides a good basis for identifying and defining specific indicators. Suggested health impact indicators are (i) diarrhea (3 or more loose stools over 24 hours period in last 2 days), (ii) acute respiratory infections—incidence of cough and cold in last 2 weeks among children under 5, (iii) body mass index for children under 5, (iv) muscle strain or back pain, among household members, due to water cartage. Likely education impact indicators are (i) whether school age children (both male and female) are enrolled in school, (ii) whether children attend school regularly; (iii) the number of day children attended school in the last month; and (iv) whether children completed full school year. Income/consumption impact indicators proposed are (i) household per capita income and consumption; (ii) household coping and averting costs (expenditure on household water treatment, water storage containers); and (iii) expenditure on medical treatment. Other gender and social inclusion impact indicators suggested include (i) women's perceptions about level of privacy provided by access to sanitation; (ii) women's perceptions about safety of using water and sanitation services; and (iii) access to water, sanitation and hygiene services by poor, minorities and vulnerable groups.

³² Multiple Cluster Indicator Survey is expected to be completed in December 2008.

³³ World Bank. 2006. A Guide to Water and Sanitation Sector Impact Evaluation. *Doing Impact Evaluation No. 4, Poverty Reduction and Economic Management*. Washington, D.C.

27. OED is in contact with UNICEF (Punjab), Punjab Planning and Development Board, and Punjab Bureau of Statistics; and exploring the possibility of accessing data associated with an ongoing Multiple Indicator Cluster Survey, which has a new module on water and sanitation. The evaluation will also seek to access recently collected water quality data of community water supply schemes collected under the support provide by UNICEF (Punjab). The study will explore possibility of integrating the Multiple Indicator Cluster Survey data with impact evaluation survey data in the final data analysis. Recent indications are that the Multiple Indicator Cluster Survey results will not be available until the end of 2008.

28. The study will generate six key outputs: (i) a rigorous impact evaluation report; (ii) selected case stories highlighting good/best practices in community-led rural WSS; (iii) an analytical report demonstrating preparation of rural communities for WSS project interventions, highlighting what works and what does not; (iv) a database for conducting a panel study in the future using double difference method; (v) a set of indicators for monitoring rural WSS projects; and (vi) a framework for financing modalities for rural WSS. The findings of the study will be disseminated through appropriate OED online publications. OED publications will be coordinated with the Knowledge Management Unit of OED, Water Financing Partnership Facility of Regional and Sustainable Development Department and Economic Research Department.

B. Survey Design and Sampling Procedure

29. The two sector projects, PRWSSP and PCWSSP have supported constructions or rehabilitation of 1,113 schemes in 30 districts of Punjab and these schemes are supposed to benefit approximately 226,000 households with approximately 3 million people.³⁴ This includes 335 schemes in seven districts under PRWSSP, and 778 schemes in 30 districts under PCWSSP. The seven districts under PRWSSP were also covered under PCWSSP and these districts alone account for 54% of all schemes. Ten of the 23 new PCWSSP districts have nine or fewer schemes, while another four districts have between 11 to 15 schemes.

30. The study will be based on a technical survey of WSS schemes, household surveys, KAP surveys, focus group discussions and key informant interviews in seven districts—covering four PRWSSP and three PCWSSP districts. These districts have been randomly selected using stratified random selection procedure representing both sector projects (PRWSSP or PCWSSP), and water supply area (barani or brackish water). The sample size for the number of schemes and household surveys for representative project area is determined following Barlett, et al. (2001).³⁵ A total of 115 schemes will be subjected to rapid technical evaluation focusing on the appropriateness of scheme design, state of schemes at the water source, distribution and storage system, cost recovery mechanisms, repair and maintenance arrangements, likely sustainability of schemes, and water quality tests using quick testing kits. The study plans to conduct 1,100 household interviews covering 115 ADB-supported schemes, and another 1,100 households representing “control” group households in selected seven districts. The sample distribution of households by district for the project area (treatment) households is reflected in the following table. The same number of control households will be interviewed from other communities within the same districts (a total of 1,100 households). These control

³⁴ Two hundred households per scheme.

³⁵ Barlett, H., J.W. Kotrlik and C.C. Higgins. 2001. *Organizational Research: Determining Appropriate Sample Size in Survey Research*. Information Technology, Learning and Performance Journal, Vol. 19(1):43–50.

communities will be similar to the project communities except for the provision of ADB supported WSS schemes.

Sample Size Distribution of Households of ADB Supported Schemes

District	No. of Sample Schemes ^a			No. of Sample Households for Survey ^b		
	PRWSSP	PCWSSP	Total	PRWSSP	PCWSSP	Total
Bahwalpur	13	8	21	125	77	202
Chakwal	11	9	20	105	86	191
D.G. Khan	0	18	18	0	171	171
Faisalabad	0	7	7	0	67	67
R.Y. Khan	13	9	22	125	86	211
Rawalpindi	11	7	18	105	67	172
Sargodha	0	9	9	0	86	86
Total	48	67	115	460	640	1100

ADB = Asian Development Bank, D.G. Khan = Dera Ghazi Khan, No. = number, PCWSSP = Punjab Community Water Supply and Sanitation Sector Projects, PRWSSP = Punjab Rural Water Supply and Sanitation Sector Projects, R.Y. Khan = Rahim Yar Khan.

^a Desired precision +/-10% and 99% confidence level.

^b Desired precision +/- 3% and 95% confidence level.

31. The participants for household survey will be drawn from four groups of schemes based on their proportional representation: (i) new water supply only, (ii) new WSS, (iii) rehabilitated water supply only, and (iv) rehabilitated WSS. The data will permit comparative analysis of water supply only and WSS scheme, thereby highlighting contribution of sanitation on impact variables. Similar comparison is also possible between new and rehabilitated schemes. The household survey will not cover “only sanitation” schemes because there are only 16 such schemes in the districts selected for the study.

32. For qualitative information and for the purpose of data triangulation, the study will also conduct five scheme/community-level focus group discussions in each district. The sites for focus group discussions will be selected randomly from the list of all schemes within each district. In addition, 10 key informant interviews will be conducted in each district. The key informants will include school teachers, health workers, local community leaders, TMA staff, and PHED staff. To assess the impact of health and hygiene awareness campaigns, the KAP survey will be conducted with 50 adults (25 male and 25 female) and 50 children (25 girls and 25 boys) in each district. The survey will cover similar number of participants from the control group. The study will also document a sample of individual experiences from WSS activities based on oral history and narratives. A technical survey will be conducted to assess the present status of handed over schemes and their likelihood of sustainable operations in the future.

C. Estimation Methods

33. Since there is no baseline data at the household level, the evaluation design is constrained to utilize single difference (with and without) evaluation design. The treatment group will consist of communities and households that have implemented the projects, while the comparison group will be similar villages and households that did not implement the project. Similarity between treatment and comparison households will be achieved through a propensity score matching that will be done using pre-implementation³⁶ project household-level data.

³⁶ The superiority of pre-implementation village-level data than post-implementation data as matching variables has been argued in Pattanayak, et al. (2007). The obvious reason is that post-intervention data may be affected already by the project. The fact finding mission seems to indicate that pre-implementation data may be poor or

Jalan and Ravallion have argued for the superiority of a matched sample, compared to an unmatched sample in the estimation of the impact of interventions. It should be noted, however, that since matching is only based on observed community and household characteristics, the impacts of unobserved characteristics are not accounted for. A multinomial method will be adopted to reflect impact of the four types of schemes. As there are very few only “sanitation schemes,” these will not be covered in the study because expected number of parameters to be estimated is likely to exceed the number of observations.

34. The actual estimation procedure will be refined after the specific impact variables, and their determinants are identified in the preparation stage. Data permitting, the study will also explore alternative estimation methods.

VI. Staffing and Scheduling

35. An Evaluation Specialist will lead the proposed impact evaluation study, with support from a Senior Evaluation Specialist, and assistance from international and national consultants on an intermittent basis. An Economist from the Economic Research Department of ADB will provide technical support during the course of the study. The international consultants will provide assistance with: (i) refinement of research methodology, (ii) determination of impact and determinant indicators and their measurement, (iii) drafting of data collection instruments, (iv) incorporating feedback from pre-testing of questionnaires, (v) qualitative and quantitative data analysis, (vi) report writing, and (vii) preparation of result dissemination material. The terms of reference of the study team and consultants appears in Appendix 11.

36. The study will require the input of one or two international consultant(s) with strong quantitative and qualitative evaluation skills, and proven experience in (i) evaluation methodologies; and (ii) conducting impact evaluation using both qualitative and quantitative methods using sample surveys, statistical and econometric tools, focus group discussions, and key informant interviews. S/he will have prior experience in conducting rigorous impact evaluation. A domestic firm or group of experts will be required for (i) pre-testing data collection instruments in Pakistan, (ii) translating applicable instruments in Urdu, (iii) conducting household surveys, (iv) KAP surveys, (v) key informant interviews, (vi) data entry and verification, and (vii) reporting study findings. Services of another firm or group of individual consultants with specialization in WSS will also be required for assessing the (i) status of randomly selected WSS schemes; (ii) assessing water quality at source and at consumption points; and (iii) assessment of scheme’s community organization and management, including O&M, cost recovery mechanisms, and sustainability.

37. It is estimated that the international consultants will be required for 2 person-months each on an intermittent basis. Two domestic firms or groups of survey experts will be engaged for 8 person-months. The estimated direct cost of the study is \$200,000 and details are presented in Appendix 12. The Team Leader has obtained an approval for \$50,000 support from the Energy, Transport and Water Division of the Regional and Sustainable Development Department. The study seeks approval of \$150,000 from OED’s RETA budget. In addition, OED has already sent a letter to the Chairman of the Punjab Planning and Development Board seeking his support for conducting this regard. The Secretary, Public health Engineering Department (Punjab) has assured the OEM for his full support while conducting the study.

non-existing. If reliable pre-implementation data is not available, then there is no other recourse but to use post implementation data to implement a matching.

38. **Limitations and Opportunities:** As discussed earlier, in the absence of verifiable household level baseline data, the proposed evaluation is restricted to adopt only single difference method of analysis for evaluating impact of the two sector projects. However, the data generated by the study will serve as a foundation for conducting a more robust rigorous impact evaluation using a panel data and applying double difference method in 2012. A second limitation of the study is that the actual number of usable respondents from the household surveys may be less than the proposed 2,200 households (1,100 treatment and 1,100 control) due to usual problems associated with non-respondents and incomplete questionnaires. To address this problem, the survey sample size will be increased by 20%. A third limitation of the study is high unit cost in hiring a firm for data collection task. Efforts were made to explore other options (e.g., a research institute or a think tank) in lieu of hiring a survey firm, in order to manage the study within the proposed cost structure. However, the local reality dictates that the field work for data collection will have to be done by two competent firms.

39. **Risks and Flexibilities:** One of the major risks for the proposed evaluation is the uncertainty in security situation in Pakistan. It may obstruct or delay data collection and, hence, delay the completion of the evaluation report. As an alternative, it is proposed that the study may be conducted in another country with long experience in rural WSS, possibly Indonesia, Nepal or the Philippines.

40. **Milestones:** The study will be conducted over a period of 12 months. Tentative milestones are:

Evaluation Approach Paper approval	II March 2008
Preparation (refinement of methodology, evaluation indicators and measurement, field data collection instruments, pre-tests, development of analytical methods for data analysis)	IV April 2008
Data collection, entry, verification, initial findings	I August–IV November 2008
Reporting best practices, completion of Operations Evaluation Missions	III April–II November 2008
Model testing and quantitative analysis	I–IV November 2008
Draft report	IV January 2009
Peer review	IV February 2009
Inter-departmental Review	IV March 2009
Editing	IV April 2009
Submission to DG, OED	IV May 2009

attachments: Appendix 1: Loan 1349-PAK (SF): PRWSSP Basic Data
 Appendix 2: Loan 1950-PAK (SF): PCWSSP Basic Data
 Appendix 3: ADB Assistance to WSS
 Appendix 4: ADB Loans to the Rural WSS Sector
 Appendix 5: TA to the Rural WSS Subsector
 Appendix 6: Lessons from ADB Operations in WSS Subsector
 Appendix 7: ADB Experience in Water Supply and Sanitation
 Appendix 8: Experience of Other Agencies In Water Supply And Sanitation
 Appendix 9: List of Waterborne Diseases
 Appendix 10: Impact Evaluation Matrix
 Appendix 11: Terms of Reference