

**Water Financing Partnership Facility**  
**RETA 6498: Knowledge and Innovation Support for ADB's Water Financing Program**

**PILOT AND DEMONSTRATION ACTIVITY**

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| <b>Activity Title: Demonstrating Use of "Aakash Ganga – Self-sustainable Rainwater Harvesting" in PRC's Northwestern Region</b> |   |
| <b>Proposer: Sustainable Innovations Inc. ; USA</b>   |   |
| <b>Request Date: December 17, 2008</b>  |   |
| <b>Country: PRC</b>   | <b>Region: East Asia</b>                              |
| <b>Activity Proposed Start Date: March 15, 2009</b>   | <b>Activity Proposed Duration: September 15, 2009</b> |
| <b>Cost Estimate: USD 50,000</b>  |   |

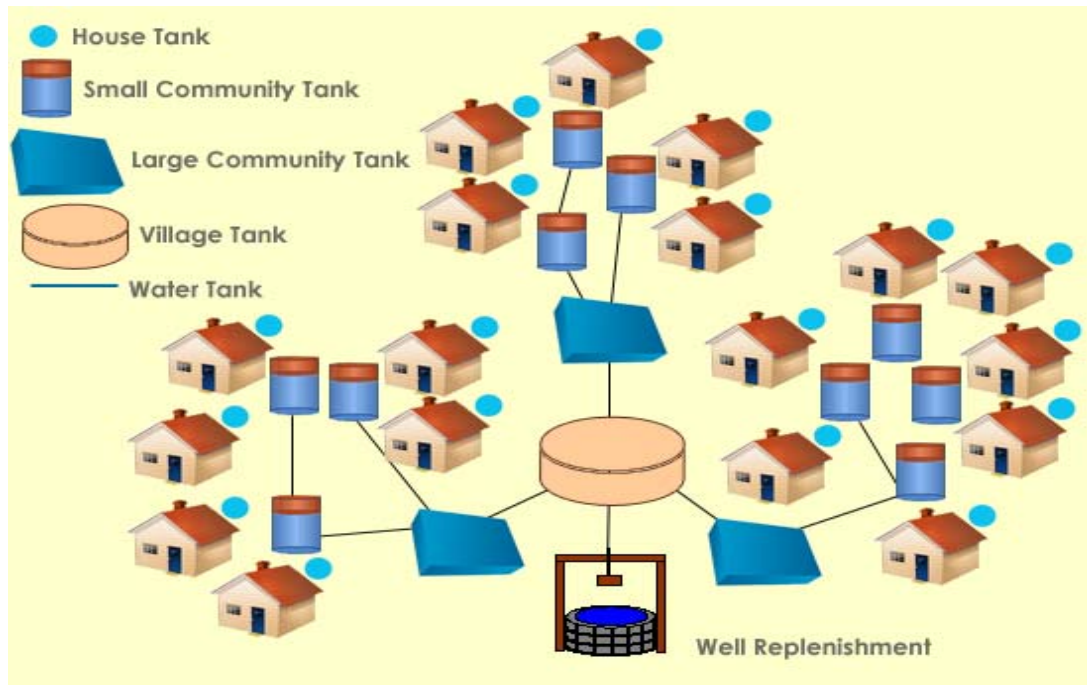
**1. Background and Rationale:**

Aakash Ganga ("River from Sky) Self-Sustaining Rainwater Harvesting was conceived by Dr. BP Agrawal to alleviate the perennial scarcity of drinking water in the arid, desert, or low rainfall regions. Aakash Ganga captures the domestic rainwater and channels it into underground water reservoirs. In 2006, Aakash Ganga received the [World Bank's Development Marketplace award for its holistic innovations and sustainability](#). Since then, Aakash Ganga, in partnership with the Birla Institute of Technology and Science ([www.bits-pilani.ac.in](http://www.bits-pilani.ac.in)), India, has been implemented in six villages in Rajasthan, India — Pilani, Raila, Lasedi, Indrasar, Kakreu Kalan, and Harinagar — providing drinking water to 10,000 people for generations, in perpetuity.

**Innovation/Effectiveness:** Aakash Ganga is a bundle of innovations in capacity (capturing enough rainwater to meet 12-months supply), technology (deploying satellite imagery, knowledge management center), economics (acquiring rights to harvest rooftop rainwater), organization (two-tier social enterprise), water utilization and quality monitoring (connecting communities over Internet), community participation (recasting quotidian wisdom and modernizing centuries-old traditions) and cultural integration (using familial bonds for operation and maintenance).

**India Implementation**

In India, AG channels rooftop rainwater from every house in a village, through gutters and pipes, to a network of multi-tier underground reservoirs as shown in Figure 1: Rooftop Rainwater Harvesting Network. AG has the capacity to collect and store several hundred cubic feet rainwater sufficient to last for an entire year with average rainfall. AG is implemented as a social enterprise or public-private-community partnership (PPCP). It acquires rights from home owners to harvest their rooftop rainwater for a fee or subsidy.



**Figure: Aakash Ganga Rainwater Harvesting Network**

Individuals with, for example, thatched roofs fill their cisterns from the shared community reservoir and take home. To encourage sustainable consumption, water is not piped to the houses. Part of the shared-community reservoir water is used for revenue generation and cost recovery.

**Sustainable Economic Model:** Aakash Ganga is market-driven social enterprise. It acquires rainwater harvesting rights from every home owner for a fee or subsidy; supplies water back to the community as per a socially-equitable policy; replicates utility industry model to minimize capital cost per household; converts annual public expenditure into infrastructural investment; expects full cost recovery over several years; and enables organic growth.

**Advanced Technologies:** Aakash Ganga deploys satellite images and Geographical Information System (GIS) to optimize the water collection network and the location of storage tanks. BITS computerized the design process, served as the knowledge center, and prepared the blueprints. The computerization shortened the implementation period and reduced project costs.

The figure below shows the Aakash Ganga Network design for Harinagar village. The dark red dots represent the reservoirs attached with a house, the green dots are the large community reservoirs, and the blue lines are the underground pipelines.

**Societal Behavioral Change:** Villagers have a “free water” entitlement mindset. Hold government responsible for their precarious water supply. AG has debunked the myth that people wouldn’t pay for water. Villagers have contributed 15% initial and 25% in recurring payments.

**Social Enterprise: Two-tier Social Enterprise:** In India, AG is organized as a two-tier social enterprise. The village-level enterprise (VLE), first tier, comports with century-old, socially-

accepted, and ingenious levy traditions. The federation, second tier, ensures flow of capital, management, and technology to the VLEs.

## **2. Objective**

The objective of this PDA is to demonstrate the full potential of Aakash Ganga to be adopted in Guiyang Municipality in PRC.

## **3. Scope, Location of Work / Description of Activities**

This PDA configuration is chosen to demonstrate a working Aakash Ganga domestic rainwater harvesting model in Guiyang municipal area. The Aakash Ganga Network and associated technologies will serve as a model for the 105,100 small reservoir networks of the Guiyang Integrated Water Resources Management (GIWRM) project. It will cover the following scope:

- Build one community reservoir
- Build 2 house-attached reservoirs
- Connect a few rooftops to the community reservoir (The exact number to be determined based on the village survey.)

Once the demonstration is completed, it will serve as a model for replicating the project under GIWRM. The ongoing maintenance and upkeep will be the responsibility of the Guiyang municipality.

Exclusions: The implementation of IT network for monitoring of water utilization, data repository, testing of water quality, timely alerts for contamination, and revenue generation are beyond the scope of this PDA. If requested under a separate grant, we will develop a complete plan for a specified area.

This PDA will be implemented in one rural village of the Guiyang municipal area in the Southwest region of China. Guiyang municipality (GM) lies on the mountainous ridge of the watershed boundary between the Yangtze River basin to the north and the Pearl River basin to the south. Annual average precipitation is quite high but large evaporative losses and uneven distribution present particular challenges for capturing and storing water, much of which drains into rivers as quick surface flows through numerous short creeks and streams that run deep in valleys, or through fast-flowing deep aquifers (groundwater rivers) through the limestone layers (karst areas).

In the surrounding rural area, shortage of water for potable use and irrigation is seen as a critical constraint to improving rural resident incomes and living standards. Only about half of the homes in rural areas of GM have piped water supply and about 420,000 rural residents face potable water shortages. In the absence of public water supply systems, the majority of the rural population relies on local springs and streams, although some have small storage structures near their homes for domestic and livestock use.

SI and GEI will undertake the following major activities:

- a. Transfer of knowledge from SI to GEI.
- b. Survey of the Guiyang area and selection of houses for participation.
- c. Mobilization of community, including securing beneficiary and government contribution.
- d. Writing of a detailed document identifying requirements for economic, social, cultural, organizational, operational, technological, and environmental sustainability.

- e. Designing of the rainwater harvesting network.
- f. Preparation of bill of materials including construction materials and labor.
- g. Construction of the rainwater harvesting network
- h. Design of processes for regular water quality monitoring and water sample testing.

#### 4. Implementation Schedule

This PDA will be implemented for a period of six and a half months. The detailed schedule shown below is provided in weeks from the date of grant approval:

|   |                       |
|---|-----------------------|
| 4.1 Hold kick-off meeting with local partners in Guiyang  | 2 <sup>nd</sup> week; |
| 4.2 Conduct surveys on the villages and select the household for participation  | 3 <sup>rd</sup> week; |
| 4.3 Carry out a stakeholder analysis, and mobilize the community awareness  | 4 <sup>th</sup> week; |
| 4.4 Prepare a detailed work plan, including the detailed TORs for the consultants/<br>parties to be involved in the PDA   | 4 <sup>th</sup> week; |
| 4.5 Submit to ADB the inception report  | 5 <sup>th</sup> week. |
| 4.6 Conduct the necessary economic, social, cultural, organizational, operational,<br>technological, and environmental analysis   | 6 <sup>th</sup> week  |
| 4.7 Discuss and agree with PMO and communities on the required physical<br>investment including beneficiary and government contribution   | 7 <sup>th</sup> week  |
| 4.8 Design the rainwater harvesting network   | 8 <sup>th</sup> week  |
| 4.9 Prepare the bill of materials including construction materials and labor  | 9 <sup>th</sup> week  |
| 4.10 Design processes for regular water quality monitoring and water sample<br>testing, which should be also included the investment cost   | 10 <sup>th</sup> week |
| 4.11 Prepare a detailed construction plan for the whole rainwater harvesting<br>network, including the detailed descriptions about the coordination with ADB<br>lending financing | 11 <sup>th</sup> week |
| 4.12 Submit to ADB the interim report   | 11 <sup>th</sup> week |
| 4.13 Construct and complete the rainwater harvesting network  | 15 <sup>th</sup> week |
| 4.14 Monitor the water quality regularly  | 15 <sup>th</sup> week |
| 4.15 Conduct the community meeting to seek feedback   | 16 <sup>th</sup> week |
| 4.16 Summarize the experiences/lessons and discuss the possibilities of further<br>replication in the GMG through a small-scale seminar with PMO and other<br>agencies            | 17 <sup>th</sup> week |
| 4.17 Prepare and submit the draft final report to ADB   | 20 <sup>th</sup> week |
| 4.18 Hold the final workshop and discuss the scale-up plan<br>week  | 24 <sup>nd</sup>      |

#### 5. Institutional Management Arrangements

The **Sustainable Innovations (SI)** ([www.sustainableinnovations.us](http://www.sustainableinnovations.us)) will have overall responsibility for managing the implementation of this PDA. SI is a US-based non-profit

corporation and is approved by the Internal Revenue Service. SI harvests innovations in technology, science, and social entrepreneurship to serve the communities. SI heads a team consisting of several India-based partners. During 2003 – 2008, SI selected its partners in India to build capacity for large scale implementation. These partners will work under Dr. Agrawal's leadership to prepare the Detailed Project Report.

SI will collaborate with the **Global Environmental Institute (GEI)**. GEI is a Chinese non-profit, non-governmental organization that was established in Beijing, China in 2004. Its mission is to design and implement market-based models for solving environmental problems in order to achieve development that is economically, ecologically, and socially sustainable.

SI will also partner with the **Birla Institute of Technology and Science (BITS)** ([www.bits-pilani.ac.in](http://www.bits-pilani.ac.in)), Pilani, a premier engineering institution of India. BITS will lead the technology development and deployment. A knowledge repository for rainwater harvesting is hosted at BITS.

## 6. Expected Results (outputs/outcomes/effects/impacts):

**Outputs:** The output of the grant will be implementation of the Aakash Ganga network in Guiyang municipal region with a network of 2 house-attached reservoirs and one cshared community reservoir.

**Outcomes:** The PDA will serve as a model for the 105,100 small reservoir networks, management of water utilization through information technology, monitoring of water quality, and for the processes for water testing and alerts. It will be a demonstration of public-private-community partnership. The beneficiaries and government are expected to contribute 50% of the construction cost.

**Impacts:** The Guiyang municipal pilot will demonstrate the multi-dimensional impact of Aakash Ganga on the GIWRM project funded by the Asian Development Bank. Piloting PDA activities in this project area will generate greater impact and make it relevant to the GIWRM operations, a key requirement for PDA approval

**Safe Water:** When fully implemented, AG will provide safe drinking water to millions of people of the Guiyang municipal area. AG will inspire other villages to replicate the social enterprise model.

**Women Empowerment:** Traditionally, women are responsible for fetching water for the whole family and may spend better part of the day to fetch water. By providing access to water, AG frees women and girls to be economically productive and independent. Adolescent girls can continue with their studies.

**Promotion of Local Artisans:** AG infuses self-esteem and pride in local artisans by valuing their crafts. In India, for example, the dedication plaques are designed by local “bangle makers” using natural materials — a **green** craft. The local musicians compose folklore music called “Dhamal” to spread awareness.

**Emigration:** The ready access to safe water is likely to impede population migration from villages to urban areas.

**Familial Bond:** These communities have strong familial bonds. These bonds ensure upkeep and maintenance. How? We will recognize the local artisans, for example, mason prominently and thereby earn the allegiance of the mason's son and grandson. The allegiance, in turn ensures timely repair and maintenance.

## 7. Measurable Performance Indicators:

The measurable performance indicators are:

- Completion of 2 house-attached and one shared-community reservoirs
- Connecting the reservoirs in a network.
- Securing 50% funding from government and beneficiaries.

## 8. Stakeholders Participation:

The participation of various stockholders is delineated below:

- |  |                        |
|--|------------------------|
| a. Sustainable Innovations                   | Project Leader         |
| b. The Global Environmental institute        | Implementation lead    |
| c. Birla Institute of Technology and Science | Technical lead         |
| d. Local governments and Beneficiaries       | Community mobilization |
| e. Asian Development Bank                    | Loan for GIWRM         |

## 9. Proponent Qualifications

**Dr. BP Agrawal** will lead the project. Dr. Agrawal, a native of Rajasthan, conceived Aakash Ganga (AG) as a self-sustainable rooftop rainwater harvesting scheme with the aim of alleviating the perennial shortage of drinking water in Rajasthan.

Dr. Agrawal is a visionary executive and social entrepreneur who combines business acumen with pioneering technologies for sustainable development. He is two-time winner of the **World Bank's** Development Marketplace Awards for holistic innovations and sustainability in water, sanitation, and health sectors. He founded Sustainable Innovations, a non-profit corporation, to harness technologies for delivery of health care to vulnerable populations and for making safe drinking water available to rural villages.

He has over thirty years experience as an executive and technologist of US-based Fortune 100 companies and entrepreneurial ventures including Alcatel, Verizon, General Dynamics, Hughes Network Systems, and Information Gateways. BP is frequent speaker on management of innovation from lab to market. Dr. Agrawal consulted with the **United Nations Development Programs** on absorption of technologies by the developing countries. He has been granted several patents and has published numerous research papers on pioneering technologies. He was an associate editor of IEEE Transactions. He is an alumnus of University of South Florida and the Executive Management program at MIT Sloan School.

**Sustainable Innovations, Fairfax, Virginia, USA** ([www.sustainableinnovations.us](http://www.sustainableinnovations.us))

Sustainable Innovations is a US-based non-profit organization. SI aims to deploy innovations for social enterprises, to serve communities, and to advance charitable activities in the areas of health, water, education, and entrepreneurship. SI aims to capitalize on the strong affinity of expatriates in the USA for contributing to their home lands by promoting community development, supporting economic betterment of masses, and building bond between expatriates living in the North America and their native villages. In furtherance of the PPCP model, AG will seek sponsors from the natives and foundations in the US. AG has

successfully secured such funding in the past.

**Dr. Rajiv Gupta**, Dean of Engineering, Birla Institute of Technology and Science, is a recognized expert on rainwater harvesting in India. He pioneered the use of satellite images to automate the design process for the rainwater harvesting network. Dr. Gupta has been leading technology development for Aakash Ganga over the last 5 years

**Mr. Zhiping (Edward) Chen**, Program Officer and Senior Economist of the Goble Environmental Institute (GEI), is in charge of the projects in the fields of renewal energy, energy efficiency, eco-tourism, and organic agriculture. After Mr. Chen joined in the GEI, he accompanied the team of specialists from e3V, the Nature Conservancy, and GEI to Guangxi Zhuang and Tibet Autonomous Region, Sri Lanka for the site survey of the project locations in Feb. 2004.

**10. Scope for Replication/Use in Other Countries:** Sustainable Innovations is collaborating with the Worldwatch Institute, Washington DC, and The Global Environmental Institute (GEI), a non-governmental organization, established in Beijing in 2004. The GEI Sustainable Rural Development Program aims to achieve self-sustaining and ecologically-sound rural development by helping farmers establish the skills and technical capacity needed to strengthen their own communities.

## 11. Cost Estimates

| <b>Expenditures</b>  | <b>Amount (USD)</b> |
|--|---------------------|
| <b>1. Consultants/Specialists Services and relate expenses</b>   | 12,500              |
| - Program Lead (US), 5 Months  | 6,000               |
| - Technical Lead, 5 Months   | 40,000              |
| - Implementation Materials, Labor, Supervision   | 1,000               |
| - Technical Writer, Accountant   | 5,000               |
| - US-China Travel, 2 trips   | 1,500               |
| - Local Travel   |                     |
| <b>2. Service Contractors such as translator, assistant researcher, secretary, etc.</b>  | 500                 |
| - detailed remuneration for each of the service contractors to be engaged for the project  |                     |
| <b>3. Conferences, workshops, seminars, surveys, and related expenses</b>  | 2,000               |
| - detailed expenses such as transportation of participants, venue, food and accommodation, cost of resource persons/speakers, etc. |                     |
| <b>4. Purchasing and/or renting of office equipment and supplies for direct use by the project</b>                                 | 1,000               |
| <b>5. Rental and associated costs for office space</b>   | None                |
| <b>6. Other costs such as reports and communication</b>  | 500                 |
| <b>Total estimated cost</b>  | 70,000              |
| <b>Less Government and Beneficiary Contribution</b>  | 20,000              |
| <b>PDA Grant request</b>   | <b>50,000</b>       |

