2030
WATER
RESOURCES
GROUP

A Catalogue of Good Practices in Water Use Efficiency

A Pilot Phase Report

Prepared for
World Economic Forum Annual Meeting 2012
25-29 January, Davos-Klosters, Switzerland

Agricultural

Municipal

Industrial

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Foreword

We are pleased to present this pilot catalogue of good practices on water use transformation, undertaken by Stockholm International Water Institute (SIWI) on behalf of the 2030 Water Resources Group (WRG), with direct support from the International Finance Corporation (IFC) and Nestlé SA.

The WRG aims to provide tools to assist in the analysis of water availability issues and identification of cost-effective levers for bringing abstractions back in line with natural renewal.

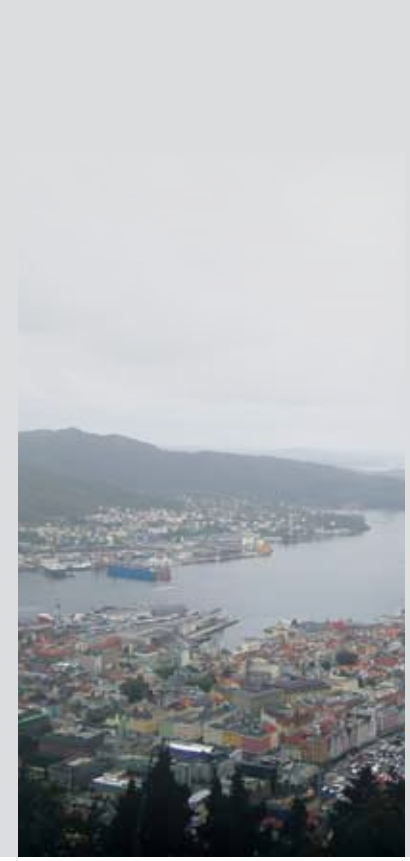
The water cost curve developed by McKinsey in cooperation with IFC and a group of private companies is a major part of our proposed analytics toolkit.

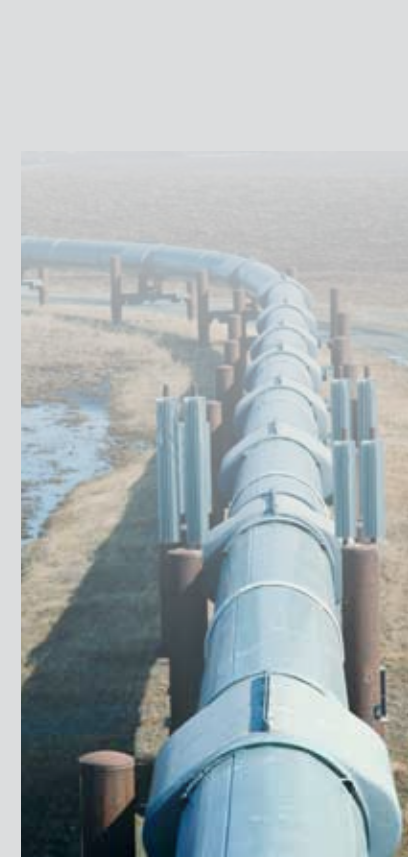
It is then up to governments and watershed authorities in dialogue with watershed stakeholders to develop strategies with priorities and concrete implementation plans. Water is local, there are no global solutions.

For successful implementation, governments and operators may need to learn from existing good practices, obtain advice from practitioners or identify suppliers of specific solutions and broader strategic consultancy (both commercial and not-for-profit).This pilot catalogue is planned as a key instrument in this regard, firstly through providing a learning tool and helping to focus exchanges between governments and operators, and secondly as a source of advice and solutions. It is an open-source instrument, open also to those who have effective practical solutions, ideas and concepts on offer, whether for-profit or not-for-profit and including existing or innovative new ideas. As we are addressing a significant challenge, we need all the advice and knowledge that is available today to develop sustainable solutions for water scarcity. Building on this pilot, we plan to develop the catalogue in two directions: gradually extending it to cover the whole range of water cost-curve levers and also inviting more expert knowledge from the international water community in relation to specific levers.

We thank SIWI and, in particular, the three governments of Jordan, the state of Karnataka and South Africa for developing this pilot catalogue that will guide further work.

Mr. Lars Thunell, CEO, IFC
Mr. Peter Brabeck-Letmathe, Chairman, Nestlé SA





Introduction

Building on the economic analysis and cost curve levers in 2030 Water Resources Group (WRG)'s 2009 *Charting Our Water Future* report[1], and to help governments access information, WRG has been collaborating with the Stockholm International Water Institute (SIWI) on the development of a pilot open source public-private catalogue of good practices on water use transformation. In its final form, the catalogue will include international and local good-practice examples, expertise, advice and innovations in water demand and supply management improvement across the key sectors and technologies, organised around economic analysis to be provided by WRG. This knowledge base has been requested by governments and fits with WRG's goal of increasing government and business access to local and international good practices.

In this pilot phase, WRG has worked with three partner governments – Jordan, the state of Karnataka and South Africa – to identify three priority levers of action in each government's water use transformation space, with each lever corresponding to ones in WRG's *Charting Our Water Future* report.

Using the priority levers proposed by the three partner governments, SIWI then identified local and international good practice projects, advisors, suppliers and partnering arrangements, including technical and policy solutions to support governments as they implement water sector reforms. Notably, the good practice project information presented here can be relevant to a number of governments and not just the government that proposed the priority levers.

The nine "good practice" projects illustrated in this catalogue represent well-documented applications and cover a wide geography including Australia, USA, India and South Africa. A good practice project is a project that demonstrably improves the efficiency or productivity of water use (through water savings and/or yield increase). It will have been implemented in the field and will have demonstrated or have the potential for transferability to other appropriate settings. Additionally, project implementation should not create any negative external impacts. Due to the pioneering nature of water use efficiency in many sectors such as agriculture, some good practice project examples remain in the demonstration phase.

The "good practice" projects presented in this pilot catalogue represent a sub set of the varied and impressive efforts to manage water more efficiently across a number of sectors and at different scales in arid and semi-arid regions. The drivers to implement water efficiency improvements are many and include legislation, water security, risk management, environmental and health damages, cost saving potential, enhancement of livelihoods and the desire to improve productivity and be more competitive. The indirect benefits of managing water more efficiently transmit to energy savings.

The delivery agents for the efficiency improvements are varied and will include a mixture of governments, businesses, NGOs and external catalysts such as international development organisations. In practice, water use efficiency and productivity solutions will be supported by collaborative action by these agents.

This pilot catalogue contains an indicative list of delivery agents linked to each case study, who can act as advisers, evaluators or solution providers. In this way, the catalogue can be used as part of one of the many steps towards building collaborative action and the development of a country strategy for water supply and demand management.

Other providers and advisors (international, national, regional or local) do exist, but have not been included in this overview, which merely gives examples of the competence available. The catalogue does not represent an endorsement of a particular provider or adviser, nor does SIWI provide any judgment on the capacity of those included.

[1] *The Charting Our Water Future* report can be accessed at www.2030waterresourcesgroup.com/water_full

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Index of Referenced Organisations

ABCD
Aakruthi Agricultural Associates of India
ABA Apparel
Accion Fraterna
Adroit Environmental Consultants Ltd
Axiom Blair Engineering
Comptex BD Ltd
Cosmopolitan Industries (Pvt.) Ltd
Delta Lake Irrigation District

EFGH
Emfuleni Local Municipality
Fakir Knitwear Ltd
GIZ
Hamza Textiles Ltd.
Harlingen Irrigation District
Cameron County No. 1
Hennes & Mauritz

IJKL
International Crops Research Institute for the Semi-Arid Tropics
International Development Enterprises India
International Finance Corporation
International Fund for Agricultural Development
Interstoff Apparel Ltd
KappAhl
Knit Concern Ltd
Levi's
Lindex

MNOP
MicroFibre/Liberty
Mothercare
MultiFabs Ltd
Nestlé
Netafim
North American Development Bank
Platinum Consultants

QRST
Reed Consulting (Bangladesh) Ltd.
S.F. Washing Ltd.
Sasol New Energy Holdings
Shree Cement
Solidaridad
State Farms Corporation of India
Texas A&M University Kingsville
Texas AgriLife Extention Services
Texas Water Development Board

UVWXYZ
United States Bureau of Reclamation
United States Department of Agriculture
Utah Knitting & Dyeing Ltd
Water Corporation
WE Fashion
WK Construction
WRP (Pty.) Ltd

Partner Governments

In this pilot phase, Water Resource Group has been reaching out to three partner governments – **Jordan, the state of Karnataka** and **South Africa**, to identify their priority areas of action in the water use transformation space.

A Jordan
B South Africa
C Karnataka

Agricultural

Crop Selection:

Drought-Tolerance – India

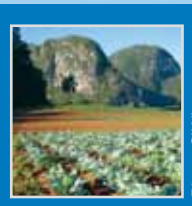
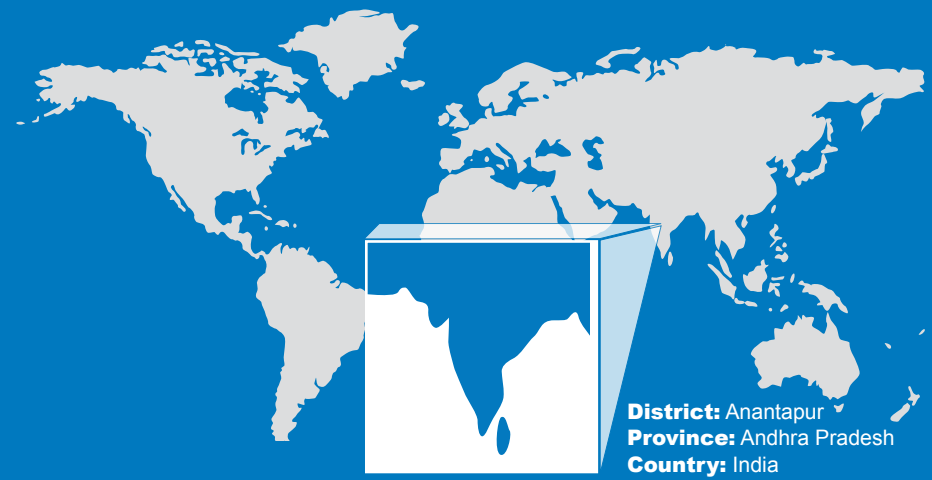


Photo: SIWI



PROJECT OVERVIEW

Groundnut is the third most important oilseed crop in India, with production concentrated in semi-arid tropical regions, most of which are rain fed and thus very vulnerable to drought. Low and erratic rainfall, frequent drought and poor soils contribute to declining groundnut productivity. Low farm productivity and crop failure can lead to unsustainable livelihoods for the poor landless and small farm households. Drought can bring about a 24-58 per cent decline in income and a 12-33 per cent rise in head-count poverty ratio over a normal agricultural year[1]. In addition, a severe drought reduces seed availability for the next cropping season, hence affecting future agricultural productivity.

The Anantapur district is one of the most important groundnut producing districts in India but also one of the most drought-prone in peninsular India. Its groundnut area ranges between 0.8-1.0 million ha, only 11 per cent of which is irrigated. The dominant groundnut variety is TMV 2, which was released 70 years ago. The problems with groundnut production in Anantapur are indicated by[2]:

1. Low yields that never exceed 1 tonnes/ha.
2. High and increasing variability in yield from 27 per cent during the 1965-1985 period to 43 per cent during the 1986-2007 period.
3. Increased probability of yield falling short by 20 per cent or more below the trend from 23 per cent in the 1965-1985 period to 32 per cent during the 1986-2007 period.

The development of drought-resilient crops is considered an effective long-term solution for the reduction of production risks to farmers without compromising crop yield. In the last two decades, the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) has developed groundnut varieties with higher productivity and greater capacities to withstand moisture stress. In 2002, ICRISAT collaborated with Accion Fraterna (AF), a local NGO operating in 230 villages in Anantapur, on the introduction of 10 new drought-tolerant varieties in two villages through farmer-participatory varietal selection trials. These trials showed that ICGV 91114 performed better than the other new varieties. Further trials were conducted in a number of other villages at a variety of times – e.g. beginning, during, and post-rainy seasons. By 2010, ICGV 91114 had been cultivated in most villages where AF operates.

The International Fund for Agricultural Development has funded ICRISAT projects on the dissemination of improved drought-tolerant groundnut cultivars. Accion Fraterna, Aakruthi Agricultural Associates of India and the State Farms Corporation of India (SFCI) are supporting partners in seed multiplication and distribution.

[1] Bhandari, HS, Pandey, R, Sharan D, Naik I, Hirway SK, Taunk and Sastri A. 2007. Economic costs of drought and rice farmers' drought coping mechanisms in eastern India: pages 43-112 in Pandey S, Bhandari H and Hardy B (eds.) Economic Costs of Drought and Rice Farmers' Coping Mechanisms: A Cross-country Comparative Analysis. Los Banõs, Philippines: International Rice Research Institute.

[2] Birthal, P.S., Niga,, S.N., Narayanan, A.V., and Kareem, K.A. 2011. An Economic Assessment of the Potential Benefits of Breeding for Drought Tolerance in Crops: A Case of Groundnut in India. Research Bulletin no. 25. ICRISAT.

COSTS

Farmer's total production cost per hectare using ICGV 91114 is Rs 9235, which is 17 per cent higher than TMV 2. When the increased productivity of using ICGV 91114 is taken into account, the unit cost of production of ICGV 9114 is 5 per cent less than TMV 2.

RESULTS

The new variety ICGV 91114 is preferred by farmers due to its higher pod and haulm yields, better kernel size, uniform maturity, and its ability to tolerate mid-season and terminal drought. The ability of ICGV 9114 to withstand mid-season drought implies its ability to utilise available water more efficiently, while its shorter growth period helps it to escape terminal drought. Better haulms of ICGV 9114 provide excellent fodder for livestock. Another advantage of ICGV 9114 seed is its higher resistance to insect pests and foliar diseases compared to other existing varieties.

The adoption of the drought-tolerant ICGV 91114 has resulted in an average pod yield increase of 23 per cent (during 2004-2005 to 2008-2009). The average haulm yield is 28 per cent higher than that of TMV 2, which results in higher body weight in sheep and higher milk production in cows. It also reduces yield variability by 30 per cent and generates 36 per cent higher net income compared to TMV 2.

The current adoption rate is estimated at 3.2 per cent in 2008-2009. It is envisaged that a 35 per cent adoption rate of the new variety will generate a surplus of Rs 694 million per annum, in which 65 per cent of the surplus is attributed to higher yield and 35 per cent to lower variability in yield, even when risk benefits are taken into account. The adoption of the new variety which improves and stabilises yield will reduce farmers' vulnerability to climatic shocks.

Appropriate institutional arrangements for multiplication and distribution of seeds would advance the adoption rate of ICGV 91114. The very high seed requirement for ICGV 91114 produces very high costs of seed multiplication, acquisition, processing, storage and distribution, which hinders private sector engagement in groundnut seed production. Therefore, public sector involvement in the multiplication and distribution of seeds at the village level is highly important. Furthermore, existing old varieties whose genetic potentials have deteriorated need to be phased out of the market.

Supervisory Control and Data Aqusition (SCADA) Systems:

Flow Measurement and Control – USA

Photo: SIWI

PROJECT OVERVIEW

The Harlingen Irrigation District covers 38,000 acres (15,379 ha) of irrigated area in Cameron County, Texas. The average annual water diversion is 52,000 acre-feet/year (64 million m^3/year) for irrigation use. The main pumping plant diverts water from the Rio Grande near the town of Los Indios. The district has 57 miles of main canal, over 180 miles of irrigation pipeline, 44 re-lift pumping stations, and three storage reservoirs. These infrastructures are owned and operated by Cameron County. A number of crops are grown in the area, such as sugarcane, citrus, cotton, corn, vegetables, turf grass, and specialty crops. All farms are privately owned and the majority of them are irrigated by furrow irrigation through polypipe field distribution systems, although some drip and /or micro-jet systems, as well as overhead sprinkler operations are found on turn farms. It is estimated that the water delivery efficiency is around 75-80 per cent[1].

To enhance water delivery efficiency to end users, the Harlingen Irrigation project focused on developing state-of-the-art irrigation water distribution network control and management coupled with on-farm irrigation techniques and management systems in a large-scale demonstration of cost-effective technologies. All programmes aim to enhance irrigation water delivery efficiency and maximise on-farm surface water use efficiency to respond to the increasing water use demand and scarcity. The information provided by the flow measurement devices is facilitating the transformation of the district to volumetric pricing of irrigation water.

A number of projects have been implemented to improve flow measurement, calibration and control by using the SCADA system[2], namely:

1. A District and On-Farm Flow Meter Calibration (FMC) and Demonstration Facility.
2. On–farm Flow Measurement Data Collection using an automated metering and telemetry system.
3. Demonstration of internet-based information on real-time flow, weather and water user accounting systems.
4. Innovative Technologies for Agriculture (ITA) that include: the design of low cost automatic gates for irrigation canals and the design of a low-cost Remote Telemetry Unit (RTU) for water level measurement and soil moisture management using radio frequency telemetry.

The first three projects are carried out within the Agricultural Water Conservation Demonstration Initiative (ADI). They started in 2004 and will run to 2014 in collaboration with the Texas Water Development Board in the lower Rio Grande Valley[3]. The ITA program was a two-year project, completed in 2011.

The FMC facility allows ADI to simulate irrigation system options that would lead to higher water conservation. The facility functions as a training centre where various actors and operators can learn about pumps and automatic controls, calibration of measuring tools, manual collection of data on water use and programmable logic controllers (PLCs) for canal automation.

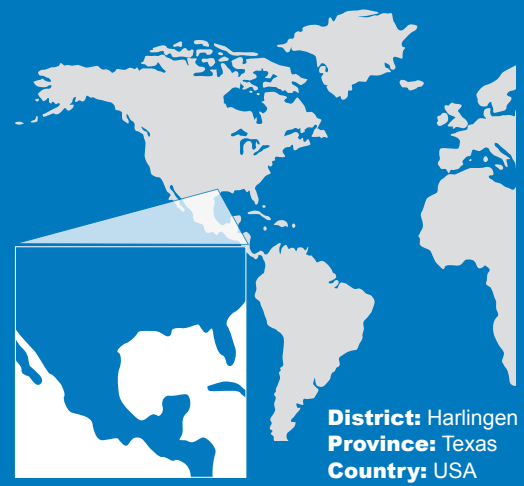
The on-farm flow measurement data collection project compares manually-collected meter information with the data from automated metering and telemetry systems. The telemetry system constantly monitors the deliveries of irrigation water and this information is then displayed in real-time over the internet. This telemetry system has become the backbone of the irrigation system that enables the development of other water conservation projects.

A low-cost automatic gate is used to control flow in irrigation canals.

[1] www.hidcc1.org/node/57

[2] Supervisory control and data acquisition (SCADA) is a system that allows an operator to monitor and control processes that are distributed among various remote sites. SCADA systems allow remote sites to communicate with a control facility and provide the necessary data to control processes.

[3] Halbert, W. 2008. Agricultural Water Conservation Demonstration Initiative: Three Year Summary report for the Texas Water Development Board. Maximisation of On-Farm Surface Water Use Efficiency by Integration of On-Farm Application and District Delivery Systems. www.texasirrigationexpo.org/images/HID_Year-3_Report_Final.pdf



Traditionally, the gate is raised or lowered manually in order to achieve a target flow rate within a specific time period. The automation enables canal gates to be raised or lowered without visiting the site and also enables frequent adjustments to maintain flow rates within a target range as water levels fluctuate within the system. Automatic gates are commercially available but are often too expensive to be economically viable. This project has resulted in the design of automatic gates that can be readily manufactured locally, assembled, and installed[4].

The software of the SCADA system used for the automated gate control was uniquely designed by Harlingen Irrigation District using an open source program; hence the design and maintenance of the software entails lower costs than the privately designed SCADA system. Furthermore, the program allows for easy maintenance that suits the local context.

The device for water level measurement is used as a controller for the automatic gates and as a transmitter for the data on field level soil moisture. Ten devices were installed in the field and the associated SCADA system software was modified accordingly. Each of the devices is powered with an external solar panel that recharges its battery system.[5]

The soil moisture management uses low-cost PLC and score board. The information is linked to the telemetry and then provided in real-time and can be controlled from a central office.

Texas AgriLife Extension Services, Axiom Blair Engineering, and Texas A&M University Kingsville provided consulting services for the projects. Technology providers engaged in the projects are Axiom Blair Engineering for the design, engineering, and production of the automatic gate control; and USDA's EPANET software for analysing the hydraulic and water quality behaviour of pressurised pipe networks.

COSTS

The ADI was launched with a USD 3.7 million grant funded by the Bureau of Reclamation and NAD Bank along with the matching funds from the district.[6] As of 2009, USD 1.63 million of funds and USD 2.54 million of matching funds have been secured to implement the projects. These matching funds have been provided by the Harlingen Irrigation District, Texas A&M University Kingsville, Delta Lake Irrigation District, USDA-EQIP, Netafim, and Axiom-Blair Engineering. The ITA program was supported with a USD 249,000 grant from the Texas Water Development Board and matching funds of USD 249,000 from the Harlingen Irrigation District.

As shown by the funds committed to projects, the estimated cost efficiency is USD 0.13 per m^3 of water savings[7].

RESULTS

The ADI program has demonstrated that it is possible to conserve water without losing money or impacting the quality of a crop. On-farm level surveys conducted in 2009 and 2010 revealed that those various water conservation technologies have resulted in an average of 32.5 per cent reduction in irrigation water and 48.2 per cent reduction of surface run-off. In total, 34.8 per cent of water savings were achieved[8].

The success of the automatic gates for irrigation canals has generated a demand from other irrigation districts, such as El Paso County and Lower Colorado Region. As a result, the technology has now been delivered or adopted by other irrigation districts.

The performance of the soil management system is still presently being evaluated.

[4] Awblair Engineering, 2010, Draft Report: Low Cost Automatic Gates for Irrigation Canals. Prepared for the Harlingen Irrigition District under a Texas Water Development Board Grant. Innovative Technologies for Agricultural Water Management and Flow Measurement.

[5] Awblair Engineering, 2010. Draft Report: Low Cost RTU for Water Level Measurement. www.hidcc1.org/files/TWDB-ITALC-RTU_red.pdf

[6] Harlingen Irrigation District Newsletter Volume no. 7, December 2007. www.hidcc1.org/files/Newsletter%20December%202007.pdf

[7] The cost efficiency is estimated with 5 per cent interest rate and 10 years lifetime of the devices.

[8] Harlingen Irrigation District Newsletter Volume no. 11-1, April 2011. www.hidcc1.org/files/News%20Letter%20April2011_FINAL_For%20Web.pdf

Micro Irrigation Systems:

Affordability for Small Farmers – India

Photo: IDEI

PROJECT OVERVIEW

More than 70 per cent of Indian farmers cultivate plots less than one hectare and they are constrained by the absence of simple and low-cost irrigation technologies suited to smallholder farmers. Existing technologies are expensive and designed for use in larger farms.

International Development Enterprises India (IDEI) was created in cooperation with the global IDE family to develop small-scale irrigation and rural mass marketing of simple, affordable, appropriate and environmentally sustainable technologies. IDEI is supported by a number of governmental and private donors, such as Acumen Fund, Bill and Melinda Gates Foundation, and Rabobank Foundation. It adopts commercial business approaches to ensure the sustainability of its programs.

IDEI saw a demand for low-cost technologies suitable for small scale farmers and, in response, developed low-cost water lifting and water application technologies, to be used for irrigation by smallholder farmers. In areas with shallow water tables, IDEI promotes the use of a manually operated water-lifting device called the treadle pump (also known as pedal pump). In semi-arid areas, IDEI has developed and introduced drip irrigation technologies (KB Drip) which are used by farmers for growing both horticulture crops and cash crops. IDEI has a strong market-based approach and works through a network of manufacturers, dealers and installers who sell the products to smallholder farmers.

When using the KB Drip, a farmer can irrigate more cultivated area per unit of water used as it requires 50-80 per cent less water when compared with traditional surface irrigation systems.

The slow and regular application of water maintains optimum moisture at the root zone, which improves plant quality and yield increases by 30-50 per cent. IDEI's water application technologies are low cost, available in small packages, operate at very low pressure and are easy to operate. Since they have a low initial cost, they remove the uptake barrier for small farmers to adopt drip irrigation.

COSTS

Investment costs range between USD 30 and USD 42 for a low-cost treadle pump and between USD 120 and USD 240 per acre for the KB drip irrigation system depending on the crop type. The cost for the drip irrigation system is about one fifth of the price of traditional drip systems.

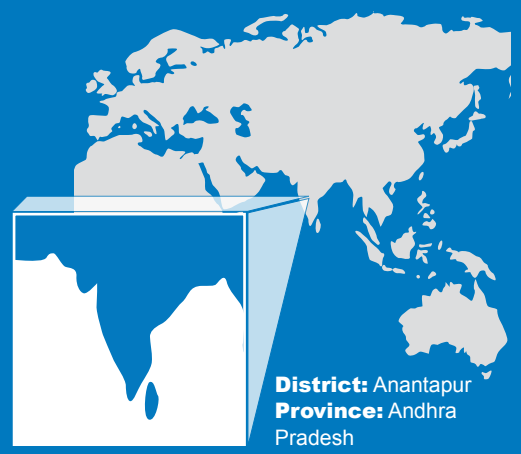
The variable costs for a standard irrigation kit range from USD 4 for 20m^2 of irrigated area to USD 40-USD 80 for 1,000m^2 of irrigated area.

IDEI understands affordability and aims to keep the cost of all its products to under 10 per cent of the average annual income for the region. This is inexpensive enough to be affordable, but substantial enough to cover production costs for the company and supply chain margins. This approach also ensures that families who purchase the systems will use them to improve the water efficiency and productivity of their farms. If the products were distributed for free to farmers, some might receive them but not use them as intended (they could for example sell them on for the purpose of making money).

As an illustration, the use of drip irrigation in Erode area has shown a cost effectiveness of USD 0.08 per m^3 water savings for banana and sugarcane crops.[1]

RESULTS

The treadle pump and drip irrigation systems are being used by 1.25 million smallholder farmers. Additional yield is reported at between 50 to 100 per cent. The increase in net returns from additional vegetable production was reported up to several times the investment cost.[1] USD 2.3 million of water savings plus USD 10.5 million of electricity savings have been made.[2] A 75 per cent increase in water use efficiency has been reported[3] (i.e. water needed for 4 acres under drip is sufficient for just 1 acre under flood irrigation), along with water savings of 5.2 billion m^3 (by March 2011).[4] Though there are substantial water savings due to KB Drip, absolute savings in water are not visible as most farmers prefer to use the water saved to either increase area under drip irrigation or undertake higher intensity of cropping, thereby boosting agricultural production.



District: Anantapur
Province: Andhra Pradesh
Country: India

Challenges for IDEI include the lack of farmer awareness of the IDEI products and the need for products to be designed to local conditions. To address these challenges IDEI markets their products in three different segments; i) Farmers engaging in irrigated agriculture for the first time; ii) Farmers who have previously used other drip irrigation systems, but had a negative experience; iii) Farmers who are using flood irrigation.

According to IDEI customer satisfaction surveys, 20 per cent of the farmers spent some or all of their additional earnings on education for their children, while 15 per cent of the farmers spent them to improve their family's health.

Once the smallholder farm families are able to meet their basic needs and can access micro-credit, they are also able to engage in asset building such as the purchase of land, cattle, jewellery etc.

For many farmers, the increased incomes also enable them to pay off debts. Other social impacts include farmers' children having three meals a day with a balanced diet, higher expenditure on health care, children staying in school[5], reduced rural-urban migration and increased social status of women-headed households. Regarding environmental impacts, the average annual CO_2 emission abatement of KB Drip adoption would be 675 kg/acre/year, due to reduced use of fuel.[6]

IDEI has received a number of national and international awards for their work, including the Tech Museum Award 2010 and 2004, Zayed Future Energy Prize 2010, Ashoka Change Maker, 2006 and The Templeton Freedom Prize, 2005. Apart from working in India, IDEI is also active in projects in 13 other countries worldwide.

1 Estimated from the data in TERI, 2007, Socio-economic-techno-environmental assessment of IDEI products: low cost KB Drip. Project Report No. 2006RR24.

2 Keller, J., and Roberts, M. 2004, Household-level irrigation for efficient water use and poverty alleviation, In: Seng, V. Craswell, E., Fukai, S. and Fischer, K. Water and Agriculture, ACIAR Proceedings No. 116e.

3 IDEI, 2011.

4 Symbiotec Research Associates, 2008. From Desperation to Drip Irrigation.

5 Couton, A. 2007. A Fairy Tale for All? A Rapid Assesment for IDEI's Teadle Pump Programme in Uttar Pradesh, and its impact on childrens welfare. Acumen Fund.

6 TERI, 2006. TERI Energy Data Directory and Yearbook. Tata Energy Research Institute.

Delivery Agents – Agricultural

Company	Range of Services	Head Office Contact Details
International Development Enterprises India (IDEI)	IDEI is a non-profit enterprise that creates demand for affordable pumping and irrigation technologies and ensures a sustainable agricultural supply chain. It develops small scale irrigation and rural mass marketing of simple, affordable, appropriate and environmentally sustainable technologies to small and marginal farm families through private marketing channels.	International Development Enterprises (India) C 5/43, (1st & 2nd Floor) Safdarjang Development Area New Delhi, 110016 T: +91 11 4600 0400 F: +91 11 4600 0444 Email: mailbox@ide-india.org www.ide-india.org
Netafim	Netafim has developed efficient drip and micro-irrigation technology since 1965. The company focuses its business lines on smart drip and micro irrigation solutions for agriculture and landscape; and tailor-made greenhouses that maximises agricultural factor and technological innovations.	Netafim Ltd. Corporate Derech Hashalom 10 Tel Aviv, Israel 67892 T: +972 8 6474 747 F: +972 8 6473 983 www.netafim.com
Rubicon Water	Rubicon Water combines powerful water management and control software with the design and manufacture of irrigation automation hardware – including a wide range of automated gate, meter and SCADA products.	Rubicon Water 1 Cato Street, Hawthorn East Melbourne VIC 3123, Australia T: +61 3 9832 3000 F: +61 3 9832 3030 Email: enquiry@rubiconwater.com www.rubiconwater.com
Campbell Scientific	Campbell Scientific provides technology and consulting services for SCADA systems, which consist of a supervisory computer running HMI (Human-Machine Interface) software and control units performing data acquisition and control functions. The control units make measurements as well as report back to and execute commands from the supervisory computer.	Campbell Scientific Australia 16 Somer St, Hyde Park, Townsville, Queensland 4812 Australia T: +61 7 4772 0444 F: +61 7 4772 0555 www.campbellsci.com.au
Sutron Corporation	Sutron Corporation designs, manufactures, installs, and supports remote real-time monitoring and control products for hydrological, meteorological and oceanic uses, especially in extreme environments. Its user-friendly data acquisition products and turnkey systems include all telemetry formats (i.e., wireless communications such as satellite, LOS radio, telephone, and secure internet) sensors and customised Oracle-based software.	Sutron Corporation 22400 Davis Drive Sterling, Virginia 20164, USA T: +1 703 406-2800 F: +1 703406-2801 fax Email: sales@sutron.com www.sutron.com
Bayer CropScience	Bayer CropScience provides technology in the area of crop protection, non agricultural pest-control (environmental science), and seeds and plant biotechnology (bioscience).	Bayer CropScience AG Alfred-Nobel-Str. 50 D - 40789 Monheim am Rhein Germany T: +49 21 7338 www.bayercropscience.com

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)	ICRISAT is a non-profit organization that conducts agricultural research for development in Asia and sub-Saharan Africa with a wide array of partners throughout the world. ICRISAT conducts research on five highly nutritious, drought-tolerant crops – chickpea, pigeonpea, pearl millet, sorghum and groundnut.	ICRISAT-Patancheru Patancheru 502324 Andhra Pradesh, India Tel: +91 40 30713071 Fax: +91 40 30713074 E-mail: icrisat@cgiar.org www.icrisat.org
Seedquest	Seedquest is an information website for global seed industry. It provides information on various seed suppliers (breeders and multipliers) and relevant technologies (laboratories, treatment products and equipments) for seed companies. Amongs others, it focuses on areas such as crop protection, seed biotechnologies, seed colorants and polimers, seed enhancement, seed processing equipment, seed treatment and vegetable seed.	T: +1 510 482 5560 Email: info@seedquest.com www.seedquest.com
Texas AgriLife Extension Services	Texas AgriLife Extension Services is part of Texas A&M University System that provides community-based educational services, consulting and research services through its grazingland animal nutrition laboratory; soil, water, and forage testing laboratory; Texas plant disease diagnostic laboratory; and Texas wildlife services.	Agriculture and Life Sciences Building 600 John Kimbrough Boulevard, Suite 509 , 7101 TAMU College Station, TX 77843-7101 USA T: +1 979 845-7800 F: +1 979 845-9542 Email: agrilife@tamu.edu http://agrilifeextension.tamu.edu
Syngenta AG	Syngenta has expertise in plant breeding, crop protection and seed care to deliver solutions designed to bring plant potential to life. It helps growers to produce premium crops and minimize the use of natural resources. The company has a broad range of products in crop protections, high quality seeds, and plant health solution for lawns and gardens.	Syngenta International AG P.O. Box, CH-4002 Basel Switzerland T: +41 61 323 11 11 www.syngenta.com
New Holland Agriculture	New Holland provides solutions that improve farming efficiency and productivity by using accessible technologies. The company offers cash crop producers, livestock farmers, contractors, vineyards and groundcare professionals the largest choice of easy-to-operate tractors, harvesters and material handling machinery and equipment.	New Holland Agriculture c/o CNH America LLC 621 State Street Racine, WI 53402, USA T: +1 866 639 4563 Email: na.topservice@newholland.com www.newholland.com
Jain Irrigation	Leadership in diverse products like Micro & Sprinkler Irrigation, Agricultural Inputs, Agro-Processed Products, Plastic Pipes & Sheets.	Jain Plastic Park, NH No. 6, P.O. Box : 72, Jalgaon - 425 001 Maharashtra, India T: +91 - 257 - 225 8011 F: +91 - 257 - 225 8111 www.jains.com

Delivery Agents

This is an indicative list of “delivery agents” (private, public and NGO entities) who can act as advisers, evaluators or solution providers. Other providers and advisors (international, national, regional or local) do exist, but have not been included in this overview, which merely gives examples of the competence available. It does not represent an endorsement of a particular provider or adviser, nor does SIWI provide any judgment on the capacity of those included.

Municipal

Water Pressure Management:

Reduced Water Loss – South Africa

Photo: SIWI

PROJECT OVERVIEW

By means of a public-private partnership between the Emfuleni Local Municipality and consulting firm WRP (Pty) Ltd., innovative pressure management technology was applied to the water supply system of Sebokeng and Evaton, two low- to medium-income residential areas. The project aimed to reduce water losses by controlling the pressure in the water distribution network, as well as lowering the costs of supplying water by reducing the energy requirements for pumping. A prior assessment had identified excessively high pressure in the water distribution network relative to demand, particularly during off-peak hours. This was causing damage to pipes and fixtures, leading to high levels of water leakage and wastage, as well as high costs to repair or replace damaged assets.

An advanced pressure reduction installation was constructed during a nine-month period from January 2005 to September 2005. This plant is among the largest single water pressure management installations in the world. The advanced pressure management system lowers the pressure in the water supply system during off-peak periods and allows it to be reduced further at night when full pressure is unnecessary. Lower pressure in the system substantially reduces water leakage.

District: Sediberg
Province: Gauteng
Country: South Africa

COSTS

The capital cost of the installation was USD 800,000, with additional running costs of USD 700,000 over the 5-year project period. The payback period on the initial capital cost was only two months.

The cost effectiveness of the measure is shown by the estimated marginal cost of the project at USD 0.08 per m^3 of water savings[1].

RESULTS

The project resulted in water savings of approximately 10 million m3 per year, leading to a 25 per cent reduction in the quantity of water required from the bulk water supplier, Rand Water.

Monetary savings of approximately USD 20 million were achieved over the 5-year project period. Approximately 15 per cent of these savings accrued to the implementing agent and 85 per cent to the municipality. The savings are expected to continue beyond the contract period, with projected savings of USD 3.8 million per year for the next 15 years, accruing 100 per cent to the municipality.

Savings have led to the municipality having excess funds available to restore the sewage treatment plant to working order.

Average flows entering the treatment plant reduced from 2,500m^3/h before the installation to 1,800m^3/h afterwards.

The project has also yielded energy savings of 14.25 million kWh per year.

Local labour was hired for the implementation of the project, providing much-needed job opportunities, and labour-based construction practices were used throughout the project.

As establishment of a 24-hour water supply is a prerequisite for successful water supply network pressure management, the network was improved where necessary and the local community now has uninterrupted water supply in almost all areas.

The project showed that public-private partnerships can be viable on a relatively small scale, contrary to the general view that PPPs are only viable for large-scale initiatives, due to the generally high transaction costs.

This was one of the first performance contracts of this type with a shared savings model in the water sector in sub-Saharan Africa.

[1] The marginal cost is estimated at 10 per cent interest rate and 10 years of asset's life.

Leakage Control:

Utility Management – South Africa

Photo: Annika Börje

PROJECT OVERVIEW

Emfuleni Municipality has a population of about 1.2 million people and an area of 987km^2. It is a largely urbanised municipality, with a relatively high population density compared with other local municipalities. High levels of water leakage, mostly in households but also in the water supply network, threaten the viability of the municipal-owned water services utility, Metsi-a-Lekoa. A skills shortage and lack of funds have rendered the municipality unable to solve the leakage problem and the level of water loss is estimated at 44 per cent. Thus, the purpose of this project is to achieve water savings through improved water conservation and water demand management in the municipality.

GIZ, the implementing agency of the German Federal Ministry for Economic Cooperation and Development (BMZ), and Sasol support the Emfuleni Local Municipality (ELM) to repair water leaks initially in 20,000 homes and public buildings (phase 1), in order to reduce water wastage and make more water available for both domestic and industrial use. Sasol is a South African technology-driven alternative fuels and chemicals company and today has grown to become South Africa's leading fuel provider and an international player in the energy and chemicals sectors. Its Sasolburg industrial complex is located near the Vaal River, a major tributary of the transboundary Orange-Senqu river system.

Leaking pipes, taps, toilets and valves will be repaired or retrofitted, starting in January 2012. Ongoing savings on the municipal water bill due to this project will be ring-fenced and used to fund the ongoing retrofitting and leak repair project for at least three years (phase 1+2). This will then also include pressure reduction initiatives and repair of water supply network pipes. Skills development will be conducted to train local people in repair and retrofitting work in collaboration with existing plumbing and civil service providers. The appointed consultant, WRP Consulting Engineers (Pty) Ltd., a Miya Group Company under contract with Sasol, will partner with the Orange-Senqu River Commission (ORASECOM) and the Department of Water Affairs (DWA) to develop and implement the training programme. This partnership project also aims to increase public awareness of water issues and conservation measures through school educational and community awareness campaigns.

Sasol will provide procurement, project management and cost control support functions for the project. GIZ will contribute through the development of human, institutional and organisational capacities and by providing an independent auditing function to keep track of the savings resulting from the project.

The potential water shortage in the Vaal (Lekoa) River has been identified as a risk to Sasol, which has identified this partnership opportunity on water conservation as a potential risk mitigation measure. GIZ is a partner of the Southern African Development Community (SADC) and ORASECOM, and supports water conservation initiatives in riparian states, with a view to promoting equitable sharing of water resources. GIZ is seeking to support public-private partnerships as an additional promising means of development cooperation.

Apart from the direct risk mitigation perspective, Sasol also intends to use this opportunity to develop a model in conjunction with the Department of Water Affairs and other stakeholders for offsetting water savings achieved in, inter alia, the municipal sector (outside its own operational boundaries) against potential water savings targets for the industrial sector. The costs involved in achieving water saving in the domestic sector may be as low as one per cent of that of achieving equal water saving in industry; thus, it is far more cost-effective for Sasol to support the municipality in reducing domestic water wastage.

The impetus for this project has been strengthened by a government directive that all municipalities supplied from the Vaal river must reduce their water consumption by 15 per cent between 2011 and 2014. Furthermore, there is a presidential directive to halve water losses in South Africa by 2014.

COSTS

Sasol will invest ZAR 5 million in this project, with an additional investment of ZAR 5 million from Germany (BMZ), Australia (AusAID) and the UK (DFID), which will be spend predominantly in the initial stage of the project. Thereafter, the Municipality will fund the ongoing scope of the three-year project through the ring-fenced savings achieved by the project. A preliminary financial analysis indicates that about two-thirds of this money will go towards labour costs, as the project is labour-, rather than technology-intensive.

The projected cost effectiveness of the project as shown by the investment cost is estimated at USD 0.016 per m^3 water savings[1].

RESULTS

The project is expected to yield water savings of 12 million m^3 per year by 2014, against the 2010 baseline usage of 81 million m^3 per year. This represents a 15 per cent improvement in water use efficiency, resulting in monetary savings of ZAR 62 million per year. Other expected benefits of the project include the following:

- Training and employment of local community members in water-related services will contribute to local skills development and job creation.
- Development of new or support of existing community plumbing entities will empower local entrepreneurs.
- The awareness campaigns will lead to a heightened consciousness on water conservation, which is hoped to improve water use practices in households.
- Reduced abstractions from the Vaal River will protect the viability of the river ecosystem and may increase water availability for the downstream users.
- A decrease in domestic leakage will reduce the hydraulic overload on the Waste Water Treatment Works, thus potentially improving the quality of the water downstream of the sewage reatment plant without plant expansions or upgrades.

[1] The cost effectiveness is calculated based on 10 per cent interest rate and 10 years lifetime of the equipment.

Wastewater Treatment and Reuse:
Wastewater Recycling – Australia

Photo: Michael Moore

District: Perth
Province: Western Australia
Country: Australia

PROJECT OVERVIEW

Western Australia is a dry state in a dry continent and the impact of climate change is predicted to bring about a 20 per cent decline in rainfall by 2030 and 40 per cent by 2060[1]. This implies that there will be reduced yields from existing dams and groundwater sources to meet a future increase in demand from rising population and temperature. For communities to adapt to a drying climate and become climate-resilient, a strategy of simply increasing water supply will be insufficient. Therefore, reduction in water use and water recycling also comprise part of Western Australia's portfolio of water options in its 50-year plan.

The Water Corporation is the principal supplier of water, wastewater and drainage services to households, businesses in Western Australia, as well as providing bulk water for irrigation. It works with regulators and customers to deliver water services to a large catchment area. In the year 2010-2011, it has delivered 360 million m^3 of water supply to two million people and treated 150 million m^3 of wastewater in 106 wastewater treatment plants[2]. Recycled wastewater is collected from some of those wastewater treatment plants. A target is set to achieve 30 per cent wastewater recycling in Perth and Mandurah by 2030 and a long-term goal of 60 per cent by 2060[3].

Wastewater recycling is an essential part of maintaining a reliable, sustainable and safe water supply for Western Australia. Increasing the amount recycled water is crucial to managing potable water resources efficiently while making the most of wastewater resource that often becomes 'wasted water'.

The range of wastewater recycling use options conducted by the Water Corporation are:

- Increasing water recycling to existing and new industry. Recycled water is delivered to support the mining industry that plays an important role in Western Australia's economy. Among others, recycled water is delivered to Boddington gold mine, BHP Billiton, and Alcoa refinery. In the future, the East Rockingham Wastewater Treatment Plant (WWTP) will be commissioned to serve the growing Rockingham Industrial Zone.
- Groundwater replenishment, where high quality recycled water is stored underground for future water supplies.
- Beneficial recycling of water to the natural environment.
- Irrigation of public open spaces and cultivated land.
- Dual reticulation system for residential use, such as flushing and gardening, where two separate pipes deliver two different qualities of water: drinking water supply and non-drinking water supply (recycled water).
- Improving water recycling in its own WWTPs and reducing freshwater intake by 10 per cent at its three largest metropolitan WWTPs and the Kwinana water reclamation plant.

The first fully fledged public private partnership in Western Australia was signed in August 2011 in which Helena Water was announced as the preferred consortium to fund, build and operate a new water treatment plant as part of the Mundairing Weir Water Supply Improvement Project. Helena Water comprises the Royal Bank of Scotland, Acciona Agua, United Utilities and Brookfield Multiplex. The consortium shall provide service for up to 37 years after which the plant will be handed over to Water Corporation in full operating condition.

[1] Water Corporation. 2009. Water Forever: Towards Climate Resilience.

[2] Water Corporation. 2011. Water Corporation Annual Report.

[3] www.watercorporation.com.au/W/water_recycling.cfm?uid=3534-8576-2335-1259

COSTS

Total investment costs for wastewater treatment including wastewater recycling in 2011 were AUD 140 million (USD 143.6 million).

Investment costs for Kwinana as one of the major water reclamation plant were AUD 28 million.

Water pricing policies entail 'full cost recovery for water services to ensure business viability and to avoid monopoly rents, including recovery of environmental externalities, where feasible and practical'. Urban and Regional Urban water suppliers have moved to upper bound pricing that reflects a return on new capital investment.

Based on the investment cost for Kwinana Water Reclamation Plant, the cost effectiveness of wastewater recycling is approximately USD 0.31 per m^3 of water savings.

RESULTS

13.3 per cent of wastewater has been recycled in the year 2010-2011 through 76 recycling schemes. This represents an increase of 1 per cent from 2009-2010.

In the Perth metropolitan area, the rate of water recycling is 7.5 per cent, an increase from 6 per cent in 2009. Wastewater recycling outside of the Perth metropolitan area is 50.2 per cent.

The dual reticulation system has been set for 1,500 houses.

The groundwater replenishment project has recharged 1.09 million m^3 of recycled water into the groundwater by December 2011 and it has reached its target of completing 85 per cent of trial objectives.

Subiasco WWTP produces 280 million m^3 of recycled water per year, which is used to irrigate 27 ha. at the McGillivray Sporting complex. Recycled water is also used to irrigate tree plantations in a number of locations. Among others, the Albany WWTP delivers recycled water to irrigate 450,000 Tasmanian blue gum trees, which are processed into woodchips for export.

Higher rates of recycled wastewater provide greater water security for basic needs, various economic activities and ecosystem services. The reduced amount of treated wastewater discharged to the environment will further protect the integrity of local water resources.

Delivery Agents – Municipal

Company	Range of Services	Head Office Contact Details
Netafim	The company provides technology products and services in engineering, hydraulic design and technical support.	Netafim Ltd. Corporate Derech Hashalom 10 Tel Aviv, Israel 67892 T: +972 8 6474747 F: +972 8 6473983 www.netafim.com
Siemens Water and Wastewater	Siemens Water Technologies for municipal purposes offer a large array of custom technologies and services to ensure flexible, cost-effective treatment solutions in infrastructure and treatment improvement, energy and solids management, and water reuse and desalination.	Siemens AG Wittelsbacherplatz 2 80312 Munich, Germany T: +1 866 926 8420 Email: information.water@siemens.com www.water.siemens.com
GE Water and Process Technologies	GE Water and Process Technologies provides water treatment, wastewater treatment and process systems solutions. GE's portfolio of water and process technologies includes separation equipment, membrane and filtration technology, monitoring solutions, analytical instruments, specialty chemicals, mobile water capabilities, and consulting services.	GE Water & Process Technologies Worldwide 4636 Somerton Road Trevose, PA 19053-6783, USA T: +1 (215) 355-3300 www.gewater.com
ABB	Technology and consultancy with regard to desalination plants, municipal water treatment plants, municipal wastewater treatment and recycling, network management solutions for real-time monitoring and control of distributed water systems, including water leakage management, motors and drivers, control products and systems, SCADA systems.	ABB Ltd Affolternstrasse 44 CH-8050 Zurich, Switzerland Tel. +41 43 317 7111 www.abb.com
Miya Group	Miya is a global provider of comprehensive urban water efficiency solutions, including Non-Revenue Water (NRW) reduction. The Company's solution includes audit of a city's water system, full project planning, execution and maintenance.	Miya Luxemburg Holdings S.a.r.l 46A. Avenue J.F Kennedy L-1855 Luxembourg T: +352 42 717 1274 F: +352 42 1961 Email: info@miya-water.com www.miya-water.com
Paques	Paques develops anaerobic water purification systems that produce energy from wastewater whilst purifying the water and facilitating water reuse. Among others, Paques produces technologies for advanced nutrient removal from effluent, ultra compact sewage treatment, back-wash treatment, biogas desulphurisation for green energy.	Paques BV T. de Boerstraat 24 8561 EL Balk, The Netherlands T: +31 514 60 85 00 F: +31 514 60 33 42 Email: info@paques.nl www.paques.nl
Wavin Group	Wavin is a manufacturer of plastic pipes and fittings for many applications: gas, water, sewer systems, building, land drainage, cable ducting and irrigation. It provides solutions for safe distribution of drinking water, sustainable management of rainwater and wastewater, energy efficiency heating and cooling for buildings.	Stationsplein 3 P.O. Box 173, 8000 Ad Zwolle The Netherlands T: +31 38 429 49 11 F: +31 38 429 42 38 www.wavin.com
Priva	Priva provides sustainable solutions for the more efficient control of energy and water within indoor environments, as a means to conserve scarce resources and reduce our impact on the planet. Priva specializes in intelligent building management systems and indoor climate control systems for horticulture.	Priva Holding B.V. Zijlweg 3, 2678 LC De Lier The Netherlands Tel: +31 174 522 600 Fax: +31 174 522 700 Email: contact.priva@priva.nl www.priva.nl
Veolia Water Solutions & Technologies	Veolia Water Solutions & Technologies responds to diverse water treatment needs of municipalities and provide solutions for drinking water, wastewater, desalination, reuse, sludge and biosolids, combined sewer overflow, odor control, water treatment chemicals, and software and services for water treatment management.	Veolia Water Solutions & Technologies L'Aquarène, 1 place Montgolfier 94417, Saint Maurice Cedex France T: +33 1 45 11 55 55 Fax: +33 1 45 11 55 00 Email: contactcom@veoliawater.com www.veoliawaterst.com
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)	GIZ draws on a wealth of regional and technical expertise and tried and tested management know-how to deliver demand-driven, tailor-made and effective services for sustainable development. They support their partners at local, regional, national and international level in designing strategies and meeting their policy goals.	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH Dag-Hammarskjöld-Weg 1-5 65760 Eschborn, Germany T: +49 6196 79 0 F: +49 6196 79 1115 Email: info@giz.de www.giz.de
CH2M HILL	CH2M Hill is an engineer-procure-construct company that offers this wide spectrum of expertise, knowledge, and services across varied industries and government agencies. The company offers to plan, design, build, upgrade, expand, modernise, renovate, retool, optimise, and operate infrastructure and facilities. It also provides services at the end of assets' life such as decommissioning, decontamination, and demolition, and restoration for new uses.	CH2M HILL World Headquarters 9191 South Jamaica Street Englewood, CO 80112, USA T: +1 888 CH2M HILL www.ch2m.com
Hindustan Construction Company India	The company's services span across diverse segments such as transportation, power, marine projects, oil and gas pipeline constructions, irrigation and water supply, utilities and urban infrastructure. Its core businesses are hydro power sector, nuclear power and special projects unit, engineering procurement and construction (EPC) business unit, water solutions business unit, and transportation business unit.	Hindustan Construction Co. Ltd. Hincon House, LBS Marg, Vikhroli (W), Mumbai - 400083 T: +91 22 2575 1000 F: +91 22 25775732 Email: corpcomm@hccindia.com www. hccindia.com
Halcrow	Halcrow delivers planning, design and management services for developing infrastructure and buildings worldwide. We contribute to the construction, operation and maintenance of the built environment, and the protection, enhancement and maintenance of the natural environment.	Halcrow Elms House, 43 Brook Green London, W6 7EF, United Kingdom T:+44 20 3479 8000 F:+44 20 3479 8001 www.halcrow.com

Delivery Agents
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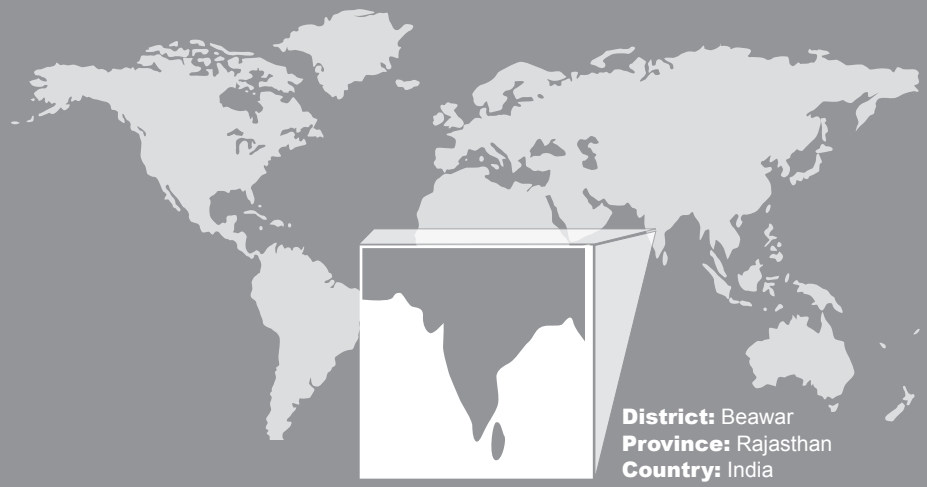
Industrial

Industrial Water Use Efficiency:

Recycling and Cooling – India

Photo: Björn Gutenstam



District: Beawar
Province: Rajasthan
Country: India

PROJECT OVERVIEW

Shree Cement is one of the top five cement manufacturers and power producers in India. Located in semi-arid water scarce regions, water recycling and water conservation practices have been implemented in various ways at all Shree Cement plants. The company has adopted a "No discharge of wastewater" policy i.e. 100 per cent utilisation of water, to prevent contamination of groundwater and reduce damage to the ecology and the potential health impact on the communities who source drinking water from linked groundwater sources.

As part of its sustainable water management program, Shree Cement has installed Sewage Treatment Plants (STP) and secondary Reverse Osmosis plants (RO-2). The STPs treat domestic wastewater generated by the company's housing settlements and supply it back to the factories where it is used for plantations and dust suppression by spraying of roads and raw material stockpiles. The RO-2 plants treat the reject of the primary RO plants (RO-1). The reject of the RO-2 plants themselves was initially used in gas conditioning in the cement plants but, after installation of waste heat recovery-based green power systems, water requirements have been reduced and the water is now used in ash quenching and synthetic gypsum manufacturing.

In addition to this, the traditional Water Cooled Condenser (WCC) systems, with evaporation losses of more than 2.7 l/kWh, have been replaced with Air Cooled Condenser (ACC) systems to further improve water efficiency. The company has devised rainwater harvesting and groundwater recharge practices that have increased water availability for both the factory operations and the nearby communities. Furthermore, the company has replaced underground pipes with overhead pipes so that leaks can be easily detected and repaired.

Although Shree Cement's water conservation measures are a private initiative, future potential public-private partnerships have been identified for the utilisation of the domestic waste water generated outside Shree Cement's plant boundary in order to further replace the use of fresh water for industrial purposes.

COSTS

- The total costs for the reverse osmosis water recycling facilities are: Capital investment: USD 281,250 and Operational cost: USD 46,819 per year.
- Shree Cement also installed Sewage Treatment Plants (STPs) for recycling domestic water at five of its locations (Beawar, Ras, Khushkhera, Suratgarh and Roorkee). The total cost for installation of STPs was USD 558,334.
- The total cost for installation of Air Cooled Condensers (ACCs) at all power plants was USD 33 million which comprises of:
  - Installation cost of USD 15.52 million for ACC at 300 MW thermal power plants.
  - Installation cost of USD 17.38 million for ACC at captive power plants and WHR based GPP.

Cost effectiveness related to the installation of the ACCs is estimated at USD 1.76 per m^3 of water savings.

RESULTS

Water recycling and reuse has reduced Shree Cement's water demand while simultaneously realising average financial savings of USD 55,153 per year. Treatment of sewage water through STPs gave a financial benefit of USD 16,680.

Through installation of the ACCs, water savings of approximately 793,500 m^3 per year have been achieved. The company has installed India's largest ACC at its Shree Mega Power Plant, which will result in water savings of about 18.72 million m^3 per year. This not only reduces water consumption but avoids use or disposal of wastewater from water cooled condensers.

Remaining challenges include developing a technology to utilise water with a high concentration of total dissolved solids while minimising wear and tear of equipment and the installation of rainwater harvesting technology tailored to water-scarce and semi-arid conditions.

Shree Cement is one of 16 companies of emerging economies recognised as New Sustainability Champions in 2011 by the World Economic Forum. Shree Cement has also received several national and international awards for its water management and sustainability efforts.

Industrial Water Use Efficiency:

Water Recovery – South Africa

Photo: Alastair Morisson

PROJECT OVERVIEW

Nestlé, the world's largest food and beverage company, recognises effective water resource management as a strategic issue for the company and has enshrined it as one of the three focus areas of its 'Creating Shared Value' approach.

Nestlé's milk products factory in Mossel Bay achieved a 54 per cent reduction in water consumption between October 2009 and May 2010 at a time when the area was experiencing its worst drought in recorded history. This project constituted the first phase of a programme to increase water use efficiency in the supply chain of Nestlé's Mossel Bay factory. The purpose of this phase was to reduce water consumption at its milk products factory in Mossel Bay, whereby Nestlé purchased and installed equipment to recover water through condensation. The factory receives about 340m^3 of fresh milk per day. About 83 per cent of the volume of milk is water; so the condensation of the water evaporated from the milk in order to produce powdered and condensed milk products yields over 250m^3 of water per day. This water was previously released to the atmosphere as steam, but is now recovered and used for various industrial purposes such as washing the exterior of the plant equipment and milk tankers. Additional immediate water saving measures were introduced, such as shortening automated wash times and modifying hose pipe nozzles and showerheads to reduce water flow.

The water conservation programme included improved water usage measurement and conducting an employee awareness campaign. The dissemination and advertising of the results from these initiatives spurs continuous improvement.

The second phase, currently underway, aims to reduce water use by Nestlé's milk suppliers, by improving the water use efficiency in growing feed for the cattle. This is being done by installing soil moisture metering to prevent over-irrigation.

The third phase will aim to make the Mossel Bay factory a zero water intake factory, drawing no water from outside the plant. This entails that some of the recovered condensate water will be treated to potable standard so that it may be used for cleaning the interior of the factory machinery as well as the exterior.

Two other Nestlé factories, in India and Chile, have since installed condensate recovery technology, inspired by the results achieved at Mossel Bay.

Group-wide, Nestlé's efforts through various projects aimed at conserving water in different stages of the supply chain have earned the company the 2011 Stockholm Industry Water Award.

District: Mossel Bay
Province: Western Cape
Country: South Africa

COSTS

The company spent ZAR 1,200,000 on the condensate recovery equipment and an additional ZAR 800,000 on the other water-saving retrofits.

The marginal cost of water-saving retrofits is estimated at USD 8.79 per m^3 of water savings[1].

RESULTS

Through this project, water usage was reduced from 25,000m^3 to 11,500m^3 per month between October 2009 and May 2010 at the same level of production, resulting in water usage per tonne of product decreasing from 17m^3 in 2009 to 8.2m^3 in 2010.

The project has raised awareness on water conservation among Nestlé staff, as well as other local industries, farmers and the community through dissemination of the results of the project.

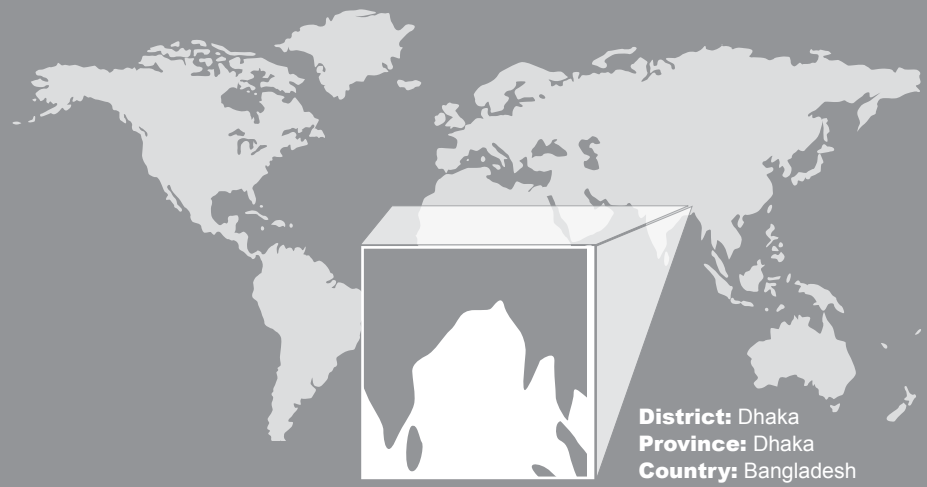
Less water is required from the municipality, freeing up water for other users.

[1] The marginal cost was estimated with 10 per cent interest rate and 10 years lifetime of the equipment.

Industrial Water Use Efficiency:

Control and Reuse – Bangladesh

Photo: Saleem Taqvi



PROJECT OVERVIEW

Bangladesh has a long history in the textile business and is the world's second largest knitwear exporter. Textile exports are a major source of foreign exchange earnings. The textile production process is a large water user with significant consumptive water use per kilogram of fabric produced. Water for production is sourced from groundwater that has been over-abstracted since the mid-1980s. In addition, the country's rivers are being impacted by pollution from the textile, tannery and pulp and paper industries.

In response, the International Finance Corporation (IFC), in partnership with UKAid, Norad and Dutch international development group Solidaridad, launched the Cleaner Production (CP) programme to reduce the overall environmental and resource impact of the Bangladeshi textile industry. Six major international buyers – *Hennes & Mauritz (H&M)*, *KappAhl*, *Lindex*, *Mothercare*, *Levi's*, and *WE Fashion*, also participated, along with local technical partners *Adroit Environment Consultants Ltd (AECL)* and *Reed Consulting (Bangladesh) Ltd*. The one-year pilot phase of the CP programme was launched in August 2010. Cleaner Production Assessments were conducted at the twelve participating factories. The assessments indicated substantial potential savings and performance improvement through implementation of options that were technically simple and required very little upfront investment.

Based on the assessments, 47 cleaner production measures were proposed, grouped into the following broad categories:

- General upkeep improvement measures;
- Process control and environmental optimisation measures;
- Thermal energy conservation measures;
- Electrical energy conservation measures.

The specific water-related measures included leakage repair, installation of steam traps, steam condensate recovery, water flow metering and fitting of water trigger nozzles. Leakage repair reduces water loss through leaking pipes; steam traps reduce steam loss and pipe erosion; steam condensate recovery facilitates water reuse; water flow metering enables operators to monitor water consumption and detect problems as they arise; water trigger nozzles ensure that water is only released when necessary.

COSTS

The pilot phase direct investment was USD 483,869, with varying amounts invested in the twelve factories. The pilot project targeted the 'lower-hanging fruits' that required little capital investments and imposed minimal disruption to operations.

A conservative estimation of the cost effectiveness of those water related measures reveals an investment cost of USD 0.60 per m^3 of water savings.

RESULTS

At the start of the pilot project phase, all twelve participating factories exceeded the benchmark water use of 111 litres per kilogram of fabric produced by a factor of three to four.

The project resulted in direct savings of 808,712 m^3 of water and 7, 626 tonnes of steam in the first year, as well as indirect savings of 73,652 m^3 due to reduced steam consumption. If the whole textile processing sector adopts Cleaner Production as efficiently as the pilot project firms did, it is possible to save approximately 10,500,000 m^3 of water per year.

The project also resulted in substantial savings in electricity (4.45 GWh) and natural gas (9,830,000 m^3).

Data from the Cleaner Production pilot project showed that it was possible to achieve annual cost savings of approximately USD 1,000,000 by these twelve firms, double the amount invested. Assuming similar distribution of factory and production sizes across the industry, adoption of Cleaner Production by the whole sector, which comprises 1,700 firms, could yield annual savings of approximately USD 70,000,000.

These improvements in water use efficiency reduce the pressure on groundwater and surface water. A related benefit is reduced greenhouse gas emissions due to lower fossil fuel energy consumption, achieved through improved energy efficiency.

Delivery Agents – Industrial

Company	Range of Services	Head Office Contact Details
ABB	Technology and consultancy in water transfer systems, industrial wastewater treatment and recycling, distribution networks, pumping stations, irrigation networks desalination plants, potable treatment plants. Technology products for electrical and automation processes in all water industry applications, including control products and Programmable Logic Controls, SCADA systems.	ABB Ltd Affolternstrasse 44 CH-8050 Zurich, Switzerland T: +41 43 317 7111 www.abb.com
Grundfos	Technology and consultancy for pumps, active leakage control, water supply (water intake, water treatment, distribution) and wastewater (wastewater treatment and transport).	Grundfos Holding A/S Poul Due Jensens Vej 7 DK-8850 Bjerringbro, Denmark T: +45 87 50 1400 F: +45 87 50 1402 www.grundfos.com
Royal Haskoning	Consultancy in an extensive range of multi-disciplinary services that relate to sustainable solutions in urban areas and buildings, infrastructure and ports, industry and energy, water and environment.	Royal Haskoning Barbarossastraat 35 6522 DK Nijmegen The Netherlands T: +31 24 328 42 84 F: +31 24 323 93 46 www.royalhaskoning.com
Siemens Water and Wastewater	Siemens Water Technologies provides comprehensive, cost-effective and reliable treatment systems and services, such as emergency water supply and conventional water treatment processes, wastewater reuse systems, membrane bioreactors, UV disinfection systems and RO cleaning contracts. It provides market specific solutions for food and beverage industry, life sciences, marine industry, mining industry, oil and gas industry, power industry, semiconductor and solar industry, and aquatic and leisure solutions.	Siemens AG Wittelsbacherplatz 2 80312 Munich, Germany T: +1 866 926 8420 Email: information.water@siemens.com www.water.siemens.com
Xylem Inc	Technology providers and consulting services in wastewater and dewatering pumps, biologic treatments, filtration and disinfection products for municipal and industrial use.	Xylem Inc. 133 Westchester Avenue White Plains, NY, 10604. USA T: +1 914 323 5700 F: +1 914 323 5800 www.xylemwatersolutions.com
Wavin Group	European manufacturer of plastic pipes and fittings for many applications; gas, water, sewer systems, building, land drainage, cable ducting and irrigation.	Wavin Group Stationsplein 3, P.O. Box 173 8000 AD ZWOLLE The Netherlands T: +31 38 429 4911 F: +31 38 429 4238 www.wavin.com
Koch Membrane Systems Inc	Koch Membrane Systems is a developer and manufacturer of innovative membrane filtration systems to serve a broad array of industries and markets, including water and wastewater process; dairy and juice, and wine processing, industrial biotechnology. It also helps industries in reducing their water footprint, increasing productivity, and lowering operating costs.	Koch Membrane Systems Inc 850 Main Street Wilmington, Massachusetts 01887-3388, USA T: +1 888 677 KOCH T: +1 978 694 7000 www.kochmembrane.com
Dow Chemical Company	Dow's diversified industry-leading portfolio of specialty chemical, advanced materials, agrosciences and plastics businesses delivers a broad range of technology-based products and solutions to customers in high growth sectors such as electronics, water, energy, coatings and agriculture.	The Dow Chemical Company 2030 Dow Center Midland, Michigan 48674, USA T: +1 989 636-1000 www.dow.com
Veolia Water Solutions & Technologies	Veolia Water Solutions & Technologies serves industrial clients to deliver engineering and turnkey design and build projects, and provide client-tailored water treatment solutions and associated services. They provide expertise in reusing, recycling, and leveraging value from water.	Veolia Water Solutions & Technologies L'Aquarène, 1 place Montgolfier 94417, Saint Maurice, France T: +33 1 45 11 55 55 F: +33 1 45 11 55 80 www.veoliawaterst.com
Solidaridad	Solidaridad is an international network organisation with nine Regional Expertise Centres (RECs) worldwide that works on creating sustainable supply chains from the producer to the consumer. This enables producers in developing countries to get a better price for better products and it helps to preserve the environment. It helps companies in the marketplace to implement Corporate Social Responsibility and find sustainable suppliers.	Solidaridad Nederland 't Goylaan 15, 3525 AA Utrecht The Netherlands T: +31 30 272 03 13 F: + 31 30 272 01 94 Email: info@solidaridad.nl www.solidaridad.nl
Pentair X-Flow	Pentair X-Flow has expertise and experience in water purification, ranging from producing potable water to treating process water and wastewater. The company produces a wide range of standard membranes and modules for filtration and purification processes for a variety of industries.	X-Flow BV Marssteden 50 7547 TC ENSCHEDE The Netherlands T: +31 53 428 7350 F: +31 53 428 7351 Email: info@xflow.nl www.x-flow.com
DHV	The DHV Group is a leading engineering consultancy providing integrated solutions in the fields of transportation, aviation, water and environment.	DHV Laan 1914 no 35, 3818 EX Amersfoort, The Netherlands T: +31 33 468 37 00 Email: info@dhvgroup.com www.dhvgroup.com
Ecolab-Nalco	Nalco provides water treatment, process-focused programs, and emissions reduction across a broad range of end users for applications related to water, energy, air, pulp and paper, and mining systems.Ecolab delivers comprehensive programs and services to foodservice, food and beverage processing, healthcare, and hospitality markets.	Nalco Company WPS Headquarters 1601 W. Diehl Road Naperville, Il 60563-1198 T: 630-305-1000 F: 630-305-2900 www.nalco.com
Novozymes	Novozymes is a biotech company with a strong focus on enzyme production. Its core business is industrial enzymes, microorganisms, and biopolymers. It provides cost savings, product improvements and greener productions for applications in agriculture, bioenergy, biopharma, food and beverages, household care, leather, pulp and paper, textile, and wastewater solutions.	Novozymes A/S Krogshoejvej 36, 2880 Bagsvaerd Denmark T: +45 4446 0000 F: +45 4446 9999 www.novozymes.com

Delivery Agents
This is an indicative list of "delivery agents" (private, public and NGO entities) who can act as advisers, evaluators or solution providers. Other providers and advisors (international, national, regional or local) do exist, but have not been included in this overview, which merely gives examples of the competence available. It does not represent an endorsement of a particular provider or adviser, nor does SIWI provide any judgment on the capacity of those included.

Way forward

WRG, with the support of key knowledge partners, will continue to develop this catalogue's completeness and interactivity with an online version forecasted. In this regard, WRG seeks to engage existing and new countries for feedback and support in the subsequent design phases of the catalogue. This will ensure that it is innovative, reaches the broadest audience of users and illustrates good practice across the range of levers in the WRG 'Charting our Water Future' report. There will be opportunities for new countries to present their priority levers for assessment in the next phase. WRG is also seeking media and knowledge partners with additional expertise in data and knowledge management to support the transition of the catalogue from a pilot to a full public-private, global, comprehensive knowledge base, thereby further improving its dissemination.