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CASE STUDY

Water Resource Planning and Natural Resource Management

MAY 2008
POLOKWANE, SOUTH AFRICA

This study is of particular relevance to those engaged in water management projects in natural resource management areas.

BACKGROUND

South Africa has the fifth lowest water availability among the forty one sub-Saharan African nations and very large water demands, making it particularly vulnerable to water stress. Polokwane, the capitol of the Limpopo Province in the northeastern part of the country, currently has insufficient water to meet its needs. The economy and population of Polokwane are growing due to expansion of the agriculture and mining sectors, which will further increase demands on water and other key resources. The Limpopo and Olifants Rivers, which flow through Limpopo Province, later enter Kruger National Park and minimum flow levels must be maintained in order to protect biodiversity and economic gains from tourism.

DEVELOPMENT CHALLENGE

To improve lives by increasing access to water, and to balance urban, rural, and natural water needs.

CORE PROJECT

The South African government's Department of Water Affairs and Forests (DWAF) was planning a project to divert water from the Olifants Basin to further support the people of Polokwane. USAID has also been supporting Watergy, a program run by the Alliance to Save Energy, which supports investments and programs to reduce water demand and improve water use efficiency. The USAID/South Africa Mission has also funded the Urban Institute to assess Polokwane's water infrastructure needs for the next 10 years.

ADAPTATION OBJECTIVE

To understand how climate change would affect water resources and water supplies, thus informing decisions about how to best utilize this already limited resource.

FOLLOWING THE STEPS IN THE USAID ADAPTATION GUIDANCE MANUAL

STEP 1: SCREEN FOR VULNERABILITY

Preliminary assessment indicated that the Olifants Dam project could be impacted by future climate change. Additionally, climate analyses could help inform the Mission's decision about how much to invest in water management programs such as Watergy.

STEP 2: CONVENE STAKEHOLDERS AND DEVELOP A PLAN FORWARD

Stratus Consulting, who managed this pilot study, worked with Matji and Associates to convene stakeholders from national and regional government and the Watergy program to discuss potential future impacts (through 2050) of climate change on the Olifants Basin, a major local water resource.

A variety of possible adaptation strategies were discussed, including:

a) **Demand management:** water sharing agreements, water trading, water market, water use policy at local level, artificial ground water recharge, and water valuation;

b) **Improved technology:** reservoir operation, flood plain management, design of infrastructure, hydro-climate monitoring; and

c) **Improved policy and education:** demand management (at regional/ district level), reallocation of water rights between rural and urban areas, education/awareness campaigns to improve water use habits, cooperative governance of resources, legislation to improve water use efficiency, enforcement of water rights and water use policies.

STEP 3: ANALYSES

Change in climate by 2050 was analyzed by BC Gildenhuys & Associates, development management and municipal finance strategists.

This analysis indicated water demand was likely to triple by 2050, due both to expected increases in total population size and in the number of households.

Change in climate in the Olifants Basin by 2050 was analyzed by the Climate Systems Analysis Group at the University of Cape Town.

A variety of models were used to project future climate in the Olifants Basin (general circulation models, regional climate models, and statistical downscaling). All models projected increased temperature. Although, in general, Southern Africa is expected to become drier, within the Olifants Basin precipitation projections varied considerably from a 30% decrease to a slight increase. Models also suggested that there might be a change in the timing of precipitation.

Impact of climate change on water supply was analyzed by Ninham Shand Consulting Services, a consulting engineering firm that works throughout southern Africa.

Water runoff was very sensitive to climate change; a 10% reduction in precipitation combined with anticipated temperature changes would result in a 50% decrease in runoff, and a similar decrease in water availability. In contrast, if runoff were to increase, the existing dam infrastructure would not be capable of capturing these higher yields.

STEP 4: SELECT COURSE OF ACTION

Following these analyses, stakeholders met to further discuss what options might be most appropriate for Polokwane. Factors considered included how the adaptation would perform under both wet and dry conditions, expected cost-effectiveness in reducing demand or increasing supply, cost, technological and sociocultural feasibility, and speed of implementation.

Reducing water demand and using a combination of simple technological improvements (such as reducing leaks and water pressure in the supply system) and policy to improve water use efficiency was decided on as the best strategy. Water recycling could also be increased, and if necessary water could be reallocated to meet urban needs. There was little interest in undertaking costly projects, such as building additional dams, which might be unneeded depending upon how water levels changed in the future.

STEP 5: IMPLEMENT ADAPTATIONS

The USAID Mission is currently evaluating its funding priorities. DWAF is considering demand management approaches, but has also authorized construction of the De Hoop dam, which they believe is needed to deal with current water scarcity problems.

STEP 6: EVALUATE ADAPTATIONS

Not yet applicable.

OUTCOMES

1. Impact on government planning: This project led to a fusion of the national and local water infrastructure planning projects, and has increased government interest in pursuing demand management approaches. DWAF has added a chapter on climate change to the Olifants Management Report. This report is used by regional and national government and provides planning analysis for the next 50 years.

2. Identification of ways in which USAID can help Polokwane deal with its problem of water limitation:

a) Working with the government to build capacity that will allow better coordination of water use and supply between communities sharing resources;

b) Promoting demand management by expanding water metering programs;

c) Working with the local government to establish a price structure in which water price rate increases with increasing water usage;

d) Working with the Department of Housing on modifying building codes to encourage adopting water efficient technologies;

e) Evaluating whether water pressure reduction would help reduce water loss through leakages, and if so, supporting implementation of such measures;

f) Working with the South African government to develop and adopt a drought management plan for the Olifants Basin and/or Polokwane; and

g) Supporting studies to investigate the potential for increased use of recycled waste water.

LESSONS LEARNED

1. Stronger involvement with the Mission would facilitate implementation. This project was only tangential to work going on at the Mission, which does not have additional resources for this project.

2. A small additional amount of money ($5,000 -$10,000) would allow for direct follow-up engagement with local parties and potential partners who might be interested in implanting adaptations identified by this pilot.

3. USAID believes adaptation activities should support improved standard of living, economic growth, and other objectives. It must be emphasized to all stakeholders that adaptations must be in harmony with broader development objectives. Some workshop participants were initially in favor of discouraging improvements in water supply, such as water taps in private homes, which might increase water use.

QUESTIONS TO CONSIDER AS YOU THINK ABOUT ADAPTING SIMILAR PROJECTS

Current Obstacles to Development

1. To what extent is demand for water currently being met? Is population growth, type of crops being grown, or changes in the balance between agriculture and other livelihood sectors likely to change water demand in the coming decades?

2. What is the condition of the existing water infrastructure? Are there any obvious inefficiencies in water delivery system (such as leaks or lack of metering) that it might be possible to improve?

3. Who makes decisions about how water is allocated and what criteria do they use? To what extent do different sectors of the community comply with governmental regulations regarding water rights and usage?

4. What are current incentives and practices for conserving water?

Observation of Change in Climate

5. Has the frequency, magnitude, or timing of precipitation changed in the last several decades? Has temperature changed?

Impacts of Climate Change

6. How have the frequency and severity of droughts changed in recent decades?

7. Are adequate flows being sustained in downstream areas to maintain livelihoods and protect biodiversity?

Sources of Advice, Support, and Training

8. Where do people go for advice on water conservation and water recycling strategies?

Current Coping Strategies

9. What coping strategies do different sectors of the community employ when confronted with drought situations?

10. Does the national or local government have a drought management plan, and if not how could development of such a plan be encouraged?

11. Energy savings from water conservation and improvements in the efficiency of water delivery could potentially pay for improving water delivery infrastructure. Have planners considered this?

For more information on South Africa, visit: http://www.usaid.gov/sa/

For a copy of the USAID Adaptation Manual, visit:
http://www.usaid.gov/our_work/environment/climate/docs/reports/cc_vamanual.pdf