RURAL WATER SUPPLY PROJECTS APPRAISAL, POVERTY AND SUSTAINABLE DEVELOPMENT*

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Abstract

Rural water supply projects play an important role in poverty alleviation through the supply of clean and safe water to the rural inhabitants. Among the major entry points for poverty reduction, water availability for domestic and productive uses particularly irrigation, has the greatest potential. Water links well with not only opportunities for increased productivity and food security through irrigation, but also with the sanitation and health dimensions through the supply and provision of clean and safe water in adequate quantities.

The report on World Water Development predicts growing per capita scarcity of water in many parts of the developing world because of population growth, pollution and expected climatic changes. It goes on to assert that, "For humanity, the poverty of a large percentage of the world's population is both a symptom and a cause of the water crisis. Giving the poor better access to better managed water can make a big contribution to poverty eradication". A healthy population will exert less pressure on the health services supplies and hence less Health related expenditure nationally. At the household level, considerable financial savings which would otherwise be used to purchase medicines would be made. In addition, the loss in production time and decline in productivity due to sickness will be minimised. However, the opportunity to obtain these benefits may be hampered by the decision making approach adopted by responsible authorities for rural water supply projects. The normal economic analysis which considers time use as the main economic factor in cost benefit analysis leaving out other important effects such as health benefits may understate the social benefits and hence reduce the feasibility of the projects. This study considers the inclusion of health effects through expenditure on consultation and purchase of medicine for water borne diseases avoided by households in rural Tanzania and finds that it improves the project feasibility.

Introduction

A safe and convenient water supply is one of the highest priorities for the rural poor. Combined with sanitation, improved water services would revolutionise rural public

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health and increase productivity in poorest rural areas. Currently the population in Tanzania is estimated to be 33million of which 26.4 million 80% live in the rural areas. One of the main root causes of poverty in rural Tanzania is lack of access to safe water, sanitation and hygiene education. This affects the farmers, pastoralists and agro-pastoralists that depend on water for their domestic and productive activities. It is well accepted that water is a basic human need.

It was announced during the World Summit for Sustainable Development in Johannesburg in 2002 that 1.1 billion people in the world lack sustainable access to clean and safe drinking water, while more than 2.2 billion people are without adequate sanitation. The ensuing declaration and target was to reduce by half the proportion of people without sustainable access to safe drinking water and sanitation by 2015, a target, which was also declared by the Millennium Development Goals (MDGs). Currently, the global water supply outlook exhibits great disparity between developed and developing countries also urban and rural dichotomy in water supply (see Table 1).

Table 1: Global Water Supply Coverage in Year 2000

Region	Population (millions)	Urban coverage (%)	Rural coverage (%)
Global	6.055	94	71
Africa	784	85	47
Tanzania*	32	73	50
Asia	3683	93	75
Latin America & the Caribbean	519	93	62
North America	310	100	100
Europe	729	100	87
Oceania	30	98	63

Source: Global water Supply and Sanitation Assessment 2000 Report, URT (2002) National water policy for Tanzania.

The Tanzania's national water policy among other things emphasises the increased participation of the private sector in the delivery of goods and services[1]. The decision to construct and/or rehabilitate water sources needs to be socially and economically viable. Private sector service providers have to meet their financial obligations before they embark on the decision to supply water. It is possible that this could be at the expense of social desirability and benefit.

Socially, the policy recognises water as a basic need and right for all human beings and therefore use of water for human consumption shall receive first priority and that investment priority shall be given to water scarce areas. Water, is also considered an economic good contributing to economic productivity and hence requires efficient management. As an environmental asset, water sources need protection and to be conserved. Clean and safe water can also facilitate the improvement of health through hygiene and sanitation. Finally, the sustainability aspect requires clear definition of the roles and responsibilities of the various actors and stakeholder groups.

Through community participation, water supply projects will be based on the concept of demand responsiveness by communities where the choice of type of projects will be determined by communities based on their willingness and ability to pay for the chosen services.

In this study, we use a case study approach for Kilosa district, Morogoro Region in Tanzania, to discuss the implication of using financial and social cost benefit analysis (CBA) for rural water provision. We discuss the various theoretical and practical aspects of feasibility of social projects.

We briefly discuss the CBA theoretical and methodological underpinnings. The implication of which the rural poor may never get clean and safe water if private operators were the only ones to provide this service! The description of the existing water supply situation and options and potential in the district is also given. Data from Kilosa District is used to demonstrate that inclusion of economic aspects of time use and health aspects of cost savings result in acceptance of the rural projects, which would otherwise be rejected if pure financial appraisal were used. Finally conclusions are provided at the end of the study.

The Case for Explicit Inclusion of Health Effects in CBA

Water is taken to be naturally clean and safe until contaminated by external forces mainly humans. Contamination occurs in the form of agricultural chemical inputs such as pesticides and fertilisers, industrial waste (both solid and effluent), municipal waste including domestic waste. These provide the pollution doses which are directed to water bodies (streams, rivers, lakes, swamps etc). Responses from these doses manifest themselves as effects felt or costs incurred by those who use the water at different levels.

These include organisms in the ecosystem that use water bodies as their habitat, feeding ground or sources of drinking water and recreation. Depending on the type of contamination, response could be devastating to some while beneficial to others. For terrestrial animals using the water for drinking and recreation, this could produce detrimental effects if the pollution doses are beyond acceptable limits such as deaths and ill health. For animals in the human food chain, this could mean that the accumulated pollutants in their bodies such as mercury and other heavy metals could be transferred to whoever consumes them and result into ill health and even premature deaths. Furthermore, for human beings water borne diseases such as typhoid, cholera, and diarrhoea may erupt, some in epidemic scale causing great losses of lives, loss of production and decline of productivity for both subsistence and cash crop produce.

This may translate into food insecurity for families living on the edge of existence. Furthermore, hospital bills and cost of medicine will accrue to the sick and their relatives straining further their meagre incomes by diverting it from daily basic

necessities and plunging some into debt because of money borrowed for bus fare for several trips to health centres, buying medicines and special diet among others.

Governments will incur higher expenditures on medicines, mounting emergency preventive and curative campaigns.

To meet these unplanned demands on their resources, governments often draw up mini-budgets which go on to re-prioritise activities and distort implementation plans of sectoral projects. The stream of events outlined above are not picked up by the set of cost and benefit data streams for the project through either market or WTP processes as a result health benefits are not explicitly included.

The computation of the costs and benefits, which determine the desirability of a project, needs to impute values of social variables, which are normally not taken into account. These include health and environmental benefits that accrue to communities due to improvement of water supply.

These aspects among others manifest the true value of clean and safe water availability to the rural population and every water user in general. Incorporating the social and environmental variables in water supply projects appraisal is a crucial entry point for poverty eradication and promotion sustainable development.

The importance of supplying adequate clean and safe water in the most convenient way possible cannot be over emphasised. Presently water supply sources are inadequate i.e. water demand is suppressed in most areas due to the long distances people have to walk to water sources or high prices they have to pay to vendors to obtain this precious resource.

As a result only a few seemingly most important uses are devoted to water obtained thus. Other water requirements are satisfied through the use of less clean and safe water hence causing health problems such as diarrhoea, typhoid, and dysentery also skin diseases among others.

Among the impact of such water use patterns and their consequences is to reduce productivity through sickness and less time used in productive activities due to fetching water especially by women and girls in most cases. In some cases girls' education is affected due to such domestic chores. The timing and amount of time girls use for fetching water conflict with school attendance.

The other impact is the high expenditure one has to incur due to treatment of water borne diseases, since people have to buy their own medicine and sometimes consultation fees. In most places water vending has become a lucrative business causing people to incur high costs in purchasing water, which is most of the time unsafe.

Water borne diseases are a major problem in rural Tanzania. Malaria, diarrhoea, dysentery, typhoid and acute respiratory infection diseases continued to top the list of diseases affecting the population in Tanzania in 2002. In this study diarrhoea, dysentery and typhoid were used for analysis.

Table 2: Type of Illness or Injury Reported By Age Group

SN	Type of Illness	Children under 15 years	Adults (15+ years)
1	Malaria	69.3	60.1
2	Diarrhoea	14.4	9.9
3	Ear, Nose and Throat	10.5	8.6
4	Eye	7.1	5.2
5	Dental	2.4	5.6
6	Accidents	2.5	5.0
7	Skin Condition	3.6	2.1
8	Multiple Complaints	18.5	19.7
9	Other	12.0	27.5

Source: Household Budget Survey 2000/01.

Theory and Practice of Cost Benefit Analysis

Cost Benefit Analysis (CBA) is a method to assess the relative desirability of competing alternatives, where desirability is measured as economic worth to society as a whole[2]. Alternatively, economic cost-benefit analysis is a social assessment of the cost and benefits of public investment decisions. There are two types of prices that can be used to evaluate investment projects. The first is the market-determined prices, called market or private prices, which are appropriate for financial or private cost-benefit analysis.

A project evaluation using market prices seeks to answer the question whether a project is profitable for the individual or firm that undertakes the investment. A benefit is defined as anything that increases human well being, and a cost as anything that decreases human well being. In turn, human well being is determined by what people prefer and able to pay for. Preferences are either revealed through choices and market behaviour or are stated through questionnaires (market and household surveys) procedures. In order to maximise social benefit, a different approach is used to measure preferences by finding out the individual's Willingness to Pay (WTP)[3], which measures benefits, while costs of the project are determined by opportunity costs. These are deemed appropriate for measuring contributions of the project to welfare. In order to obtain the Net Social Benefit (NSB), opportunity costs are subtracted from WTP. Graphically, benefits are measured as the relevant area under the demand curve and costs as the relevant area under a supply curve[4]. In computing the NSB both consumer and producer surpluses are added together. This is different from the private cost benefit

analysis, which considers market prices and costs for the valuation of costs and benefits. Net social benefits are net benefits that accrue to society as a whole as opposed to private net benefits that accrue to individuals or individual interest groups. The different approaches for appraising private sector and social/ public sector projects indicate the existence of a divergence of interest and goals between private benefit and social benefit whereby the society has broader goals compared to the private narrow definition of benefit[5].

There are however some social costs or benefits, which cannot be captured by the above approach. These include outcomes external to the market transaction that may result into external benefits or costs to others not included in the project and that may require compensation. Others include 'un-priced outcomes' of the project that change the NSB such as, "improved water quality, improved air quality, better health, and more recreation..."[6]. Such aspects may be included into the CBA analysis by imputing shadow prices to costs or benefits to reflect their true value to society. Shadow prices are used where market prices do not reflect social benefit or costs as the ones demonstrated above.

These prices may be different for different time periods as well as geographically. Shadow pricing, is used when placing a value on project outcomes other than market price. Project outcomes that cannot be bought or sold, such as social value, can be ascribed a monetary value. However, some effort is required to construct good shadow prices that reflect the actual situation. When projects significantly reduce incidence of disease for beneficiaries for instance as compared to the situation before the project, this shadow price can be used as a means of determining estimated savings or benefits to society. Reasonable and realistic application of shadow pricing is necessary in order to avoid overly pessimistic or highly undervalued estimates of project benefits and vice versa.

Presently, shadow prices are available for effects such as noise, enhancement of the greenhouse effect due to the emission of carbon dioxide, soil contamination due to the use of pesticides and air pollution due to the emission of various substances like nitrogen oxide. Shadow prices for victims of accidents - e.g. road accidents - are also available[7].

In reality though, not many aspects of social dimensions of CBA are practiced for rural water supply studies. The World Bank, which accounts for about half of external financing — about $3 billion per year[8], uses the Economic CBA that essentially includes the NSB concept in appraisal of rural water supply projects (World Bank 1997a, 1997b, 1999, 2000, 2001, 2002a, 2002b). The other International Financial institutions such as the Asian Development Bank, African Development Bank, likewise use similar approach. In addition to the WTP, other aspects like time use and health benefits are also considered as unpriced outcomes. Despite such positive developments however, there are other studies that do not include the effect on people's health of

availability of clean and safe water and what benefits that can bring with it. There are two major reasons for such exclusion.

The first is the lack of significant health related benefits (World Bank 1999)[9] and the second is the lack of adequate and reliable data for such an analysis to be made (World Bank 1997a, 2000, 2002a, 2002b)[10]. For those studies that include health benefits of safe water provision, use different methods such as computing shadow prices of health benefits using cost of medicines and transport to and from health centres (World Bank 1997b), and loss of production or the increase of it, cost of medicine (World Bank 2001). We attempt to include the health effects through a shadow price of expenditure on medication. This cannot cover all the benefits of health effects such as increased production and productivity due to good health, prevention of deaths among others, but can somehow help to reduce the left out benefits that are significant. In all the studies surveyed, the environmental values (cost or values) were not included[11].

Existing Water supply Situation and Potential

Kilosa District is endowed with a multitude of sources of water. The survey information reveals that rural dwellers obtain their water needs from shallow wells (traditional and improved), rivers and streams, springs and rainwater and charco dams.

According to the Social Assessment study 50% of Kilosa district's population is served with clean and safe water through water projects constructed as early as 1950s. However, the remainder of the population faces water shortage problems inadequate and unsafe water supply.

The type of water supply technologies found in Kilosa District include shallow wells traditional, hand dug, hand drilled, shallow bore holes, spring sources, Deep Bore-hole mechanised and gravity schemes

Profile and Water Supply Situation in Two Surveyed Villages

Survey data for a study on water supply options from two villages in Kilosa district is used as a case study to demonstrate the importance of considering economic and social aspects in deciding the feasibility of water projects in rural areas.

Msimba village situated in the South of Kilosa District along the Dar es Salaam-Tunduma highway in Mikumi some 120 kilometres from Morogoro Municipality had a total population of 1856 as at the end of year 2000 living in 456 households of these 43% were able bodied adults of which 53% of the able bodied were women.
This is predominantly an agriculture-based economy producing main crops of maize 60%, Millet 20% cassava 10%, simsim 5% and 5% beans. Maize serves both as a cash and food crop.