

DOES IT PAY TO INVEST IN POTABLE WATER IN THE DEVELOPING WORLD? RELATIONSHIPS BETWEEN EXTERNAL FINANCING AND ECONOMIC DEVELOPMENT IN SUSTAINABLE COMMUNITY-RUN INTEGRATED PROJECTS

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Abstract: This paper quantifies the impact of external aid channelled through a support agency that practises a participatory approach to development. Researchers compiled completed project data collected from the non-governmental organisation (NGO) Agua del Pueblo and discovered a positive relationship between external funding for water development projects and resulting economic development. This paper discusses the importance of water development as a channel for achieving overall economic development and the importance of the participatory approach for community development projects. Copyright © 2012 John Wiley & Sons, Ltd.

Keywords: economic development; community development; participatory approach; sustainability; international aid; potable water; Guatemala

1. INTRODUCTION

Target 7.C of the United Nation's Millennium Development Goal is to halve the proportion of the population without sustainable access to safe drinking water and basic sanitation by 2015 (United Nations, 2010). In 1990, 77 per cent of the global population had access

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to safe water (WHO, 2004). This percentage increased to 83 in 2002 (WHO, 2004). Global sanitation coverage in 1990 was only 49 per cent, but that percentage rose to 58 in 2002 (WHO, 2004). The United Nations reports, 'The world is on track to meet the drinking water target, though much work remains in some regions' (United Nations, 2012: 1). However, the United Nations states, 'With half the population of developing regions without sanitation, the 2015 target appears to be out of reach' (United Nations, 2012: 1).

Currently, 884 million people worldwide lack access to safe drinking water, and 2.6 billion people are without basic sanitation services (United Nations, 2010). There are four billion cases of diarrhoea that occur annually, and 2.2 million cases are fatal (Massoud, *et al.*, 2010). According to the United Nations Educational, Scientific, and Cultural Organization (UNESCO), 2.3 billion people suffer from water-related disease worldwide (Azizullah, *et al.*, 2011). In recent years, there have also been improvements in access to safe drinking water. Between 1990 and 2004, 1.5 billion people have gained access to safe drinking water (WHO, 2006).

As stated earlier, more than 40 per cent of the world's population, or 2.6 billion people, do not use a toilet (WHO, 2006). This means that they are defecating in the open or unsanitary places. This situation particularly impacts children and has contributed to the deaths of 1.6 million children, younger than 5 years, each year (WHO, 2006). This is eight times the number of people who died in the Asian Tsunami of 2004 (WHO, 2006). About 80 per cent of the population that does not have proper sanitation coverage is located in sub-Saharan Africa, Eastern Asia and Southern Asia (WHO, 2006) with about 1.9 billion people in Southern and Eastern Asia and 437 million people in sub-Saharan Africa (WHO, 2004). If this trend continues, nearly 1.7 billion people will still not have access to proper sanitation by the year 2015 (WHO, 2006).

Studies show that public health can have an impact on economic development. One study showed that working age adults, ages 15 to 59, gained 2 days of work per case of diarrhoea that was prevented with an improved water supply (Hutton, *et al.*, 2007). School attendance also has a large impact on educational attainment, and there is evidence that shows that countries with weaker educational conditions have a more difficult time sustaining economic growth (WHO, 2001). Children between the ages of 5 and 14 years can gain 76 million school days if the world meets the Millennium Development Goal for improved water supply (Hutton, *et al.*, 2007). Much of the water management responsibility falls on women and girls; thus meeting water supply goals would have an even great impact on them. Countries that are less economically developed have a large agricultural work force without much education background (Harbison and Myers, 1964; German Federal Ministry for Economic Cooperation and Development, 2012; WHO, 2012). Children could receive an education that would give them the opportunity to compete for more highly skilled jobs.

The situation is even more problematic in rural areas. The United Nations (2010) estimates that eight out of 10 people without a safe drinking water supply live in rural areas. During March of 1991 in Ecuador, there was an outbreak of a strain of *Cholera vibrio* that caused the indigenous population to suffer greatly. In the urban areas of Quito and Guayaquil, where people have access to sanitation infrastructure, the outbreaks were under control within 11 months. In the rural townships in the Andes, the outbreak lasted 3 years. This is a result of the population not having the proper resources, including soap and chlorination, to sanitise their hands or water supply (Whiteford and Whiteford, 2005). Low levels of schools and concomitant educational opportunities are endemic in the rural population of the developing world. This heightens the problem. Health education is a typical component in public education but is impossible without improved public education. Another difficulty with providing a clean water supply in rural areas is the lack of technology (Hokanson, *et al.*, 2007).

Even though there are many difficulties with providing water to rural villages of developing countries, one non-profit organisation in Guatemala has been supervising the creation of potable water systems in rural communities since 1972 (Clemens, *et al.*, 2002). Agua del Pueblo (AdP), which literally means ‘The People’s Water’, works with communities to design potable water systems that are able to suit the people’s needs and can be maintained by the community without requiring the constant help of government or non-governmental organisations (NGOs). Sustainable development should be the response by a community in an ‘agile and adaptive’ way. AdP is able to provide sustainable water projects in this way by researching a community before construction begins and addressing a community’s specific needs. AdP is then able to adapt the project to the individual requests of each community. Two of AdP’s three offices are located in the Petén and Alta Verapaz, two of the poorest areas of Guatemala (World Bank, 2009). This was done in order to decentralise from the capital city and to make sure that the offices were located near the areas where people need potable water systems. According to the director of AdP, Pablo Quijivix, AdP’s goal is *not* merely water supply or sanitation. Water supply and sanitation are rather means to the ultimate end of addressing poverty and underdevelopment (P. Quijivix, personal communication, May 25, 2011).

2. THEORY DEVELOPMENT

To what degree does the level of community participation in a water project affect the resulting development in that community? This question is a popular debate in development scholarship; however, a substantial share of the evidence used to date has been largely qualitative or theoretical. This study sets out to demonstrate a quantitative relationship between international investment through a development agency using a participatory approach and economic development.

The United States National Research Council proposes three priorities to promote sustainability science:

- (1) Promoting research that integrates global and local perspectives in a place-based framework for understanding the interactions between environment and society;
- (2) Focusing, at the outset, on a limited set of questions, those that underpin the understanding of those interactions;
- (3) Promoting more efficient use of existing tools and processes that link knowledge and action.

‘The NRC notes further that the process should bridge the gulf between the detached practice of scholarship and the engaged practice of engineering and management, and ultimately should broaden knowledge of the interplay of environment, economy, and social systems’ (Weinstein, 2010:2).

This research sets out to bridge the aforementioned gap between scholarship and engaged processes by examining real world data through the lens of development theory with special attention given to social and economic sustainability.

In the post-WWII era, US foreign aid policy revolved predominately around a neoclassical theory of development (Meier and Seers, 1984). Western funds channelled largely through the World Bank and the International Monetary Fund provided large loans to developing nations (Meier and Seers, 1984). In return, these investors argued for trade liberalisation and reduced role for state governments. Neoclassical theory urged

developing nations to exploit their comparative advantage in raw materials and inexpensive labour rather than attempt to industrialise and compete head on with already advanced nations (Gereffi and Stephanie, 1992). This strategy was successful at transferring capital from the developed world to the developing but was ineffective at reducing poverty. The wealth that was generated remained in the hands of a few and further expanded the gap between rich and poor (Hellinger, *et al.*, 1988).

In the 1960s, the USA began to question the effectiveness of its aid policy. This doubt led to a surge in research and the formulation of new ideas about aid. Most notable was, a decreased focus on the top-down, neoclassical method and the proliferation of a bottom-up approach based on basic human needs (Hellinger, *et al.*, 1988).

This idea of ground level poverty reduction took hold of western aid policy in the 1970s. 'As early as 1973, the prime purpose of the United States aid was changed from growth to the satisfaction of "basic human needs"... Under these new approaches to aid-giving, donors focused their aid far more on particular sectors and sub-sectors of aid-recipient economies and gave far greater prominence to aid provided in the form of discrete projects – in education, health and water' (Riddell, 2007:32).

A key component of poverty reduction through basic needs improvement is the level of community participation. In 1966, Title IX was added to the US Foreign Assistance Act. Title IX placed emphasis on 'assuring maximum participation in the task of economic development on the part of the people of the developing countries' and using 'the intellectual resources of such countries and areas in conjunction with assistance provided under this Act so as to encourage the development of indigenous institutions... ' (US Foreign Assistance Act, 1980).

The conventional approach to water supply programmes involves an external funding agency controlling and financing the entire project. Aid agencies look for a community in need and then design, finance and implement the project with minimal local input. If the sole goal is providing water, this approach is potentially faster and less difficult. However, Lockwood (2004) showed that this approach is less sustainable and does not address the root causes including poor economic development. Arlosoroff (1987) found that too often, an improved water supply has been seen as a free service that the government must provide to improve the life of its citizens. He argued that although the communities may need financial help, relegation of their role to that of recipients without significant participation has often resulted in an inappropriate choice of technology and service level, wrong location of the water point, unnecessarily high cost, inability to keep the scheme operating and ultimately user rejection.

An alternative to the approach favoured by many external funding agencies is based on community participation or community management. In this model, communities seek out the aid agency. This ensures proper community demand and suggests a stronger commitment to complete the project. The development agency gives the community the responsibility in all phases of implementation of a water project. In addition, the development agency requires the community to shoulder a portion of the financial burden (Clemens, *et al.*, 2002).

As far back as 1993, the International Water and Sanitation Centre highlighted three tenants of participation: community management requires that the community have control over the water system and its use and should be responsible for upkeep of the system; the supporting agency and the community should engage in a long-term partnership with pooled resources; and the supporting agency whether it be an NGO or a government should be a facilitator, not a provider (IRC, 1993).

Three benefits of a participatory approach include: efficiency (better project outcomes), empowerment (improvement in the capacity of individuals and societies to improve their situation) and sustainability (Cleaver, 1999; Lockwood, 2004). Cleaver (1999) and Lockwood (2004) found that this participatory approach produces outcomes that are more beneficial and sustainable.

Agua del Pueblo's first four projects were in Tzalamabáj, Panimaquíb and Pampojilá in San Lucas Tolimán, Sololá; El Novillero also in Sololá; and Chíjtinamit, Chichicastenango, El Quiche. None of these villages had elected organisations prior to organising water committee to build the projects. The water committees elected and organised to implement the water project were the villages' first effort at organisation. The process of organising such representative bodies 'enables societies to achieve future success by implanting an organizational mentality, and a culture of payment' (Clemens, 1978). Furnishing communities with the organisational capacity to make collective decisions facilitates internal development and growth (Lockwood, 2004).

Giving control of the water system to a community provides them with a sense of ownership and will presumably provide the incentive to maintain existing systems or expand and improve upon them. 'By being in control of the process of service delivery, communities will have a vested interest in seeing that the service, and its commensurate benefits, continues indefinitely' (Lockwood, 2004). This effect epitomises the superior sustainability in the participatory approach.

The participation approach utilises the valuable labour and human resources of communities and pairs it with the capital of aid organisations and foreign financiers. Alone, the community lacks the engineering expertise to successfully complete an intensive development project like a potable water programme. To address this problem, AdP trains 'barefoot engineers' in gravity flow potable water project design as well as advanced algebra, fluid dynamics, mechanics and physics. As Cleaver (1999) notes, 'there is significant evidence of very real structural and resource constraints operational on communities, most severely impacting on those which may need development the most.' This leads us to our Hypothesis:

The level of outside investment channelled through a participatory approach aid-giving institution correlates positively with the level of economic development.

3. METHOD

3.1. Data Collection

Over several years, students from Furman University, Western New England University and James Madison University collected the data from the original files in the AdP's offices in Quezaltenango, Guatemala and entered them into a database. The data included over 387 unique projects, with a maximum of 43 items of data recorded per project. The dates of the project range from 1982 to 2005.

3.2. Approach

The independent variable was the mean of the total external contribution of the project. The measure includes all financing not provided by the community, including support from

NGOs, foreign countries and AdP. Many of the projects reported only a pre-construction cost estimate rather than the actual costs. According to AdP personnel, these cost estimates generally proved to be accurate. Thus, the researchers included projects that only provided estimated costs. The financial data are in Guatemalan currency, the Quetzal, which over the past 10 years has maintained an average conversion rate of eight Quetzals to one US dollar.

The researchers derived the dependent variable, from Census data provided by Guatemalan government. The Guatemalan government collected the data in 1994 and 2002. The data measures the economic status of each of the 332 municipalities of Guatemala. The dependent variable is the mean of the difference between 1994 and 2002 of four factors: housing quality, overcrowding, school attendance, and subsistence capability. Variables measuring potable water availability and sanitation coverage were intentionally omitted.

The researchers used local in-kind contribution as the control variable. This variable is the monetization of the labour performed by the communities in Quetzals. The researchers chose this control variable to isolate the effects of differing contractual relationships between the specific community and AdP.

4. RESULTS

The variables were normally distributed. Table 1 provides the descriptive statistics.

Table 2 provides the regression results that support the hypothesis. The analysis did not find any significant multicollinearity.

5. DISCUSSIONS

Table 2 confirms the hypothesis by correlating the level of international aid to the economic growth variable. Hickey (2002) accuses development organisations of a failure to produce evidence that the participation approach to aid has an impact on poverty. The results of this paper should begin to fill the absence of empirical evidence.

McGillivray, *et al.* (2006) observe a common trend among aid scholarship in which researchers prove microeconomic success of an aid programme and then imply macroeconomic success. It is important to determine the proper scope for AdP's success and not to make prodigious leaps regarding this research's implication. With that in mind, what do these results contribute?

Table 1. Descriptive statistics and correlations¹

	Mean	Standard deviation	N	1	2
1. Economic development	7.46	4.11	203		
2. Agua del Pueblo contribution	92 000	110 000	203	.14*	
3. External investment	110 000	110 000	203	.22**	.91*

¹Pearson's correlation coefficients.

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

Table 2. Results of the hierarchical regressions—centred variables

	Standardised beta coefficients	
	Model 1	Model 2
Control:		
AdP contribution	2.0*	-2.1*
Direct Effect:		
External Investment		3.2**
R ²	.02	.07

Dependent variable: economic development—one-tailed tests $N=200$

* $p < .05$.

** $p < .001$

The importance of the results found in this research is its implications for aid value maximisation. The target of the research, AdP, demonstrates a successful return on aid dollars over the long-term using a participatory development approach. Brown (1998) notes the importance of retroactive evaluation of 'continued benefit flow' sustainability within a development programme. The results of our analysis show an increase of economic development over the long term or a 'continued benefit flow'.

6. LIMITATIONS

One limitation of the research was the lack of measures of economic development on the village level. Each individual water project used in the study is located within one or two villages. Each village is located within a municipality. The authors used health and economic development measures that are based on the entire municipality. Instead of being able to pinpoint the direct affects on a certain village, the authors had to assume that the economic measures affect the entire municipality. The authors did not locate any consistent data for individual villages. This lack of more fine-grained data (on the village level) for economic development is a limitation of the study.

A second limitation the researchers encountered was locating the data from previous water projects. AdP stores data on projects completed before 1985 in hard copies in three ring binders in a shed outside the main office in Quezaltenango. Some of the data were difficult to read and some of the pages were missing from the reports. Different AdP representatives compiled the reports over the past 30 years. The formatting and type of data collected for projects has changed over the decades.

7. FUTURE RESEARCH

One possible avenue of future research would be to follow a water project from start to finish and take various measures of health and economic development before, during and after the project. This way, there would be quantitative evidence that the water projects were causing improvements in the individual villages in which they are built.

Another possible avenue would be to investigate a subset of these projects in far greater detail. Researchers could return to certain communities to verify the data compiled by AdP. The researchers could include open-ended questions to obtain data directly from

the beneficiaries rather than from AdP archives and Guatemalan government databases. This approach would provide a more contextual content to the research.

A final recommendation is to expand this research into other regions. All of the projects investigated are in rural communities in Guatemala. Because these projects share cultural, climatic and political features, it is difficult to generalise the results to other areas of the world. Future studies could collect data from other organisations in different countries. Without significant additional data, it is difficult to generalise the results.

8. CONCLUSION

The goal of this paper is to provide evidence that the installation of a potable water supply will increase economic development. The results in Tables 1 and 2 supported our hypothesis. In particular, the Pearson correlation coefficient of .22 in Table 1 and the standardised beta coefficient of a *positive* 3.2 in Table 2 indicate a *positive* relationship between external investments and economic development. That is, *more* external investment leads to *greater* economic development. Further, Table 2 shows that the beta coefficient was significant at the .001 level. That is, the odds that the relationship between external investment and economic development was due to chance, is less than one in a thousand.

This study provides evidence that directing foreign aid through organisations based on community participation is related to economic growth. When communities are involved in their own water supply project, they have a sense of ownership and are more likely to use and maintain the water supply. This means that the project is efficient long term because it is sustainable and will not just be a short-term fix to the problem.

As this paper described, a significant body of important literature hypothesised and qualitatively argued that a positive relationship exists between external investments in water supply and economic development (IRC, 1993; Cleaver, 1999; Clemens, *et al.*, 2002; Lockwood, 2004; Hutton, *et al.*, 2007; Riddell, 2007; Weinstein, 2010). However, this paper is the first study that the authors uncovered that empirically tested these theories with data. The authors hope that the positive results of this paper will open opportunities and the desire for additional research to investigate the proposed hypotheses. In addition, further research should investigate the limitations of this study described in the earlier section on limitations. The authors feel strongly that the issues discussed in this paper are both important on a global scale to practitioners and fascinating to the academic research community. The most important beneficiaries of this study are the citizens of the rural communities in the developing world that deserve to have access to potable water and economic development. It is shameful that the knowledge, expertise and affluence of the developed world have yet to solve the problems of economic development among our fellow brothers and sisters.

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