AGDS Advances in Gender and Development Studies
Vol: 1 (1): 1-8, 2022

Article

EFFECTIVENESS OF FOREIGN AID IN WATER SUPPLY AND SANITATION SECTOR: A COMPREHENSIVE REVIEW OF LITERATURE

Masood Ahmad *
Lecturer, Department of Public Administration, Faculty of Management Sciences, University of Kotli, Azad Jammu and Kashmir, Pakistan
Qurrah-tul-ain Khan
Assistant Professor, Department of Public Administration, Faculty of Management Sciences, University of Kotli, Azad Jammu and Kashmir, Pakistan

Keywords: Foreign aid, water supply, sanitation, development sector of Pakistan

Received: 24th February, 2022
Accepted: 14th March, 2022
Published: 31st March, 2022

Abstract: *This study reviews the research studies conducted to estimate the impact of foreign aid on access to improved water sources and sanitation facilities. More than half of the studies show a positive impact of foreign aid on the water supply and sanitation (WSS) sector. Due to improved econometric techniques and better availability of data, increase in number of studies have helped to analyze the impact of foreign aid on WSS and have shown that foreign aid to WSS is effective only under certain circumstances. As the literature on foreign aid effectiveness is still at the nascent stage, there are many questions to further the research in this area. These questions include exploring reasons why aid to WSS is more effective in rural areas as compared to urban areas and what role local politicians can play in rural areas? Whether aid money compliments or substitutes the local expenditures?*

INTRODUCTION

The importance of water supply and sanitation cannot be ignored. Water makes over 60% of the human body. Improvements in water and sanitation not only generate direct benefits but produce significant externalities in the form of increased School attendance, improved the productivity of workers and enhanced educational performance (Hutton et al. 2004; Rijsberman and Zwane 2012). According to the United Nations Organization (UNO), the access to safe drinking water and sanitation is a basic human right yet 2 billion people around the globe are deprived of it as human waste is continuously dumped into rivers and oceans, so the availability of clean drinking water is dwindling day by day. This has resulted in the health issue of enormous magnitude. According to estimates, more than 800 children under five years of age die every day due to unavailability of clean drinking water and poor sanitation conditions. Due to this, UNO has included access to clean drinking water and sanitation services previously in Millennium Development Goals (MDGs) and now in Sustainable Development Goals (SDGs). Tackling this problem is not only important but costly as well. According to the World Bank estimates, 28.4 US$ billion is needed every year from 2015 to 2030 to extend basic water and sanitation services to the un-served. As much of this problem exists in developing countries, so it is evident that these countries are not able to fund water supply and sanitation projects them and need to sustain foreign aid in this sector (United Nations). Comprehensive reviews aim to aggregate the existing body of research on a given subject, make sense of the information generated, appraise the quality of the methods used and try to find out what works and what not

* Corresponding Author: Masood Ahmed. Email: masood.ahmed@uokajk.edu.pk

(Roberts, 2006). A comprehensive review synthesizes the best available research on a specific question.
A comprehensive review is not primary research on its own; instead, it evaluates already accomplished research. A comprehensive review uses a structured and clearly defined methodology to search the studies aimed at answering a specific question. The studies included in the review go through a quality appraisal so that their finding could be combined (Campbell Collaboration). “This study aims to conduct a comprehensive review of academic literature on the effectiveness of foreign aid, commonly referred to as Official Development Assistance (ODA) on access to improved water sources and sanitation in developing countries. United Nations Joint Monitoring Program (JMP) on water supply and sanitation defines improved sources of water and improved sanitation as “An improved drinking water source is one that, by the nature of its construction and when properly used, adequately protects the source from outside contamination, particularly fecal matter” (WHO/UNICEF Joint Monitoring Program for Water Supply and Sanitation). An "improved sanitation facility is one that hygienically separates human excreta from human contact.” The developing countries are those categorized as "Medium Human development" and "Low Human Development" by the United Nations Development Program (UNDP) in 2009.” A preliminary search showed that as to this day, there is no comprehensive review conducted of the studies evaluating the impact of ODA in the WSS sector. Aid to water and sanitation reaches billions of dollars a year. According to the OECD Creditor Reporting System on the average, more than $8 billion of aid has been given to developing countries in the WSS sector from 2006 to 2015 annually (OECD). This aid includes all modalities of aid, i.e. general budget support, sector budget support, basket funds and project aid.

METHODS OF LITERATURE SEARCH AND EXAMINING RELEVANCE OF STUDY

Different search engines were used to identify relevant studies like Scopus, Web of Science, Google Scholar and National University of Singapore (NUS) e-library search function. Different search queries were applied, keeping in view the research question to be addressed (mentioned above). Titles and abstracts of the studies generated using queries from the databases, as mentioned earlier, were then examined for the potential relevance. A search of Scopus generated seven results out of which only 3 met the inclusion criteria described below. Web of Science (WoS) generated only three results which were all duplicates of Scopus results. NUS library search function generated more than 100 results out of which only five met the inclusion criteria described below; three results were duplicates with Scopus results. One of the two remaining results was a master thesis, and the other was an academic paper. A total of 10 studies are included in this review; these included six academic papers, three working papers, and one master level thesis.

SYNTHESES OF STUDIES

As only ten studies are addressing the relationship between ODA and WSS, the review has analyzed them one by one in chronological order. All the studies analyzed the secondary data obtained from sources like the World Bank'sWDI database, OECD-CRS database, AidData and UN. The literature of aid effectiveness in the WSS sector only started appearing recently. Wolf (2007) was the first to analyze the relationship between foreign aid water supply and sanitation. The paper titled “Does Aid Improve Public Service Delivery?” analyzed the impact of aid on WSS, Education, and Health. The secondary data from 1988 t0 2000 is used for 100 developing countries. Data is taken from OECD-DAC and World Bank Databases. The authors used a reduced form equation to estimate the impact of aid in general and WSS sector-specific aid on access to improved water sources and sanitation. The author also included in the analysis of institutional and socio-economic variables. The results showed no significant relationship between ODA share for WSS and access to improved water sources and sanitation facilities in different specifications. However, there are some quality concerns for the analysis. The author concludes that the aid effectiveness in the provision of services in the WSS sector is more or less limited. The impact of aid volatility on the water and sanitation was found positive and significant in three out of the four specifications, but the author herself downplays the significance of this finding due to the possibility of reverse causality (Wolf 2007). Botting et al. (2010) “did a country-level analysis of the relationship between per capita ODA and improved water and sanitation coverage, and infant and child mortality. It included 49 countries defined as low-income countries by the World Bank. The ODA data from 2002 to 2006 was taken from OECD-CRS database, and data of improved coverage of Water and Sanitation was taken from UN official website for Millennium Development Goals (MDGs) indicators. The analysis also used several control variables to account for confounding and effect modification. These variables included country population, GDP, health expenditure, corruption perception index and land area. To identify the statistically significant relationship between variables, the Spearman rank correlation coefficients were obtained. A logistical regression model with a 95% confidence interval was used to assess the association between variables of interest. The results were adjusted for country area

and population." The analysis did not detect a significant correlation between total WSS-ODA and improved coverage of water and sanitation. However, the story is deferent for per-capita WSS-ODA. The countries were divided into highest, middle and lower tertile based on per-capita WSS-ODA received. The countries in the highest tertile were 4 to 18 times more likely to achieve greater progress in access to improved sources of water. For the sanitation, the results were complicated and inconclusive. Trends showed improved access to sanitation, but evaluations were statistically non-significant. For some years, the relationship between total ODA and access to improved sanitation was negative, which is counterintuitive. The authors were unable to solve this paradox and suggested more research. There are some quality concerns in this study. The sample size was relatively small, and data was only for a very limited number of years which makes the study weak in its external validity. The paper itself acknowledges the absence of essential data (Botting et al. 2010)." Salami et al. (2014) in their working paper for African Development Bank used the Watsan Index of Development Effectiveness (WIDE) to estimate how effectively the four countries Madagascar, Kenya, Uganda and Burkina Faso used development aid in water and sanitation to meet millennium development goals. The paper considers four types of inputs measured from 1995 to 2008. These inputs include (i) average yearly per capita ODA to WSS sector, (ii) the average per capita gross domestic product, (iii) per capita renewable water resources of the country, (iv) Government's capacity. Covering 114 developing countries over 20 years Bain, Luyendijk, and Bartram (2013) used a panel data fixed effects model to estimate the relationship between aid and progress (coverage of improved water sources). First, they used Spearman's correlation coefficients. They discovered that the association between ODA per capita and advances in improved source coverage was larger than the relationship with improvements in home connection coverage or decreases in surface water usage. Therefore, they focused their assessment on the improved water sources at the aggregate level. They used per capita ODA lagged for five years as their measure of aid; the lag was added to account for the delay between aid disbursement and outcomes. Different economic, governance and demographic indicators were included as control variables. Six different versions of the basic model were used with each adding some more control variables. However, the results showed no significant effect of the volume of aid on improved water sources. The unadjusted fixed effects model had an adjusted R-square value of only .006, indicating a minimal correlation between the amount of ODA and water coverage. The adjusted R-square increased to .32 when the log of GDP was added as a control variable. There can be many reasons for such results; some of them are acknowledged by authors as well. They have not taken into account within-country drivers of coverage of improved water sources, for example, inequalities between urban and poor dwellers, between rich and poor and between ethnic groups (Bain, Luyendijk, and Bartram 2013). Joshua Wayland, in his thesis used a large variety of specifications to estimate the impact of WASH aid on different health indicators like child mortality, infant mortality and life expectancy. He used data from 133 countries over 50 years from 1960 to 2009: As part of his estimation of the impact of WASH aid on health, he analyzed the impact of WASH aid on access to improved drinking water. The aid for water and sanitation projects was the primary explanatory variable of interest. These projects were selected from AidData's water supply and sanitation Purpose Code Group and were related to water provision, water quality, sanitation and water management. Irrigation and large hydroelectric dam projects were excluded. Percentage of population with access to improved drinking water was used as one of the dependent variables. The impact of WASH aid on access to an improved source of drinking water was estimated from 1990 to 2009, and data was taken from World Bank WDI database. Several control variables were also included in the estimation. These control variables included the official development assistance (ODA) per capita measured in constant dollar terms to control for any aid effect unrelated to water. Trade openness expressed as the combined value of all imports and exports as percentage of GDP, rural population expressed as a percentage of the total population was used as one of WASH Sector-specific variable; the water scarcity index (WSI) was used as another sector-specific variable. WSI was calculated using WDI estimates of annual renewable freshwater resources. A governance variable was constructed from polity IV index, which measures the degree of institutional democracy and authoritarianism in a country, the score was constructed as an integer from - 10 to 10 with higher values indicating a higher degree of democracy and low level of autocracy. The polity score represents three general principles, the existence of democratic institutions, the presence of institutional checks on executive power and legal and practical extent of civil liberties granted (Marshall et al. 2011). The results indicated that the WASH aid had a positive and statistically significant impact on the access to improved sources of drinking water. GDP, polity score, and trade openness also had a positive and significant impact on access to improved water sources while the rural population had a significant and negative impact (Wayland 2013). Wayland (2013) also used the propensity score matching technique to estimate the impact of WASH aid on access to improved sources of water and sanitation in Malawi (SSA). To construct dependent and control variables, the analysis used the Third Integrated Household Survey (IHS3) conducted in 2010 and 2011 by the National Statistics Office of the government of Malawi. The data in the survey was collected by using stratified random sampling and consisted of 12271 households. The results of the survey were taken from World Bank's Central Micro data catalogue. Three dependent variables were used in the estimation two of them regarding water and sanitation the responses of the

respondents were matched with the JMP definitions of improved water and sanitation. In this way, households were categorized as having or not having access to improved water. For constructing independent variable geospatial information contained in the ISH3 dataset was utilized. The geographical area of interest was divided into blocks with the help of a virtual grid. The blocks where one or more WASH aid-related projects were going on were included in the estimation. Per capita, WASH aid was calculated by dividing aid disbursed in treated blocks by the population of the block. Population data was taken from the Malawi National Statistics Office. Several control variables, including population density and monthly household income, were also included in the estimation. The primary explanatory variable and two control variables, i.e. monthly household income and population density were used in the logarithmic form. First, a simple logit model was used to estimate the impact of WASH aid on access to improved sources of water and sanitation. The results of the logit estimation indicated a positive and significant relationship between WASH aid and access to both improved sources of water and sanitation. In order to mitigate the impact of potential selection bias in the above mentioned simple logit model, the author used propensity score matching (PSM) technique to estimate the relationship between WASH aid and access to improved water and sanitation. In the PSM technique, propensity scores are calculated for individuals. After the estimation of the propensity scores was done, the treated and untreated individuals were matched have similar propensity scores (Rosenbaum and Rubin 1983; Heckman et al. 1998). The author used the nearest-neighbor method with replacement to create the matched sample of treated and untreated individuals. Then the average treatment effect on treated (ATT) was calculated. The results indicated that ATT is positive and significant for access to improved sources of water at 5% level but is insignificant for sanitation (Wayland 2013). A panel data set of 139 middle and low-income countries (as defined by the World Bank) was taken from 2002 to 2012. WSS-specific aid disbursement data was taken from the OECD-DAC creditor reporting system (CRS) and was taken as a key independent variable. A selected collection of macroeconomic, demographic, and institutional variables impacting increased access to water and sanitation services in a nation were used as control variables. The macroeconomic control variables included GNI per capita, inflation, total government expenditures as a share of GDP, KOF index of globalization (which measures three dimensions of globalization, i.e. economic, social and political) and FDI inflows as % of GDP. The demographic control variables included population density and age dependency ratio. Three institutional variables were also included on the notion that better institutional capacity will enhance the aid effectiveness. These institutional variables included government effectiveness, regulatory quality, and the rule of law. The empirical analysis was carried out in three parts. The first part estimated the baseline model to assess the impact of the aid of improved sources of water and sanitation using fixed effects method; the second part explored non-linearities in the relationship between aid and WSS outcomes particularly concerning the differences in income levels of the countries. The last part estimated the differences in aid effectiveness in access to improved water and sanitation sources in rural and urban areas. The results were positive and significant in all three specifications of the baseline model. Among the control variables, GNI per capita, KOF index, and population density have a positive and significant impact on access to improved sources of water. The institutional control variables, as mentioned before, did not appear to have a significant impact on access to improved sources of water. For sanitation, the results are similar. The WSS ODA has a positive and significant impact on access to improved sanitation in all three specifications of the baseline model. Similarly, among the control variables, GNI per capita, KOF index, and population density have a positive and significant impact on access to improved sources of water. One additional control variable age dependency ratio also has a positive and significant impact on access to improved sanitation. To estimate the non-linearities, the paper divides the countries into three groups, low-income countries, lower-middle-income countries, and upper-middle-income countries. The baseline model with the same specifications and control variables was run on these groups of countries separately. The results showed that the relationship between aid and access to improved water sources was positive and significant only in lower-middle-income countries. The same relationship is insignificant in low-income countries and upper-middle-income countries. Particularly in the upper-middle-income countries, the relationship showed a negative sign which may indicate a diminishing return on aid according to paper. The results for sanitation are also similar. All three specifications of the baseline model were estimated separately for the rural and urban areas. The results indicated that the aid disbursements had a positive and statistically significant impact on access to improved sources of water only in rural areas as compared to urban areas, among the control variables GNI per capita, KOF Index and population density were positive and significant in rural regressions. For sanitation, the impact of WSS aid was positive and significant for both rural and urban areas, but the impact was more substantial in rural areas. The paper analyzed data for 47 SSA countries from the OECD Creditor Reporting System (CRS) database. The results showed a non-linear relationship between aid disbursement and rural access to sanitation up to a certain threshold of aid as a percentage of GDP. The aid has a positive impact on rural access to sanitation if aid is up to 5% of GDP. If the aid crosses this threshold, then aid was associated with declining access to sanitation. However, for most of the countries as the aid did not cross this threshold, so it was concluded that aid would generally have a positive impact on access to sanitation in the rural areas of SSA. For the urban access to

sanitation, the results were mixed. The fixed effects technique revealed no association between assistance and urban sanitation access, but GMM regression revealed unexpected results for aid and government health spending. For access to water, the GMM method showed positive and significant results in both rural and urban areas while the fixed effects method did not give any significant relationship between aid and access to an improved source of water.

According to the paper, this is due to substantial cross-country variability in the quantity of aid, access to water, and the links between aid and access to water. The results from the second estimation, which estimated the relationship between aid and rural-urban disparities in access to water and sanitation are somewhat similar. The fixed effects estimation results showed that aid disbursement and urban-rural access gap in sanitation has a negative relationship as long as an aid to WSS sector does not cross the threshold of 5.1% of GDP showing an improvement in rural access to improved sanitation relative to urban access. The GMM estimation also suggested a reduction in the gap between urban and rural access to sanitation with an increase in aid to WSS. This negative relationship between WSS aid and urban-rural access gap in sanitation suggests that aid may have been more effective in rural areas than in urban areas. Similarly, for water, the relationship between WSS aid and rural-urban access gap to an improved source of water is negative until aid reaches the threshold level of 3.5% of GDP in the GMM method. Wayland (2013) tested the impact of per-capita ODA on improved sources of water and sanitation. The specific hypothesis he tested was "the amount of per-capita WASH aid received by a country has a positive impact on the proportion of the population with access to improved sources of drinking water and sanitation and a negative impact on child mortality rate in the country". He used the total dollar (constant 2009 dollar) value of aid committed to a given country by all donors divided by the total population of the country and summed to five years. He summed the figure because he used aid commitments instead of aid disbursed and aid commitments take the time to materialize. The paper utilized a panel data set from 1994 to 2013 and included only low-income and middle-income countries according to the World Bank definition.

Three national indicators were used as dependent variables. The paper used three different specifications in the analysis. In the first specification, Dynamic Panel Model (DPM) is used. DPM is an extension of the fixed effects panel regression method which also accounts for dynamic trends in the variables by including both time variable and lagged value of the dependent variable. In the second specification, the paper employed the Latent Growth Model (LGM), this is also a variant of multilevel mixed-effects regression model where an independent time variable is estimated for each panel group which in this case is an individual country. To counter the potential threat of WASH aid variable being endogenous with the error term, the paper in the third specification used a 2 staged instrumental variable regression. In the instrumental variable regression, some exogenous variable is used as an instrument for the already existing endogenous variable.

The paper used aid for transportation as an instrumental variable for WASH aid. The results of the analysis are somewhat mixed. The WASH aid has a positive and statistically significant impact on access to improved sources of drinking water in two of the three specifications used in the paper. The results are positive and significant or DPM and IVM specifications but not for LGM specification. The paper also conducted subgroup analysis by analyzing WASH aid effectiveness in low, middle and high-income countries. The paper found that WASH aid is effective in the WSS sector in middle-income countries in all three specifications. The paper also individually tested the ten components of WASH aid, i.e. basic water supply, water training, water policy, large systems, waste management, water research, river development and resource protection and found that the effectiveness of WASH aid varies concerning what form it comes in a country. It found that aid for large water supply and sanitation systems has a significant and positive effect on the usage rate of improved sources and sanitation in middle-income countries.

SUMMARY OF SYNTHESES

All the ten studies included in the analysis estimated impact of aid on access to improved sources of water while nine studies estimated the impact of aid on access to improved sanitation. The results are summarized in the Table below. Out of the ten studies analyzed, seven found some positive and significant relationship between official development assistance (ODA) to WSS and access to improved sources of water. Botting et al. (2010) did not find a positive and significant impact of foreign aid on access to improved sources of water for total ODA to WSS sector but for per capita ODA to WSS sector he found a positive relationship. Salami et al. (2014) a positive and significant relationship between ODA and access to improved water sources for all the four countries included in the study. Anand (2013) and Wayland (2013) also found a positive and significant relationship between ODA to WSS and access to improved sources of water.

ASSESSMENT OF LITERATURE AND FUTURE RESEARCH DIRECTIONS

It is evident from the collection of the papers included in this review that the literature on aid effectiveness in water supply and sanitation (WSS) sector is in early stages of development. The first study Wolf (2007) emerged 7 years after the announcement of the Millennium Development Goals (MDGs). As compared to the other areas of research in the field of aid effectiveness like economic growth, health and education the number of aid effectiveness studies in WSS is very limited. In the areas just mentioned above one can find the literature reviews but in WSS sector one can only find a handful of single studies. Even out of 10 studies analyzed in this review 4 studies were not primarily focused on aid effectiveness in WSS sector rather it was a part of an analysis including outcomes in other sectors, particularly health. Among those studies primarily focused on WSS sector a couple of studies including Different regions can have different attitudes regarding drinking water and sanitation due to religious and cultural differences more regional studies can produce better pictures of aid effectiveness in WSS sector. Another point to note is that the literature has mostly analyzed similar data with different econometric models and different control variables and produced different as well as similar results. Little attention has been paid to the other factors which impact the effectiveness of aid like the type of aid, its modality, and the channels through which it is utilized. We do not know from this literature whether project aid is more effect or budgetary support has more impact? Whether aid disbursed through govt. channels have a more impact or aid spent through non-govt. channels like NGOs and the private sector. Another avenue for future research can be studying how political regimes and institutional settings can influence the aid effectiveness. Although Wayland (2013) estimated the impact of some political and institutional variables on WASH aid effectiveness but more research can be done in this area. Another avenue for future research can be studying how political regimes and institutional settings can influence the aid effectiveness. Although Wayland (2013) estimated the impact of some political and institutional variables on WASH aid effectiveness but more research can be done in this area.

REFERENCES

Bain, Robert, Rolf Luyendijk, and Jamie Bartram. 2013. "Universal access to drinking water: The role of aid." In.: *WIDER* Working Paper.

Botting, Marianne J, Edoye O Porbeni, Michel R Joffres, Bradley C Johnston, Robert E Black, and Edward J Mills. 2010. "Water and sanitation infrastructure for health: The impact of foreign aid." *Globalization and Health* 6 (1):12.

Heckman, James, Hidehiko Ichimura, Jeffrey Smith, and Petra Todd. 1998. "Characterizing selection bias using experimental data." In.: *National Bureau of Economic Research*.

Hutton, Guy, Laurence Haller, Sanitation Water, and World Health Organization. 2004. "Evaluation of the costs and benefits of water and sanitation improvements at the global level." In.: *Geneva: World Health Organization.*

Rijsberman, F, and A Zwane. 2012. "Challenge paper–Water and Sanitation." *Copenhagen Consensus*.

Rosenbaum, Paul R, and Donald B Rubin. 1983. "The central role of the propensity score in observational studies for causal effects." *Biometrika* 70 (1):41-55.

Wolf, Susanna. 2007. "Does aid improve public service delivery?" *Review of World Economics* 143 (4): 650-72.