Public engagement in integrated urban water management in Saudi Arabia: teachers’ perceptions in relation to water awareness
Abdullah Alsaluli, Abdullahi Ahmed and John Davies

ABSTRACT

This paper presents an overview of interpretative analysis of a survey to evaluate the potential for public engagement/ positive public participation in integrated urban water management (IUWM) in Saudi Arabia. The research targeted different stakeholders to investigate the current practices and visions, in order to determine the extent to which IUWM could be enhanced by positive stakeholder participation and public awareness. The paper concentrates on teachers’/schools’ perspectives; even though the wider study investigates the views of a number of key public stakeholder groups within Saudi society, all of the selected stakeholder groups have a public interface within the selected section of society. Data collection was through in-person administering of hardcopy questionnaires in Riyadh, Jeddah and Albaha, collecting responses from a wide range of stakeholder groups, including teachers, policy makers, water professionals and managers, environmental managers, technical practitioners and engineers, industrial managers, lecturers and researchers, and from the general public. This paper presents initial findings of questionnaire responses of teachers in 60 schools (one teacher for each school), relating to teachers’ perception of students’ awareness level of water issues and the potential role of schools in raising levels of awareness and engagement.

Key words | integrated urban water management, positive public participation, public awareness, public engagement

INTRODUCTION

Saudi Arabia is located in the arid climate zone of the Arabian Peninsula. Arid countries such as Saudi Arabia are faced with insufficient water supplies. Saudi Arabia is located in extremely arid regions where the average annual rainfall ranges between 100 and 200 mm. The annual evaporation rates are very high, up to 2,500–4,500 mm. The country covers an area of 2.25 million km² where 40% of the land is desert (Ministry of Agriculture and Water (MWA) 1984). This has led to increasing demand for water associated with higher living standards, scarcity of acceptable quality resources and excessive water pollution due to industrial and agricultural expansions. The population of Saudi Arabia has tripled, leading to an increase in the demand for water resources and growth in the industrial sector. Although the result has been an improved quality of life, it is in turn causing environmental destruction on a magnitude that cannot be predicted (Buchholz 1993). From the Central Department of Statistics and Information in Saudi Arabia (2010), the population of Saudi nationals is 20,271,058 and the total population living in the country 29,994,272 according to the 2010 Population Census.

Centre for Strategic and International Studies (CSIS) (2011) provided an overview of the current situation of the water sector in Saudi Arabia. It found that the kingdom has very little naturally occurring water. The Saudi government invested in desalination and domestic agriculture in providing potable water to the entire country. There are several issues for the government to address as it responds to the issue of water scarcity. Although domestic agriculture is in
decline, there remains a strain on groundwater resources. It is estimated that by 2016, the government will stop producing wheat domestically, which will provide some relief to the country’s groundwater supply. Al-Hussayen (2007) found that only 45% of all wastewater produced is actually collected and only 6% of the treated water is being reused. Also, about 70% of Saudi’s potable water needs are produced by 50 water-desalination plants serving 40 cities, which makes Saudi Arabia the world’s largest producer of desalinated water, representing 30% of the global production.

RATIONALE FOR THE RESEARCH

Al-Kahtani (2012) has analysed the most important factors in rationalizing the consumption of domestic water in Saudi Arabia. The study relies mainly on the primary data gathered from the questionnaire for 700 consumers in Riyadh. The results suggested that only 11% of the water consumers are likely to be influenced by water conservation campaigns organized by the Ministry of Water and Electricity, suggesting that voluntary policy may not be effective in the short term, and the Ministry should search for a complementary policy of water-demand management to be more influential on the rationalization of water consumption.

According to Gasson (2011), Saudi Arabia is expected to become the third largest water reuse market in the world after the United States and China. Gasson also points out that only 18% of the 1.84 million m³ of wastewater the country processes daily is currently reused. Zaharani et al. (2011) emphasized the urgency of adopting conservation and water-demand management initiatives to maintain the demand-supply relationship and achieve an acceptable balance between water needs and availability. In the kingdom’s situation, emphasis is placed on the shift from supply development to demand management to use of critical and non-renewable water resources efficiently. Al-Zahrani & Baig (2011) is posing significant risk that all the available water sources collectively are unable to meet the water needs of the ever-increasing population and water demand in the kingdom. To evaluate this risk and develop risk mitigation measures there is a need for integrated urban water management (IUWM) in Saudi Arabia. The conditions indicate that in Saudi Arabia, there is a lack of effective integrated water resource management systems to aid effective optimization of the available water resources. This would be achieved through optimization of both water sources and water uses. Sustainability remains the key paradigm when planning, designing and understanding the value of the available water resources via optimal uses.

According to the United Nations International Children’s Emergency Fund (UNICEF) (2010), 82% of the population in the Kingdom of Saudi Arabia (KSA) lives in urban areas. By 2015, 91% of the Saudi population will be in urban areas as estimated by Global Water Intelligence in the Pinsent Masons Water Yearbook 2009–2010. Mays (2009) explains that IUWM is a new approach to managing the entire urban water cycle in an integrated way, a key to achieving the sustainability of urban water resources and services. The IUWM approaches that deal with all of the water matters, including water supply and conservation, can improve the current situation. This leads to the need to evaluate the potential improvements that could be achieved by applying the IUWM approach in KSA.

It is difficult to establish a clear picture of the existing situation without investigating current practices and visions of all stakeholders in relation to IUWM applications. The IUWM strategies integrate together social abilities, water policies, education and economics through the active public contribution principle, which is an important factor in achieving integrated/sustainable urban water management. Hence, this research is studying public awareness and public participation in relation to integrated water management in KSA, and the study focuses on the realization of IUWM since the majority of the Saudi population lives in urban areas.

Al-Zahrani & Baig (2011) argued that: ‘without creating awareness among the users and educating the general public on the importance of this precious resource, all conservation measures adopted would be limited. Once they are convinced for its wise use and become water conscious consumers, they will happily put all the suggested water conservation measures
into their practice and implement the plans and policies with letters and spirits, offered by the kingdom.’

Public engagement is very central, and even though there are barriers, most of these would be overcome through higher public awareness. The research will investigate: is it necessary to have more public awareness/positive public participation to enhance IUWM processes? Is there a history of past involvement? Are there active groups who can be engaged? To what extent must enriching the public’s water knowledge play a part in IUWM?

Overall, the study will focus on the social-economic (political, economic and cultural) rather than the physical (environmental, ecological, hydrological) dimensions of IUWM.

**RESEARCH AIM AND OBJECTIVES**

The aim of this study is to determine the extent to which IUWM could be enhanced by positive stakeholder participation and awareness. The ultimate goal is to assist building a strong foundation of collaboration in the society to enable participation in the implementation of IUWM. These tasks and procedures are based on positive public participation after having a high public awareness of the water security strategies. To achieve that, the process will happen optimally via two stages. Figure 1 shows the proposed dynamic enhancement implementation plan of public engagement in IUWM: the first stage involves the evaluation and regulation of current activities from water managers, water engineers, water planners, and water researchers; and the second stage involves reaction and implementation, towards new plans and suggestions, as the common action from public/stakeholders. Thus, the continual suggestions and solutions in this dynamic loop of application plan lead to the public support of the comprehensive implementation of IUWM.

The main research question of this study is: ‘To what extent could IUWM be enhanced by positive stakeholders/public participation and public awareness?’ The following are associated sub-questions:

1. What is the current level of public awareness?
2. How much public engagement is likely?
3. To what extent can public engagement be stimulated?
4. How could public engagement be stimulated?
5. To what extent can public engagement be harnessed?
6. How could public engagement be harnessed?

As a preliminary stage in answering these questions, a series of questionnaires with 60 teachers have been

![Figure 1](https://iwaponline.com/ws/article-pdf/15/4/871/413843/ws015040871.pdf)
analysed, giving initial results which present a starting point in achieving the aims of the whole project.

DATA COLLECTION PROCEDURES

The researcher decided to investigate the issue of water awareness in general education from the teachers’ perspective by collecting different views of teachers from three of the main cities in KSA which have different geographical conditions. Thus, the data were collected: firstly, from Riyadh city, which is the capital and the biggest city in KSA, and located in the middle of a desert representing the desert climate in the kingdom; secondly, from Jeddah city, which is the largest sea port on the Red Sea, and the second largest city in Saudi Arabia, representing coastal cities; and, thirdly, from Albaha city, which is representing the south western region of KSA on The Sarawat Mountains. Data collection was through a personal administering of hardcopy questionnaires collecting 60 responses from 60 teachers during a field trip for 3 months at the beginning of 2013, as detailed in Table 1.

The researcher administered the questionnaires one-to-one, and the 60 teachers were asked seven open questions (qualitative questions) about the level of students’ awareness and the role of education in raising awareness; together with two quantitative questions: one about the extent of the interaction of schools with World Water Day (WWD) (see Figure 2) and the other for the most effective sources for public awareness campaigns on water issues (see Figure 3).

APPROACH TO ANALYSES

There was a combination of both quantitative and qualitative analysis based on the nature of the questions of the questionnaires. The majority of survey questions were analysed through the method of coding, thematic and interpretative analysis.

RESULTS: TEACHERS

There is a continuing process of data analysis. Preliminary results show the following findings from the perspective of school teachers in primary (age of students from 6/7 to 12/13 years), intermediate (13/14 to 15/16 yrs) and high (16/17 to 18/19 yrs) schools. The main themes are presented below together with selected quotations.

The perception of level of students’ awareness

The responses of the 60 teachers (30 female and 30 male) suggest that there is a spectrum of different levels of awareness by male and female students towards issues and problems of water in the KSA. That spectrum is from totally unaware (no awareness at all), through weak awareness to enough/good awareness. However, generally most of the teachers indicate that more than half of them possess a weak level of awareness. Only a very small number of teachers believe that there is a good awareness. Also, it was stated that it is hard to determine and describe the students’ awareness but that the index of awareness towards water might best be described by students’ reaction to the rationalization of consumption of water inside schools.

Teachers have described the weakness of awareness in many ways. Many teachers described that Saudi students are apathetic about water issues. In relation to knowledge about the water status in the region, and what is going on, there are many students who do not have background about the kingdom or the Arab World in general. Moreover,
there are students in primary and intermediate schools who do not even know what the main water resources in the kingdom are. Also, there were many opinions, particularly relating to the students in primary schools, showing that there is ignorance about not only conservation of water, but also the value and importance of water itself; and many students think that water is the cheapest and easiest thing to get in the world, whereas the reality is that Saudi Arabia is an arid country.

The generally low level of awareness was apparent to most of the teachers because of the existence of wrong practices and behaviours, particularly in primary schools, with widespread extravagance (excessiveness) and lack of awareness about levels of consumption.

‘Unfortunately, there is not enough awareness about the water issues and problems, and the nature of excessiveness (carelessness and wastefulness) and (non-thoughtful) uncalculated consumption is a common phenomenon on most of the daily life practices and the water usage is a part of this phenomenon’ (Male primary school – all quotes translated from Arabic).

On the matter of sense of responsibility, some teachers confirmed that there is no responsibility from most students towards water issues, particularly for primary school students, and having no responsibility is a reason particularly for having no conservation of water at schools. That’s why many teachers advised that the concept of responsibility should be instilled and there should be permanent care about the water issues starting from when the students are young to educate them that water is a nationally important wealth that will lead to disaster when it is absent.

‘The students do not have enough awareness towards water problems and there is no responsibility towards water conservation’ (Female intermediate school).
Teachers’ thoughts on influences that affect the level of awareness

Islamic religion: the Islamic religion influences all of the daily life of Saudi people as well as creating the potential for raising awareness of water issues from a religious perspective. This is considered further below.

‘Raising awareness will never succeed unless it is linked to Islamic religion in terms of the fear of God to be the recipient of a great reward from him (God/Allah)’ (Female intermediate school).

The family/home influence: many families have contributed to making the Saudi students’ awareness weak; only a few teachers feel that families have a positive influence on their sons and daughters’ awareness. The impact of media: teachers have addressed another reason for having a weakness about water issues in the kingdom, which is the lack of profile for water issues in the media.

‘The awareness of students about this issue (issues and problems of water in Saudi Arabia) is very weak and this is because of the lack of media attention to the issue’ (Male intermediate school).

On the other hand, even the teachers who declared that there is some awareness or good awareness believe that the current awareness is not as much as necessary in relation to the importance of water problems and issues in the kingdom. Also, those teachers pointed out that there was an improvement after the Ministry of Education adopted the topic of water consumption rationalization/water conservation, but the awareness is still absent for a big segment of students.

Perceived role of education/schools in raising awareness

The current situation of schools

The teachers’ views demonstrate that the education system has not presented the current water issues and its major/deep problems clearly. Moreover, some teachers mentioned that because there is a need to provide information to teachers, the General Education Directorates must consider teachers’ levels of awareness as well.

‘The months are coming and going and there is no guidance and instruction about water issues and problems’ (Male high school).

The role of education in raising awareness of water issues

Many teachers strongly believe that the schools have a key and fundamental role in raising awareness because school is the first place that teaches the parents of the future.

Most teachers feel that education can play a significant role in raising awareness of both the students and the teachers and then it can educate families indirectly through the students and the teachers as well. Furthermore, most teachers confirmed that the education sector could educate all kinds of employees, whether teachers or administrative workforce or others like cleaners, and teachers strongly believe that this kind of awareness comes most effectively from the education sector, where it plays a key role in shaping the consciousness of the community about public problems.

This confirms findings of other studies. The United Nations Environment Programme (UNEP) (2007) said that ‘education is critical for promoting sustainable development and improving the capacity of the people to address environment and development issues’; furthermore, education is stated to be an essential means of ‘achieving environmental and ethical awareness, values and attitudes, skills and behaviour consistent with sustainable development and effective public participation in decision-making’ (Chapter 36).

Also, Littledyke (1996), in his study about science education for environmental awareness in a postmodern world, confirms that: ‘Science education has an important part in developing understanding of concepts that underpin environmental issues, leading potentially to pro-environmental behaviour.’

‘Yes, it is appropriate for schools to play a role in raising awareness of water issues in society, and even it is necessary for schools to play a role in raising public awareness by educating students and their families because the
school is the place that all segments of society are meeting in' (Male intermediate school).

It is noted that the teachers in primary schools confirm the particular importance of the primary stage, and describe it as a stage of instilling values and principles.

The perception of the interaction of schools in the WWD

The majority of teachers demonstrated that schools did not react significantly with WWD. Many teachers admitted that they were completely unaware of it.

Only a few schools interacted with the WWD by organizing special events. Generally, the interaction in female schools was more than in male schools (Figure 2).

Suggestions on how schools should raise awareness of water issues

Methods of raising awareness through the curriculum

Many teachers think that the education system can play a role in educating students by including water issues in the curricula, for example making relevant links to problems of water in relation to health issues and behaviour. Also, there is a need to regularly update some of the current curriculum in relation to water issues.

‘Education can increase awareness by the inclusion of the importance of water as teaching material within the curriculum in which we have to emphasize the importance of water and be honest with ourselves that the most areas of kingdom are desert and the water resources are few, also we have to demonstrate the high cost of desalination and there is the possibility of our inability to secure it in the future’ (Male primary school).

The role of teachers

Teachers mentioned that there is a need to provide information to teachers to raise their awareness and to make them a role model/inspiration. The teachers can support their students by participating in the morning school broadcast, talking about water issues directly to all students. Also, some teachers suggest that there should be a partnership with the water services organizations in preparing the water flyers.

Monitoring students

Many teachers felt that monitoring of students is required from both the teacher and society. Also, some teachers want to act firmly against the students who do not listen to the instructions about using water, like reflecting this in comments about good behaviour in the students’ records.

‘To raise awareness, it is raised by doing punishments as solutions to prevent extravagance in using water, for example, when we see the students in the school campus playing with water and laughing; if the students are educated and informed and directed properly, nothing happens like this’ (Female high school).

Pragmatic demonstration of the current condition of water resources

Teachers called for realistic approaches to raise awareness, like field visits to observe the reality on the ground, for example visiting water services providers and organizations.

Motivation to do research and additional activities (not in the classroom)

The teachers have recommended not to focus only on the curricula all the time, but to make students research water issues, particularly for high school students, in order to increase awareness, improve skills of thinking and expression as well. Many teachers claimed that there was no motivation for students to do research about water problems, environment and pollution in the KSA or even generally about the Arab world, to know the nature of the problems and its causes.

Promoting awareness of water conservation

Some teachers gave emphasis to water conservation, particularly in the stages of primary and intermediate school. Teachers believe that there should be practical activities and programs outside classes in guiding students to reduce
excessive consumption of water, showing them the necessity for water saving, and how to achieve it. This includes demonstrating devices for saving water, and introducing a school system for checking and closing water taps, or checking water leakages.

The role of the media

The teachers expect that the awareness will be increased if the education system in Saudi Arabia realizes the importance of the media for increasing awareness. Then, some of the teachers alleged that there is a need for education through television, educational films and via the internet, to promote an environmental awareness including water awareness.

‘There will be awareness if the education system is conscious and purposeful, and also if the raising awareness would be done through public/general seminars and publications, television and internet; thus the society will produce the aware generations’ (Female high school).

Teachers’ stated enthusiasm for schools playing a role in raising awareness of water issues in society

The majority of teachers demonstrated a high enthusiasm, and many teachers were optimistic that the reaction from the Saudi community would be positive and that students would benefit, particularly if water saving campaigns could start from schools. Teachers said that they felt responsibility as educators to educate students about the importance of water issues and its vital role in our life. Also, many teachers declared that teachers must have a high enthusiasm for this topic because they felt that water problems are the biggest problems faced in the kingdom, due to water scarcity and dependence on desalination. A common view was that teachers should naturally be enthusiastic because they are Muslims, and water has an important role in their religion. Therefore, this reinforces the importance of religion in this context.

‘The enthusiasm is 100% due to the importance of water for us and because the water sources in the Kingdom are limited and most regions depend on desalination projects’ (Female primary school).

Perceived cultural issues/aspects in KSA that make raising awareness easy or difficult

The aspects that facilitate raising awareness

Religious aspect: teachers displayed that the religious aspect in the kingdom is the most important cultural factor; and most teachers explained that the effectiveness of the religious influence in society is because individuals must be committed by self-censorship and by the fear of Allah in doing things.

Teachers combine the education system in Saudi Arabia with the religious aspect. Many teachers pointed to the importance of combining the water issues with teaching of the Islamic religion, in terms of the Islamic optimal instructions, behaviours and practices; these are the most important factors in changing behaviours and practices of Saudi students.

For example, in the issue of water saving we find the principles of Islam urge the economic use of water as the Prophet used to do.

In this regard, some teachers said that the process of raising public awareness of water issues in the Saudi population might be easier than in liberal, non-religious, secular populations. With regard to the religious aspect, there was a concentration of some teachers on the voluntary work in the process of raising awareness of the kingdom, as Muslim community principles support voluntary activity in any positive work.

‘Yes, there are cultural aspects that make the issue of raising awareness easier in the Kingdom, for the Saudi society is a religious one, and it encourages voluntary work because there are sincere teachers, parents, employees and citizens who endeavour to do good things in every matter that benefits society for the sake of Allah’ (Male primary school).

In addition, many teachers mentioned other aspects that would facilitate raising awareness: firstly, the use of technology in Saudi society, where teachers believe that there will be many advantages in raising awareness easily by the devices of social communications; secondly, the increase and the spread of the cultural/scientific competitions and contests has become an important aspect in the various
media in Saudi Arabia, which could be exploited in the process of raising awareness; and, thirdly, having many cultural centres such as the King Fahd cultural centre and King Abdulaziz Centre For National Dialogue in Riyadh, which can have a role in raising awareness.

The aspects that complicate raising awareness

In relation to the features that are going to make raising awareness challenging, many teachers have commented on the common practice in the Saudi community of the use of excessive water to clean the hallways, large tiled spaces inside their homes, and their automobiles. Many rich Saudi families care about cleaning more than the average and they use water extensively in almost all types of cleaning without any care for how much water they use. Also, many rich individuals waste water in swimming pools and in the leisure facilities which are underused. One reason for this is that the water bills in Saudi Arabia are cheap compared with other countries.

Some teachers pointed out that the presence of apathy and the lack of concern and sense of responsibility towards the society’s problems exist within a minority of Saudi nationals and foreign citizens. In the end, teachers feel that the cheapness of clean and potable water makes it harder for the value of water to be appreciated.

‘Yes, the rich materialistic aspect of the kingdom makes students and people feel that any problem could be solved by money, thus from this perceptive there will be difficulty in raising awareness’ (Male high school).

The most effective public awareness campaign on water issues

 Teachers were asked whether they thought the most effective public campaigns would emanate from mosques, schools, water service providers or other government organizations; they could select any number of these. Figure 3 demonstrates that the majority of teachers from 60 different schools think that the most effective public awareness campaign on water issues would have to come from an integrated awareness campaign approach involving all of these organizations.

Figure 4 summarizes the total number of responses to each category of organization by the 60 teachers; it reveals that mosques have the highest overall, with a total of about 95% of teachers rating them of high importance, even more than schools (86%), given that teachers are the subject of this questionnaire. Water services providers and governmental organizations are selected by a total of 71.7% and 66.7%, respectively. The result in the figure further emphasizes the need for an integrated and holistic approach to the strategy for raising public awareness on water issues.

CONCLUSIONS

This paper has presented the initial stages of a research project which aims to evaluate the potential for public engagement/positive public participation in IUWM in Saudi Arabia. It has presented strong indications from the literature that the kingdom needs to move significantly towards this approach to water management and that public engagement/ positive public participation should be seen as an important component.

Teachers in 60 schools, one teacher per school, covering primary, intermediate and secondary, in three distinct geographical locations, have been surveyed using questionnaires consisting predominantly of open questions, administered on a one-to-one basis. The findings of this
part of the study suggest that most school students have a low level of awareness of water issues. And while the teachers find this discouraging, they generally have a high level of commitment towards their potential role in raising awareness. They commonly point to a need for more educational materials relating to water issues and more formalized inclusion in the curriculum. Religion (Islamic culture) is identified as a factor that should facilitate raising awareness, whereas accepted (wasteful) practice and the lack of financial incentives are identified as factors that will make raising water awareness a challenge.

The project is continuing with the analysis of surveys of a range of other stakeholders within KSA, including the general public, water professionals and managers, policy makers, water managers, environmental managers, technical practitioners and engineers, industrial managers, and lecturers and researchers. The ultimate aim is to propose strategies for stimulating and harnessing public engagement in water issues.

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First received 5 September 2014; accepted in revised form 7 January 2015. Available online 2 April 2015