

# Public engagement in integrated urban water management in Saudi Arabia: teachers' perceptions in relation to water awareness

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# Water Science and Technology: Water Supply

## Public Engagement in Integrated Urban Water Management in Saudi Arabia: Teachers' Perceptions in Relation to Water Awareness

--Manuscript Draft--

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<b>Abstract:</b>	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 stakeholders groups have a public interface within 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 stakeholders 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 questionnaires responses of teachers in 60 schools (one teacher for each school), relating to teachers' perception of students' awareness level for the water issues and the potential role of schools in raising levels of awareness and engagement.

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## Public Engagement in Integrated Urban Water Management in Saudi Arabia: Teachers' Perceptions in Relation to Water Awareness

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Abdullah Alsaluli, Abdullahi Ahmed and John Davies

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### 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 stakeholders groups have a public interface within 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 stakeholders 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 questionnaires responses of teachers in 60 schools (one teacher for each school), relating to teachers' perception of students' awareness level for the water issues and the potential role of schools in raising levels of awareness and engagement.

**Keywords:** Integrated Urban Water Management (IUWM), Public Engagement, Positive Public Participation, Public Awareness

### 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 2500 – 4500 mm. The country covers an area of 2.25 million square kilometers 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

1 environmental destruction on a magnitude that cannot be predicted (Buchholz, 1993).  
2 From the Central Department of Statistics and Information in Saudi Arabia (2010),  
3 the population of Saudi nationals is 20,271,058 and the total population living in the  
4 country 29,994,272 according to the 2010 Population Census.  
5

6 CSIS (2011) provided an overview of the current situation of the water sector in  
7 Saudi Arabia. It found that the Kingdom has very little naturally-occurring water. The  
8 Saudi government invested in desalination and domestic agriculture in providing  
9 portable water to the entire country. There are several issues for the government to  
10 address as it responds to the issue of water scarcity. Although domestic agriculture is  
11 in decline, there remains a strain on groundwater resources. It is estimated that by  
12 2016, the government will stop producing wheat domestically which will provide  
13 some relief to the country's groundwater supply. Al-Hussayen (2007) found that only  
14 45% of all wastewater produced is actually collected and only 6% of the treated water  
15 is being reused. Also about 70% of Saudi's potable water needs are produced by 30  
16 water-desalination plants serving 40 cities, which makes Saudi Arabia the world's  
17 largest producer of desalinated water representing 30% of the global production.  
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## 25 **Rationale for the research**

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27 Al-Kahtani (2012) has analyzed the most important factors in rationalizing the  
28 consumption of domestic water in Saudi Arabia. The study relies mainly on the  
29 primary data gathered from the questionnaire for 700 consumers in Riyadh. The  
30 results suggested that only 11% of the water consumers are likely to be influenced by  
31 water conservation campaigns organized by the Ministry of Water and Electricity,  
32 suggesting that voluntary policy may not be effective in the short term, and the  
33 Ministry should search for a complementary policy of water demand management to  
34 be more influential on the rationalization of water consumption.  
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40 According to Gasson (2011), Saudi Arabia is expected to become the third largest  
41 water reuse market in the world after the United States and China. Gasson also points  
42 that only 18 percent of the 1.84 million m<sup>3</sup> of wastewater the country processes daily,  
43 is currently reused. Zaharani, Al-Shayaa and Baig (2011) emphasized the urgency of  
44 adopting conservation and water-demand management initiatives to maintain the  
45 demand supply relationship and achieve an acceptable balance between water needs  
46 and availability. In the Kingdom's situation emphasis is placed on the shift from  
47 supply development to demand management to use of critical and non-renewable  
48 water resources efficiently. Al-Zahrani and Baig (2011) clarified that in Saudi Arabia,  
49 an appreciable amount of water is being lost due to wasteful consumption and  
50 irrational use by the general public where users take water as a free enterprise because  
51 the Kingdom provides generous subsidies to its consumers.  
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57 The high growth in water demand in domestic, agricultural and industrial sectors  
58 as discussed by Al-Zahrani and Baig (2011) is posing significant risk that all the  
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1 available water sources collectively are unable to meet the water needs of the ever-  
2 increasing population and water demand in the Kingdom. In order to evaluate this risk  
3 and develop risk mitigation measures there is a need of Integrated Urban Water  
4 Management in Saudi Arabia. The conditions indicate that in Saudi Arabia, there is a  
5 lack of effective integrated water resource management systems to aid effective  
6 optimization of the available water resources. This would be achieved through  
7 optimization of both water sources and water uses. Sustainability remains the key  
8 paradigm when planning, designing and understanding the value of the available  
9 water resources via optimal uses.  
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13 According to the UNICEF (2010), 82% of the population in the kingdom of Saudi  
14 Arabia (KSA) lives in urban areas. By 2015, 91% of Saudi population will be in urban  
15 areas as estimated by Global Water Intelligence in the Pinstent Masons Water  
16 Yearbook 2009-2010. Mays (2009) explains that IUWM is a new approach to  
17 managing the entire urban water cycle in an integrated way, a key to achieving the  
18 sustainability of urban water resources and services. The IUWM approaches that deal  
19 with all of the water matters including water supply and conservation, can improve  
20 the current situation. This leads to the need to evaluate the potential improvements  
21 that could be achieved by applying the IUWM approach in KSA.  
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27 It is difficult to establish a clear picture of existing situation without investigating  
28 current practices and visions of all stakeholders in relation to IUWM applications.  
29 The IUWM strategies integrate together social abilities, water policies, education and  
30 economics through the active public contribution principle which is an important  
31 factor in achieving integrated / sustainable urban water management. Hence this  
32 research is studying public awareness and public participation in relation to integrated  
33 water management in Kingdom of Saudi Arabia, and the study focuses on the  
34 realization of integrated urban water management since the majority of Saudi  
35 population lives in urban areas.  
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40 Al-Zahrani and Baig (2011) argued that: 'without creating awareness among the  
41 users and educating the general public on the importance of this precious resource, all  
42 conservation measures adopted would be limited. Once they are convinced for its  
43 wise use and become water conscious consumers, they will happily put all the  
44 suggested water conservation measures into their practice and implement the plans  
45 and policies with letters and spirits, offered by the Kingdom'.  
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49 Public engagement is very central, and even though there are barriers, most of  
50 these would be overcome through higher public awareness. The research will  
51 investigate: Is it necessary to have more public awareness/positive public participation  
52 to enhance IUWM processes? Is there a history of past involvement? Are there active  
53 groups who can be engaged? To what extent must enriching the public's water  
54 knowledge play a part in IUWM?  
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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

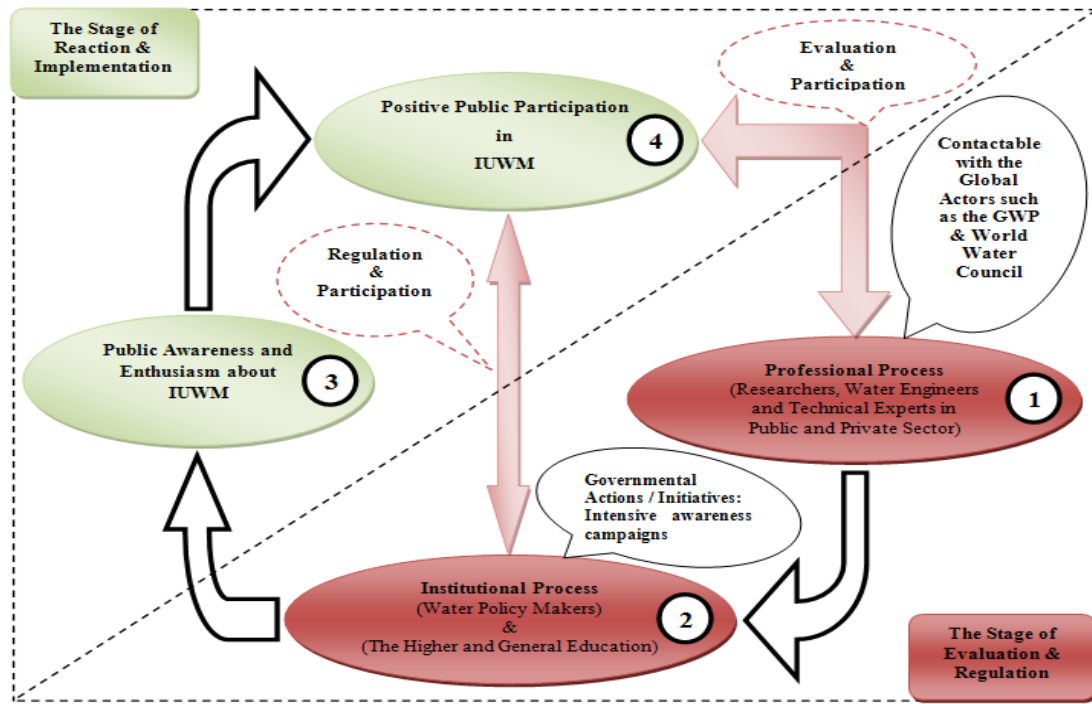


Figure 1: The proposed dynamic implementation of enhancing the positive public engagement in IUWM

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 the high public awareness towards the water security strategies. In order 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: 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 integrated urban water management.

The main research question of this study is: *To what extent could Integrated Urban Water Management 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 analyzed 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 them 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, and 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 three months in the beginning of 2013, as detail below:

30 Male & 30 Female Teachers from 60 Different Schools								
12 male & 12 female schools in Riyadh			9 male & 9 female schools in Jeddah			9 male & 9 female schools in Albaha		
4 male & 4 female Primary School	4 male & 4 female Intermediate School	4 male & 4 female High School	3 male & 3 female Primary School	3 male & 3 female Intermediate School	3 male & 3 female High School	3 male & 3 female Primary School	3 male & 3 female Intermediate School	3 male & 3 female High School

Table 1 : Table of the teachers' sample

1  
2 The researcher administered the questionnaires one-to-one, and the 60 teachers were  
3 asked 7 open questions (qualitative questions) about the level of students' awareness  
4 and the role education in raising awareness; together with two quantitative questions:  
5 one about the extent of the interaction of schools with World Water Day (WWD) (see  
6 figure 2) and other for the most effective sources for public awareness campaign on  
7 water issues (see figure 3).  
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### 10 11 **Approach to analyses**

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14 There was a combination for both of quantitative and qualitative analysis based on the  
15 nature of the questions of the questionnaires. The majority of surveys questions were  
16 analyzed through the method of coding, thematic and interpretative analysis.  
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### 19 **Results - teachers**

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21 There is a continuing process of data analysis. Preliminary results show the following  
22 findings from the perspective of school teachers in primary (age of students from 6/7-  
23 12/13 years), intermediate (13/14-15/16 yrs) and high (16/17-18/19 yrs). The main  
24 themes are presented below together with selected quotations.  
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#### 27 ***1-The perception of level of students' awareness:***

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30 The responses of the 60 teachers (30 female and 30 male) suggest that there is a  
31 spectrum of different levels of awareness by male and female students towards issues  
32 and problems of water in the kingdom of Saudi Arabia. That spectrum is from totally  
33 unaware (no awareness at all), through weak awareness to enough/good awareness.  
34 However, generally most of the teachers indicate that more than half of them possess  
35 a weak level of awareness. Only a very small number of teachers believe that there is  
36 a good awareness. Also it was stated that it is hard to determine and describe the  
37 students' awareness but that the index of awareness towards water might best be  
38 described by students' reaction to the rationalization of consumption of water inside  
39 schools.  
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45 Teachers have described the weakness of awareness in many ways. Many teachers  
46 described that Saudi students are apathetic to water issues. In relation to knowledge  
47 about the water status in the region, and what is going on, there are many students  
48 who do not have background about the kingdom or the Arab World in general.  
49 Moreover there are students in primary and intermediate schools do not even know  
50 what the main water resources in the kingdom are. Also there were many opinions,  
51 particularly relating to the students in primary schools, showing that there is  
52 ignorance not only about conservation of water but also the value and importance of  
53 water itself; and many students think that water is the cheapest and easiest thing to get  
54 in the world, whereas the reality is that Saudi Arabia is an arid country.  
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1 The generally low level of awareness was apparent to most of teachers because of  
2 the existence of wrong practices and behaviours, particularly in primary schools, with  
3 widespread extravagance (excessiveness) and lack of awareness about levels of  
4 consumption.  
5

6 *“Unfortunately, there is not enough awareness about the water issues and problems,  
7 and the nature of excessiveness (carelessness and wastefulness) and (non-thoughtful)  
8 uncalculated consumption is a common phenomenon on most of the daily life  
9 practices and the water usage is a part of this phenomenon” (Male primary school –  
10 all quotes translated from Arabic)*  
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14 On the matter of sense of responsibility, some teachers confirmed that there is no  
15 responsibility from most of students towards water issues particularly for primary  
16 schools’ students, and having no responsibility is a reason particularly for having no  
17 conservation of water at schools. That’s why many teachers advised that the concept  
18 of responsibility should be instilled and there should be permanent care about the  
19 water issues starting from when the students are young to educate them that water is a  
20 nationally important wealth, will lead to the disaster when it is absent.  
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24 *“The students do not have enough awareness towards water problems and there is no  
25 responsibility towards water conservation” (Female intermediate school)*  
26  
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## 28 ***2-Teachers’ thoughts on influences that affect the level of awareness***

29 **Islamic Religion:** the Islamic religion influences all of the daily life of Saudi people  
30 as well as creating the potential for raising awareness of water issues from a religious  
31 perspective. This is considered further below.  
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35 *“Raising awareness will never success unless it is linked to Islamic religion in terms  
36 of the fear of God to be the recipient of a great reward from him (God/Allah)”*  
37 *(Female intermediate school)*  
38  
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40 **The Family/Home influence:** many families have contributed to making the Saudi  
41 students’ awareness weak; only a few teachers feel that families have a positive  
42 influence on their sons and daughters’ awareness. **The impact of media:** Teachers  
43 have addressed another reason for having a weakness about water issues in the  
44 kingdom which is the lack of profile for water issues in the media.  
45  
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48 *“The awareness of students about this issue (issues and problems of water in Saudi  
49 Arabia) is very weak and this is because of the lack of media attention to the issue”*  
50 *(Male intermediate school)*  
51  
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53 On the other hand, even the teachers who declared that there is some awareness or  
54 good awareness believe that the current awareness is not as much as necessary in  
55 relation to the importance of water problems and issues in the kingdom. Also those  
56 teachers pointed out that there was an improvement after the Ministry of Education  
57 adopted the topic of water consumption rationalization/water conservation, but the  
58 awareness is still absent for a big segment of students.  
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### ***3-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 of 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 is 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 Littlelyke (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 behavior".

*"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 stage of instilling values and principles.

*The perception of the interaction of schools in the World Water Day (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 event. Generally the interaction in female schools was more than the male schools (Figure 2).

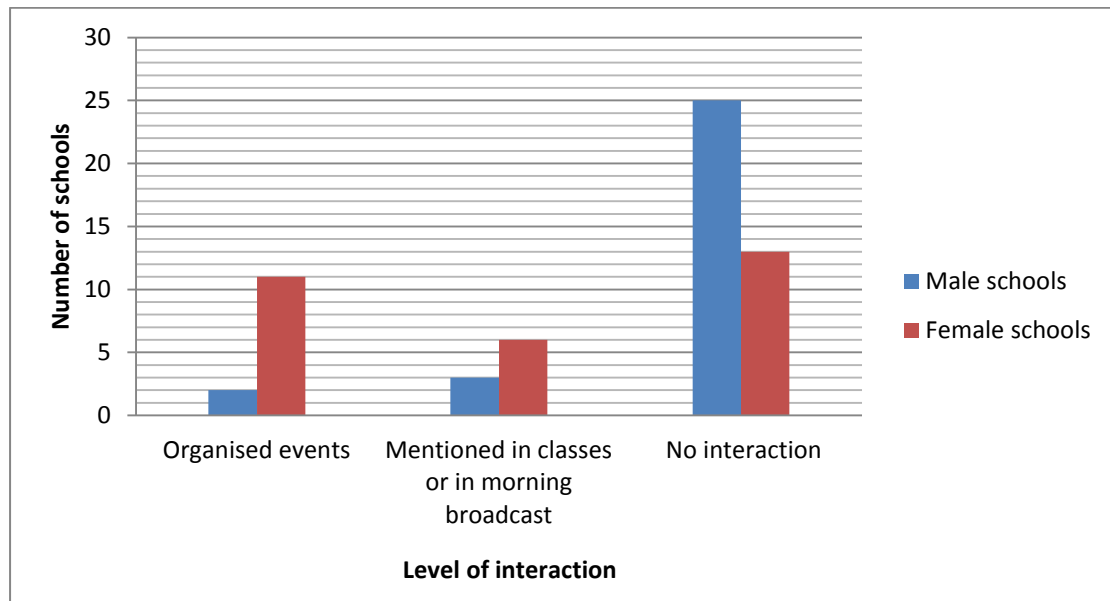


Figure 2: The interaction of schools in the World Water Day

**4- 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 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 teacher*

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

1 their students by participating in the morning school broadcast, talking about water  
2 issues directly to all students. Also some teachers suggest there should be a  
3 partnership with the water services organizations in preparing the water flyers.

#### 4 5 *Monitoring students*

6  
7 Many teachers felt that monitoring of students is required from both the teacher and  
8 society. Also some teachers want to act firmly against the students who do not listen  
9 to the instructions about using water, like reflecting this in comments about good  
10 behaviour in the students' records.

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

#### 17 18 19 20 *Pragmatic demonstration of the current condition of water resources*

21  
22 Teachers called for realistic approaches to raise awareness, like field visits to observe  
23 on the reality on the ground for example visiting water services providers and  
24 organizations.

#### 25 26 27 *Motivation to do research and additional activities (not in the classroom)*

28  
29 The teachers have recommended not to focus only on the curricula all the time, to  
30 make students research water issues particularly for high school students, in order to  
31 increase awareness, improve skills of thinking and expression as well. Many teachers  
32 claimed there was no motivation for students to do research about water problems,  
33 environment and pollution in the kingdom of Saudi Arabia or even generally about  
34 the Arab world, to know the nature of the problems and its causes.

#### 35 36 37 38 *Promoting awareness of water conservation*

39  
40 Some of teachers gave emphasis to water conservation particularly in the stages of  
41 primary and intermediate school. Teachers believe that there should be practical  
42 activities and programs outside classes in guiding students to reduce excessive  
43 consumption of water, showing them the necessity for water saving, and how to  
44 achieve it. This includes demonstrating devices for saving water, and introducing a  
45 school system for checking and closing water taps, or checking water leakages.

#### 46 47 48 49 *The role of the media*

50  
51 The teachers expect that the awareness will be increased if the education system in  
52 Saudi Arabia realizes the importance of the media for increasing awareness. Then,  
53 some of teachers alleged there is a need for education through television, educational  
54 films and via the internet, to promote an environmental awareness including water  
55 awareness.

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*"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"(Girls high school);*

#### **5- 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)*

#### **6- Perceived cultural issues/aspects in KSA that makes 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 to the economic use of water as the Prophet used to do.

In this regard, some teachers said that the process of raising public awareness in water issues in the Saudi population might be easier more than 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.

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*"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 endeavor to do good things in every matter that benefits society for the sake of Allah" (Male primary school)*

In addition, many teachers mentioned about 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 the exploited in the process of raising awareness; thirdly, having many cultural centres such as the King Fahd cultural centre and King Abdulaziz Center 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 to 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)*

#### **7- 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 organisations; they could select any number of these. Figure 3 demonstrates that 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.

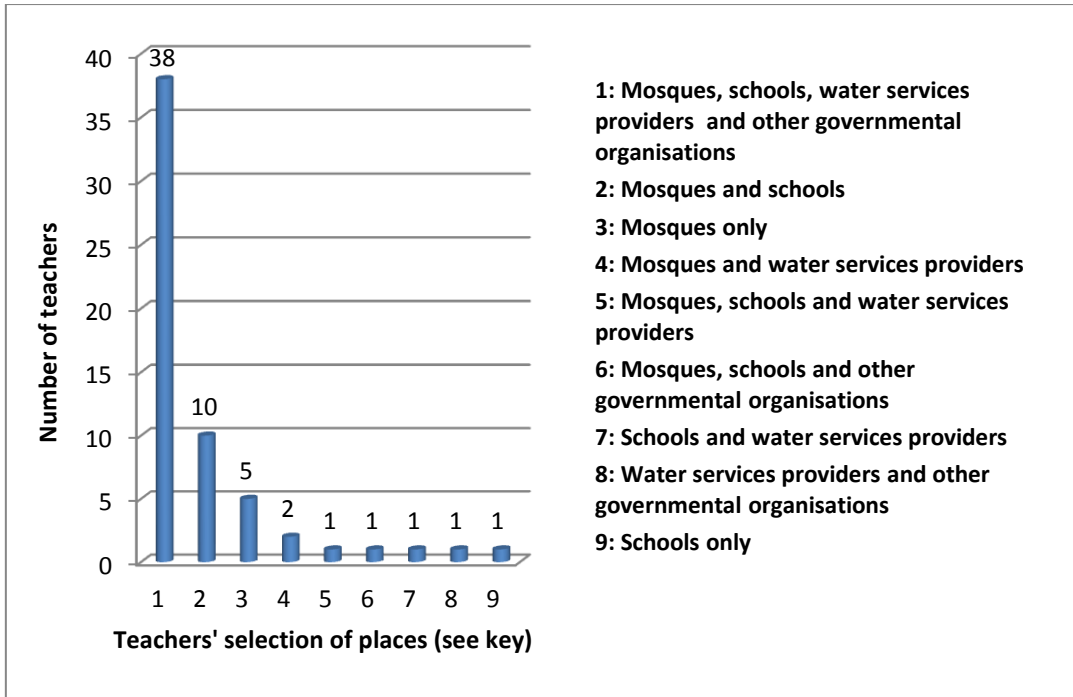


Figure 3: The most effective public awareness campaign on water issues

Figure 4 summarises 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 it of high importance even more than schools (86%) given that teachers are the subject of this questionnaires. 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 integrated and holistic approach to the strategy for raising public awareness on water issues.

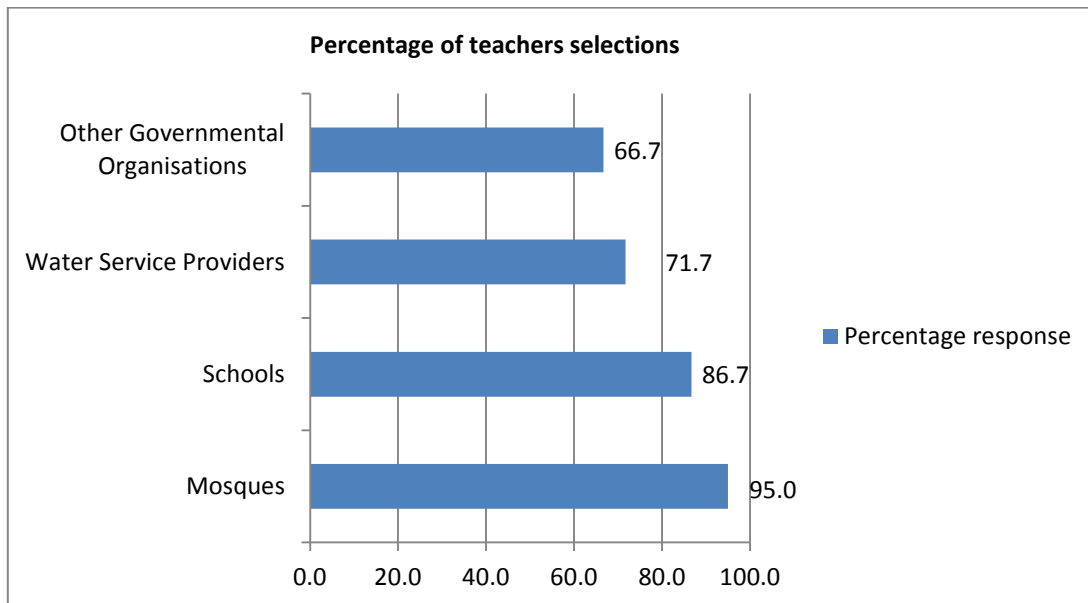


Figure 4: Percentage selection of organizations by teachers

## Conclusion

This paper has presented the initial stages of a research project which aims to evaluate the potential for public engagement/ positive public participation in Integrated Urban Water Management 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 formalised 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 from lecturers and researchers. The ultimate aim is to propose strategies for stimulating and harnessing public engagement in water issues.

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## Public Engagement in Integrated Urban Water Management in Saudi Arabia: Teachers' Perceptions in Relation to Water Awareness

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Abdullah Alsaluli, Abdullahi Ahmed and John Davies

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### 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 stakeholders groups have a public interface within 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 stakeholders 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 questionnaires responses of teachers in 60 schools (one teacher for each school), relating to teachers' perception of students' awareness level for the water issues and the potential role of schools in raising levels of awareness and engagement.

**Keywords:** Integrated Urban Water Management (IUWM), Public Engagement, Positive Public Participation, Public Awareness

### 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 2500 – 4500 mm. The country covers an area of 2.25 million square kilometers 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

1 environmental destruction on a magnitude that cannot be predicted (Buchholz, 1993).  
2 From the Central Department of Statistics and Information in Saudi Arabia (2010),  
3 the population of Saudi nationals is 20,271,058 and the total population living in the  
4 country 29,994,272 according to the 2010 Population Census.  
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6 CSIS (2011) provided an overview of the current situation of the water sector in  
7 Saudi Arabia. It found that the Kingdom has very little naturally-occurring water. The  
8 Saudi government invested in desalination and domestic agriculture in providing  
9 portable water to the entire country. There are several issues for the government to  
10 address as it responds to the issue of water scarcity. Although domestic agriculture is  
11 in decline, there remains a strain on groundwater resources. It is estimated that by  
12 2016, the government will stop producing wheat domestically which will provide  
13 some relief to the country's groundwater supply. Al-Hussayen (2007) found that only  
14 45% of all wastewater produced is actually collected and only 6% of the treated water  
15 is being reused. Also about 70% of Saudi's potable water needs are produced by 30  
16 water-desalination plants serving 40 cities, which makes Saudi Arabia the world's  
17 largest producer of desalinated water representing 30% of the global production.  
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## 25 **Rationale for the research**

26  
27 Al-Kahtani (2012) has analyzed the most important factors in rationalizing the  
28 consumption of domestic water in Saudi Arabia. The study relies mainly on the  
29 primary data gathered from the questionnaire for 700 consumers in Riyadh. The  
30 results suggested that only 11% of the water consumers are likely to be influenced by  
31 water conservation campaigns organized by the Ministry of Water and Electricity,  
32 suggesting that voluntary policy may not be effective in the short term, and the  
33 Ministry should search for a complementary policy of water demand management to  
34 be more influential on the rationalization of water consumption.  
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40 According to Gasson (2011), Saudi Arabia is expected to become the third largest  
41 water reuse market in the world after the United States and China. Gasson also points  
42 that only 18 percent of the 1.84 million m<sup>3</sup> of wastewater the country processes daily,  
43 is currently reused. Zaharani, Al-Shayaa and Baig (2011) emphasized the urgency of  
44 adopting conservation and water-demand management initiatives to maintain the  
45 demand supply relationship and achieve an acceptable balance between water needs  
46 and availability. In the Kingdom's situation emphasis is placed on the shift from  
47 supply development to demand management to use of critical and non-renewable  
48 water resources efficiently. Al-Zahrani and Baig (2011) clarified that in Saudi Arabia,  
49 an appreciable amount of water is being lost due to wasteful consumption and  
50 irrational use by the general public where users take water as a free enterprise because  
51 the Kingdom provides generous subsidies to its consumers.  
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57 The high growth in water demand in domestic, agricultural and industrial sectors  
58 as discussed by Al-Zahrani and Baig (2011) is posing significant risk that all the  
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1 available water sources collectively are unable to meet the water needs of the ever-  
2 increasing population and water demand in the Kingdom. In order to evaluate this risk  
3 and develop risk mitigation measures there is a need of Integrated Urban Water  
4 Management in Saudi Arabia. The conditions indicate that in Saudi Arabia, there is a  
5 lack of effective integrated water resource management systems to aid effective  
6 optimization of the available water resources. This would be achieved through  
7 optimization of both water sources and water uses. Sustainability remains the key  
8 paradigm when planning, designing and understanding the value of the available  
9 water resources via optimal uses.  
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13 According to the UNICEF (2010), 82% of the population in the kingdom of Saudi  
14 Arabia (KSA) lives in urban areas. By 2015, 91% of Saudi population will be in urban  
15 areas as estimated by Global Water Intelligence in the Pinstent Masons Water  
16 Yearbook 2009-2010. Mays (2009) explains that IUWM is a new approach to  
17 managing the entire urban water cycle in an integrated way, a key to achieving the  
18 sustainability of urban water resources and services. The IUWM approaches that deal  
19 with all of the water matters including water supply and conservation, can improve  
20 the current situation. This leads to the need to evaluate the potential improvements  
21 that could be achieved by applying the IUWM approach in KSA.  
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27 It is difficult to establish a clear picture of existing situation without investigating  
28 current practices and visions of all stakeholders in relation to IUWM applications.  
29 The IUWM strategies integrate together social abilities, water policies, education and  
30 economics through the active public contribution principle which is an important  
31 factor in achieving integrated / sustainable urban water management. Hence this  
32 research is studying public awareness and public participation in relation to integrated  
33 water management in Kingdom of Saudi Arabia, and the study focuses on the  
34 realization of integrated urban water management since the majority of Saudi  
35 population lives in urban areas.  
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40 Al-Zahrani and Baig (2011) argued that: 'without creating awareness among the  
41 users and educating the general public on the importance of this precious resource, all  
42 conservation measures adopted would be limited. Once they are convinced for its  
43 wise use and become water conscious consumers, they will happily put all the  
44 suggested water conservation measures into their practice and implement the plans  
45 and policies with letters and spirits, offered by the Kingdom'.  
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49 Public engagement is very central, and even though there are barriers, most of  
50 these would be overcome through higher public awareness. The research will  
51 investigate: Is it necessary to have more public awareness/positive public participation  
52 to enhance IUWM processes? Is there a history of past involvement? Are there active  
53 groups who can be engaged? To what extent must enriching the public's water  
54 knowledge play a part in IUWM?  
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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

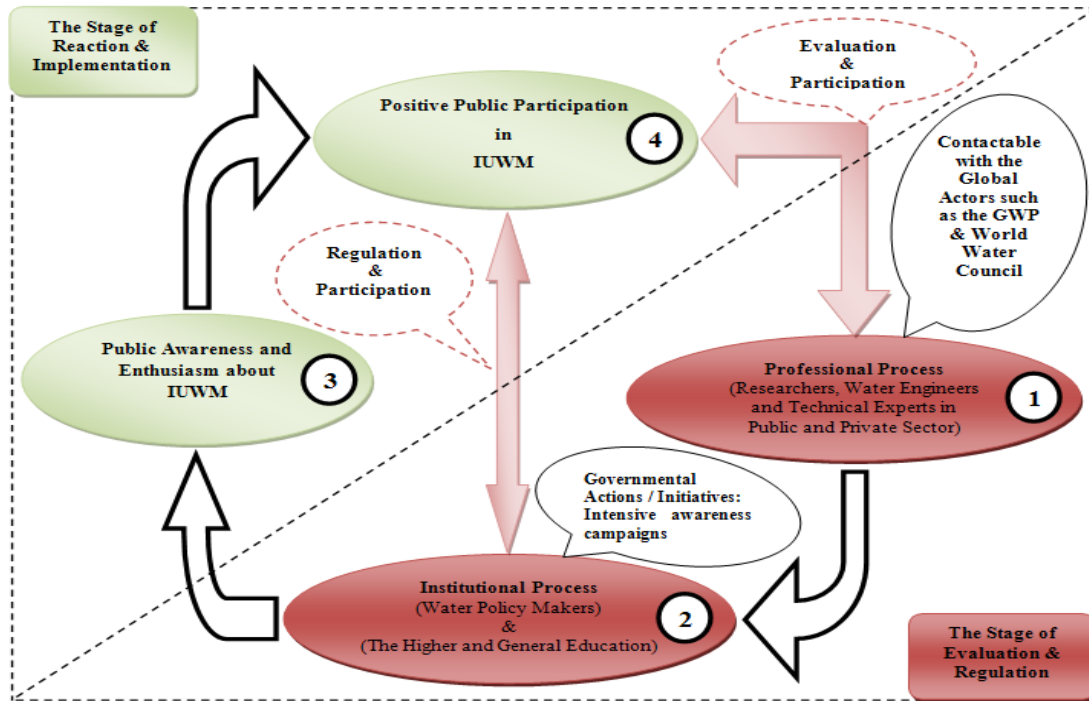


Figure 1: The proposed dynamic implementation of enhancing the positive public engagement in IUWM

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 the high public awareness towards the water security strategies. In order 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: 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 integrated urban water management.

The main research question of this study is: *To what extent could Integrated Urban Water Management 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 analyzed 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 them 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, and 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 three months in the beginning of 2013, as detail below:

30 Male & 30 Female Teachers from 60 Different Schools								
12 male & 12 female schools in Riyadh			9 male & 9 female schools in Jeddah			9 male & 9 female schools in Albaha		
4 male & 4 female Primary School	4 male & 4 female Intermediate School	4 male & 4 female High School	3 male & 3 female Primary School	3 male & 3 female Intermediate School	3 male & 3 female High School	3 male & 3 female Primary School	3 male & 3 female Intermediate School	3 male & 3 female High School

Table 1 : Table of the teachers' sample

1  
2 The researcher administered the questionnaires one-to-one, and the 60 teachers were  
3 asked 7 open questions (qualitative questions) about the level of students' awareness  
4 and the role education in raising awareness; together with two quantitative questions:  
5 one about the extent of the interaction of schools with World Water Day (WWD) (see  
6 figure 2) and other for the most effective sources for public awareness campaign on  
7 water issues (see figure 3).  
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### 10 11 **Approach to analyses**

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14 There was a combination for both of quantitative and qualitative analysis based on the  
15 nature of the questions of the questionnaires. The majority of surveys questions were  
16 analyzed through the method of coding, thematic and interpretative analysis.  
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### 19 **Results - teachers**

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21 There is a continuing process of data analysis. Preliminary results show the following  
22 findings from the perspective of school teachers in primary (age of students from 6/7-  
23 12/13 years), intermediate (13/14-15/16 yrs) and high (16/17-18/19 yrs). The main  
24 themes are presented below together with selected quotations.  
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#### 27 ***1-The perception of level of students' awareness:***

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30 The responses of the 60 teachers (30 female and 30 male) suggest that there is a  
31 spectrum of different levels of awareness by male and female students towards issues  
32 and problems of water in the kingdom of Saudi Arabia. That spectrum is from totally  
33 unaware (no awareness at all), through weak awareness to enough/good awareness.  
34 However, generally most of the teachers indicate that more than half of them possess  
35 a weak level of awareness. Only a very small number of teachers believe that there is  
36 a good awareness. Also it was stated that it is hard to determine and describe the  
37 students' awareness but that the index of awareness towards water might best be  
38 described by students' reaction to the rationalization of consumption of water inside  
39 schools.  
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45 Teachers have described the weakness of awareness in many ways. Many teachers  
46 described that Saudi students are apathetic to water issues. In relation to knowledge  
47 about the water status in the region, and what is going on, there are many students  
48 who do not have background about the kingdom or the Arab World in general.  
49 Moreover there are students in primary and intermediate schools do not even know  
50 what the main water resources in the kingdom are. Also there were many opinions,  
51 particularly relating to the students in primary schools, showing that there is  
52 ignorance not only about conservation of water but also the value and importance of  
53 water itself; and many students think that water is the cheapest and easiest thing to get  
54 in the world, whereas the reality is that Saudi Arabia is an arid country.  
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1 The generally low level of awareness was apparent to most of teachers because of  
2 the existence of wrong practices and behaviours, particularly in primary schools, with  
3 widespread extravagance (excessiveness) and lack of awareness about levels of  
4 consumption.  
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6 *“Unfortunately, there is not enough awareness about the water issues and problems,  
7 and the nature of excessiveness (carelessness and wastefulness) and (non-thoughtful)  
8 uncalculated consumption is a common phenomenon on most of the daily life  
9 practices and the water usage is a part of this phenomenon” (Male primary school –  
10 all quotes translated from Arabic)*  
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14 On the matter of sense of responsibility, some teachers confirmed that there is no  
15 responsibility from most of students towards water issues particularly for primary  
16 schools’ students, and having no responsibility is a reason particularly for having no  
17 conservation of water at schools. That’s why many teachers advised that the concept  
18 of responsibility should be instilled and there should be permanent care about the  
19 water issues starting from when the students are young to educate them that water is a  
20 nationally important wealth, will lead to the disaster when it is absent.  
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25 *“The students do not have enough awareness towards water problems and there is no  
26 responsibility towards water conservation” (Female intermediate school)*  
27

## 28 ***2-Teachers’ thoughts on influences that affect the level of awareness***

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30 **Islamic Religion:** the Islamic religion influences all of the daily life of Saudi people  
31 as well as creating the potential for raising awareness of water issues from a religious  
32 perspective. This is considered further below.  
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36 *“Raising awareness will never success unless it is linked to Islamic religion in terms  
37 of the fear of God to be the recipient of a great reward from him (God/Allah)”*  
38 *(Female intermediate school)*  
39

40 **The Family/Home influence:** many families have contributed to making the Saudi  
41 students’ awareness weak; only a few teachers feel that families have a positive  
42 influence on their sons and daughters’ awareness. **The impact of media:** Teachers  
43 have addressed another reason for having a weakness about water issues in the  
44 kingdom which is the lack of profile for water issues in the media.  
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48 *“The awareness of students about this issue (issues and problems of water in Saudi  
49 Arabia) is very weak and this is because of the lack of media attention to the issue”*  
50 *(Male intermediate school)*  
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53 On the other hand, even the teachers who declared that there is some awareness or  
54 good awareness believe that the current awareness is not as much as necessary in  
55 relation to the importance of water problems and issues in the kingdom. Also those  
56 teachers pointed out that there was an improvement after the Ministry of Education  
57 adopted the topic of water consumption rationalization/water conservation, but the  
58 awareness is still absent for a big segment of students.  
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### ***3-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 of 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 is 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 Littlelyke (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 behavior".

*"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 stage of instilling values and principles.

*The perception of the interaction of schools in the World Water Day (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 event. Generally the interaction in female schools was more than the male schools (Figure 2).

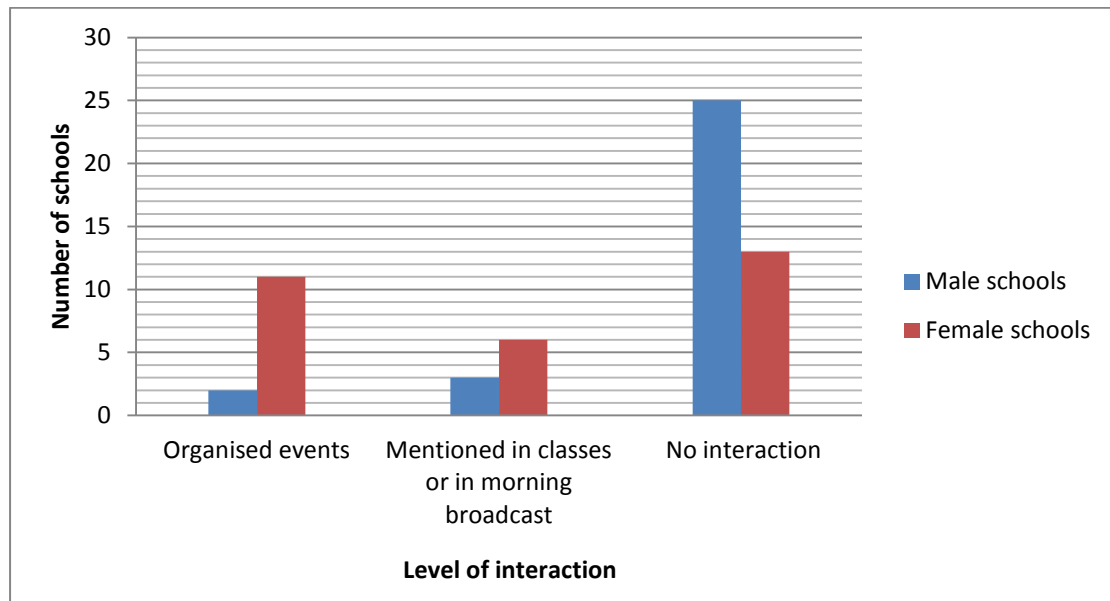


Figure 2: The interaction of schools in the World Water Day

**4- 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 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 teacher*

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

1 their students by participating in the morning school broadcast, talking about water  
2 issues directly to all students. Also some teachers suggest there should be a  
3 partnership with the water services organizations in preparing the water flyers.  
4

#### 5 *Monitoring students*

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7 Many teachers felt that monitoring of students is required from both the teacher and  
8 society. Also some teachers want to act firmly against the students who do not listen  
9 to the instructions about using water, like reflecting this in comments about good  
10 behaviour in the students' records.  
11

12  
13 *“To raise awareness, it is raised by doing punishments as solutions to prevent*  
14 *extravagance in using water, for example, when we see the students in the school*  
15 *campus playing with water and laughing; if the students are educated and informed*  
16 *and directed properly, nothing happens like this” (Female high school)*  
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#### 19 *Pragmatic demonstration of the current condition of water resources*

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21 Teachers called for realistic approaches to raise awareness, like field visits to observe  
22 on the reality on the ground for example visiting water services providers and  
23 organizations.  
24

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

26  
27 The teachers have recommended not to focus only on the curricula all the time, to  
28 make students research water issues particularly for high school students, in order to  
29 increase awareness, improve skills of thinking and expression as well. Many teachers  
30 claimed there was no motivation for students to do research about water problems,  
31 environment and pollution in the kingdom of Saudi Arabia or even generally about  
32 the Arab world, to know the nature of the problems and its causes.  
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34

#### 35 *Promoting awareness of water conservation*

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

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47 The teachers expect that the awareness will be increased if the education system in  
48 Saudi Arabia realizes the importance of the media for increasing awareness. Then,  
49 some of teachers alleged there is a need for education through television, educational  
50 films and via the internet, to promote an environmental awareness including water  
51 awareness.  
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*"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"(Girls high school);*

#### **5- 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)*

#### **6- Perceived cultural issues/aspects in KSA that makes 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 to the economic use of water as the Prophet used to do.

In this regard, some teachers said that the process of raising public awareness in water issues in the Saudi population might be easier more than 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.

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*"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 endeavor to do good things in every matter that benefits society for the sake of Allah" (Male primary school)*

In addition, many teachers mentioned about 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 the exploited in the process of raising awareness; thirdly, having many cultural centres such as the King Fahd cultural centre and King Abdulaziz Center 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 to 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)*

#### **7- 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 organisations; they could select any number of these. Figure 3 demonstrates that 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.

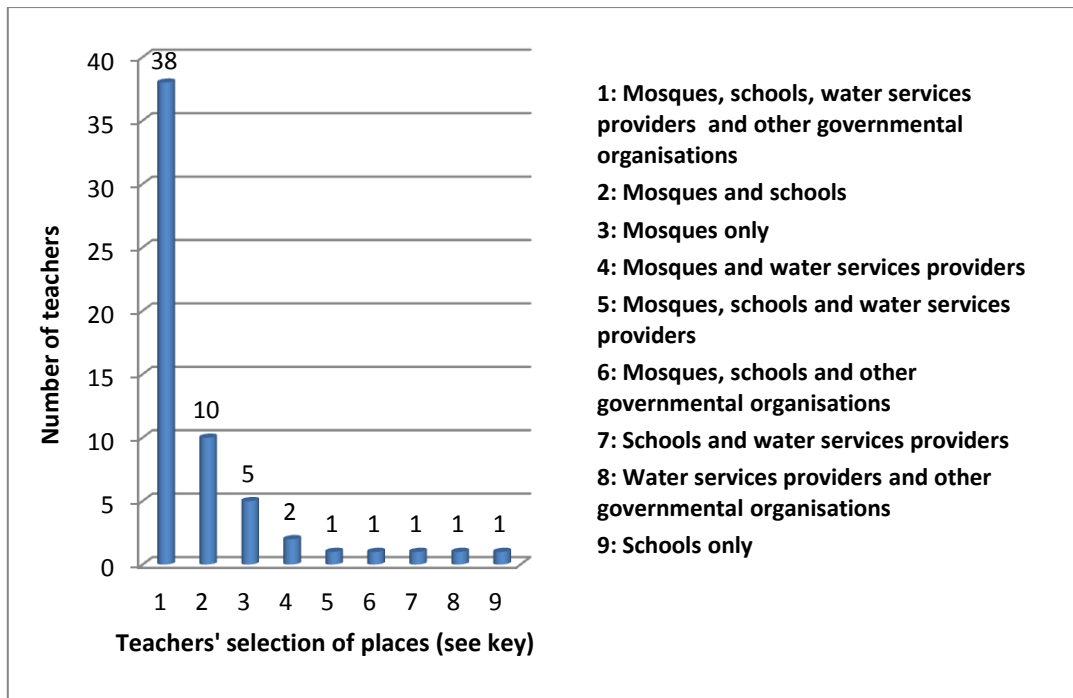


Figure 3: The most effective public awareness campaign on water issues

Figure 4 summarises 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 it of high importance even more than schools (86%) given that teachers are the subject of this questionnaires. 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 integrated and holistic approach to the strategy for raising public awareness on water issues.

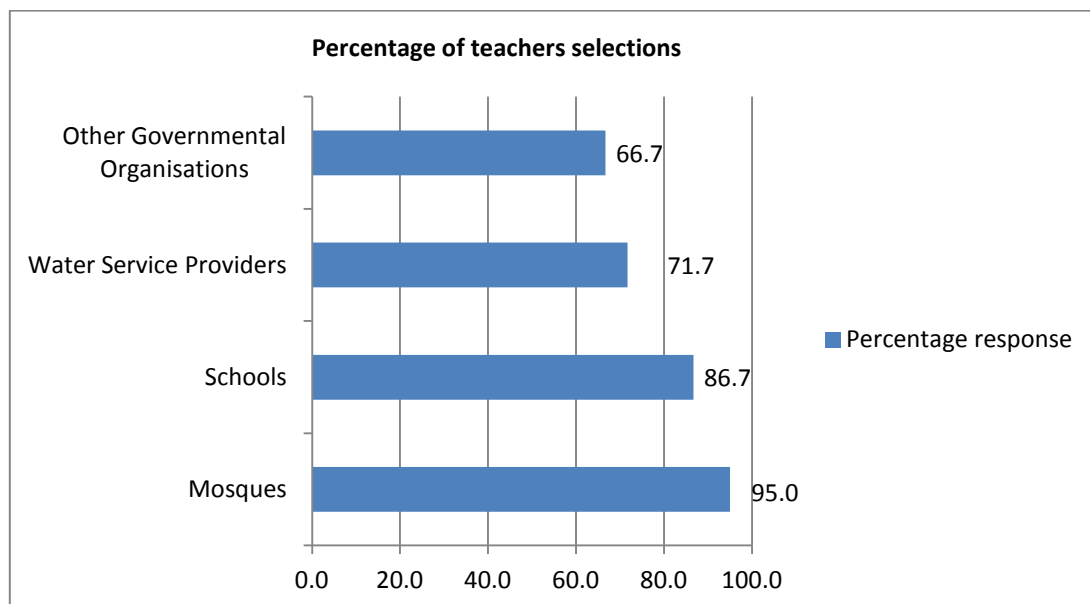


Figure 4: Percentage selection of organizations by teachers

## Conclusion

This paper has presented the initial stages of a research project which aims to evaluate the potential for public engagement/ positive public participation in Integrated Urban Water Management 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 formalised 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 from lecturers and researchers. The ultimate aim is to propose strategies for stimulating and harnessing public engagement in water issues.

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