South African National Water Game Competition aimed at eliciting the perceptions that youth in South Africa hold towards water and water-related careers

Report to the
WATER RESEARCH COMMISSION

by

Andrew Pott & Moroka Letshela
DHI

WRC Report No. KV 335/14
ISBN 978-1-4312-0603-2

December 2014

Obtainable from
Water Research Commission
Private Bag X03
GEZINA, 0031

orders@wrc.org.za or download from www.wrc.org.za

The publication of this report emanates from a project entitled *South African National Water Game Competition aimed at eliciting the perceptions that youth in South Africa hold towards water and water-related careers* (WRC Project No. K8/1068)

EXECUTIVE SUMMARY

BACKGROUND

The primary aim of this consultancy research project was to elicit (i.e. draw out/discover) the water and possible water career-related perceptions of young South Africans in high school and at University. A secondary aim was to assess the effectiveness of the approach used to elicit the feedback from the youth involved in this research project. Conventional methods to elicit perceptions held by individuals could include, amongst others, person-to-person interviews, telephonic interviews and emailed interviews, where the interviewee is asked to answer a list of questions. A novel approach was used to elicit this information in which questions were embedded within a Serious Water Game. The game is based on the Mid-Olifants catchment in South Africa, and observed river flows are used in the game. The motivation to use this novel approach of interviewing the youth included the following:

- The game is a web-based online game, meaning that youth from across South Africa could participate in the game. The questionnaire embedded in the water game promised to have advantages over other conventional survey approaches, in that the other approaches would either require contact details of the youth to be available, or for high costs to be incurred in order to pay for interviewers to make contact with large numbers of youth located throughout South Africa,
- The game, in addition to asking questions (from which the perceptions would be elicited), also served to educate and inform the participants about water and the growing water challenges many catchments in South Africa face. It has been well documented that serious games are effective at building awareness as the players learn through doing. The intricate linkages between water, energy, food and ecology are better understood after playing the game, which in effect is a gamified simulation model, with the simulation model representing actual processes and challenges in a catchment.

To encourage and incentivise youth from across South Africa to play the game, the approach was to hold a 30 day national water game competition, which ran from 18 July to 18 August 2014. The Mid-Olifants South Africa (MOSA) version on an online (i.e. internet-based) serious water game (Aqua Republica) was used for the competition. The German Ministry of Education and Research (BMBF) had funded the development of the MOSA version of the game. With the funding provided in this project the research team was able to further develop the MOSA version of the game to include a number of multiple-choice questions. The software development included setting up a database to record the feedback

(answer to the questions) of all the players participating in the competition. The inclusion of the questions in the serious game appears to be quite novel.

In-game prizes (in the form of cell phone airtime) were included in the game, as well as high-score prizes to incentivise people to play the game. SANPARKS participated in the competition. A number of computers with internet access were set up at the Skukuza rest camp in the Kruger National Park. Groups of school-children from surrounding communities were invited to participate in the competition, playing the game using the computers in Skukuza, with support by the SANPARKS staff. SANPARKS also generously offered a lucky draw prize of a weekend at any SANPARKS park in South Africa.

To participate in the competition the player had to do the following:

1. As the game is an on-line (internet based) game the player would need to visit www.watergame.co.za on a computer with a Windows or MAC operating system. Note that at present the game cannot be played on mobile devices with non-Windows operating systems,
2. The player would be prompted to register. The registration page includes details about the player, such as:
    a. Player name
    b. Player email address (mandatory)
    c. Player birth year
    d. Category of player (i.e. at school, at university, working, other)
3. The player would then start playing the game. The game is a turn-based game (with 15 turns in the game, with each turn representing a period of 1 year). The objective of the game is to maximise the game score. The game scoring mechanism considers social, economic and ecological aspects. The player is challenged to find the balance between economic and population growth with the sustainability of ecological processes.
4. Between each game turn a set of multiple questions was asked. Some of the questions are very direct, for example, would you like to work in a water-related career (yes or no), while other questions are less direct and can be used to infer perceptions related to water. The full list of questions and answers is shown in Appendix A.

The competition was advertised as follows:

1. Mindset TV which screens free-to-view educational TV to hundreds of thousands of viewers in South Africa advertised the competition during the 30 day period that the competition was being held,
2. Emails were sent to Universities and companies, providing details of the competition,
3. Details of the competition were announced at a few water-related conferences that were being held in South Africa over the period that the competition was being played.

Although the competition targeted high school and university-going youngsters, it was possible for anyone to play the game. A set of questions was asked to all players, with some tailored being questions being asked dependent if the player was at school, university, or working respectively.

This report answers, amongst others, some of the following questions:

1. What is a serious game?
2. What was the motivation for using a water game to elicit water-related perceptions of the youth (and others) in South Africa?
3. Was there a good response to the national water competition (i.e. did many people participate in the competition?
4. What types of questions were asked to elicit information regarding water career and other water-related perceptions?
5. What were the results of the questions asked?
6. What conclusions and recommendations can be drawn from the study

Some key results from the competition are:

- Over a thousand people viewed the www.watergame.co.za website. However most of these were from people browsing the site on their mobile phones, but not able to play the game on their mobile phones as the game cannot be played on devices with an Android operating system yet.
- 254 people successfully fully completed the game (240 from South Africa, 14 from outside SA). The big difference between the number of people viewing the competition website compared to the number that successfully completed the game most probably relates to the fact that more people have access to mobile phones (with Android operating system) compared to their access to Windows operating system driving computers which have internet access.
- Of the 240 South Africa players, 60% were male, with 40% being female.

- Of the 240 South African players, 28% are currently at school, with 57% currently attending university. This was satisfactory, as together the total is 85%, and these were the primary target for the research project.
- 83% of the respondents felt that it was very important to manage water quantity and quality for the benefit of current and future generations.
- Just under 60% of the respondents felt that only via more water-related research would South Africa be in a position to grow the economy without compromising on the protection of water resources.
- 51% of the respondents felt that South Africa had more water-related challenges compared to other countries, with 49% of the respondents being of the opinion that South Africa has less water-related challenges than other countries.
- Interestingly, a very high figure of 88% of the respondents indicated that they would be interested in a water-related career.
- 69% of the players indicated that they really enjoyed playing the MOSA Aqua Republic serious water game.
- 55% of all respondents felt they had learnt much by playing the MOSA Aqua Republica game, 40% felt they learnt a bit, with only 5% stating they did not learn anything.
- 62% of the respondents indicated that serious games could be used to teach and/or build awareness around issues, 33% felt that serious games could maybe be used in to teach, and 5% felt that serious games could not be used for teaching purposes.

Some conclusions and recommendations that can be drawn from the project include:

1. The number of respondents was not as high as was initially expected, but can be explained by the fact that most people visiting the www.watergame.co.za site did so with their mobile phones. The game could not be played on these devices. The recommendation would be for the game to be further developed so that it can be played on mobile devices.
2. The feedback from SANPARKS was that the serious water game was very well received by all the scholars that played the game using the SANPARKS facilities in the Kruger National Park. The SANPARKS staff was able to provide guidance and support to the players. The recommendation would be for the Department of Water and Sanitation to potentially use the free-to-play Aqua Republica game as part of any water-related training being built into curricula of schools.

3. The feedback from the school- and university-going youths is that (a) they do believe that water challenges are problematic in South Africa, and (b) the large majority showed an interest in working in a water-related career.
4. The large majority of participants enjoyed the game, and were happy to answer questions in the game. The recommendation would be for organisations such as water boards or municipalities to consider using such an approach to get feedback from stakeholders in their service-provision area.

Some video material uploaded to YouTube related to the competition can be found at:

https://www.youtube.com/watch?v=SckIrnDwtdw&feature=youtu.be	Kruger Park video
http://youtu.be/hkAl3S61kZo	DHI video
http://youtu.be/JLTC_DcpL6o	WRC video

The two aims of this consultancy research project were achieved;

- The perceptions of the youth towards water and water-related careers was successfully elicited, and
- The feedback from the game participants was that they enjoyed playing the game, and that they did not mind answering the questions embedded in the game.

The Water Research Commission could consider hosting a version of the game, around which it runs frequent competitions. The questions included in the game can be changed to target perceptions and to elicit feedback related to various research projects that the WRC may be running at that point in time. The game, which can target the youth, can also help to build awareness related to the Water Research Commission, and the work it is doing. There appears to be a need for this awareness creation as a high percentage of the competition participants, although being familiar with the existence of the WRC, were not aware of the work that the WRC do.

ACKNOWLEDGEMENTS

The authors would like to thank the following organisations and people who contributed toward this project:

- The WRC is acknowledged for its generous funding and support of the project, and in particular a word of thanks is extended to Dr Inga Jacobs who provided support and inspiration for the project,
- The BMBF, UNEP and DANIDA are acknowledged for the prior funding they had provided to help develop the MOSA Aqua Republica serous water game. This project would not have been possible without access to the game.
- The DHI Group is acknowledged for making the MOSA Aqua Republica game available for the project.
- The Serious Games Institute at the University of the North West is acknowledged for their contributions towards the project, and for allowing the prizes to be announced at the Serious Games conference held on 27/28 August 2014.
- SANPARKS is acknowledged for their participation in the project, and for the generous prize they offered.
- Dr Mark Dent and Dr Kevin Winter are acknowledged for their guidance and support, especially related to the types of questions to be included in the game.
- The contribution of colleagues from DHI-Germany and DHI-Denmark, IEEH, as well as from Serious Games Interactive (SGI) is acknowledged. Without their input and support, the project would not have been possible.
- Special thanks is extended to Mr Francois Hayden from Vivid Productions, who produced excellent video footage of the competition, as well as to Mindset TV who flighted the footage on their TV channels.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

BMBF	German Federal Ministry of Education and Research
IWRM	Integrated Water Resources Management
MOSA	Middle Olifants South Africa
SGI	Serious Games Institute
UNEP	United Nations Environmental Programme
WRC	Water Research Commission

1 INTRODUCTION AND OBJECTIVES

1.1 Introduction

The inspiration for this project relates to the following:

- The BMBF are funding the tailoring of the Aqua Republica serious water game to the Mid-Olifants catchment in South Africa. This version of the serious water game is known as the MOSA Aqua Republica game. This is a free-to-play game.
- There is a recognition that the WRC is involved in water awareness creation programmes targeting the youth.

The researchers involved in this project saw the potential for the MOSA Aqua Republica serious game to be used in a national water game competition. However, instead of only providing the scores of the players, questions would be added to the game. The questions (with multiple answers), would then enable the researchers to elicit from the players information related to their perception regarding the water situation in South Africa, and their potential interest in a water-related career.

Fruitful discussions were held with the WRC in this regard, and the national water game competition was successfully held.

1.2 The South African 30-Day national water game competition

The South African National competition is sponsored by the Water Research Commission (WRC) & the German Federal Ministry of Education and Research (BMBF). The screen-shot below shows the full list of organisations that were directly or indirectly involved in this project. Many thanks and acknowledgements are extended to these organisations.

The national water game competition ran from 18 July to 18 August 2014. In order to play the game, the following website needed to be visited by the player/s: www.watergame.co.za.

To participate in the competition all players first had to register. The registration page asked the players to answer the following type of questions:

- Gender (Male/Female)
- Birth year
- Living in : A large city, a medium sized city, a town, a rural village
- What they are currently doing, i.e. : at school, at university, working or other

- Cellular provider: MTN, Cell-C, Vodacom, 8ta (we needed this information as cell-phone airtime could be won in the game).

Prizes included in the completion include:

- 1st = R5,000 2nd = R3,000 3rd = R2,000
- Over R20,000 worth of cell phone airtime to be won as you play the game,
- A weekend trip for four at a SANPARKS game reserve anywhere in South Africa,
- A Samsung Galaxy Tab 3, which will be a lucky-draw prize for players who complete the game.

1.3 Competition Winners

The following participants are the winners of the competitions as stipulated above.

First Prize Winner: Chikondi Makwiza

"*On the game, the main issue I noted was the water use. It wasn't scored at all. It did not matter how much water you save during the game, it never affected the final score. When you built dams, it didn't seem to improve water availability. Maybe the water available at every turn could*

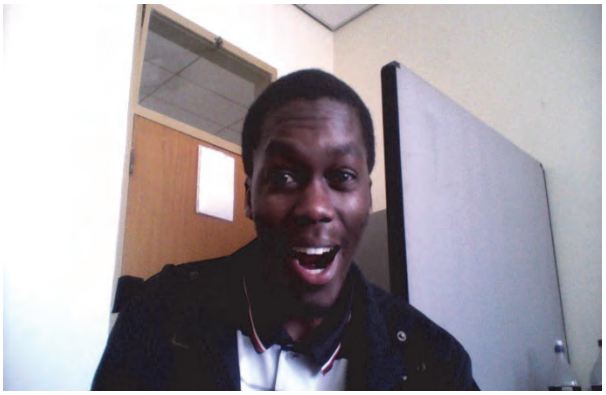
be shown in the status bar just as the population, energy etc. I also felt the score given to the environment, particularly which for forests, grasslands and bushes is on the lower side. You could neglect these completely throughout the game, use the funds for the industry and still get a more decent score. It is an excellent game for showing/emphasizing the relationships that exist in watersheds. I think that's what I got at the end of everything."

Second Prize Winner: Jacqueline Munetsi

"*My experience of playing the game went from bad to pro or so I like to think. At first I was clueless about how to score points, what to do, how the whole thing worked but after a few rounds of playing I got the hang of it. My points were low at the beginning because I wanted to make sure my planning was perfect and my buildings did no harm to my environment, but as I played more and more I figured out how to protect my environment and at the same time score a lot of points. The first thing that I did every morning when I woke up was checking my score to make sure I was still in the top three and during the day I made sure I played the game whenever I was free. I enjoyed playing the game and I loved the challenge brought on by the other players.*"

Third Prize Winner: Kudakwashe Ronald Chinyemba

"I enjoyed playing this game a lot, so I found myself playing it whenever I had any free time available. I liked how the game was a practical experience to my hydrology subjects I took at school, playing the game so many times made me see the environment in a whole new perspective. For example, I thought I knew that ecosystems are essential in the environment but the game really showed exactly how important things like these are and also how easily the environment is polluted even with the least of intentions. I got my colleagues playing the game also and most of them enjoyed it."



2 AIMS OF THE CONSULTING PROJECT

The primary aim of this research project was to elicit the perceptions of the youth (i.e. youth in high school and in university) related to water, and their potential interest in water-related careers. A secondary aim was to assess the potential of including the questionnaire (multiple-choice type questions) directly into the game, as opposed soliciting feedback via other conventional methods.

3 METHODOLOGY

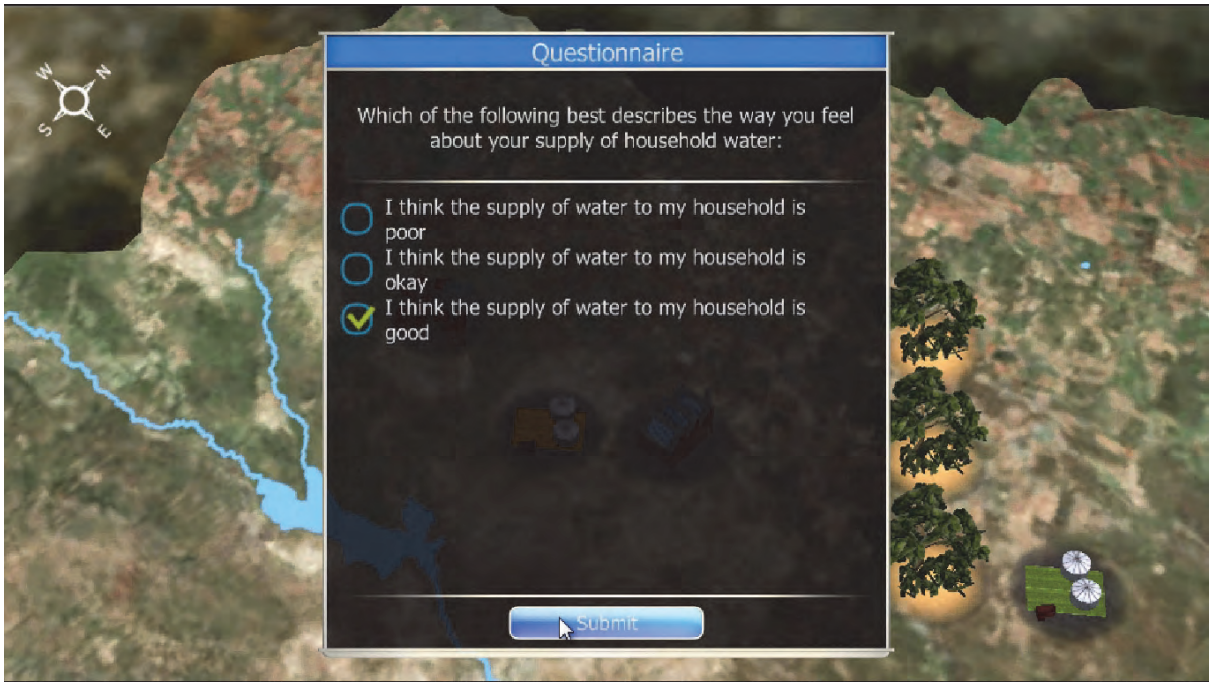
Conventional methods of soliciting information from a target group of people could include:

- A face-to-face survey. A person would "interview" people individually, asking them to answer a list of questions. The interviewer would record the responses and collate these into a report. Digital equipment, such as a tablet or a computer could be used to capture the responses of the interviewees. The problem with this approach is that it can be expensive to afford the labour costs of the interviewer. It is also logistically difficult and costly to interview a geographically separated target market.
- A telephonic survey. In this example the interviewer phones targeted individuals. The advantage of this approach is that transportation costs and associated logistics can be reduced. The challenges with this approach are that firstly telephone numbers of the targeted persons are required, and secondly the willingness of people to respond to the telephone interviews may be low.
- An email survey. A questionnaire can be emailed to the targeted individuals. The challenges with this approach are that firstly one will need access to the email addresses of the persons to be targeted, and secondly it is likely that only a small percentage of the persons targeted will respond to the survey. Without some form of incentive in place, the response percentage can be expected to be poor.

A novel approach was used to solicit feedback from the youth in this research project. Multiple-choice type questions were included into a serious water game. The game is called Aqua Republica (see www.Aquarepublica.com). Prizes, in the form of cell-phone airtime, top three high-scores and a few random draw prizes were included in the game to incentivise people to participate in the game. In order to qualify for the high-score and random draw prizes the participants had to fully complete the game, and to answer all the questions asked in the game. The questions were dispersed in the game, so that only a few questions needed to be answered at a time, followed by some fun/challenging game-time.

The game itself is a serious water game, the purpose of which is to build awareness around water-related challenges. The game is founded on a hydrological catchment model of the Mid-Olifants Catchment in South Africa. One needs to play the serious water game a few times in order to fully grasp the game, and to achieve a high score. After completing the game the first time, the player is not asked the multiple choice questions again. As the questions are only asked the first time the game is played, and as it takes a few games for the user to understand the messages the game is aiming to convey, the answers that the player provides during his/her first game will not be influenced by the game. Assuming the player answers the questions truthfully, the game will not have influenced the perceptions of the players and the answers will be a true reflection of the water-related perceptions held by the participants.

The screen-shot below is an example of a multiple-choice question being asked in the game. The game can be seen in the background.



This particular Water Game (Aqua Republica) exposes the conflicts and trade-offs that exist in a real catchment (Middle Olifants) by experiencing them through meaningful play. This game has enabled the Water Research Commission to understand the public's thoughts related to water issues in South Africa.

The MOSA Aqua Republica water game can be described as follows:

- The game is a single-player game (i.e. it is not a multi-player game)

- It is a turn-based game, with 15 turns each representing 1 year in the game
- The objective of the game is to maximise the game score. The game score is dependent on the number of people in the catchment, the ability to feed the people, the ability to provide the people with energy, and the ability to keep the rivers clean so that ecological processes are maintained. It is not easy finding this balance.
- There are funds (money) involved in the game, and the player can use the money available to develop and/or protect the catchment. The development includes options such as: to build farms, to build cities or towns, to start businesses, to develop power stations, to develop mines, to rehabilitate the ecology in a given area, and more… In the screen-shot below one can see the population, funds available, food available, energy available, condition of the ecosystem and the score.

In order to promote the update of the game, a “win-and-spin” mechanism was built into the game. Questions are asked after each game turn, and after the player has fully completed all the multiple choice questions the player gets to spin and win. Two different types of prizes could be won. The first type is an in-game prize. For example extra game funds could be awarded, or more food, more energy etc. The second type of prize was cell-phone airtime. If the player won airtime, details of the airtime voucher code were immediately emailed to the player. The screen-shots below are from the short video flighted on Mindset TV, showing some of the prizes that could be won by participants. Mindset is a free-to-view educational channel which reaches hundreds of thousands of homes in South Africa.

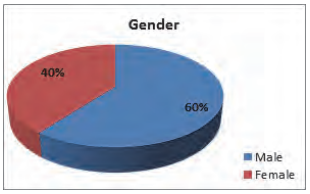
4 RESULTS, TREATMENT OF RESULTS AND DISCUSSION

4.1 An Overview of the Water Game Participants

4.1.1 Total Number of Competition Participants

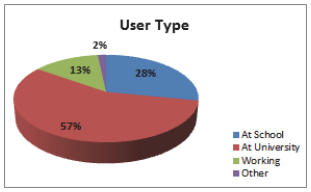
254 People participated in the game competition. Of the 254 participants 240 live in South Africa. The remaining 14 participants were split between India, Germany, Denmark, Brazil, France, Egypt and Spain. These included employed and unemployed people, university students as well as school pupils.

4.1.2 Gender of the South African Participants



Sixty percent of the participants were male, with 40% being female.

4.1.3 Categories of Participants

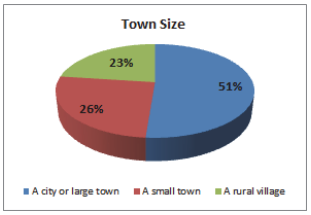


All participants had to register before they could play the game. One of the registration questions categorised players into either (i) school goers, (ii) students at university / tertiary education, (iii) people in the workforce, and (iv) other (this could cater for unemployed persons). The outcome was that 57% of the participants were at university, 28% were school going, 13% were in the workforce, and 2% fell in the "other" category. The school goers and university students fall within the "youth" category. The primary aim of the research project was to solicit the water-related perceptions of the youth. The "youth" constituted 85% of the competition participants, which was a satisfactory outcome.

The high number of university participants can probably be explained by the fact that the students had access to computers and the internet. Many professors at the universities encouraged students to participate in the competition. It is likely that many of the school

goers did not have access to computers and the internet. A limitation of the game was that it could only be played on a computer with Windows or Mac operating system, and not only mobile devices. It could be seen that many persons tried to play the game using mobile devices, but could not. A recommendation would be to migrate the current version of the game to a version that can be played on mobile devices.

4.1.4 Town Size



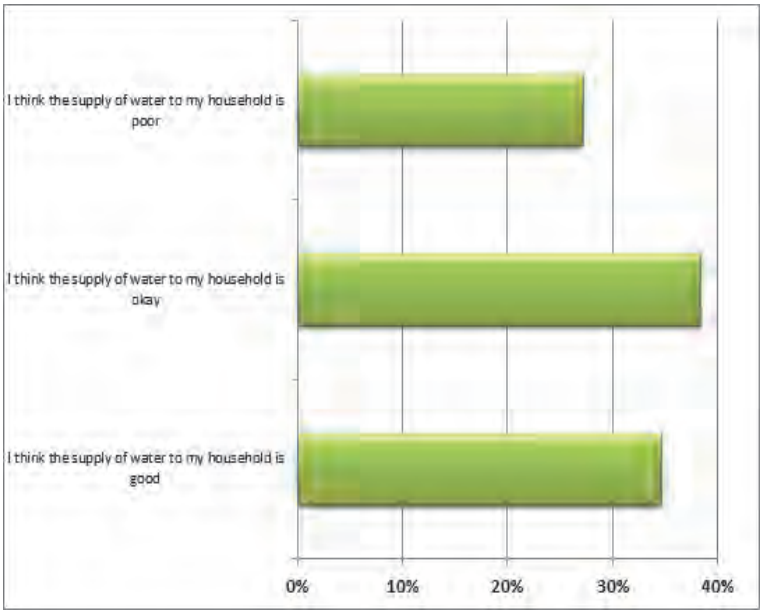
During the registration process the participants were asked to describe the size (type) of the town that they live in. The logic behind this is that water services in rural towns may be quite different than water services in larger towns or cities. The majority of the participants hail from a large town or city (51%), 26% from a small town, and 23% from a rural village.

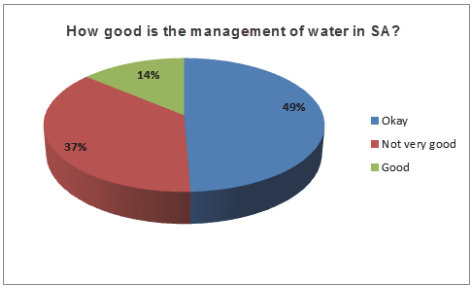
4.2 AIM 1: TO SOLICIT THE WATER–RELATED PERCEPTIONS OF THE YOUTH, AND TO ASSESS IF THE YOUTH WOULD BE INTERESTED IN WATER-RELATED CAREERS

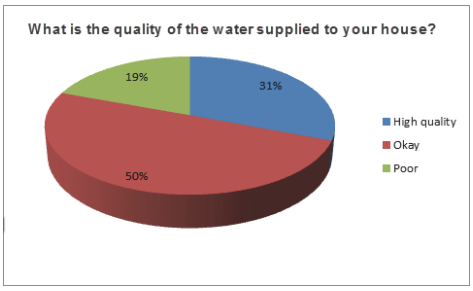
4.2.1 Perceptions Related to the Quality of Water Services

A number of questions were asked to gain an insight into the perceptions that people hold towards water, water-related services and water-related careers.

The set of graphs below shows the responses to the questions “Which of the following best describes the way you feel about your supply of household water?”, “How good is the management of water in SA”, and “What is the water quality supplied to your house”.





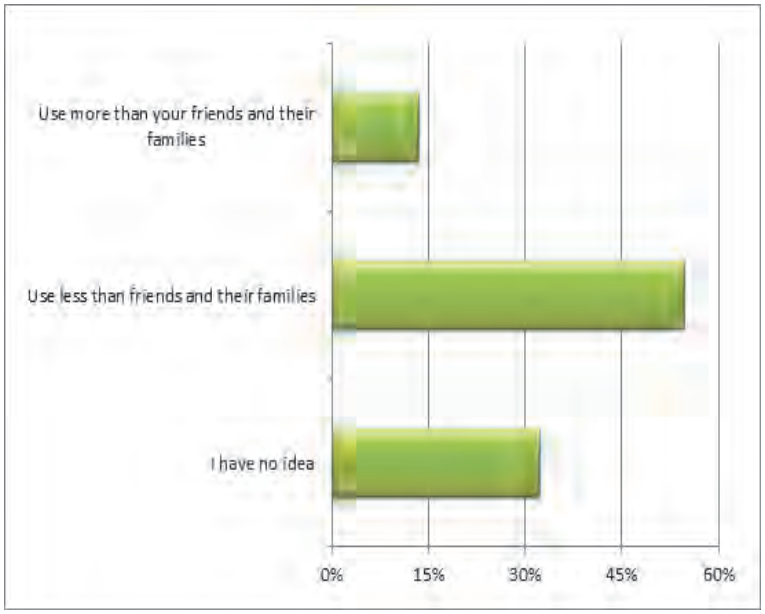


It is interesting to see the high number of respondents (approximately 27%) who believe that their water supply is poor, yet the pie graph shows that a much smaller percentage (14%) of the respondents believe that the management of water in South Africa is poor. A review of the water quality-related pie graph shows that 19% of the respondents believe their water quality is to be of poor quality. The question arises as to why such a large percentage of respondents believe the supply of water to be poor, yet a far smaller percentage of the same respondents believe the quality of the water to be poor and/or for the management of water in South Africa to be poor. A possible explanation of this that water services may be intermittent due to logistical challenges of supplying water to communities. When the water is supplied the quality is okay. So although a high number of respondents believe their supply of water to be poor, they acknowledge that the management of water is not poor (it is just challenging and difficult to provide a high level of water service at this point in South Africa's history with so much redress of basic services taking place". According to statistics provided by the Department of Water and Sanitation over 95% of South Africa's population has access to water services infrastructure. It is plausible that although the infrastructure may be in place, there be operational challenges which prevent the water services from being delivered efficiently.

The three graphs do show that the large majority of South African's believe the management of water, the quality of their water, and the supply of water to their households to be reasonable (okay) or of a high standard/quality. This is encouraging.

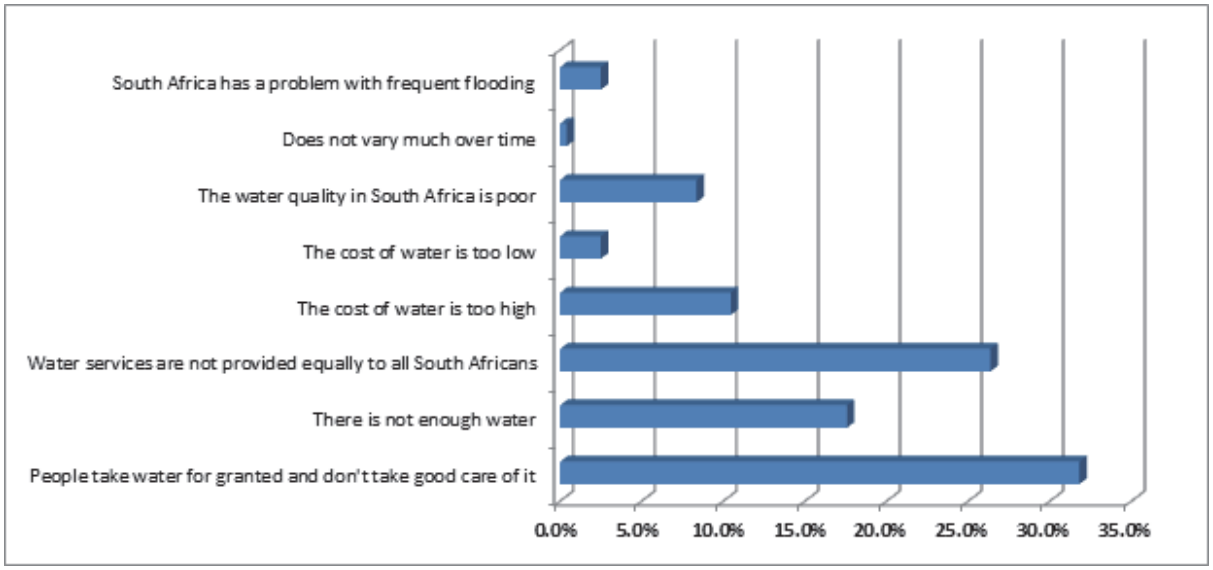
4.2.2 Did the participants believe they used less or more water than others?

The graph below shows the responses to a question which asks if the participants felt if they used less or more water than their friends and other family members. It is interesting to see that over 50% of the respondents felt they use less water than their friends and other family members, whereas less than 15% of the participants felt that they used more water than others. Also of interest is the high number of respondents who did not know. An interesting and useful WRC research project may be to benchmark water use of individuals and households in various household categories in South Africa. If this information is packaged in a way that is meaningful to individuals, then the individuals may be placed in a better position to evaluate if they do indeed use less or more water than others. For example, it may not resonate with people if you provide them with for example the cubic meters of water that an average person uses in South Africa. It may be more appropriate to communicate what those cubic meters of water translate into, for example 10 baths with the water filling the bath half-deep, 4 cups of coffee, 20 flushes to the toilet etc.



4.2.3 What Participants Believed to be the Biggest Water Challenge in SA

The responses received to the question “Please select which of the following options you find most problematic in South Africa” are very interesting.

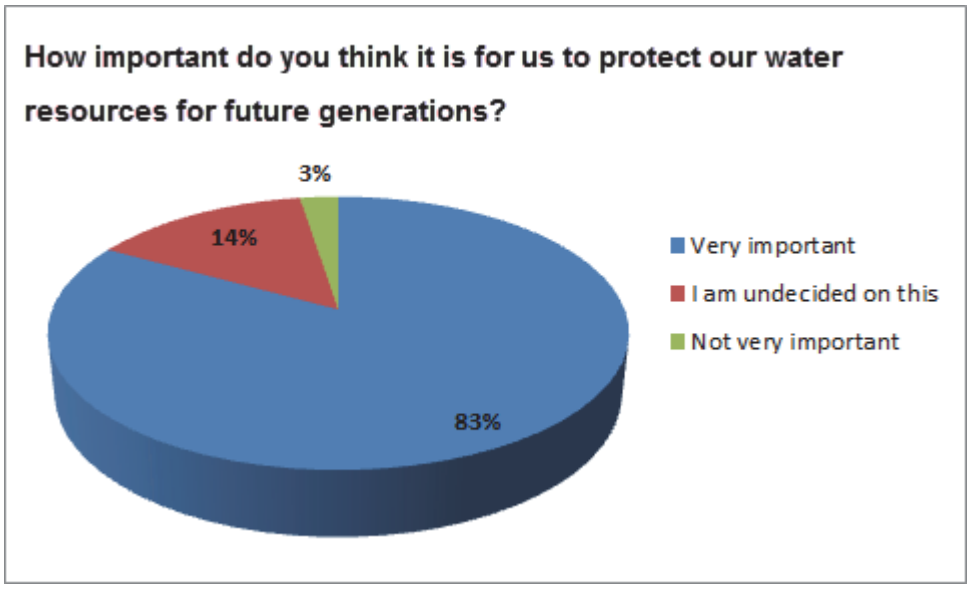


Over 30% of the participants felt that people take water for granted and don't take good care of it. Yet a very small percentage of the respondents felt that the price (user charge / tariff) for water is too low. On the contrary, just under 10% of the respondents felt that the price for water is too high. Raising the price of water will certainly send a strong signal to people that water is valuable and should be used wisely. Apart from increased water charges, increasing awareness around water can also help to improve the regard people have towards water and managing and using it wisely. A useful and interesting WRC study may be to assess the impact of different management options (such as pricing compared to awareness campaigns) on the water use behaviour of individuals. It may also serve the research ambitions of the WRC to be involved in water awareness related presentations and shows flighted on national educational programs such as Mindset TV for the reason being that increased awareness of the water issues, and of the WRC and what it does, could potentially lead to more young people being inspired to study towards water-related careers. In this process these young people may be directly involved in one or several WRC-related research projects.

A high percentage of respondents felt that the unequal provision of water services was the most problematic of the options provided. This is understandable given the legacy of Apartheid. This perception will probably change over quite a long period of time as the inequity is redressed.

4.2.4 Perceptions Related to the Need to Protect our Water Resources for Future Generations

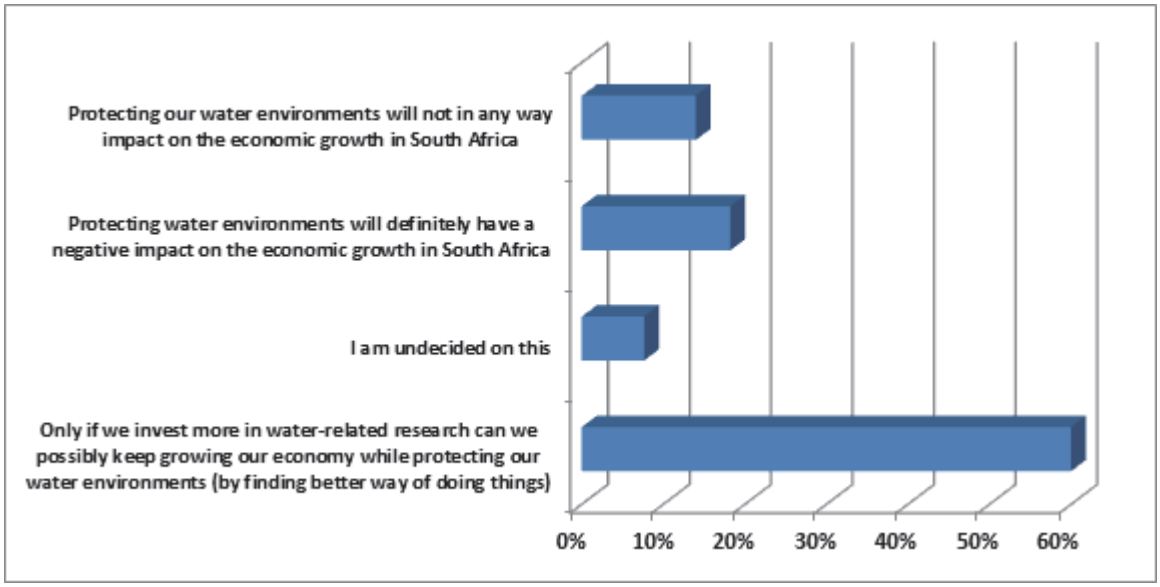
The responses to the question “How important do you think it is for us to protect our water resources for future generations?” showed the overwhelming majority (83%) to be of the opinion that this is very important, 14% indicated they were undecided on this, and only 3% being of the opinion that this is not important. The conclusion that can be drawn from this is that many people acknowledge that active management and intervention is required to protect the water resources, otherwise a higher percentage of the respondents would have indicated that protection of resources would not be necessary.



4.2.5 The Need for Water-Related Research

To follow up on the question related to the need to protect water resources, the following question was asked “In terms of protecting our water environments, which of the following do you believe to be most true?”. The following answer options were given:

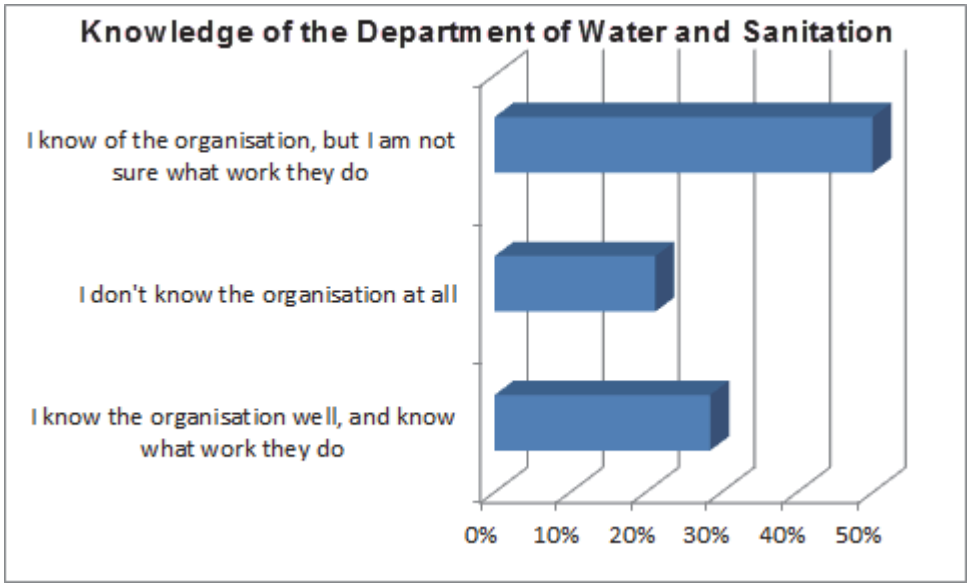
- Protecting our water environments will not in any way impact on the economic growth in South Africa,
- Protecting water environments will definitely have a negative impact on the economic growth in South Africa,
- I am undecided on this, and
- Only if we invest in water-related research can we possibly keep growing our economy while protecting our water environments (by finding better ways of doing things).

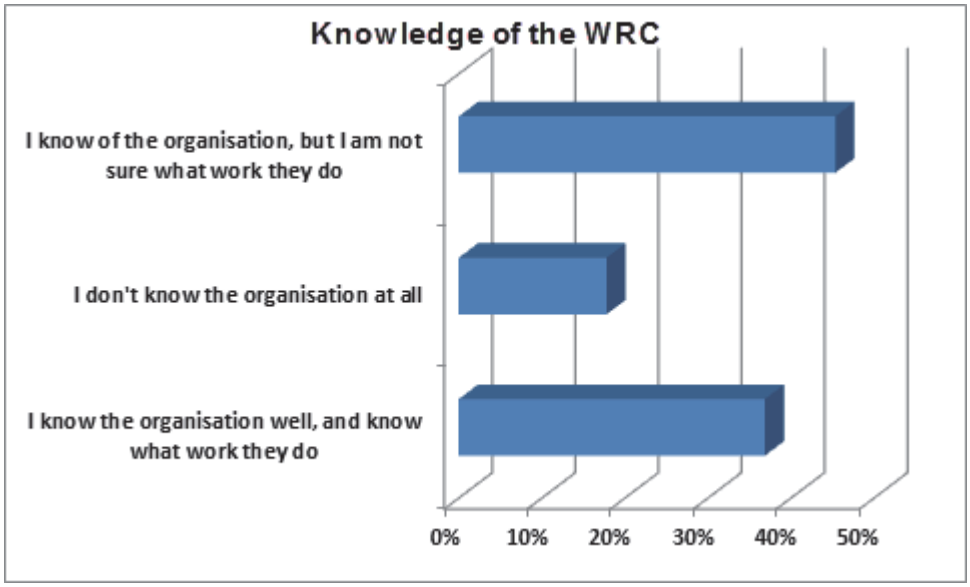


The vast majority of the respondents chose the last option. This response should be of particular interest to the WRC. If the vast majority of people in the country are of the opinion that we need to protect our water environments for future generations, and if the vast majority of the people are of the opinion that in order to protect our water environments without impacting negatively on economic development we need to invest more in water-related research, this bodes very well for the need for the WRC and the work it is doing.

4.2.6 Participant Knowledge of the DWS and of the WRC

From the sections above it is clear that most respondents acknowledge the importance of water, the importance of sound management and protection of water resources, and the need to invest in water-related research. The participants were then asked if they knew of the Department of Water and Sanitation (DWS) and of the WRC, and if they knew what work these organisation did.

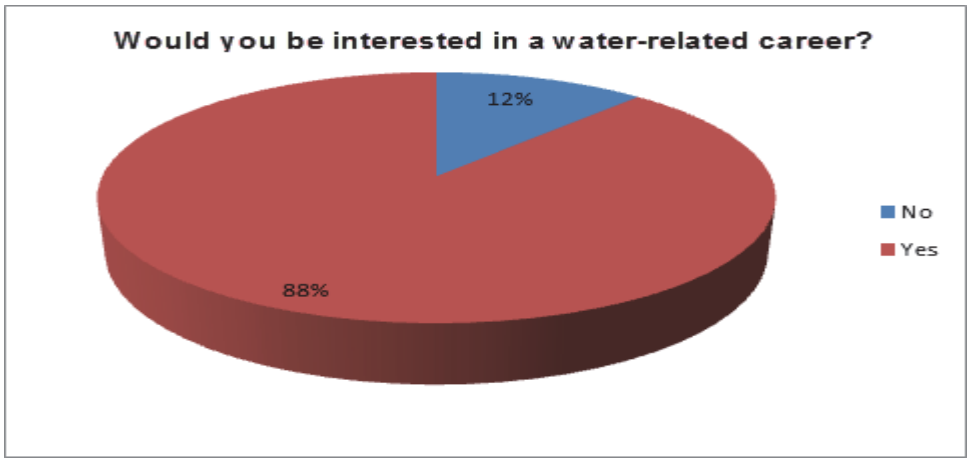




It is very alarming at the high percentage of respondents that did not know of either organisation at all, and in the cases that they did know of the organisations they did not know what work these organisations did. Considering that a high percentage of the respondents are at university, one would have thought that a higher percentage of the respondents would not only know of DWS and the WRC, but would also know very well what type of work these organisations do. The recommendation is that both DWS and the WRC increase the awareness of the public not only about the existence of the organisations, but also the work the organisations are doing and the value of the work to the well-being of the South African society. Water awareness-related educational TV programs could be an effective channel through which to convey this type of information, and can also encourage and direct youth to move into water-related careers.

4.2.7 Are the youth interested in water-related careers?

Consider the pie-graph below which shows that an astounding 88% of the school and university going participants indicated that they would be interested in water-related careers. There appears to be a unique opportunity for the WRC and other water-related organisations to direct the youth towards water- related careers.



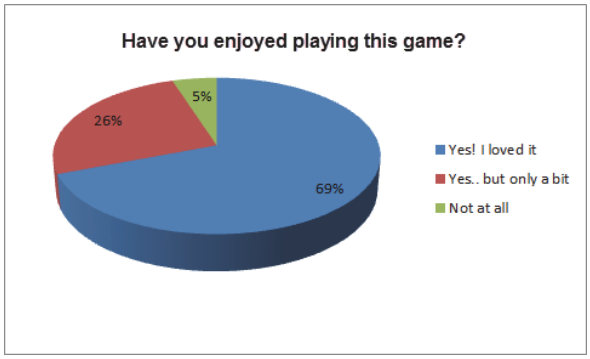
4.3 AIM 2: WAS THE INCLUSION OF THE QUESTIONNAIRE IN THE GAME AN EFFECTIVE WAY OF SOLICITING THE WATER-RELATED PERCEPTIONS OF THE PARTICIPANTS?

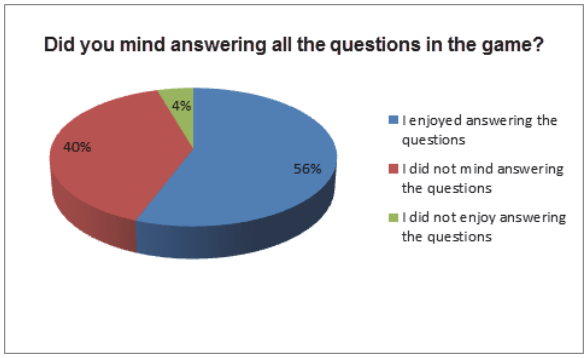
The inclusion of questions in a serious game is a novel approach to eliciting feedback from people. Many people do not like surveys, where they are requested to complete a list of questions. There is a very high probability that even if the research team had access to the emails of the people who participated in this competition, and if the research team had emailed these people the very same questions that were included in the game, that the percentage of completed and returned questionnaires would have been a fraction of what was received from the competition. The option of employing people to visit various schools and universities throughout South Africa would have been very costly indeed, and may have taken several months to gather the required information. Telephonic interviews may have yielded reasonable responses (in terms of number of people who responded), but access to phone numbers would have been required.

To assess if the survey methodology adopted (i.e. embedding questions in the game) is a reasonable way of eliciting perceptions of the participants, the following questions were asked:

1. The participants were asked if they enjoyed playing the serious game. If the participants did not enjoy playing the game, then embedding questions in the game would not yield favourable responses.
2. The participants were then asked how they felt about answering questions in the game.

The answers received from the participants to the questions above, are shown in the diagrams below.





The pie graphs above show that the vast majority of the participants enjoyed playing the game, and like-wise the vast majority of the participants did not mind answering questions in the game. The recommendation put forward is that water-boards, DWS and the WRC considering using a serious water game to not only convey important water-related messages, but also to elicit feedback from the persons playing the game. A better understanding of people's perceptions and their water use practices can potentially help the WRC, Water Boards and the DWS to find ways to deliver more efficient and effective water services to the public.

5 LESSONS LEARNT

The following feedback was received from people who played the game during the competition:

Water-related perceptions of the youth, and interest is water-related careers:

The feedback from the in-game survey (questionnaire) suggests the following:

- The participants recognise the importance of water and that water challenges are on the rise,
- The participants recognise that investment in water-related research is essential if we are to grow our economy while at the same time protecting water resources for use by future generations,

- That a very large number of the youth (88%) would be interested in water-related careers.
- That the WRC and DWS are not know at all to many of the respondents, and for those who do know of the organisations, they do not know precisely what the organisations do. There appears to be room for improvement in this aspect.

The potential to elicit feedback by embedding questions into a serious game

Eliciting feedback from a large number of people who are distributed over large areas (i.e. the entire South Africa) can be a difficult and costly task. The lessons learnt from the methodology adopted in this research project are:

- The vast majority of the participants indicated that they partially or greatly enjoyed playing the serious game, and
- The vast majority of the participants indicated that they did not mind answering questions in the game. Many participants indicated that they actually enjoyed answering the questions embedded in the game.
- The vast majority of participants indicated that they felt that the game taught them something related to water and water-related challenges.

The lesson learnt is that embedding questions in a serious game may be a very effective way of eliciting feedback from a large number of geographically separated participants.

Other lessons learnt

From the perspective of the research team, the following was learnt:

- A significantly larger number of people would have played the game if the game was able to be played on mobile devices (with an Android operating system)
- The game was enjoyed by the large majority who played it. However having said that the game was initially a bit complex to many users. It may make sense to have different levels to the game, so that it starts easier, and then gets progressively more complex.
- The best results are achieved when (i) computer facilities are made available, and (ii) some tuition / guidance takes place. This helps the players to better understand what is required in the game.

6 RECOMMENDATIONS AND CONCLUSIONS

The following became evident from this research; the vast majority (i.e. 83%) of participants acknowledged that protecting water for future generations was very important. 59% of the participants acknowledged that in order to grow our economy while protecting water for future generations South Africa would need to invest heavily in water-related research. Water-related research is the core business of the Water Research Commission. However, what was concerning was that only about 35% of the participants knew who the WRC were and knew what work they did (reworded, this means that 65% of the participants either don't know the WRC at all, or know of them but don't know what work they do). Consider also that the 88% of the respondents indicated they would be interested in water-related careers. The recommendation is that the WRC (and the DWS for that matter) undertake awareness campaigns, not only related to the water challenges we face in South Africa, but also about the type of work that the WRC and the DWS are doing. It is recommended that DWS, the WRC and other water-related organisations such as the water boards in South Africa jointly undertake such awareness campaigns. The use of the serious water game, together with other prepared materials could be used in this regard. It would be recommended to consider regular water-related programs on the free-to-view educational Mindset channel, as this reaches the homes of many thousands of young people in South Africa.

Given the positive feedback received from the people who participated in the competition it is recommended that the WRC consider this as an annual event. However, it would be recommended that in order to increase the number of players the competition should be undertaken with more involvement from schools and universities.

In order to gain larger numbers of participants, it is recommended that the game be further enhanced in the following ways:

- The game should be developed to include multiple levels, e.g. starting with a simple level, and as the user progresses, it can become more complex,
- The game should be developed to be playable off mobile devices (e.g. tablets and smart-phones)
- There would be value in developing a multi-player version of the game.
- It would be interesting to have a water game challenge where the youth in South Africa compete against the youth in other countries. The web-based nature of the game makes this type of challenge a possibility.

7 LIST OF REFERENCES

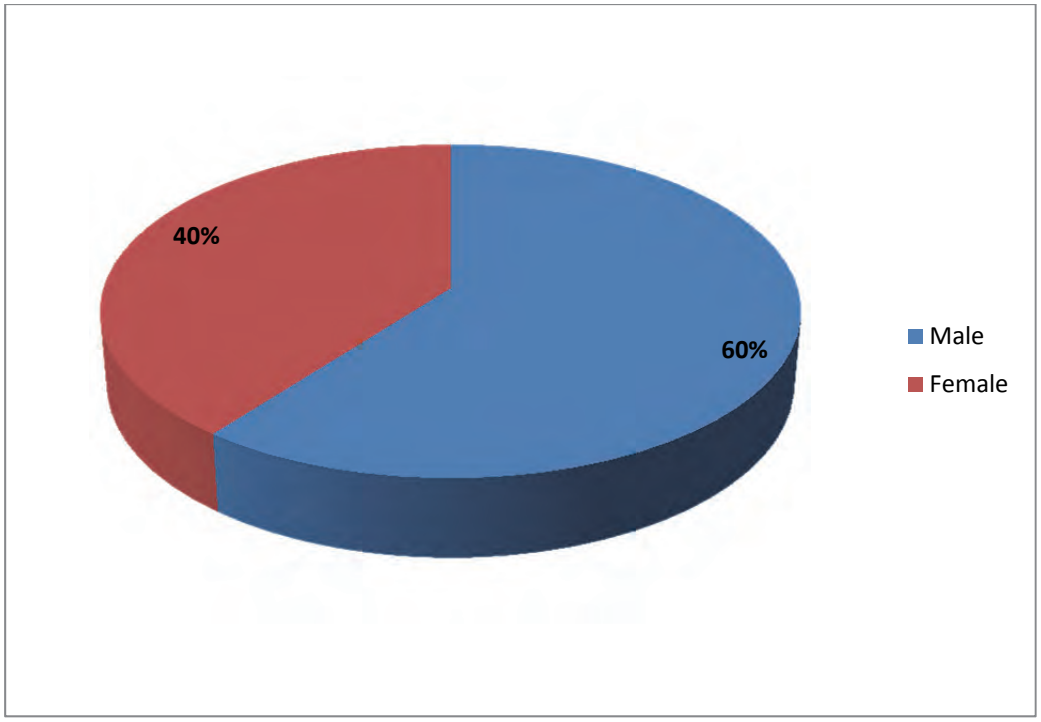
National Water Game Competition http://www.watergame.co.za

MOSA - Integrated Water Resources Management Pilot Project "Middle Olifants", South Africa http://www.iwrm-southafrica.com

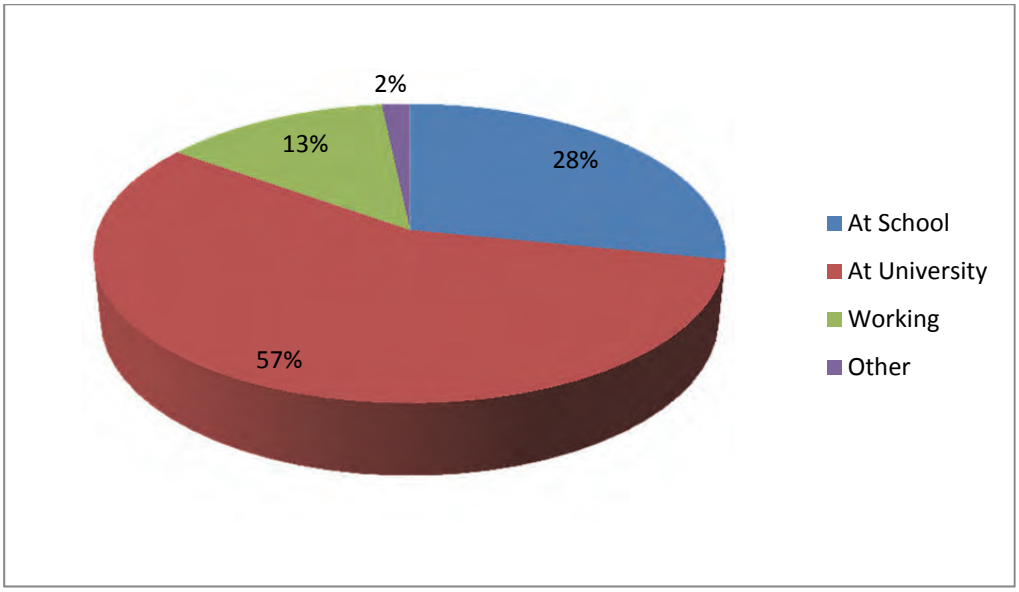
APPENDIX A:

QUESTIONS INCLUDED in the GAME, INCLUDING A SUMMARY OF THE ANSWERS RECEIVED

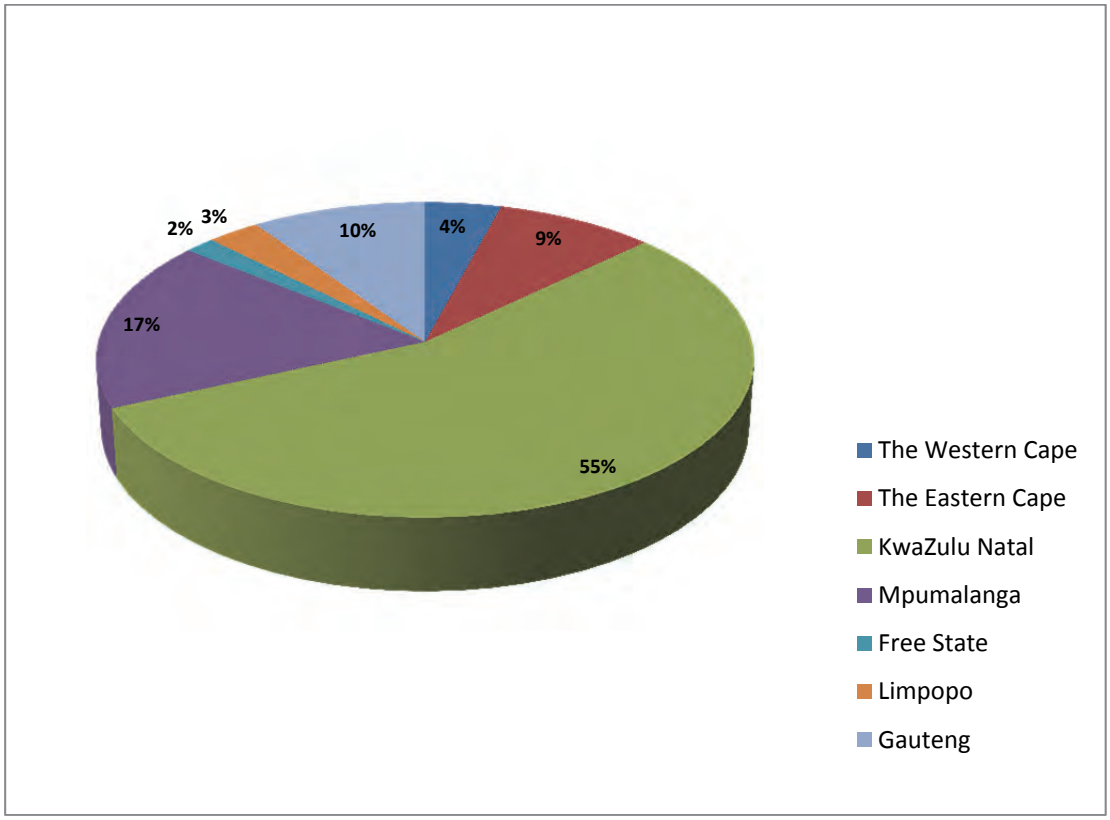
Gender



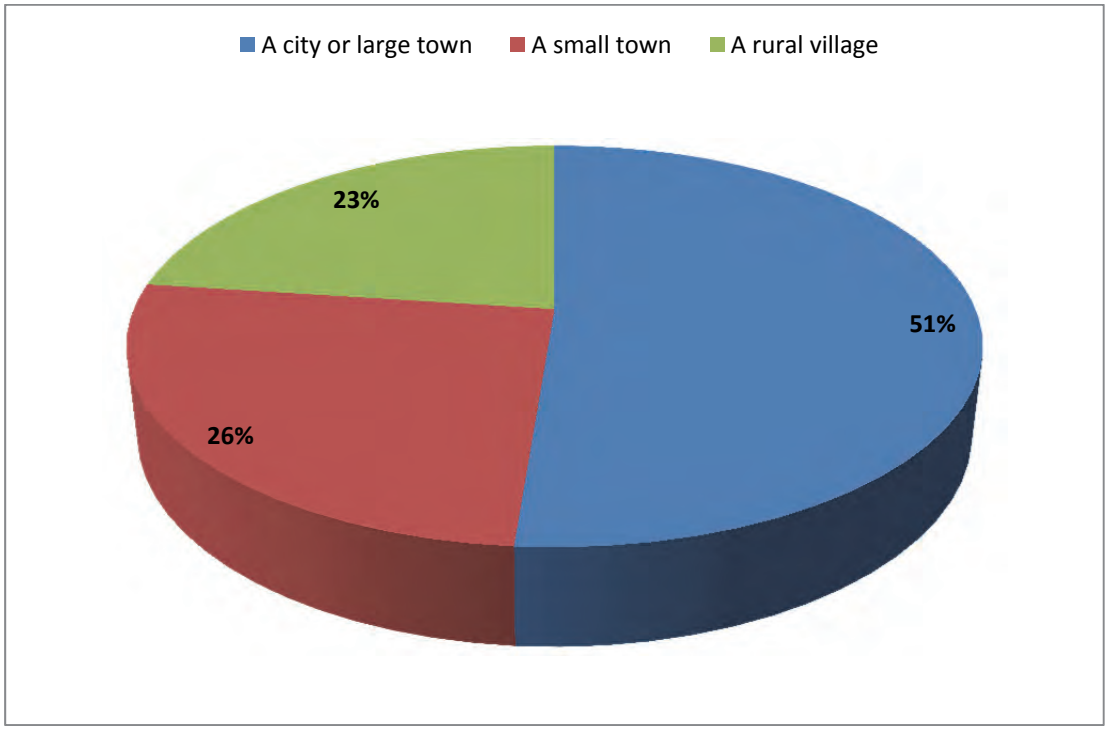
User type



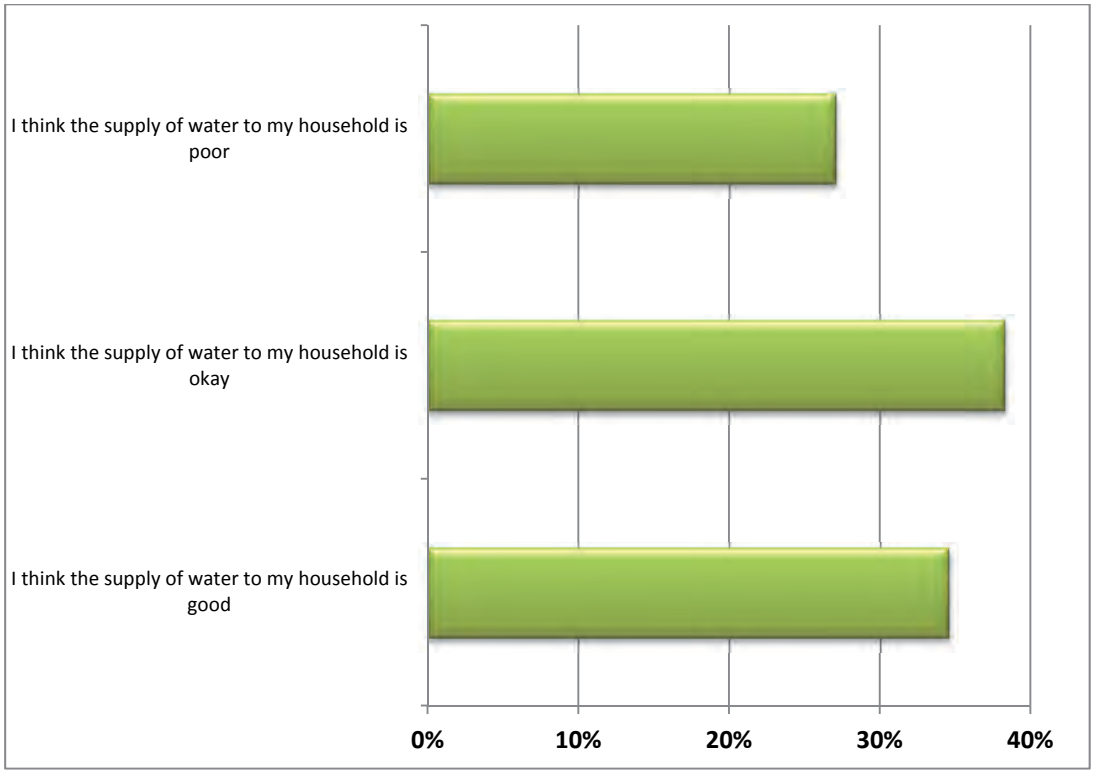
Province



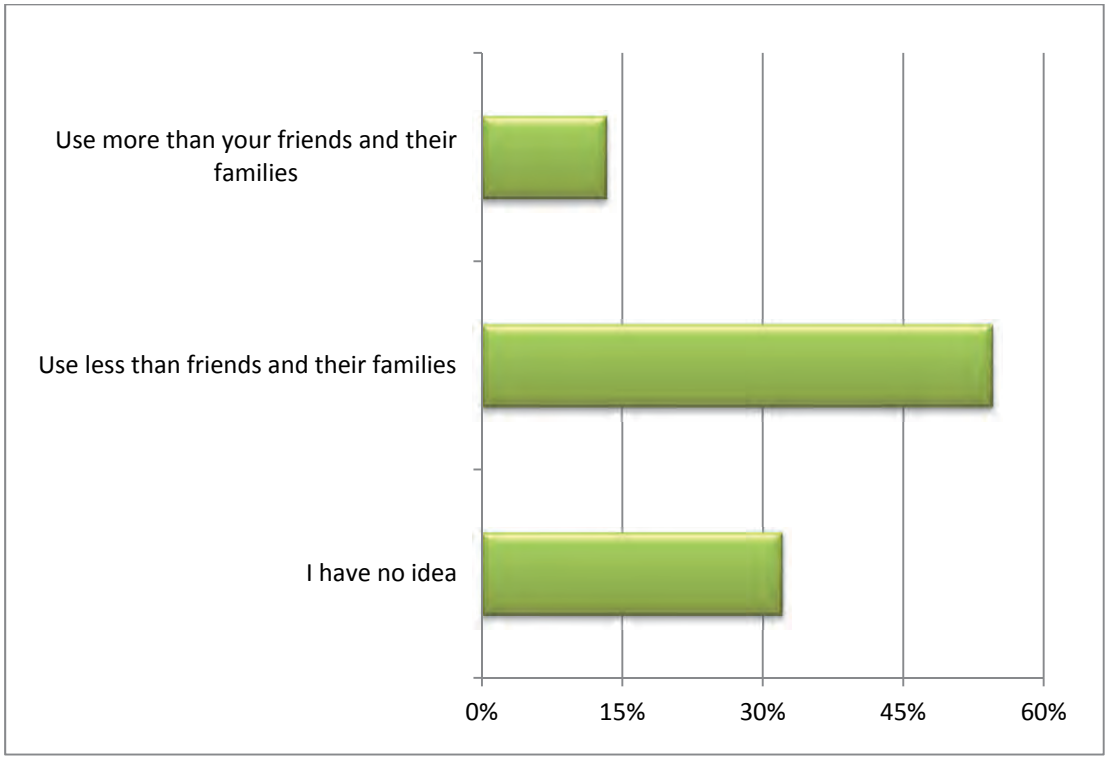
Town size



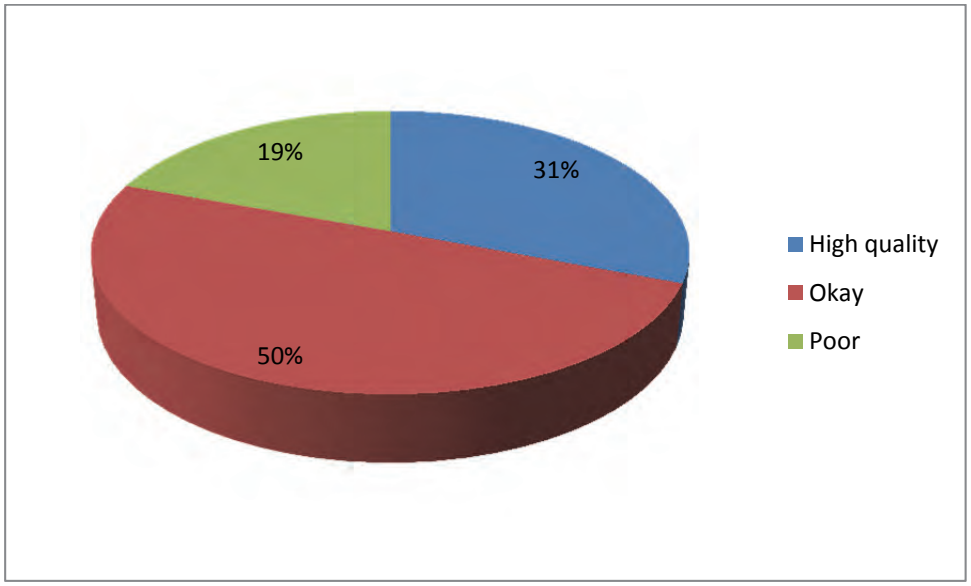
Which of the following best describes the way you feel about your supply of household water?



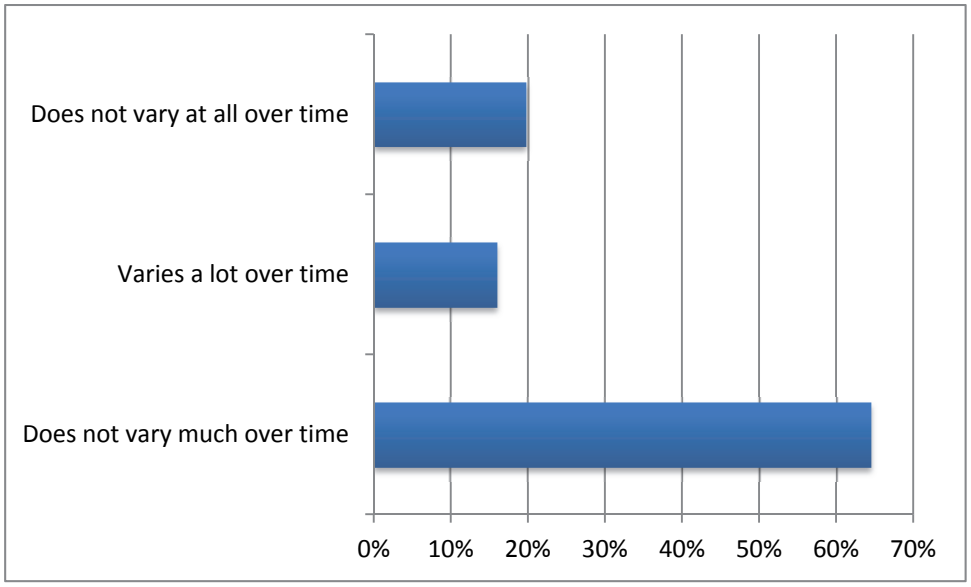
Do you think you and your family?



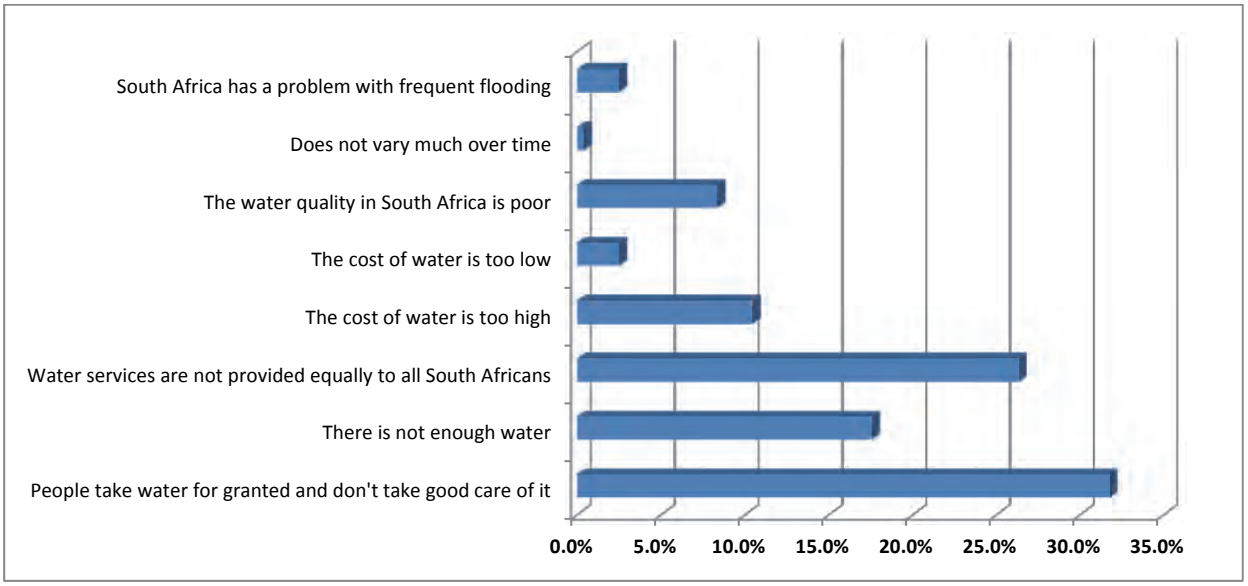
Do you think the quality of your water on average is:



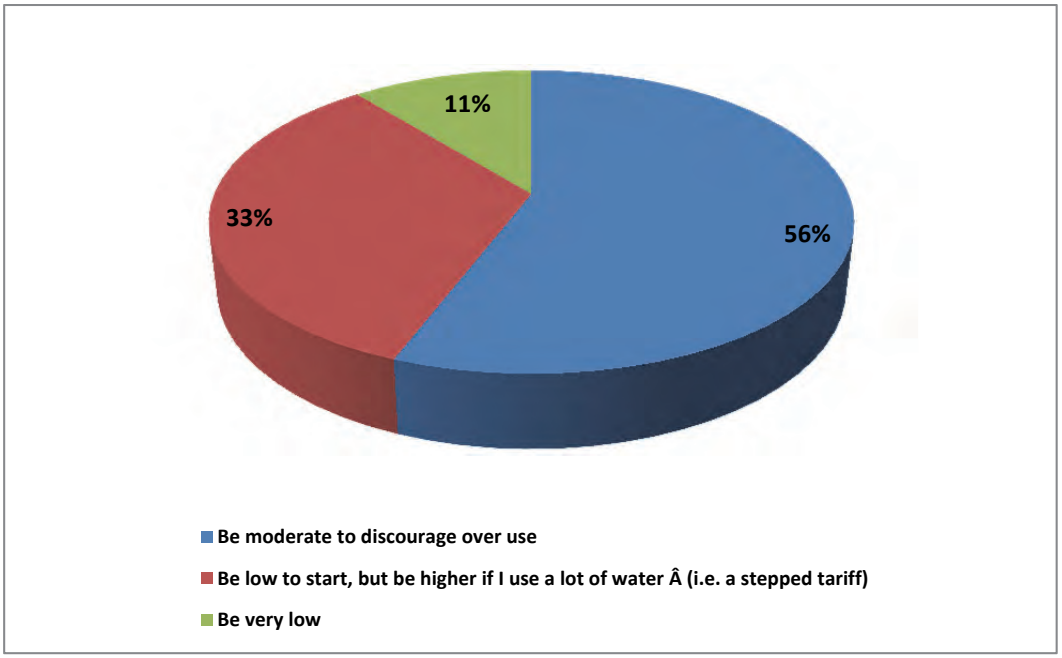
The quality of your household water:



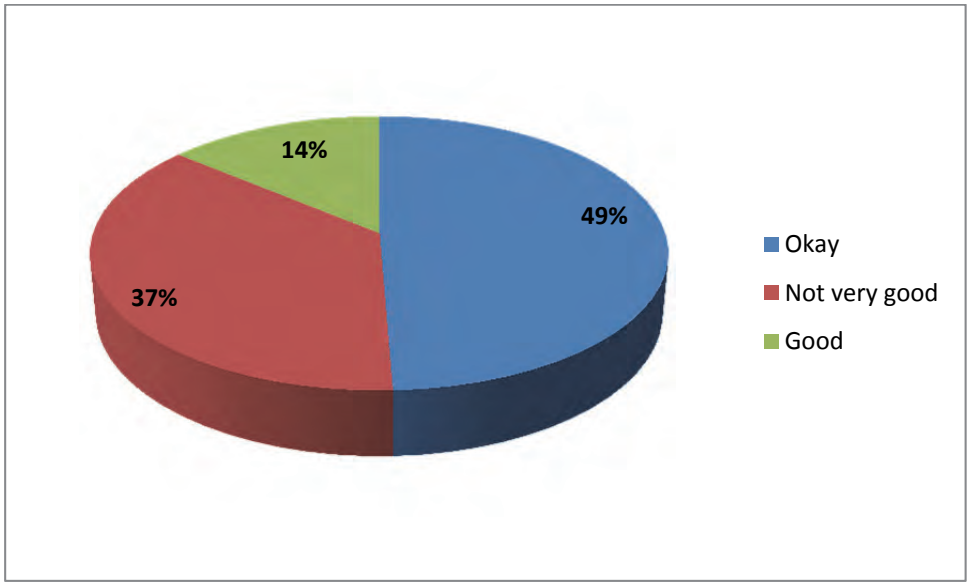
Please select which of the following options you find most problematic in South Africa



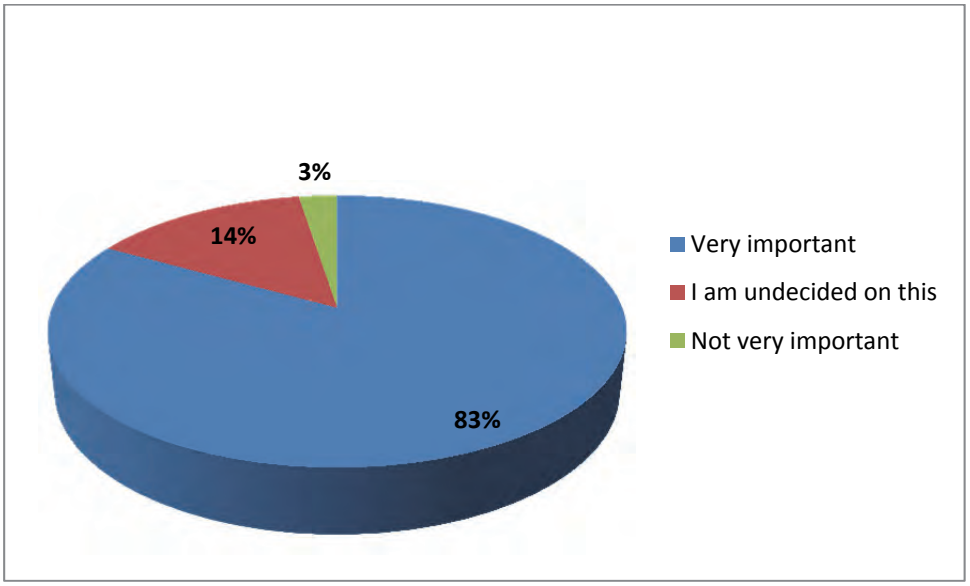
If you had to pay for water then the water price should:



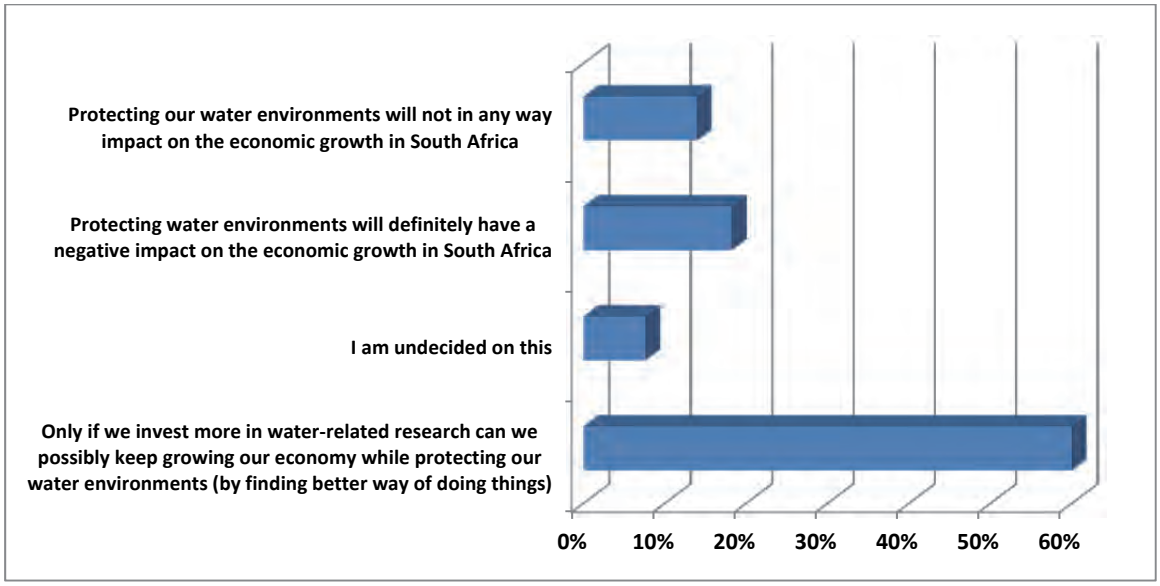
How would you rate the current management of water in South Africa:



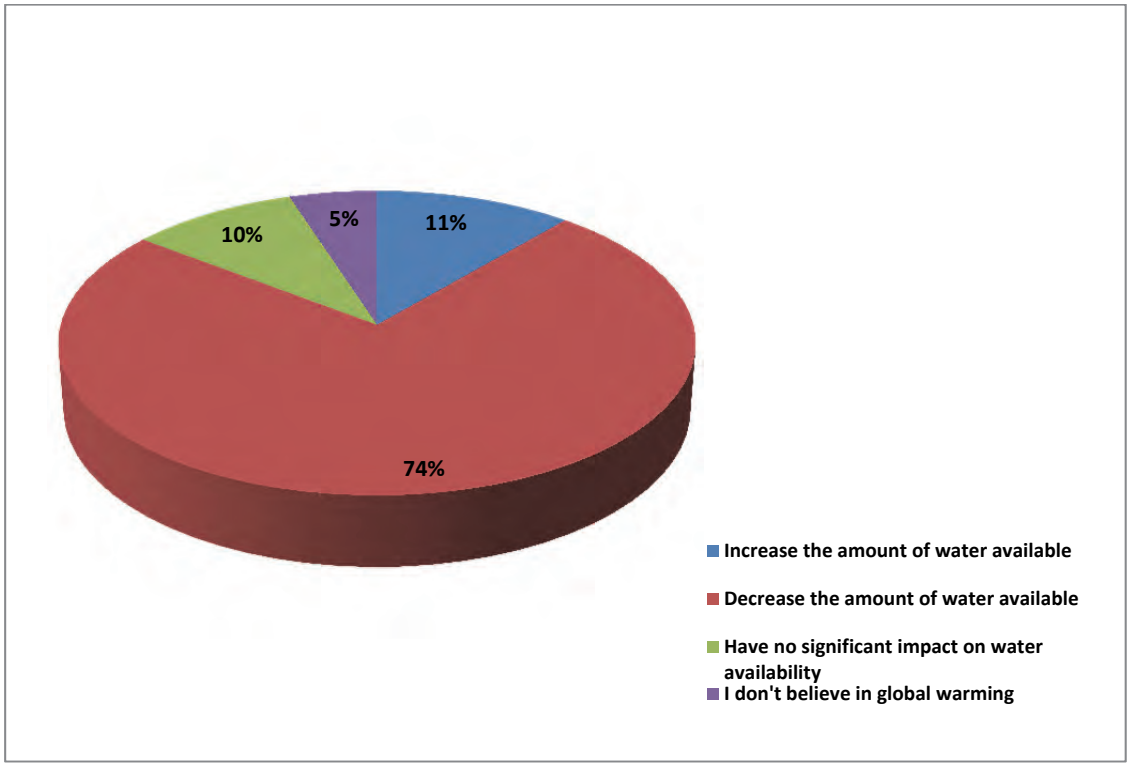
How important do you think it is for us to protect the amount and quality of water in our dams, rivers and groundwater reserves for future generations?



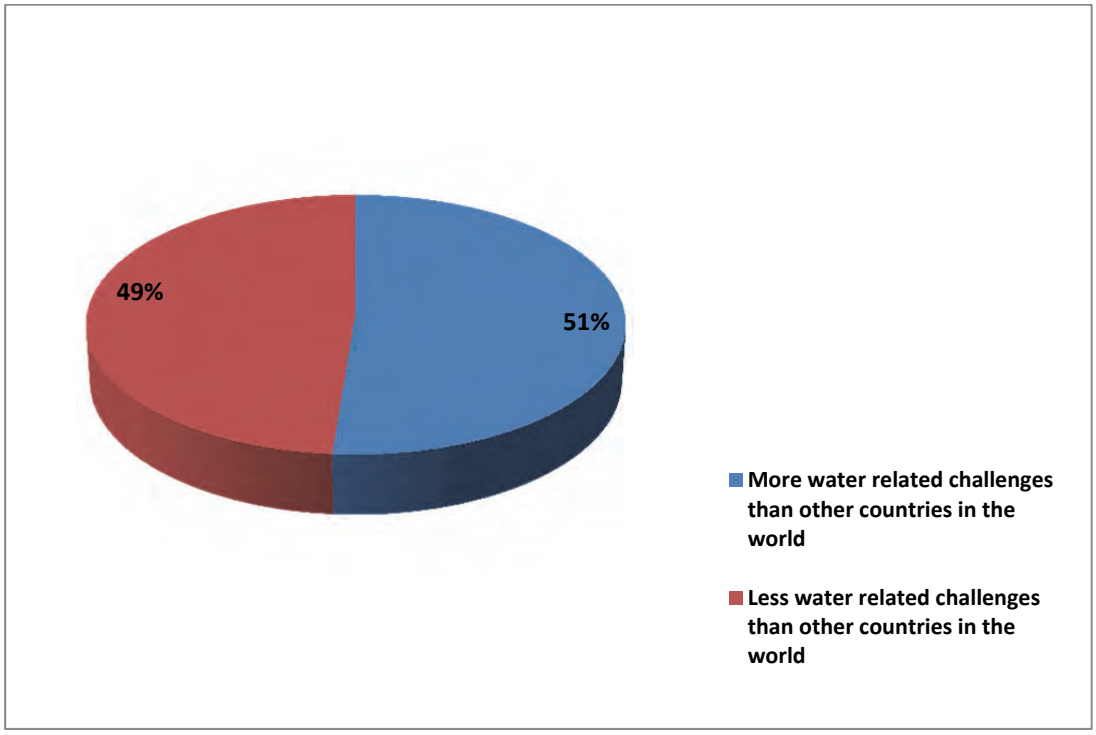
In terms of protecting our water environments, which of the following do you believe to be most true:



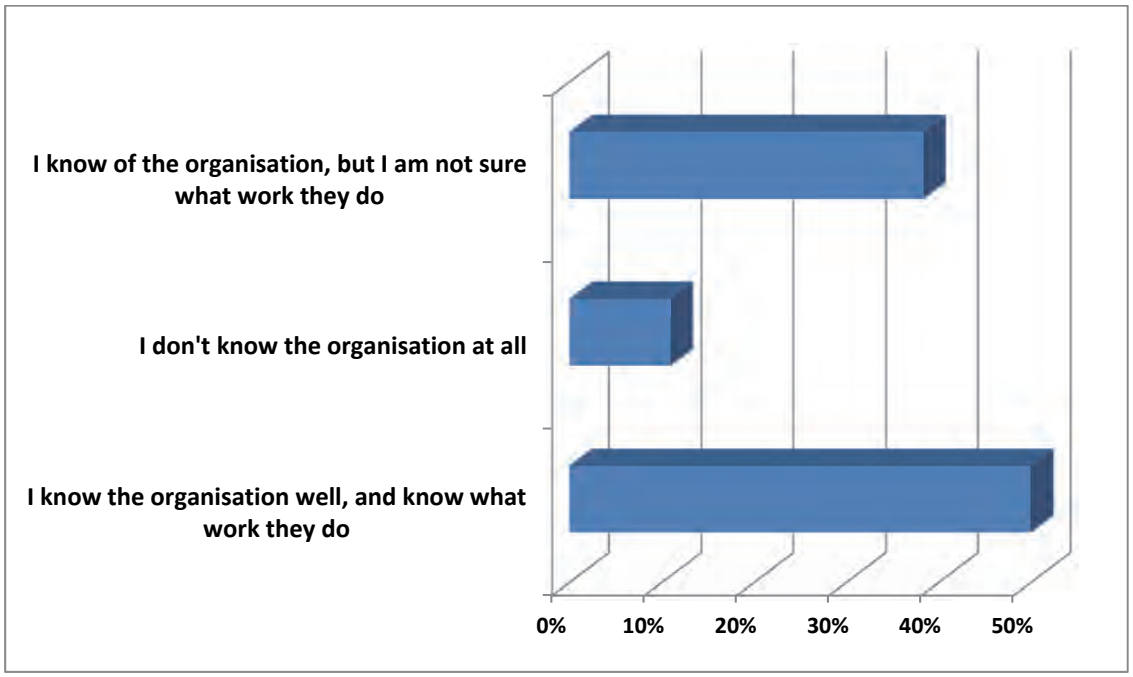
In South Africa, do you think global warming will:



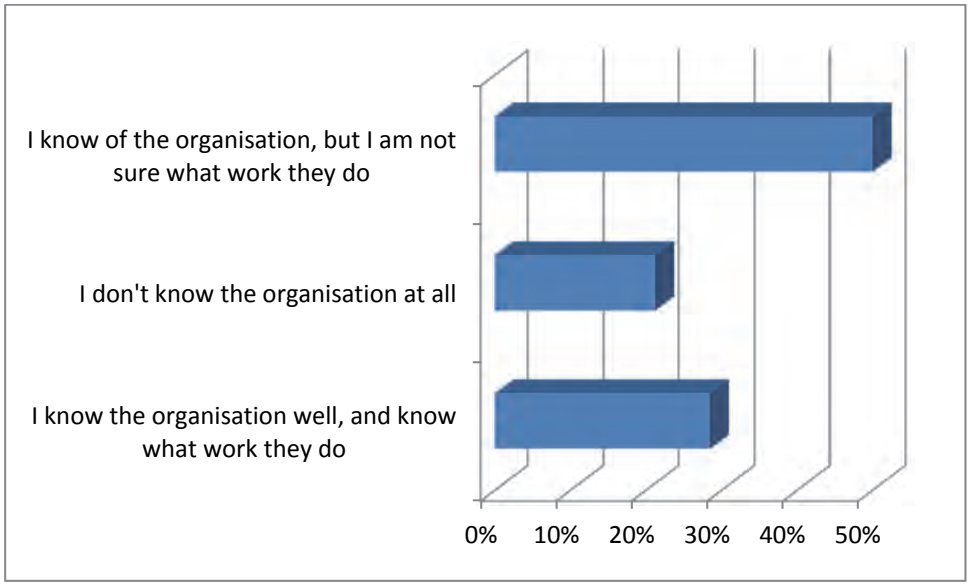
Do you think South Africa has:



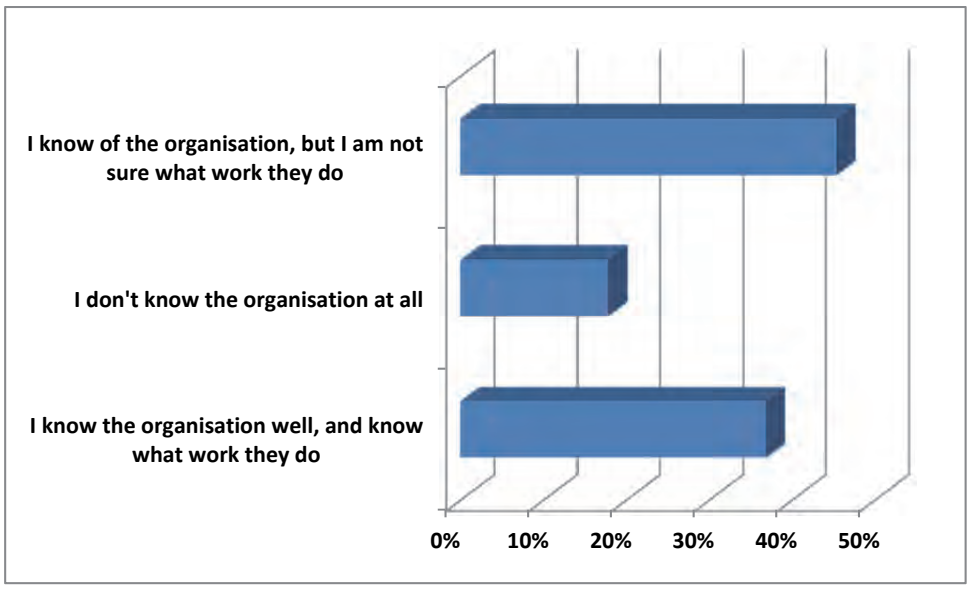
Have you ever heard of the Department of Water and Sanitation (previously known as the Department of Water and Environmental Affairs)?



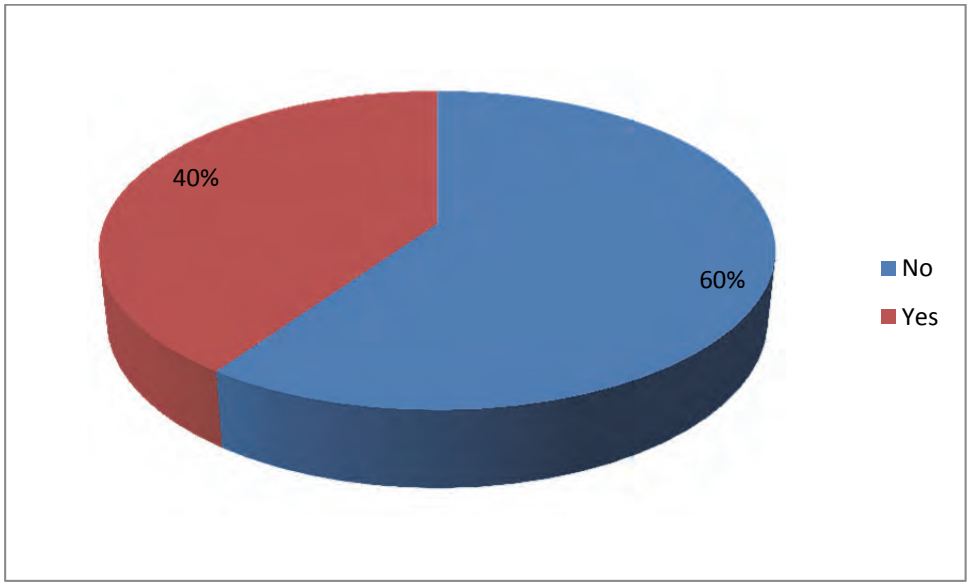
Have you ever heard of the United Nations Environmental Programme (UNEP)?



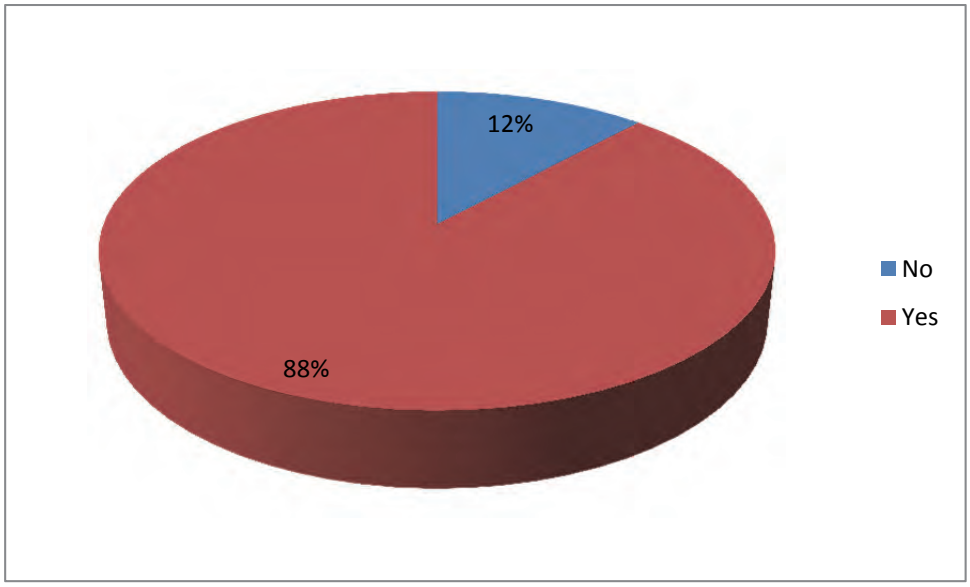
Have you ever heard of the Water Research Commission?



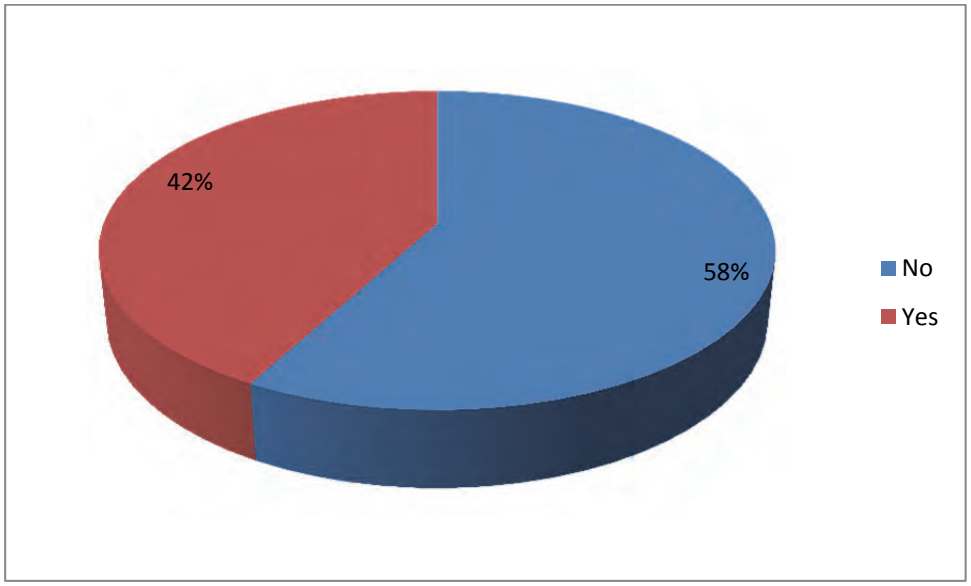
Are you currently working in a water-related career?



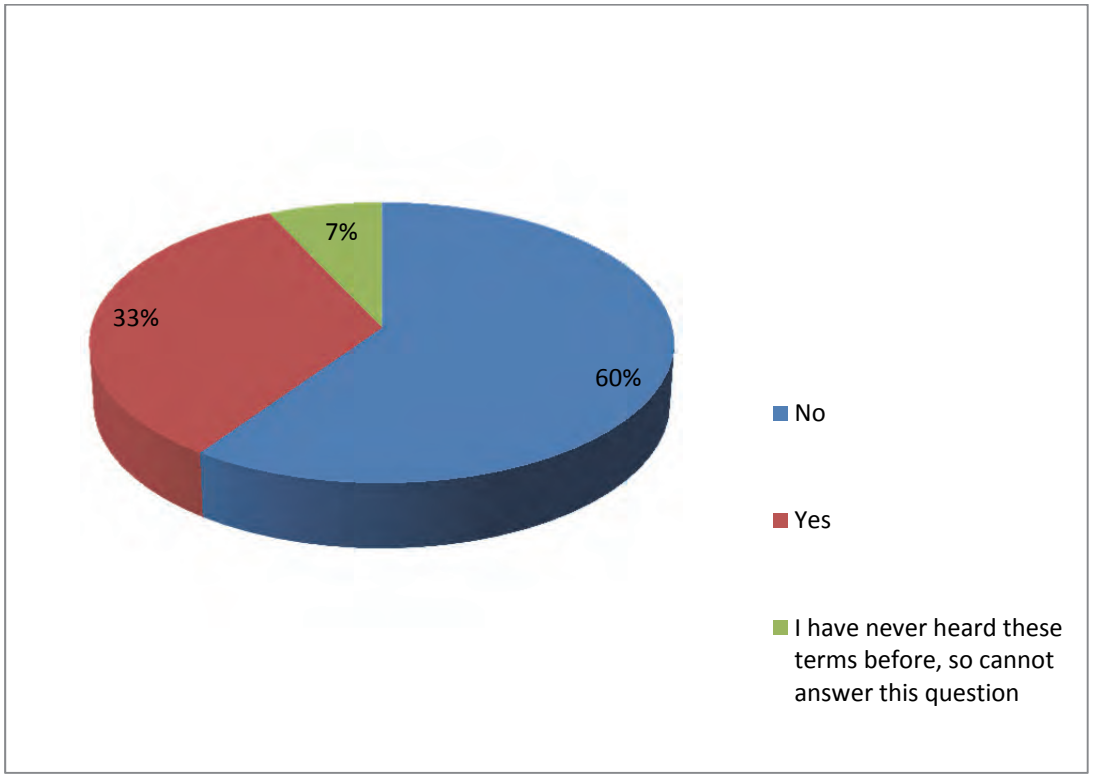
Would you be interested in a water-related career?



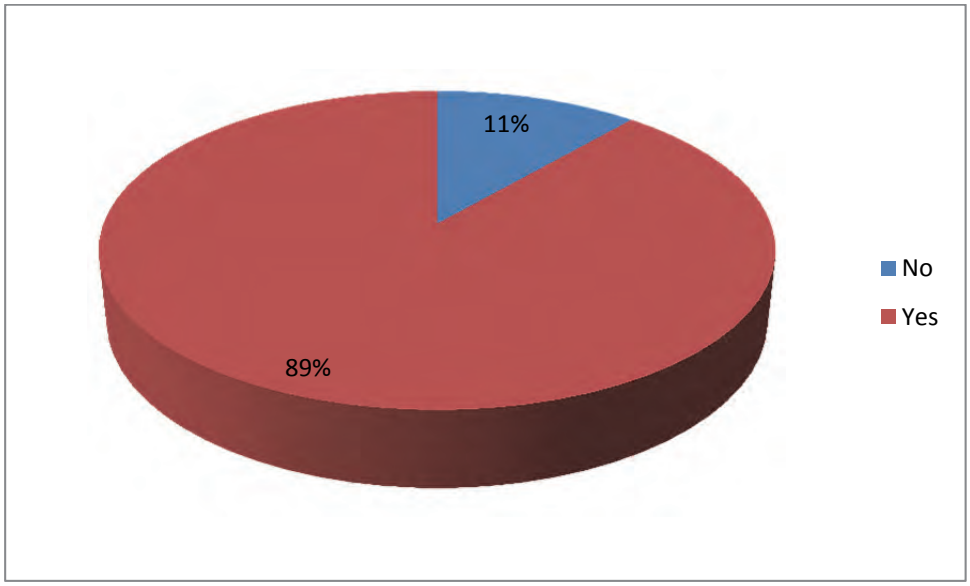
Have you had any training / education geared towards a water-related career?



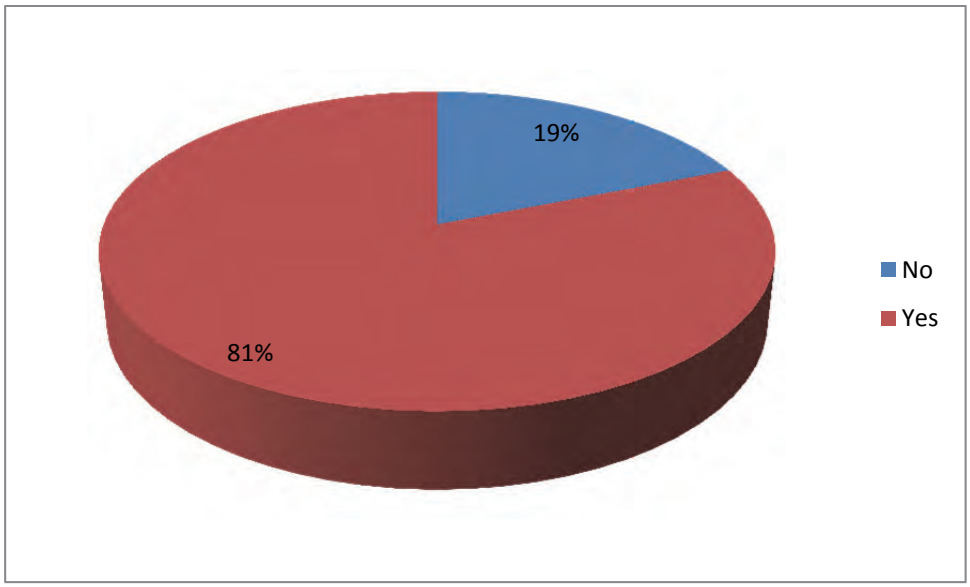
Do the company / organisation you work for implement any form of Water Conservation (WC) and/or Water Demand Management (WDM)?



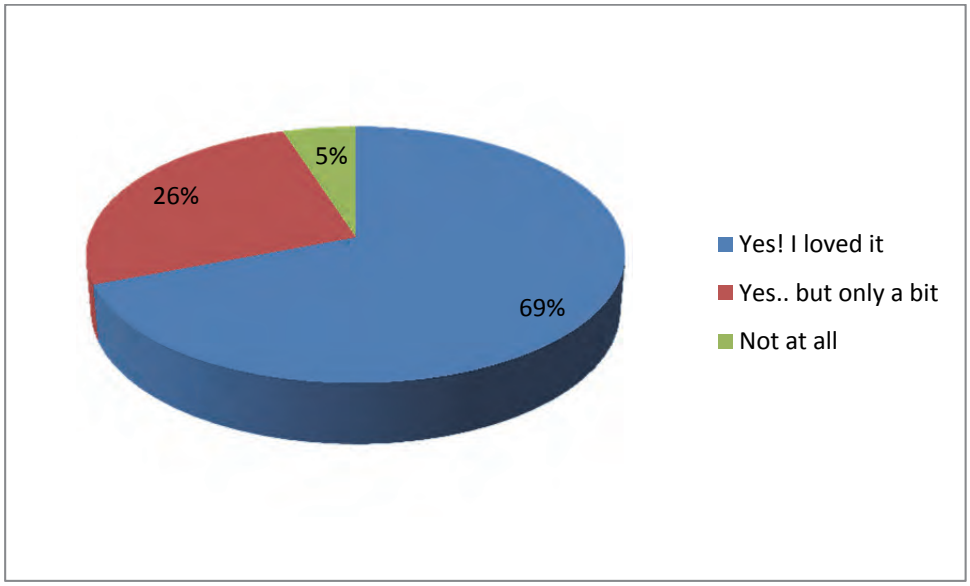
Did you take the subject of Math at school?



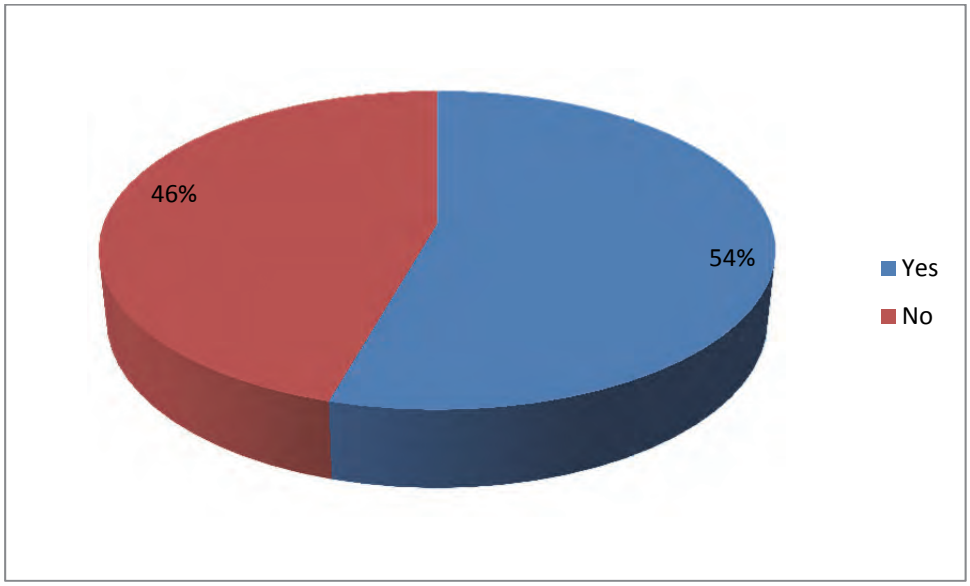
Would you like to receive information related to water-related action and information groups?



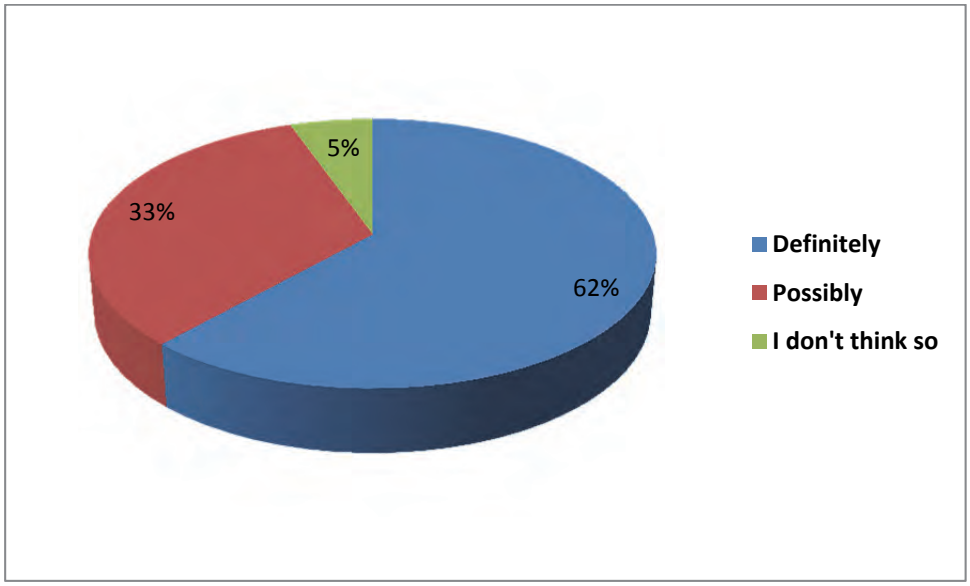
Have you enjoyed playing this game?



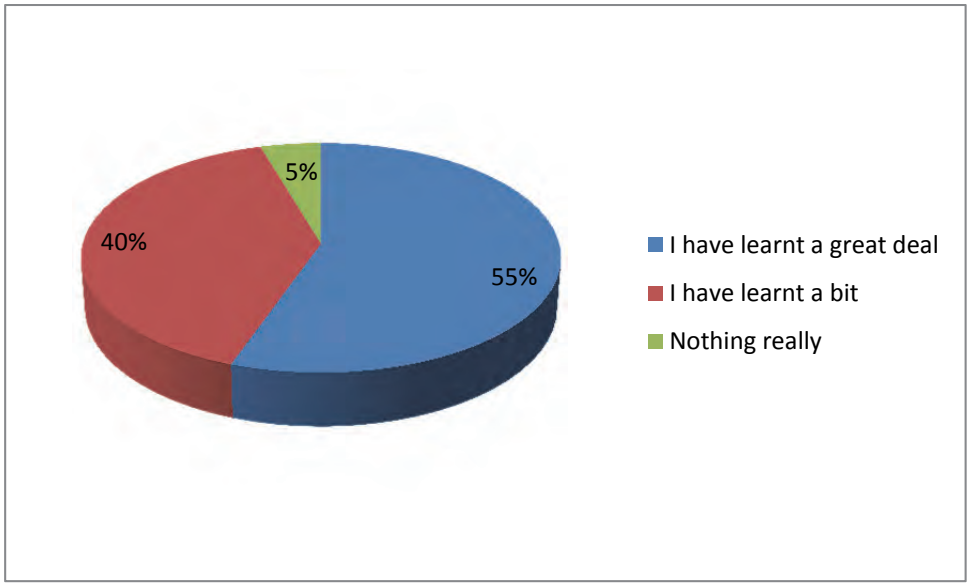
The game you are playing is termed a serious game. Have you ever heard this term before?



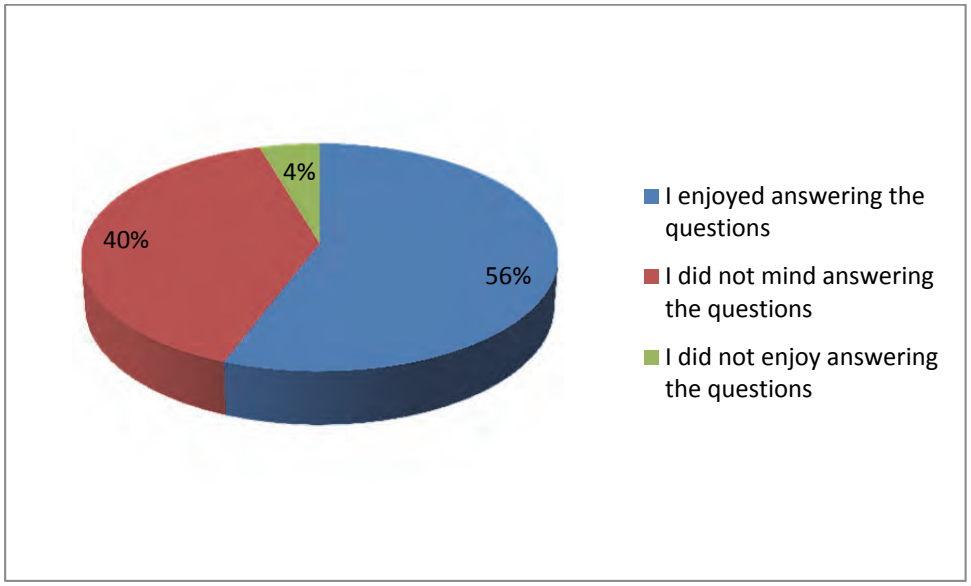
Do you believe serious games could be used to teach people?



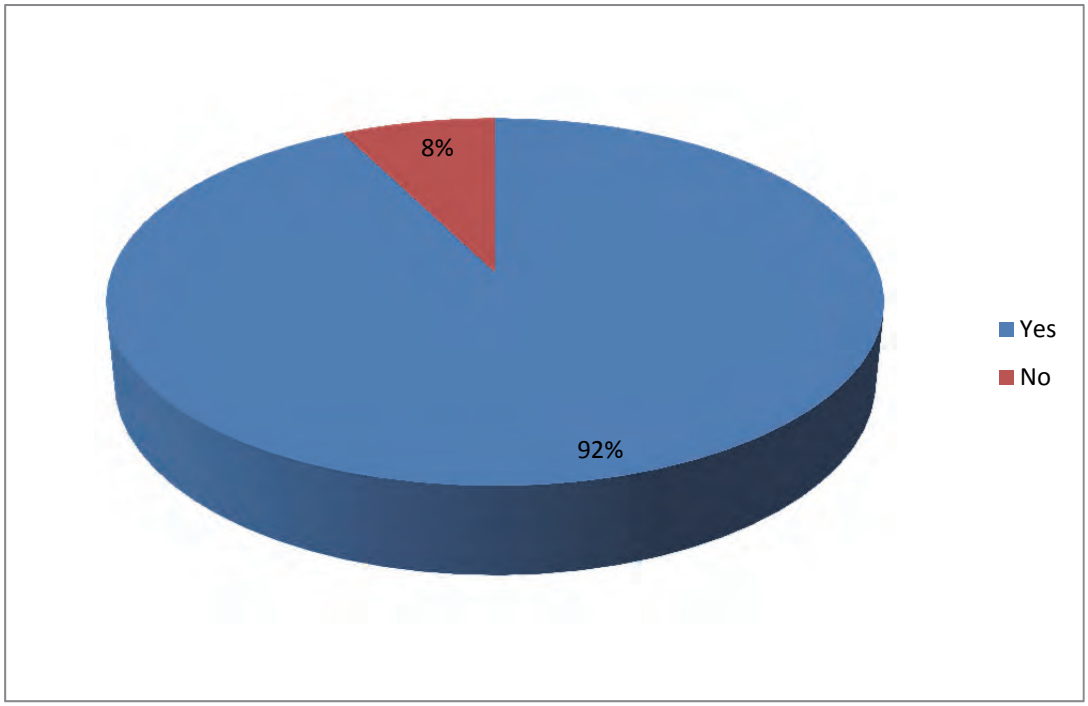
Has this game taught you anything?



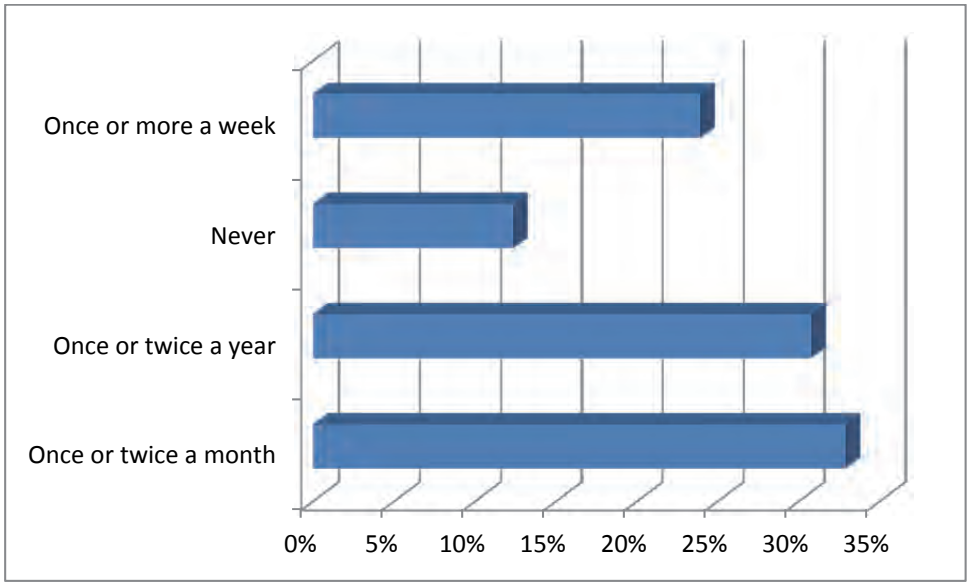
Did you mind answering all the questions asked in the game?



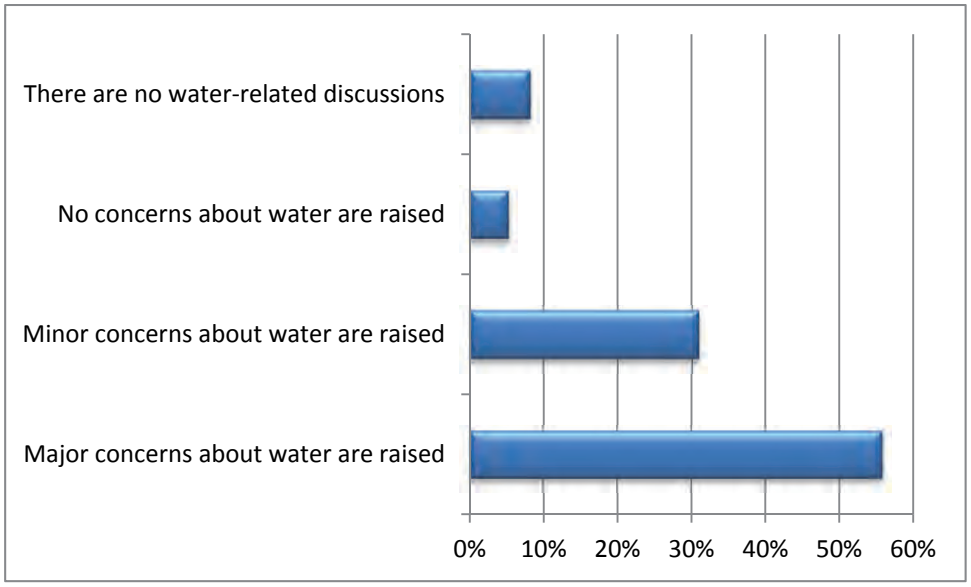
Will you challenge your family and friends to play the game?



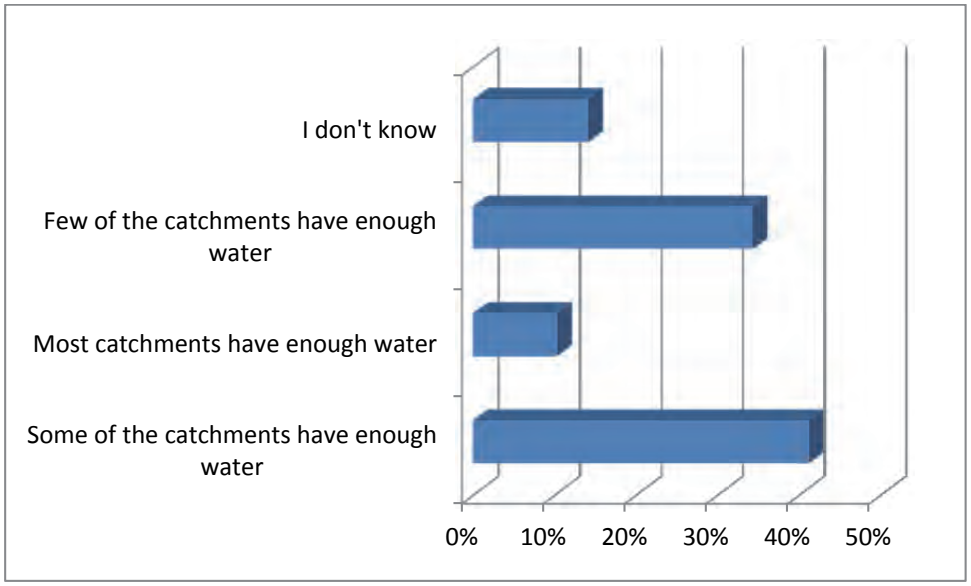
Do you and your family ever discuss water-related issues?



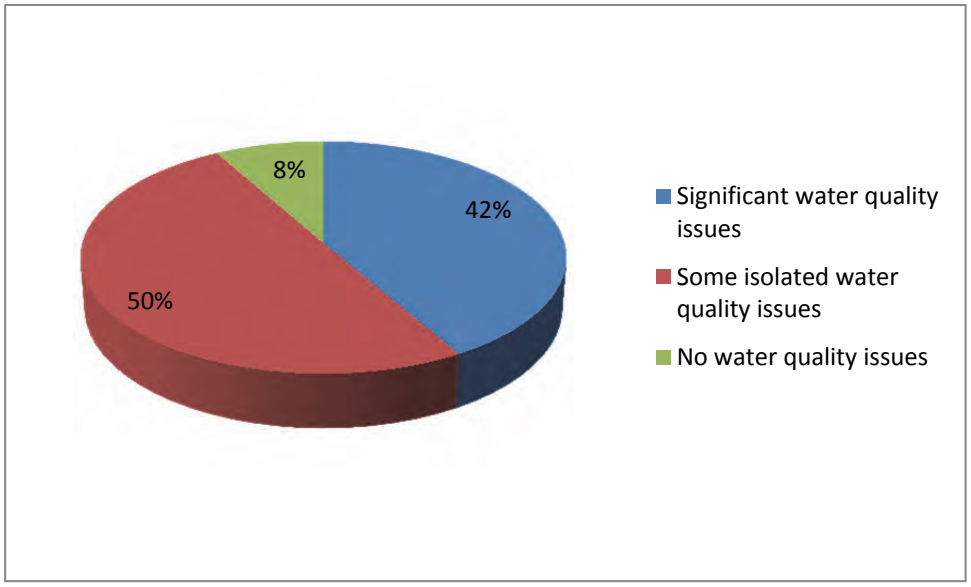
In the discussions about water:



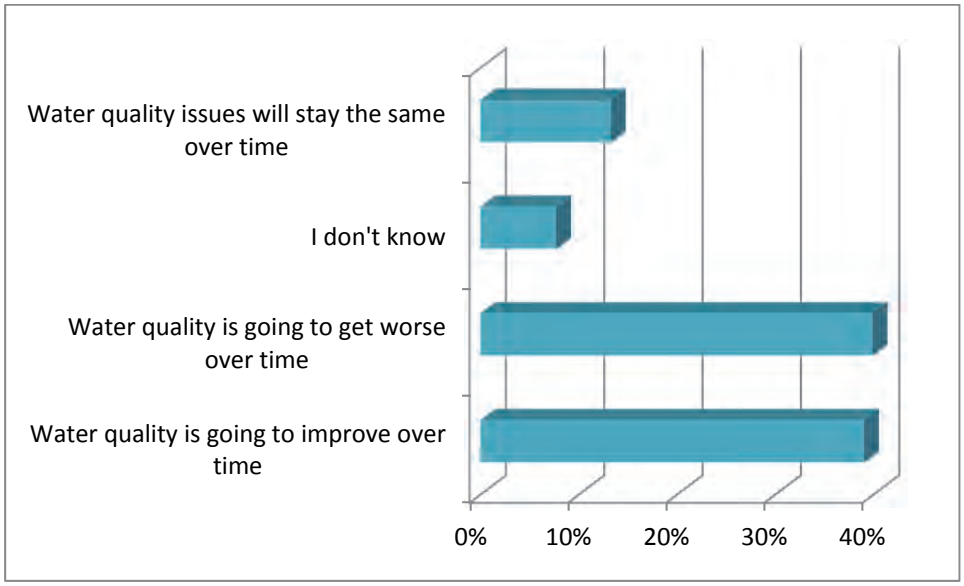
In South Africa, which do you think:



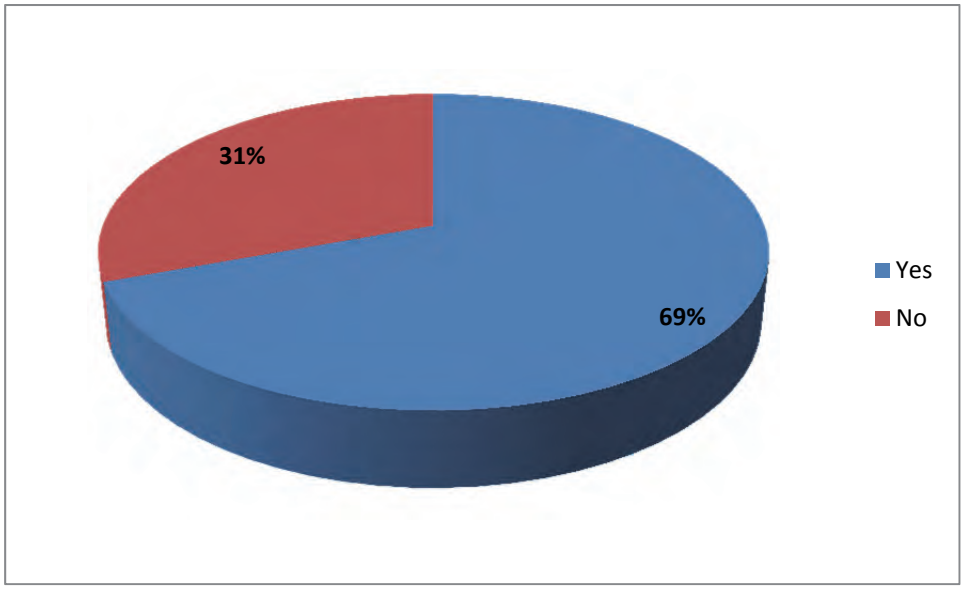
In South Africa, do you think there are:



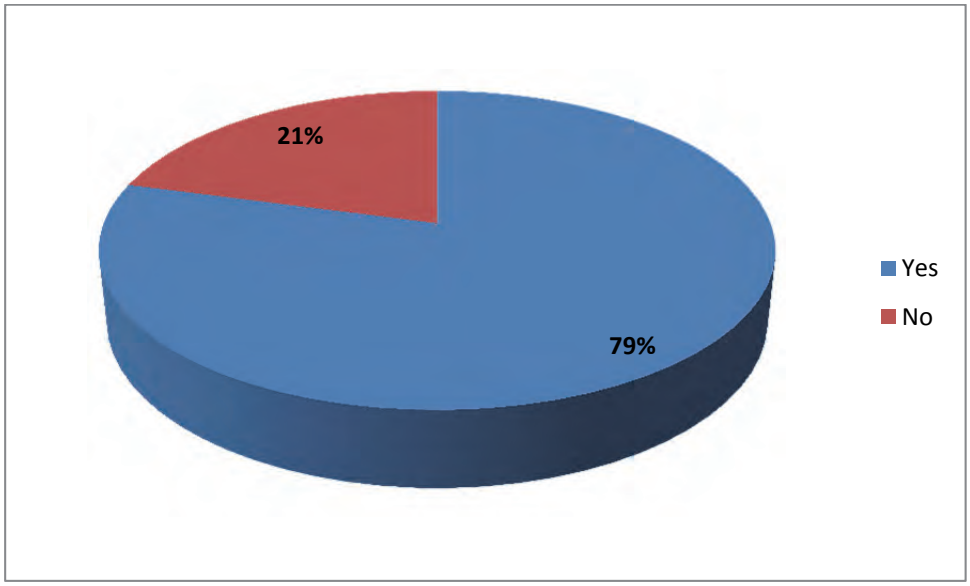
In South Africa, do you think?



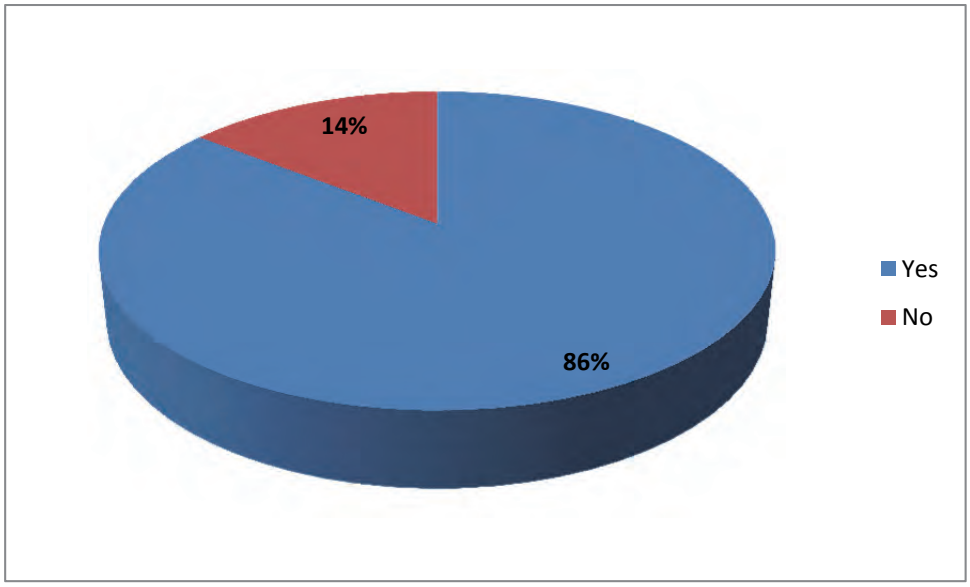
Do you have computer/s or laptop/s at home?



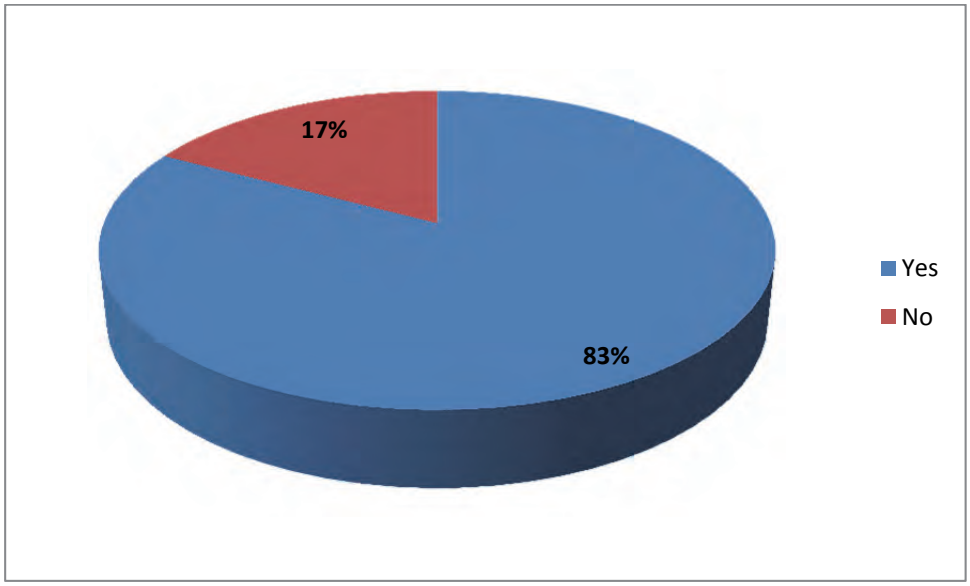
Are you planning to work in a water-related career?



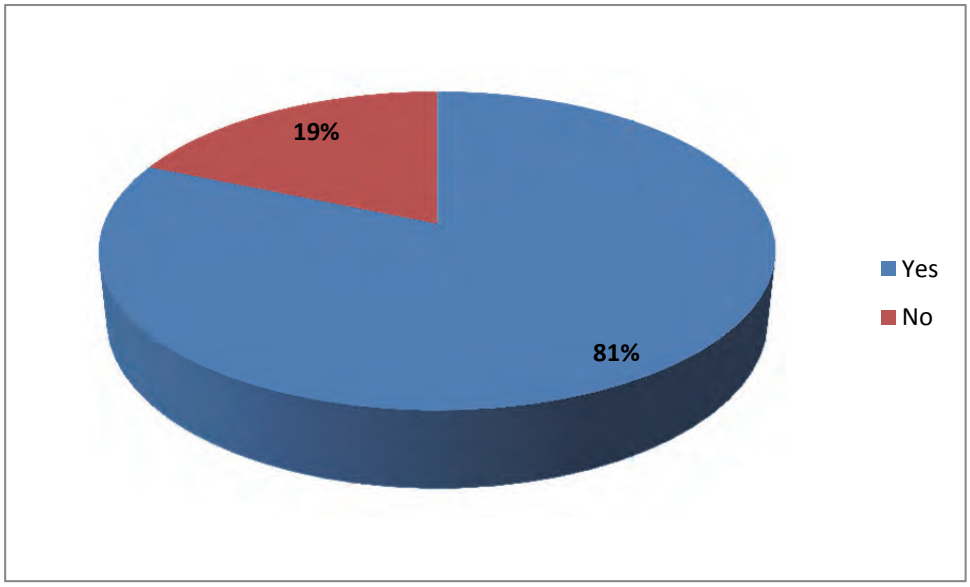
Would you like more information about water-related career options?



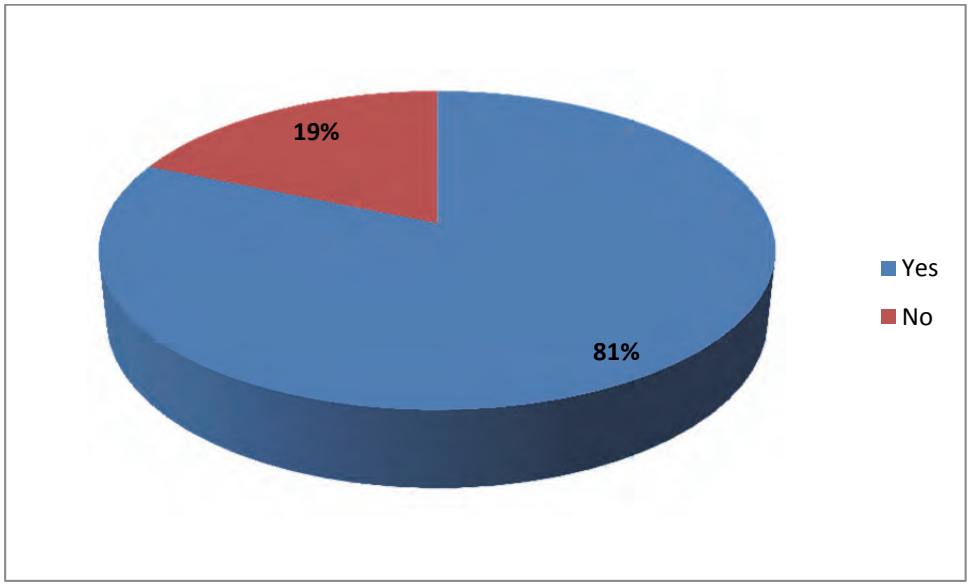
Did you take the subject of Science at school



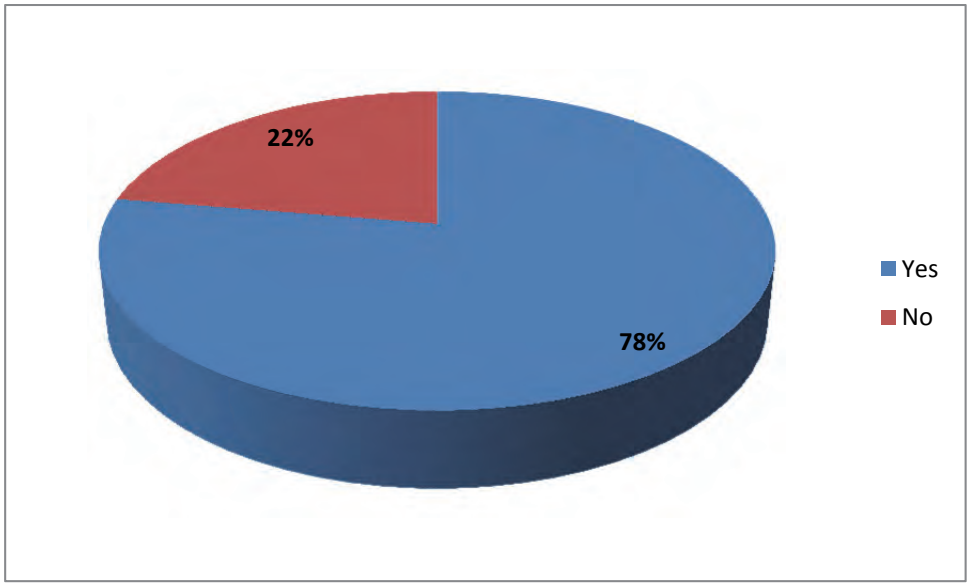
Did you take the subject of Life Sciences (Biology) at school



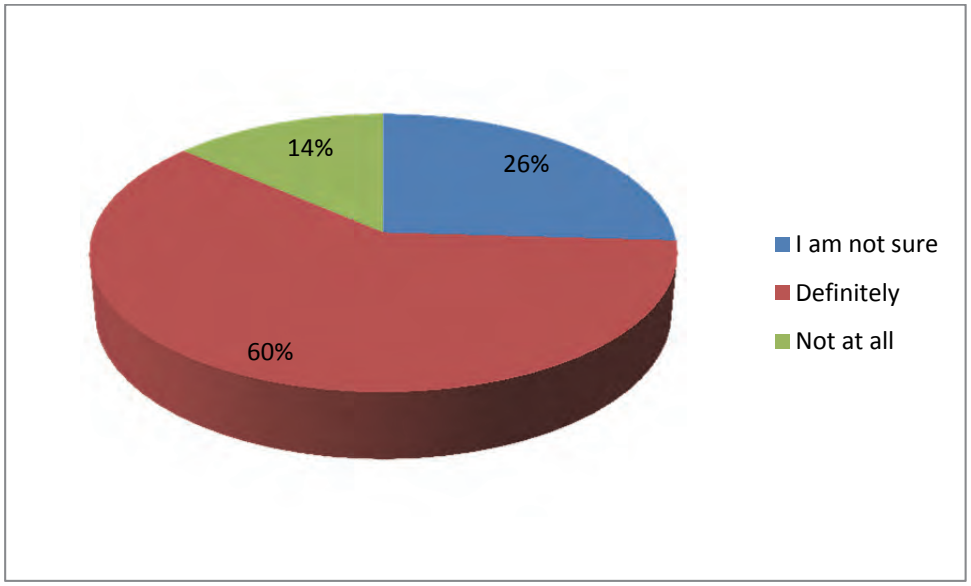
Did you take the subject of Geography at school



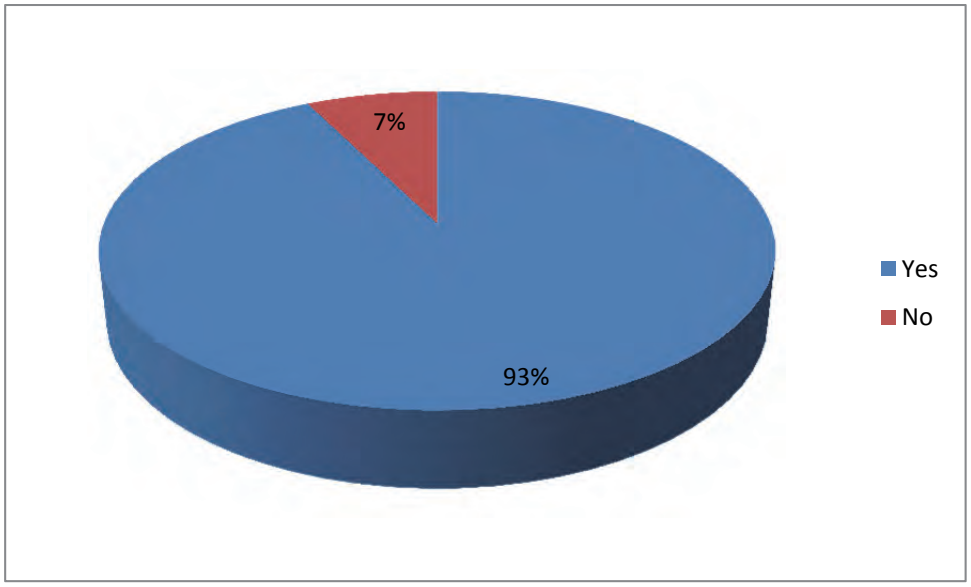
Do you have any water-related subjects at University?



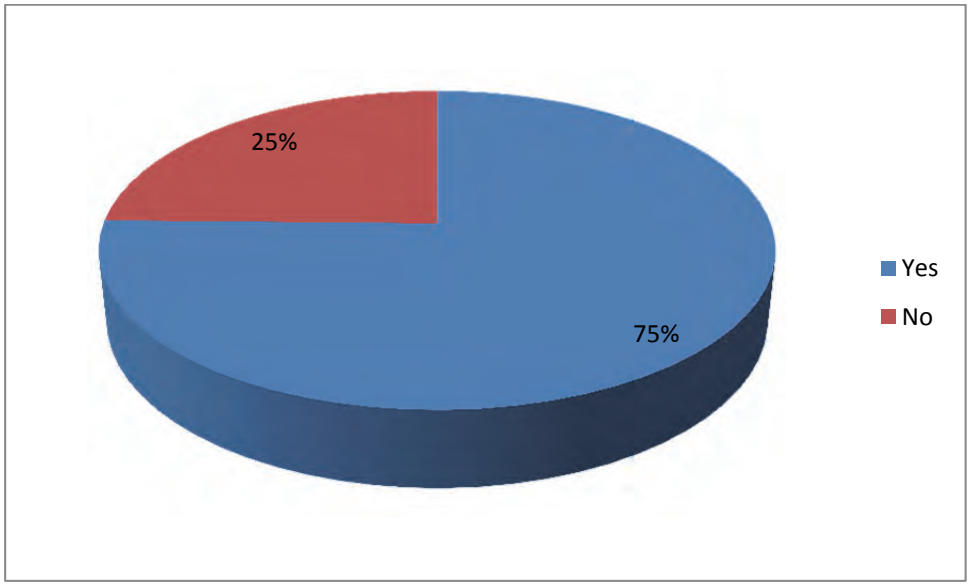
Would you be interested in a water-related career when you leave school?



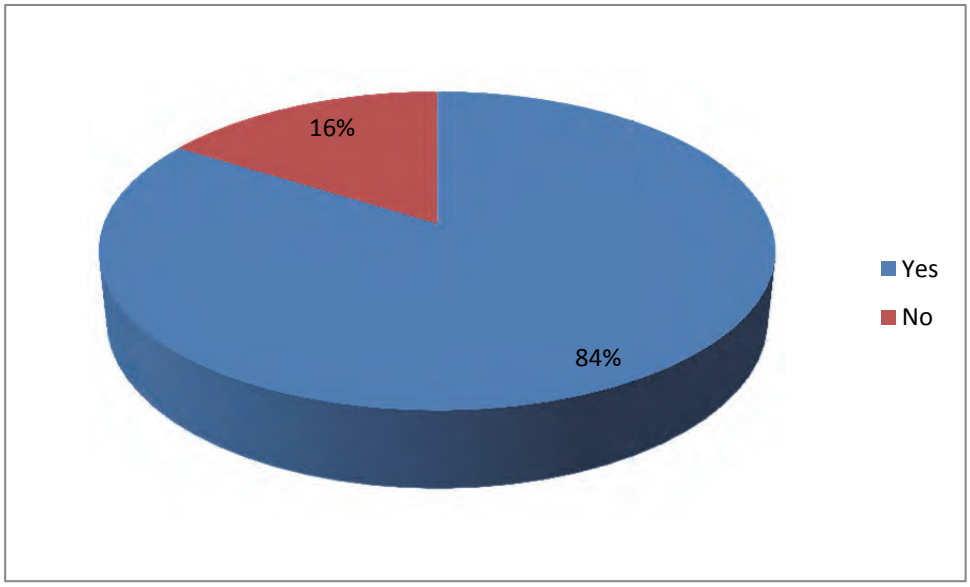
Are you doing (or planning to do) the subject of Maths at school:



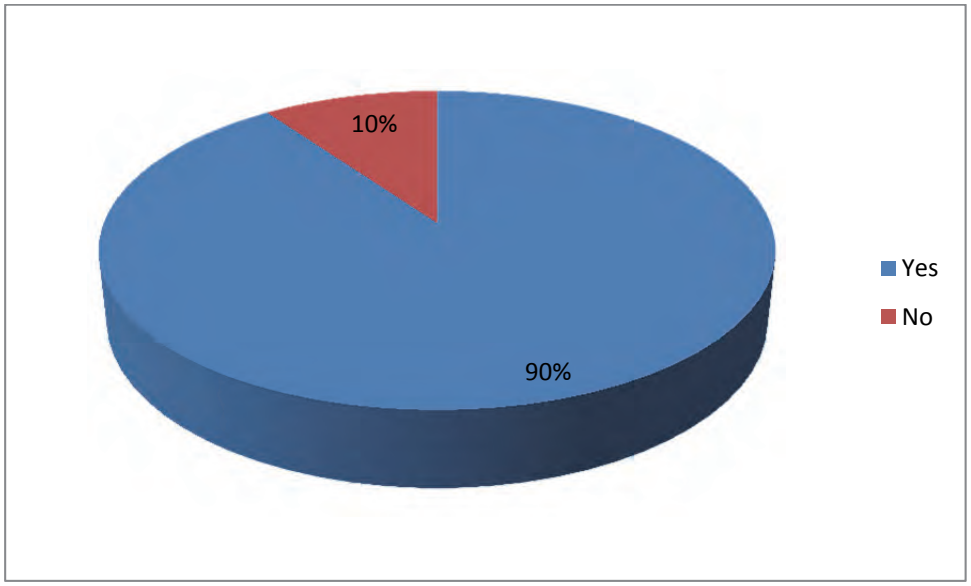
Are you doing (or planning to do) the subject of Geography at school:



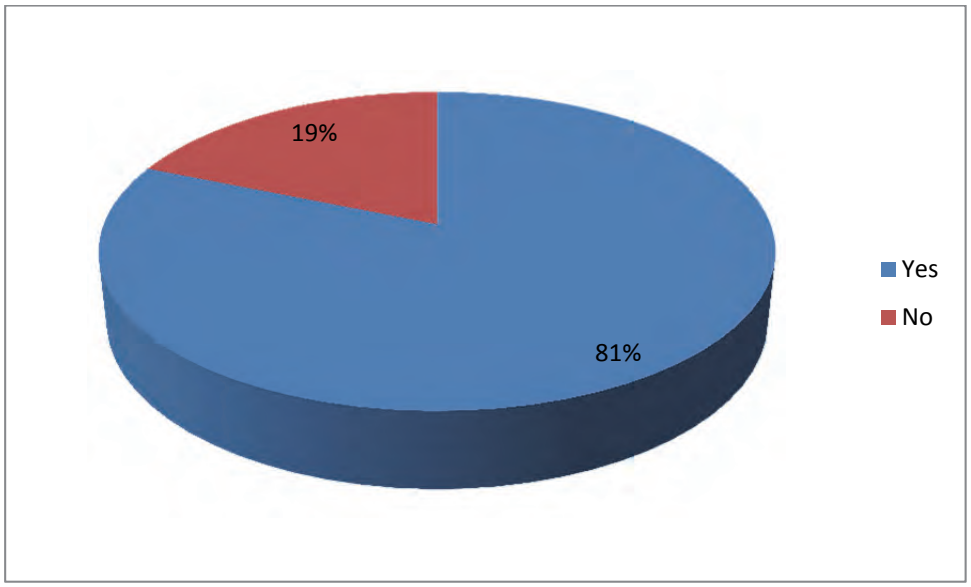
Are you doing (or planning to do) the subject of Science at school:



Are you doing (or planning to do) the subject of Life Sciences (Biology) at school:



Would you like to receive water-related information and/or details of water-related discussion groups?



APPENDIX B:

A PHOTOGRAPH OF THE GAME BEING PLAYED AT SKUKUZA