

**WATER SCIENCE AND TECHNOLOGY ASSOCIATION  
12TH GULF WATER CONFERENCE**

**THE SAFETY, QUALITY, AND ENVIRONMENTAL AWARENESS OF  
POTABLE WATER IN THE KINGDOM OF BAHRAIN**

**A CONSUMER PERCEPTION**

**BY**

**TAHANI HUSSAIN**

**DR. ABDUL AMEER AHMED ALLAITH**

**UNIVERSITY OF BAHRAIN**

**MANAMA , 30 MARCH 2017**





# OUTLINE

- **DEFINITIONS**
  - **BOTTLED WATER INDUSTRY**
  - **ENVIRONMENTAL IMPACTS**
  - **POPULARITY OF BOTTLED WATER**
  - **WATER SOURCES IN BAHRAIN AND GCC**
  - **OBJECTIVES**
  - **METHODOLOGY**
  - **RESULTS**
  - **CONCLUSION**
- 



# DEFINITIONS

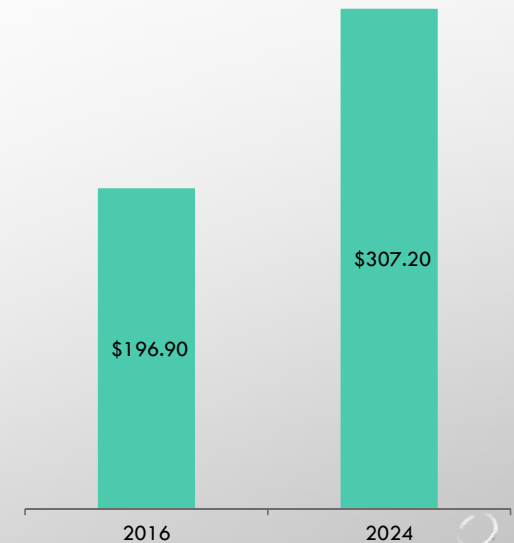


- Potable water** Is water that is safe to drink or to use for food preparation either its bottled filtered or tap water.
- Bottled water** Drinking water that is sold in bottles including (mineral, sparkling and spring water)
- Filtered water** Its tap water that is filtered using home filtration systems, distilled and filtered water sold in shops and water tanks.
- Tap water** Water that is supplied by the water authorities.
- Perception** A belief or opinion held by many people and based on how things seem.

# BOTTLED WATER INDUSTRY

2013		Gallons per Capita		Liters per Capita	
Rank	Countries	2008	2013	2008	2013
1	Mexico	56.6	67.3	257.3	306.0
6	United Arab Emirates	27	37.3	123	170
8	United States	28.5	32	129.6	145.5
15	Saudi Arabia	26.6	28.2	121	128
Global Average		7.8	9.9	35.5	45

**Bottled Water Market Value**



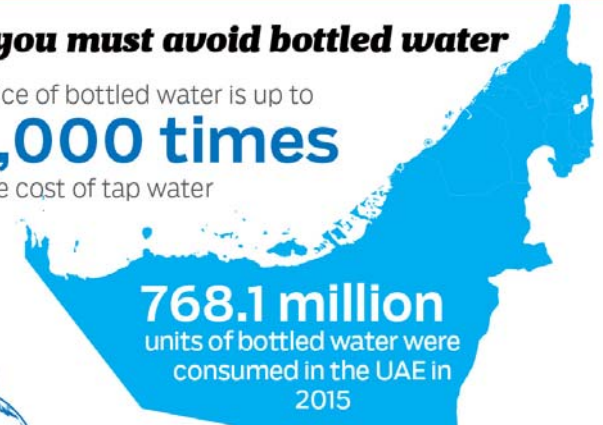
- 40-60% of bottle water globally consistent of reprocessed and repackaged tap water
- 800-2,000 times more costly than the original

# ENVIRONMENTAL IMPACT



## Why you must avoid bottled water

Price of bottled water is up to **1,000 times** the cost of tap water



**UAE** has one of the highest consumption of bottled water per capita in the world



It takes **3 litres of water** and **half a litre of oil** to produce a **1 litre plastic bottle**


**80%** of water bottles are not recycled



It can take up to **1,000 years** for plastic water bottles to degrade

**54%** of the **120 marine mammal species on the threatened list** have been observed entangled in, or ingesting plastic



In March 2016, **13 sperm whales** were stranded on Germany's coasts **with their stomachs full of plastic** 

# POPULARITY OF BOTTLED WATER

- **Versatility**
- **Convenience**
- **perception of their healthfulness and safety over the other alternatives.**
- **it solves the problem of unsafe water found in many economically developing countries.**
- **Organoleptics**
- **hardness**
- **Risk**
- **chlorine taste**

- **On the other hand, microbiological, chemical, and physical contaminations of bottled waters have been reported by many research groups around the world**

- **(Naidenko, et al., 2008) USA**
- **(Shotyk & Krachler, 2007) Germany**
- **(Allen , et al., 1989) USA**
- **(Alfadhli, 2015) Kuwait**
- **(Westrell, et al., 2006) Sweden**
- **(Wait, 2008) UAE**

# WATER IN BAHRAIN

## Top 33 Water-Stressed Countries: 2040

2040

Rank	Name	All Sectors
1	Bahrain	5.00
1	Kuwait	5.00



Annual rainfall 83mm

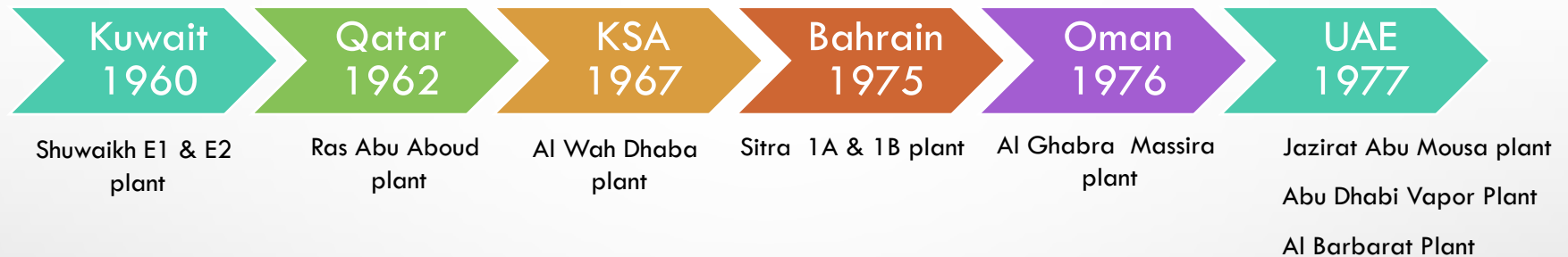
Salinity of dammam Aquifer range is 2,300-4,800 mg/l

Salinity of Rus – Umm Er Radhuma aquifer range 7000 -15000 mg/l

1	United Arab Emirates	5.00
1	Palestine	5.00
8	Israel	5.00
9	Saudi Arabia	4.99
10	Oman	4.97
11	Lebanon	4.97



# SOURCES OF WATER IN GCC




- GCC operates 199 desalination plants , representing 57% of global production capacity (AL-Rashed & Akber, 2015).
- Bahrain has 5 plants producing 165 MIGD , representing 87% of total water production.





# OBJECTIVES

- Explore the public perception about safety, health, quality, and their patterns of usage of the potable water sources available in Bahrain.
  - Examine how the consumers' demographic attributes affects their potable water preferences, attitude and drinking patterns.
  - How the environmental awareness impacts their water choices.
- 

# METHODOLOGY

Category No.	Questions Category	No. of Questions	Nature of Questions
1	Demographic & Socioeconomic	10	Demographic
2	Health Status	1	Demographic
3	Drinking Water Pattern	7	Practice
4	Home filtration Systems accessibility and usage	2	Practice
5	Safety and Quality of potable water	3	Knowledge
6	Bottle water Consumption	3	Practice
7	Environmental Awareness	3	Knowledge
8	Perception	4	Attitude
9	Willingness to modify behavior	4	Attitude
10	General Information	2	General

4) Name of governorate (المحافظة):

- Capital (العاصمة)
- Muharraq (المحرق)
- Northern (الشمالية)
- Sothern (الجنوبية)
- Capital (العاصمة)
- I don't know (أعلم)

5) What is your nationality (جنسية):

- Bahraini (بحرينية)
- Non-Bahraini (غير بحرينية)

6) If you are not Bahraini, how long have you lived in Bahrain (إذا كنت غير بحريني، كم من الوقت تعيش في البحرين):

- Less than a year (أقل من سنة)
- 1-2 years (سنة إلى سنتين)
- 3-4 years (ثلاث إلى أربع سنوات)
- 5 year or more (أكثر من خمس سنوات)

7) Level of education (المستوى التعليمي):

- Secondary (ثانوية)
- University (جامعة)
- Higher education (أعلى من الجامعة)
- Other education (أخرى)

8) Monthly income (الدخل الشهري):

- BD 299 and below (299 دينار أو أقل)
- BD 300 - 399 (300 - 399 دينار)
- BD 400 - 499 (400 - 499 دينار)
- BD 500 - 599 (500 - 599 دينار)
- BD 600 - 699 (600 - 699 دينار)
- BD 700 and above (700 دينار أو أكثر)

9) Type of water supply (نوع إمداد المياه):

- Private (خاص)
- Government (حكومي)
- Other (أخرى)

## Potable Water Consumer Preferences Survey in the Kingdom of Bahrain

استبيان (مسح) للتعرف على ذواق المستهلك بملكه البحرين لتفضيل شرب انواع معينة من المياه

This survey is designed for scientific purposes as a part of M.Sc. thesis in the Environmental and Sustainable Development Program at the University of Bahrain. You are not required to declare your identity while filling the survey. Thank you for your interests in taken this survey, your time is highly appreciated. To achieve the objectives of the study, we kindly request you to answer all the questions. This takes about 6 - 10 minutes.

The followings are clarifications for the terms used in this survey to describe types of water:

**Bottled water:** drinking water that is sold in bottles including (mineral, sparkling water)

**Filtered water:** its tap water filtered using home filtration systems and filtered water tanks.

**Public (Municipal) water:** that is supplied by the government.

الاستبيان الذي بين يديك مصمم لأغراض البحث العلمي كجزء من رسالة لنيل درجة الماجستير في البيئة والتنمية المستدامة من جامعة البحرين. ولا تتطلب هذه الاستبانة الإفصاح عن هويتك. نشكركم لاهتمامكم بتعبئة استبياننا. نعتز بوقتكم الثمين الذي تفضلوننا به لتقديم استبياننا. نرجو منكم الإجابة على جميع الأسئلة. نعتز بوقتكم الثمين الذي تفضلوننا به لتقديم استبياننا. نرجو منكم الإجابة على جميع الأسئلة. نرجو منكم الإجابة على جميع الأسئلة. نرجو منكم الإجابة على جميع الأسئلة.

فيما يلي توضيح لبعض المصطلحات المستخدمة في الاستبيان:

**المياه المعبأة:** مياه الشرب التي تباع في زجاجات المياه المعبأة، الفوارية والجبليّة.

**المياه المرشحة:** مياه الصنبور التي يتم تصفيتها باستخدام أنظمة تنقية المياه المنزلية (كما تشمل المياه المرشحة التي تباع في المحلات وعن طريق أصحاب صهاريج (التنكر) المياه).

**مياه الحنفية (الصنبور):** المياه التي يتم توفيرها من قبل الحكومة من خلال شبكة توزيع الماء

1) Gender (النوع أو الجنس):

- Male (نكر)
- Female (أنثى)

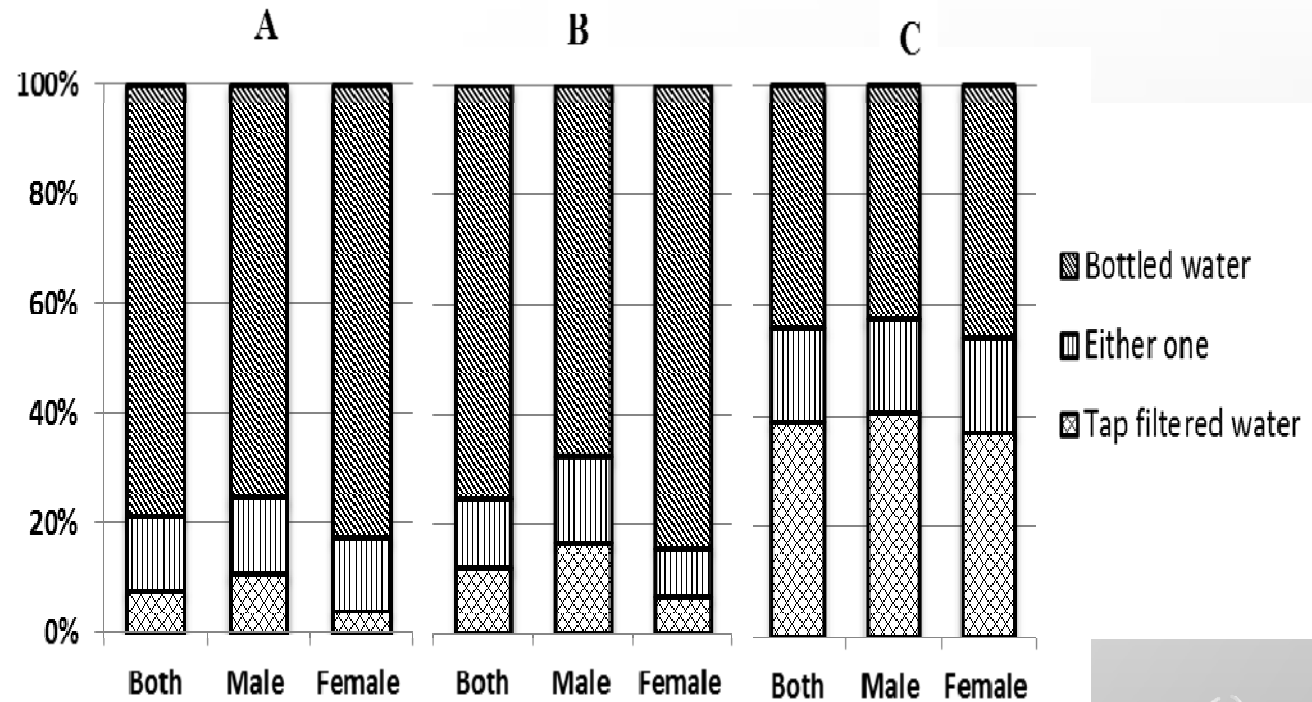
2) Age group (الفئة العمرية):

- 18 to 34 (ما بين 18 إلى 34 سنة)
- 35 to 44 (ما بين 35 إلى 44 سنة)
- 45 - 64 (ما بين 45 إلى 64 سنة)
- 65 and above (65 سنة وأزيد)

3) Residential Area. Please specify (منطقة السكن. الرجاء ذكر أسم المنطقة):

## RESULTS – PATTERNS OF DRINKING BOTTLED WATER

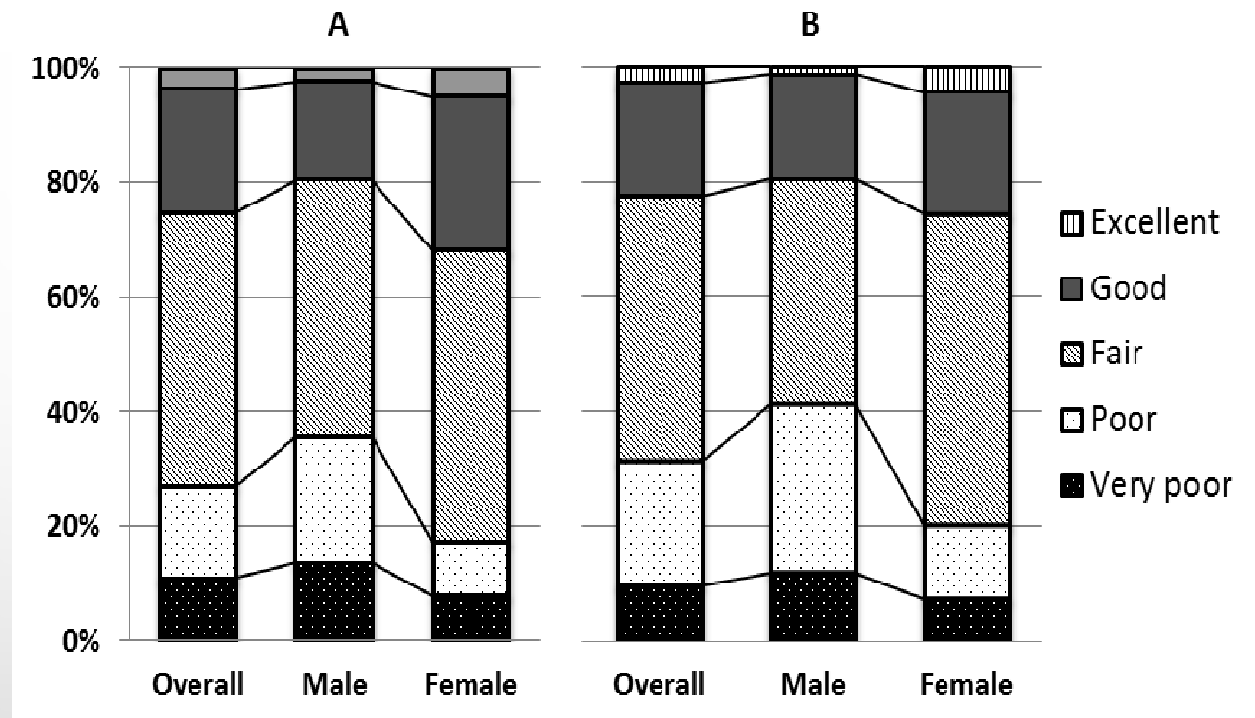
- 79% drink bottled water
- The respondents who drink tap and filtered water are more likely to have a water filtration system at home
- Respondents with high monthly income tend to install home water filtration systems. In addition to that, they do tend to give a lower rating of tap water's safety and quality.



**A represents the overall usual water drinking pattern of the investigated consumers. B and C represent their drinking water patterns while not home and home, respectively.**

## RESULTS –SAFETY AND QUALITY OF POTABLE WATER

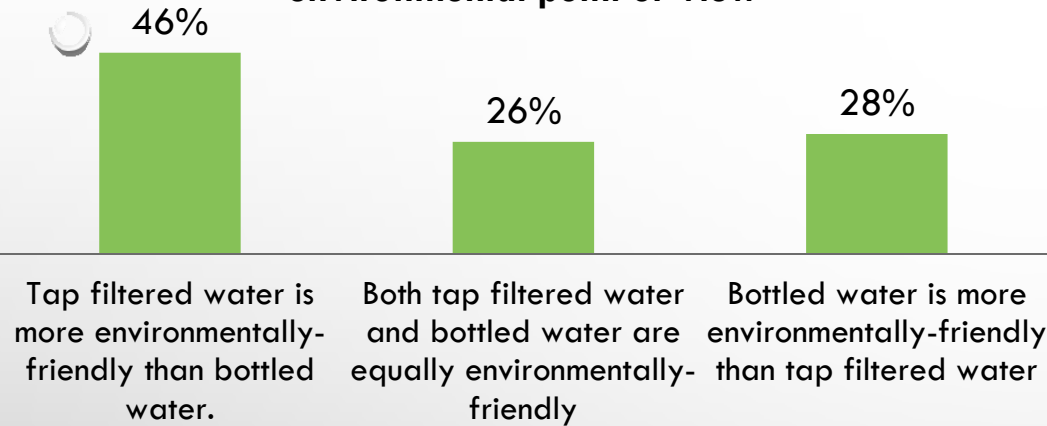
- 27% consider bottled water be safer than tap water
- 21% consider it healthier
- 46% consider tap water safety is fair
- 48% consider tap water quality is fair
- Females trust less the safety and quality of the tap water than males.
- the higher the respondents education the better rating they give to the tap water.



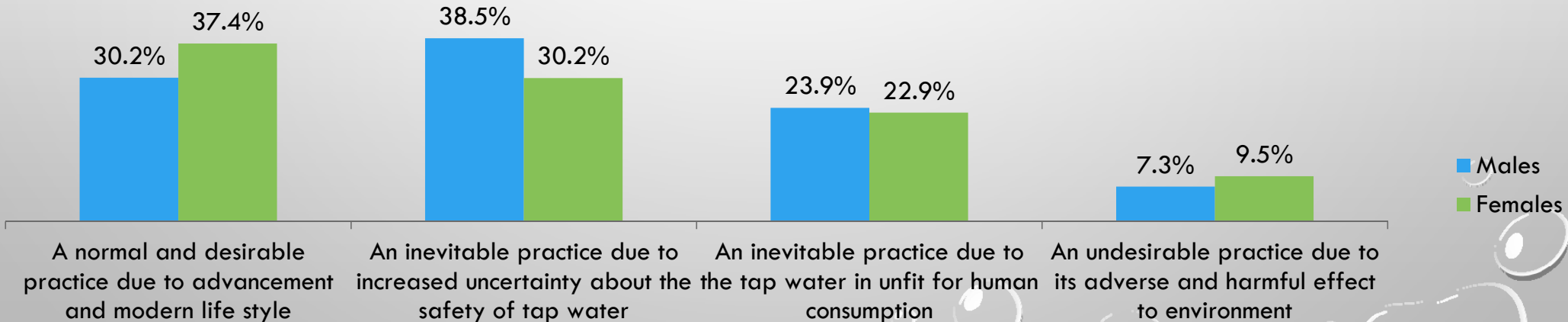
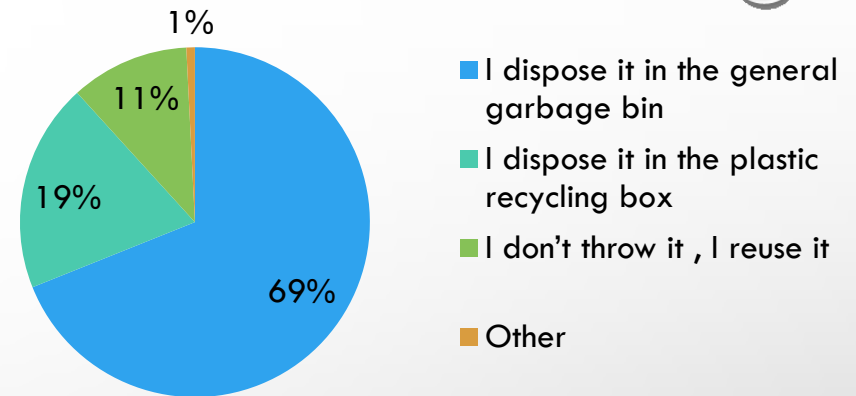
**Rating of quality (A) and safety (B) of public tap water among Bahraini respondents.**

# RESULTS –ENVIRONMENTAL AWARENESS INFLUENCES

**Tap filtered water versus bottled water from an environmental point of view**

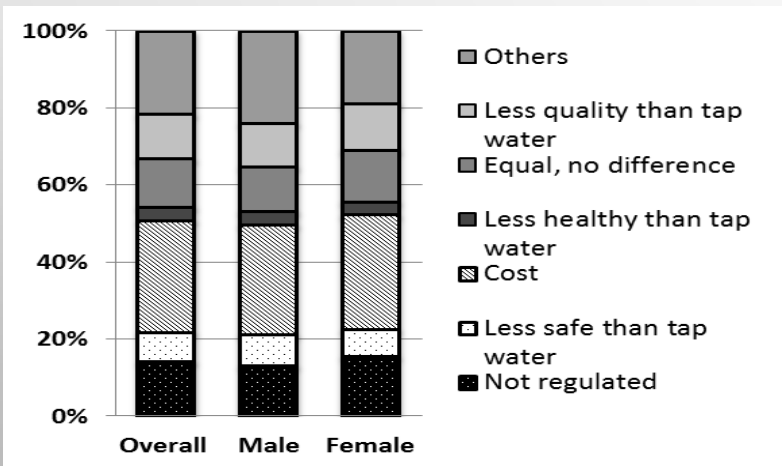


**Fate of Plastic bottles after consumption**

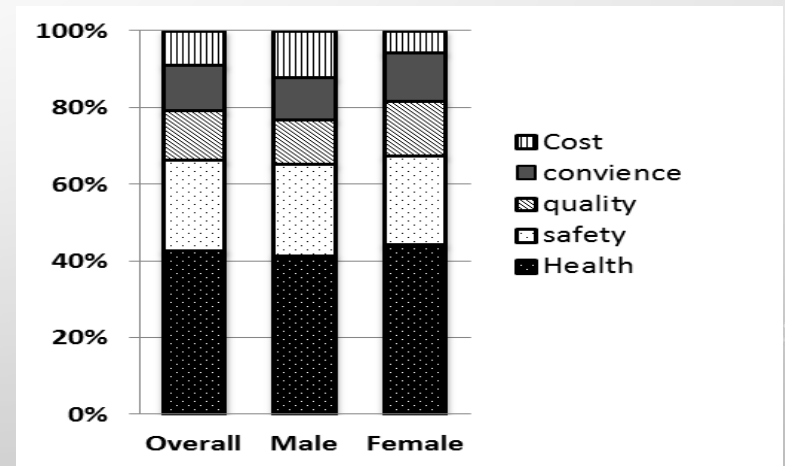


## RESULTS –PUBLIC PERCEPTION

- 55% viewed bottled water to be safer than tap filtered water
- 36 % of respondents consume it bottled water because it has lower sodium content and more balanced mineral content (27%).
- Only 23% of the respondents indicated that bottled water is not healthier than tap or filtered water.
- high income respondents are more likely to buy bottled water because they perceive it to be healthier.



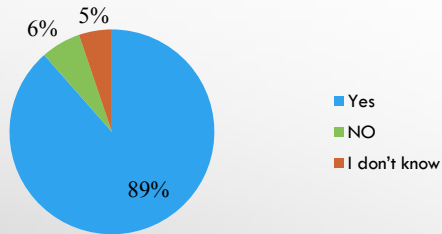
Reasons for not buying bottled water among Bahraini respondents.



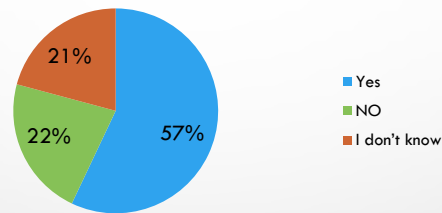
Reasons for buying bottled water among Bahraini respondents.

# RESULTS –WILLINGNESS TO MODIFY BEHAVIOR

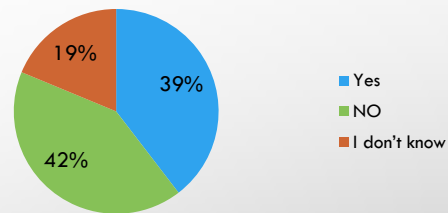
**If tap water quality and safety increased will you support it**



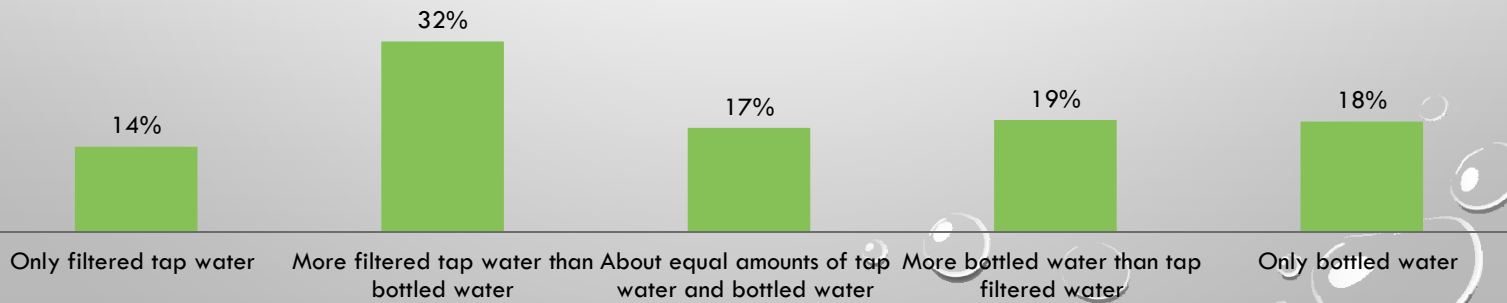
**If tap water quality and safety did increase will you not drink bottle water**



**If tap water quality and safety got improved will you pay for it**



**The cost effect on bottle water purchase**






## CONCLUSIONS -1




### MAJORITY OF BAHRAINI RESPONDENTS

- **Drink more bottled water**
  - **Limit their tap water to cooking**
  - **They are not satisfied with the current quality and safety of the tap water and they do not perceive it to be suitable for drinking purposes.**
- 





## CONCLUSIONS - 2

- **Bahraini consumers indicate their conditional willingness to modify their drinking behavior to the tap water if significant improvements are made to the public water supply in appreciation of the negative impacts of the water bottling industry.**
- 

**THANK YOU**