COLLEGE OF COMPUTING, INFORMATICS & MEDIA

BACHELOR OF INFORMATION TECHNOLOGY

ICT653: TECHNOLOGIES FOR FUTURISTICS SYSTEM

ISSUES PAPER

CS2406A (GROUP 1)

TITLE:

AQUACLEAN: SMART WATER MANAGEMENT: COMBINING RAINWATER AND GREYWATER FOR SUSTAINABLE USE

PREPARED BY:

NO	NAME	MATRIC NO
1	SITI AUNIWAZNAH BINTI MUSTAZI	2020837642
2	MUHAMMAD AMIRUL AIMAN BIN MOHD NASIR	2020627888
3	FARAH SYAFIQA BINTI ZAINUDIN	2020495322
4	NUR HUMAIRA HANISAH BINTI NGASIMAN	2020827904
5	MUHAMMAD AL MUKHRIS BIN GASFAR	2020615208

PREPARED FOR:

DR AFDALLYNA FATHIYAH BINTI HARUN

SUBMISSION DATE:

9 JUNE 2023

Table of Contents

1.0. LIST OF SEVEN QUESTIONS

1. If you could spend some time with someone who knew the future smart water management, what would you want to know?
2. If things went well, how would you expect the rainwater and greywater harvesting practices to develop and what would be the signs of success?
3. How could the environment change to threaten rainwater and greywater harvesting? How could these practices deteriorate?
4. From your knowledge of the water system, which impact on smart water management, should be changed to achieve an optimistic outcome?
5. What factors shaped the current state of water usage in your area?
6. What decisions need to be made in the near term to achieve the desired long-term outcome for rainwater and greywater harvesting?
7. If you had a mandate, free of all constraints, what more would you do to ensure a successful future for smart water management?

2.0. ISSUES PAPER

2.1. POLITICS

- Government water-use restrictions and policies influence how people use water. Individual and community habits and behaviours all contribute to overall water usage trends.
- Stricter water-use restrictions, encouraging the use of water-saving technologies, and promoting water education in schools and communities can all help to achieve long-term responsible water consumption.
- Raising water conservation awareness through a campaign and educational programme to ensure a prosperous future for smart water management and responsible water consumption.
- Focusing on comprehensive water management strategies, research and development for innovative solutions, community-led initiatives, partnerships, and public awareness campaigns are additional steps to ensure the successful future of smart water management and responsible water consumption.

- Population growth, climate, prior behaviours, and government rules all have an impact on how people use water in our area right now.
- If people are given mandate, free of all constraints, they will put in place the rules and policies that support responsible water use, ensuring a prosperous future for smart water management and responsible water consumption.
- Enacting legislation requiring buildings to employ greywater and rainwater gathering systems.
- Better communication and coordination among many organisations will be beneficial in smart water management. More public awareness campaigns will be required to educate people on the need of water conservation and how they can help.

2.2. ECONOMY

- How water management system can impact the cost effectiveness.
- Discovering whether smart water management can lead to new revenue streams or business models in the water industry.
- Saving money might be an indication of success in rainfall and greywater gathering practises.
- Implementing a smart water management system can result in cost savings by incorporating renewable energy sources such as solar and wind power.
- Rainwater and greywater gathering practises can be successful if they help reduce water bills while also increasing sustainable practises.
- We hope that more individuals use rainwater and greywater for non-essential activities, which will have a favourable influence on water usage. The decrease in water usage and less strain on water supplies are indicators of whether they utilise the practises or not.
- Fostering collaboration among stakeholders can aid in the long-term achievement of responsible water consumption.
- Teach people how to spend money on smart water management system infrastructure enhancements.

- Water source pollution or contamination may have an impact on the quality of captured rainfall and greywater.
- Estimate the cost of establishing the rainfall and greywater collection system. Government, business, and communities working together to create and implement large-scale rainwater and greywater collection projects.

2.3. TECHNOLOGY

- Are there any breakthrough technologies on the horizon that will assist people in conserving water? Is it possible to find practical solutions that have a meaningful impact?
- Are there any new technology or ideas that could assist us in conserving water? Is there anything simple that people can do at home or in their community to conserve water? What does the future of water management hold?
- Energy-efficient devices and systems, including smart pumps and intelligent water distribution networks, contribute to significant water savings.
- How are sensors being integrated into rainwater harvesting and greywater recycling systems?
- Advancements in water treatment technologies are crucial for ensuring the quality of harvested rainwater and treated greywater.
- Innovative filtration systems with improved efficiency and capacity help remove impurities, dirt, bacteria, and contaminants from water, making it safe for various uses.
- The increase in adoption of smart water management systems at both individual and community levels.
- Energy-efficient pumps in the water distribution system incorporate features such as variable speed drives, high-efficiency motors, and optimized hydraulic design to minimize electricity consumption.
- The advanced water harvesting system utilizes IoT sensors to enable real-time monitoring of data at various stages of the process. This includes rainfall sensors for efficient collection, level sensors for storage tank management, pH sensors for water quality maintenance, and flow meters for streamlined distribution.
- Rainwater and greywater harvesting can be impacted by environmental factors such as pollution and shifts in rainfall patterns. These factors can potentially

compromise the quality of harvested water, posing challenges for its safe utilization. Furthermore, neglecting the maintenance of collection systems and failing to educate people about proper water usage could undermine the effectiveness of these practices.

- Collaboration and communication among different organizations involved in water management are essential for developing sustainable strategies and addressing water-related challenges.
- Raising awareness through educational campaigns to promote water conservation practices and encourage individuals and communities to actively participate in conserving water.
- Investing in sensor technologies capable of detecting pH levels and water levels in tanks can yield significant advantages.
- Monitoring pH levels aids in water quality control, environmental monitoring, and industrial process optimization. Detecting water levels helps with water management, conservation, automation, and preventive maintenance.
- Rainwater and greywater collection systems are becoming increasingly common and popular. The installation of devices in buildings to collect rainwater and reuse greywater signifies success in water conservation. A noticeable reduction in water usage further reinforces the effectiveness of these practices.
- Environmental factors such as prolonged droughts or increased pollution can pose challenges to rainwater and greywater harvesting practices.
- To ensure effective water management, there is a need for continuous improvement in water system infrastructure, including storage tanks, filtration systems, and distribution networks.
- Failure to maintain and upgrade infrastructure can result in the deterioration of various components. In the absence of regular maintenance, storage tanks, filters, pumps, and distribution systems may experience issues such as blockages, damage, or reduced efficiency.
- The design of the rainwater and greywater harvesting system involves assessing and determining key aspects such as the appropriate size and capacity of storage tanks, the arrangement of pipes and filters, and the incorporation of a pH sensor.

3.0. LIST OF USER REQUIREMENTS IN THE CONTEXT OF THE TECHNOLOGY INNOVATION

how are they integrated is not clear

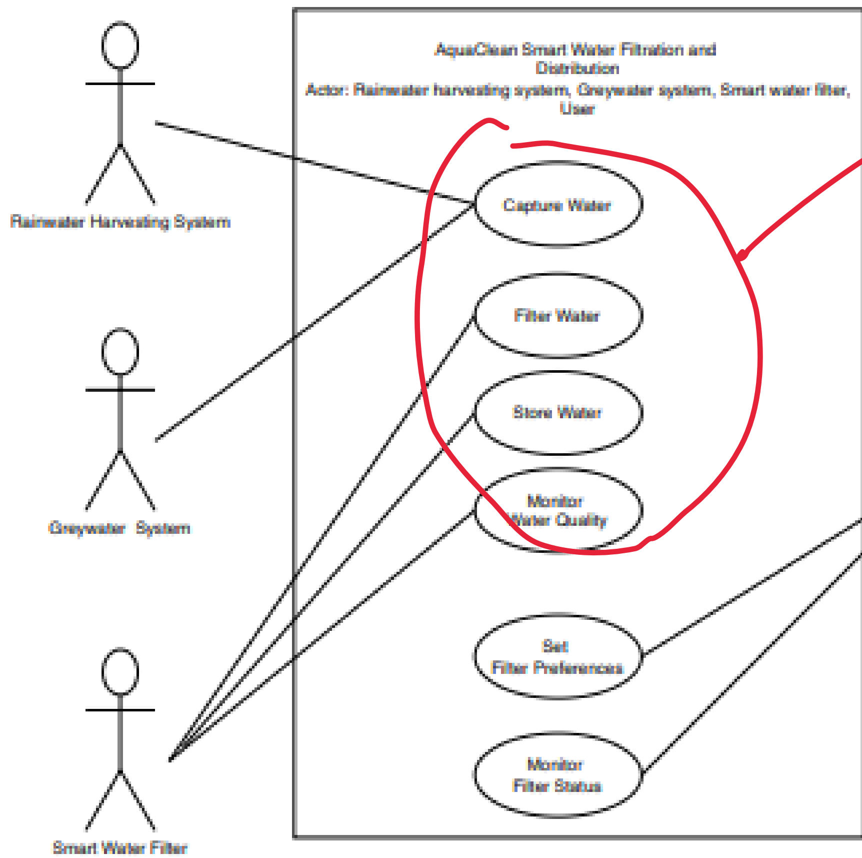


Figure 1: Use Case Diagram for AQUACLEAN: SMART WATER MANAGEMENT: COMBINING RAINWATER AND GREYWATER FOR SUSTAINABLE USE

Unclear image

* the issues paper indicate that indepth study was done
* the theme appear very relevant to the solution concept but some phrases can be simplified
* UCD appears incomplete as it does not show how the systems are integrated to each other

on the video:
* highlights the problem well and clear on the challenges of water scarcity and using treated water that leads to water wastage (car wash, watering plants)
* the name of the system was clearly mentioned
* listed the features of technologies which are sensible
* visuals were provided making it easier to understand the solution concept
* highlighted the benefits of the features well with very clear examples and elaboration
* the provided visuals were helpful
* very creative video with proper storytelling and visual aids
* the whole content helps in understanding problem, solution mechanics and benefits
it is clear all members are involved

UCD table is not required for this assignment

Table 3.1 Non-Functional Requirements for Capture Water

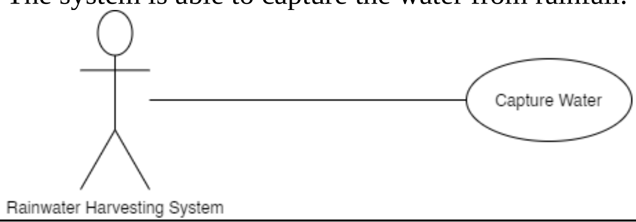
Use Case Name	Capture Water
Actor:	Rainwater Harvesting System
Use Case:	The system is able to capture the water from rainfall. 
Preconditions:	Rain starts to fall. The system is working, and the storage container is not full.
Postconditions:	The rain has stopped. Rainwater is channelled into the filtering system via a pipe.
Flow of the event:	Actor
	1. The rainfall event begins. 2. The rainwater catchment system collects the precipitation. 3. Rainwater is directed through a pipe to a filtration system. 4. Use case end.
Exceptions Flow:	E 1.0 If there was no rain E 1.1 The system remains idle.

Table 3.2 Non-Functional Requirements for Capture Water

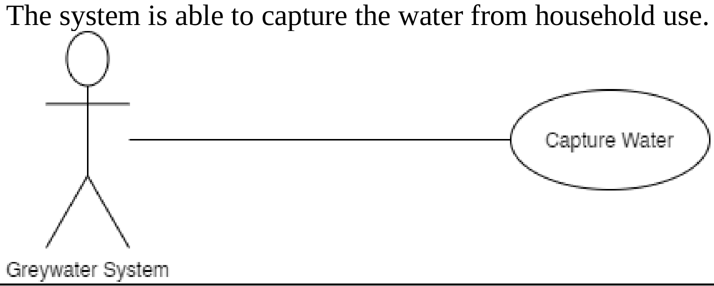
Use Case Name	Capture Water
Actor:	Greywater System
Use Case:	The system is able to capture the water from household use. 
Preconditions:	The system is up and running, and greywater is being produced.
Postconditions:	The greywater is channelled into the filtering system via a pipe.
Flow of the event:	Actor
	1. Greywater is produced (e.g., from household use). 2. The greywater filtration system captures the greywater. 3. Greywater is directed through a pipe to a filtration system. 4. Use case end.
Exceptions Flow:	E 1.0 If there was no greywater production E 1.1 The system remains idle.

Table 3.3 Non-Functional Requirements for Filter Water

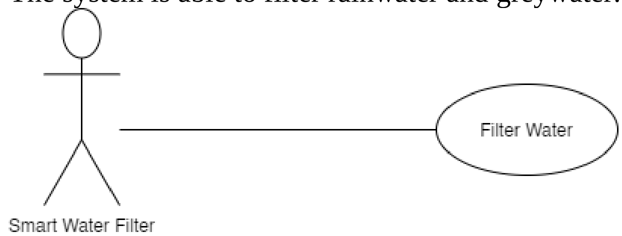
<table>
<tr><td>Use Case Name</td><td>Filter Water</td></tr>
<tr><td>Actor:</td><td>Smart Water Filter</td></tr>
<tr><td>Use Case:</td><td>The system is able to filter rainwater and greywater.

</td></tr>
<tr><td>Preconditions:</td><td>Rainwater or greywater are available for filtration, and the system functions.</td></tr>
<tr><td>Postconditions:</td><td>The water that has been filtered is safe to store in a container.</td></tr>
<tr><td rowspan="2">Flow of the event:</td><td>Actor</td></tr>
<tr><td>1. Rainwater or used water flows into the system.
2. The smart water filter begins to clean the water.
3. The system checks on the filtering process and makes changes as needed.
4. Water that has been filtered is taken to where it will be used or stored.
5. Use case end.</td></tr>
<tr><td>Exceptions Flow:</td><td>E 1.0 If their filter maintenance required
E 1.1 The system notifies the user of required maintenance or filter replacement.</td></tr>
</table>

Table 3.4 Non-Functional Requirements for Store Water

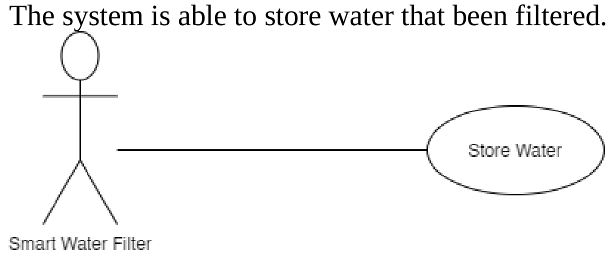
<table>
<tr><td>Use Case Name</td><td>Store Water</td></tr>
<tr><td>Actor:</td><td>Smart Water Filter</td></tr>
<tr><td>Use Case:</td><td>The system is able to store water that been filtered.

</td></tr>
<tr><td>Preconditions:</td><td>The filtration procedure is complete, and storage system capacity is available.</td></tr>
<tr><td>Postconditions:</td><td>Water that has been filtered is stored and available for use when needed.</td></tr>
<tr><td rowspan="2">Flow of the event:</td><td>Actor</td></tr>
<tr><td>1. The filtration procedure concludes.
2. The smart water filter initiates the process of water storage.
3. The water is directed to the system's storage area.
4. The system monitors the amount of water stored.</td></tr>
<tr><td>Exceptions Flow:</td><td>E 1.0 If the storage capacity is reached
E 1.1 The system ceases to store water and generates an alert.</td></tr>
</table>

Table 3.5 Non-Functional Requirements for Monitor Water Quality

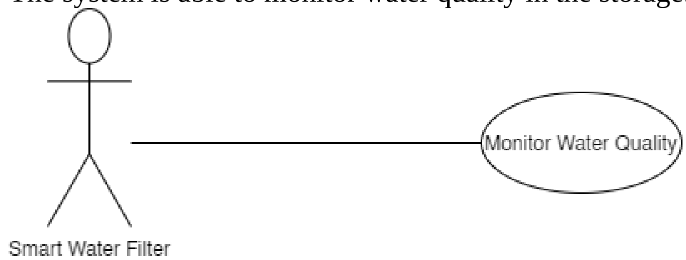
Use Case Name	Monitor Water Quality
Actor:	Smart Water Filter
Use Case:	The system is able to monitor water quality in the storage. 
Preconditions:	The system's storage unit contains water, and the monitoring system is operational.
Postconditions:	The quality of the water has been monitored and logged, and any necessary warnings have been issued.
Flow of the event:	Actor 1. This smart water filter initiates the procedure of water quality monitoring. 2. The system measures numerous parameters of water quality. 3. The system compares the measured values to the thresholds that have been specified. 4. The system logs water quality information and updates the user interface.
Exceptions Flow:	E 1.0 If water quality parameters exceed acceptable thresholds E 1.1 The system issues a warning.

Table 3.6 Non-Functional Requirements for Set Filter Preferences

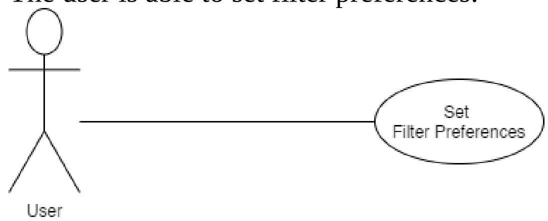
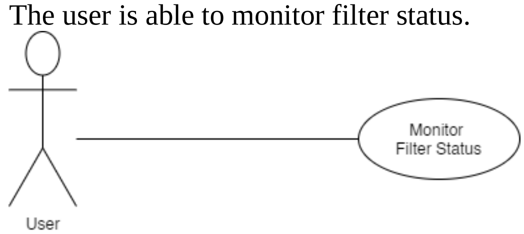
Use Case Name	Set Filter Preferences
Actor:	User
Use Case:	The user is able to set filter preferences. 
Preconditions:	The user has access to the control interface of the system, and the system is operational.
Postconditions:	The filter settings have been modified in response to the user's input.
Flow of the event:	Actor 1. The user accesses the smart water filter's control interface. 2. The user navigates to the filter preferences and settings. 3. The user modifies the filter's parameters to their liking. 4. The system then saves and implements the modified filter settings.
Exceptions Flow:	E 1.0 If the system is inactive or unresponsive E 1.1 User cannot access the control interface.

Table 3.7 Non-Functional Requirements for Monitor Filter Status

Use Case Name	Monitor Filter Status
Actor:	User
Use Case:	The user is able to monitor filter status. 
Preconditions:	The user has access to the control interface of the system, and the system is operational.
Postconditions:	The user is cognizant of the current status of the filter
Flow of the event:	Actor 1. The user accesses the smart water filter's control interface. 2. The user navigates to the section on filter status. 3. The system displays the filter's present status.
Exceptions Flow:	-