

## Report:

### description of our solution:

#### **WATER SOLUTION**

Recycling water from the bathroom sink and shower is an eco-friendly practice that involves treating and reusing water to minimize waste. The recycled water is stored in a tank equipped with level sensors, allowing for efficient monitoring of the water level.

In the context of irrigation, a control and management system is implemented to optimize water usage in gardens or farms. Sensors strategically placed throughout the facility provide detailed water consumption statistics by zone or room, contributing to a more precise understanding of water usage patterns.

To enhance user engagement and control, a mobile application is developed. This app serves as a comprehensive tool for managing, controlling, and monitoring water consumption. It not only offers real-time statistics but also sends alerts if the monthly consumption surpasses the average. Additionally, the app provides information about the stored water level, ensuring users are well-informed about their water resources.

#### **POWER SOLUTION**

In the electricity solution, the project incorporates the innovative use of piezoelectricity. Piezoelectricity is a phenomenon observed in certain crystalline materials when subjected to mechanical deformation. This technology allows the conversion of mechanical stress into electrical energy, presenting a sustainable and efficient method to generate electricity. By

harnessing piezoelectric properties, the project aims to provide a reliable and renewable source of energy, contributing to the overall sustainability of the initiative.

Project Mission

The fundamental requirements of a community in Africa extend beyond mere access to essential resources; they encompass a comprehensive approach to improving overall living standards. Access to a clean water source is a cornerstone, not only for basic hydration but also for establishing effective sanitation systems that ensure the health and well-being of the community.

In addition to these basic needs, there's a crucial aspect of agricultural irrigation, recognizing the significance of water in sustaining local agriculture. This goes beyond individual households, contributing to the community's food security and economic stability. Turning attention to electricity needs, the spectrum is broad, covering essential aspects of daily life. Adequate home lighting is not only a matter of convenience but is fundamental for creating safe living spaces. The power required for household appliances is critical for modern living standards and eases the burden of daily chores.

Moreover, electricity plays a pivotal role in supporting vital services such as healthcare and education. From powering medical equipment to facilitating e-learning, a reliable electricity supply is indispensable for advancing the community's well-being and knowledge. Communication means, another facet of electrical needs, have become integral to modern society. Whether for social connectivity, accessing information, or participating in the global discourse, electricity is the enabler. Recognizing and understanding these specific needs are at the core of our project, ensuring that our solutions are not just utilities but catalysts for holistic community development. Through tailored and sustainable solutions, we aim to address these needs comprehensively, fostering positive transformation and empowerment within the community.

Inputs	Activities	Outputs	Outcomes
<p>team &amp; relevant experience:</p> <ul style="list-style-type: none"><li>Mobile Developers: Instrumental in crafting our mobile app to meet project specifications.</li><li>IoT Engineers: Tasked with shaping the robust IoT architecture that underpins our initiative.</li><li>Industrial Electronics Engineers: Bringing a wealth of understanding and practical expertise in the realm of piezoelectricity.</li><li>Water Experts: Armed with significant experience in water systems, emphasizing sustainable practices, cutting-edge technologies, and innovative solutions.</li><li>Agricultural Engineers: With expertise in irrigation and a</li></ul>	<p>Clearly defined timeline:</p> <p>Months 1-2:</p> <ul style="list-style-type: none"><li>Conduct a thorough analysis of the water and electricity needs of the target community.</li><li>A comprehensive technical study encompassing all technical systems, including their IoT architecture, such as IoT Monitoring Systems, Smart Control Systems, Mobile Management Applications, and Piezoelectric Technologies</li><li>Conducting a financial and legal analysisConducting a financial and legal analysis</li></ul> <p>Months 3-4:</p> <ul style="list-style-type: none"><li>Develop infrastructure plans for water and electricity networks.</li></ul>	<p>products:</p> <ul style="list-style-type: none"><li><b>Piezoelectric Energy Harvesters (square Piezoelectric / Piezoelectric shoes / sports bicycle Piezoelectric).</b></li><li><b>A system for filtering and storing drinking water within a residence, structure, or educational institution.</b></li><li><b>Smart Irrigation Systems</b></li></ul> <p>service:</p> <ul style="list-style-type: none"><li><b>A mobile app designed to oversee water usage, offering statistical insights into both overall water consumption and the filtration status in a storage tank.</b></li></ul>	<p>Short-Term Outcomes:</p> <ul style="list-style-type: none"><li>Rapid access to clean water</li><li>Initial improvements in energy efficiency through piezoelectric technologies.</li><li>Increased awareness of water and energy conservation practices.</li></ul> <p>Mid-Term Outcomes:</p> <ul style="list-style-type: none"><li><b>Sustainability:</b> Establishment of sustainable water and electricity infrastructure.</li><li>Extension of the project to reach more households and community spaces.</li><li>Positive economic effects through job creation and enhanced productivity.</li></ul> <p>Long-Term Outcomes:</p>

<p>deep understanding of plants' water percentage requirements.</p> <ul style="list-style-type: none"> <li>• Project Manager: A seasoned professional with relevant experience, overseeing projects akin to ours, ensuring seamless execution.</li> <li>• Sponsor Manager: Possessing a wealth of experience tailored to the specific requirements of our project, ensuring effective collaboration and support</li> </ul> <p><b>partnerships (established/proposed):</b></p> <p>established:</p> <ul style="list-style-type: none"> <li>• IEEE SIGHT <b>Special Interest Group on Humanitarian Technology</b></li> </ul> <p>proposed:</p> <ul style="list-style-type: none"> <li>• <b>Tunisian Electricity and Gas Company</b></li> <li>• <b>National Water Exploitation and Distribution Company</b></li> <li>• <b>Contracting Company:</b> BLUE BELL CONSTRUCTION COMPANY / CHALLENGE CONSTRUCTION COMPANY</li> </ul> <p><b>Chemical and Physical Laboratory:</b> RINA - LAB21</p> <p>Additional Resources:</p> <ul style="list-style-type: none"> <li>• <b>Bank Financing</b></li> <li>• <b>State funding</b></li> </ul>	<ul style="list-style-type: none"> <li>• Obtain necessary approvals from local authorities and stakeholders.</li> </ul> <p><b>Months 5-7 :</b></p> <ul style="list-style-type: none"> <li>• Begin developing the mobile application for remote management.</li> <li>• Conduct tests on the systems to ensure proper functionality.</li> </ul> <p><b>Months 8-11 :</b></p> <ul style="list-style-type: none"> <li>• Designing and implementing all technical systems: for water, IoT Monitoring Systems, Smart Control Systems, and for electricity, Piezoelectric Technologies</li> <li>• Conduct training sessions for the community on using the new technologies and marketing our products</li> </ul> <p><b>Months 8-10 :</b></p> <ul style="list-style-type: none"> <li>• Implement monitoring mechanisms to assess system performance.</li> <li>• Make adjustments and optimizations based on community feedback.</li> </ul> <p><b>Months 11-12 :</b></p> <ul style="list-style-type: none"> <li>• Compile reports on water and electricity consumption and the effectiveness of new technologies.</li> <li>• Evaluate the social, economic, and environmental impact of</li> </ul>	<p><b>The expected number of people impacted:</b></p> <p><b>power solution:</b></p> <ul style="list-style-type: none"> <li>• Piezoelectric energy harvesters can have a broad impact by targeting the entire African population. They can be installed in public places, and the generated energy can be utilized to power public electricity sources such as streetlights, electrical outlets, nightclubs, and stadiums.</li> </ul> <p><b>water solution:</b></p> <ul style="list-style-type: none"> <li>• The water systems in our solution could benefit every individual with water installations in their homes, residents of buildings, hospital staff, educational institutions personnel, and employees in businesses, potentially reaching around 20% of the African population. Please note that this is an approximate estimate.</li> </ul>	<ul style="list-style-type: none"> <li>• Long-term health benefits due to sustained access to clean water.</li> <li>• Improved educational opportunities with reliable electricity in schools.</li> <li>• Reduction of environmental impact through sustainable water and energy practices.</li> <li>• Contributing to overall economic growth by fostering development in the region.</li> <li>• Empowering communities to manage and sustain their water and energy resources independently.</li> </ul> <p><b>description of expected long-term outcomes for the community:</b></p> <ul style="list-style-type: none"> <li>• In the long term, our project aims for a profound transformation within the community by ensuring sustainable access to clean water and reliable electricity. This initiative seeks to establish energy self-sufficiency, drive sustainable economic development, preserve the environment, enhance community resilience, and promote education and empowerment. These outcomes are designed to bring about significant positive change in residents' quality of life, fostering a balanced,</li> </ul>
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<b>Raw materials:</b> <ul style="list-style-type: none"><li>• <b>A company supplying sensors:</b> HITEC primarily designs and manufactures level transmitters for: Drinking water tank as a strategic partnership.</li><li>• <b>Storage Tanks</b></li></ul>	the project. <b>next year :</b> <ul style="list-style-type: none"><li>• Employing clever strategies to upgrade our technology and effectively market our products.</li></ul> <b>key milestones:</b>	resilient, and thriving community in the long run.  <b>Description de la manière dont les résultats du mon projet contribueront aux résultats à long terme:</b> <ul style="list-style-type: none"><li>• The long-term outcomes of this</li></ul>
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<b>Environmental Implications</b>  <b>comparative study:</b>   <b>Unique Advantages of Our Project Over Competitors:</b>  <b>Holistic Approach:</b> <p>Our project adopts a holistic approach that addresses both water and electricity needs, offering an integrated solution to enhance overall living standards. Unlike competitors with singular focuses, we recognize the interconnectedness of these essential services.</p> <b>Innovative Technologies:</b> <p>Leveraging cutting-edge technologies, such as IoT monitoring systems and piezoelectric technologies, sets us apart. These innovations not only improve efficiency but also contribute to sustainable practices, showcasing a commitment to technological advancement.</p> <b>Community Engagement and Training:</b> <p>Our project goes beyond infrastructure implementation. We prioritize community engagement and conduct training sessions to ensure that end-users understand, appreciate, and actively participate in the sustainable use of water and electricity resources.</p> <b>Strategic Partnerships:</b> <p>Establishing strategic partnerships, both existing and proposed, with reputable entities like the IEEE SIGHT Special Interest Group and national utility companies, adds credibility to our project. These partnerships enhance our capacity for successful implementation and long-term sustainability.</p> <b>Diverse Team Expertise:</b> <p>The diverse expertise within our team, ranging from mobile developers and IoT engineers to water and agricultural experts, ensures a comprehensive and well-rounded approach. This multidisciplinary team is better equipped to navigate the complexities of both water and electricity solutions.</p> <b>Environmental Considerations:</b> <p>Our project places a strong emphasis on environmental sustainability. By incorporating smart irrigation systems and efficient water use practices, we contribute to environmental conservation, differentiating our project as environmentally conscious.</p> <b>Long-Term Impact:</b>
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Looking beyond immediate outcomes, our project envisions long-term impact, including health benefits, educational opportunities, and economic growth. This forward-looking perspective distinguishes us from competitors focused solely on short-term gains.

**Navigating the Complex Landscape:**

Our project operates within a multifaceted environmental context, and a comprehensive understanding of various factors is vital for successful implementation. In a comparative study using the PESTEL framework, we analyze political, economic, social, technological, environmental, and legal aspects to anticipate and address potential challenges and opportunities.

**Political Considerations:**

Government factors wield a significant influence on our project. Regulations pertaining to water and power management are critical, impacting everything from infrastructure development to daily operations. The availability and speed of securing government funds or incentives are crucial determinants of our financial viability. Political stability, or the lack thereof, in the region plays a pivotal role in ensuring the feasibility and security of our project.

**Economic Dynamics:**

Economic factors, such as inflation and growth patterns, pose both challenges and opportunities. Inflation may lead to cost fluctuations in construction materials, labor, and equipment, affecting our overall budget. Economic downturns can impede our ability to secure financing, potentially causing delays. However, economic stability enhances the attractiveness of Public-Private Partnerships and private investments in our project.

## Community Buy-In and Involvement

The acceptance of our project by the African community is rooted in the impending water crisis anticipated by 2026, a consequence of climate change leading to reduced water resources. This looming threat has prompted the community to embrace our solution as a vital means to secure a sustainable and consistent water supply. Additionally, the accessibility of electricity remains a challenge for a significant portion of the population, exacerbated by frequent power disruptions. Our innovative piezoelectric solution emerges as a fitting response to these challenges, offering a reliable and accessible source of electricity while addressing the essential needs of the community. The community's engagement is driven by the urgent need for practical and sustainable solutions, positioning our project as a beacon of hope in the face of impending water and power shortages.

# External Environment Worksheet

“PESTEL Analysis”

<p><b>Political:</b> How might government factors impact your work?</p> <ul style="list-style-type: none"><li>• Government regulations and policies related to water and power management can affect our project implementation.</li><li>• The availability and speed of securing government funds or incentives for our project can greatly impact your initiative's finances.</li><li>• The overall political stability of the region can influence the feasibility and security of our project. Unstable political environments may pose risks to our project continuity.</li></ul>	<p><b>Economic:</b> How might economic factors (inflation, growth patterns etc.) impact your work?</p> <ul style="list-style-type: none"><li>• L'inflation peut entraîner des fluctuations des coûts des matériaux de construction, de la main-d'œuvre et de l'équipement, affectant le budget global our projet.</li><li>• Economic downturns may pose challenges in securing financing or loans for our project, potentially delaying or hindering implementation.</li><li>• Economic stability can influence the attractiveness of Public-Private Partnerships and private investments our project.</li></ul>	<p><b>Social:</b> How might social factors (demographics, culture etc.) impact your work?</p> <ul style="list-style-type: none"><li>• Understanding local demographics is crucial for our project as larger cities with higher populations require more of our technology for increased water and electricity supply compared to smaller towns.</li><li>• Cultural attitudes towards water and electricity usage can impact the acceptance and effectiveness of our project</li><li>• Social factors play a key role in community engagement. Understanding local social structures and communication preferences is essential for successful our project implementation.</li></ul>
<p><b>Technology:</b> How might technological factors impact your work?</p> <ul style="list-style-type: none"><li>• The availability and reliability of existing technological infrastructure, such as grid systems and water treatment facilities, can impact the integration of our new solutions.</li><li>• As our project become more connected, ensuring the security of</li></ul>	<p><b>Environmental:</b> How might environmental factors impact your work?</p> <ul style="list-style-type: none"><li>• Local climate, temperature, and precipitation patterns impact the efficiency of our project. Extreme weather events can pose challenges.</li><li>• Our water-related project should prioritize efficient water use and conservation practices</li></ul>	<p><b>Legal:</b> How might laws and regulations impact your work?</p> <ul style="list-style-type: none"><li>• Disruptions in obtaining necessary permits and approvals result in disruptions to our project.</li></ul>

data generated by sensors and control systems is essential to prevent unauthorized access and potential disruptions.

because Africa is facing water scarcity and drought conditions.

# Risk Analysis Worksheet



What is the risk?	What is the potential impact of the risk?	How will you mitigate your risk?
<i>What might prevent us from achieving our outcomes and objectives?</i>	<i>How will it change our course and how likely it is to happen?</i>	<i>What is your plan to prevent the risk and what will you do if the risk occurs?</i>
<p><b>Insufficient Financial Resources:</b></p> <p>Challenge: Limited funding can lead to delays, compromised quality, or incomplete execution of planned activities.</p> <p>Mitigation: Regular financial assessments, exploring diverse funding sources, and establishing contingency plans can help address this risk.</p>	<p><b>High-Risk Scenario: Timeline Disruptions</b></p> <p><b>Challenge:</b></p> <p>The potential for high-risk timeline disruptions poses a significant threat to the project's overall schedule. Any delays in the planned timelines could have cascading effects on subsequent activities and milestones.</p> <p><b>Impact:</b></p> <p><b>Project Delays:</b> The primary consequence is the extension of the project's completion date, which may impact the overall project schedule.</p> <p><b>Resource Allocation Challenges:</b> Extended timelines may strain the allocation of resources, leading to potential</p>	<p><b>Prevention:</b></p> <p><b>Robust Planning:</b> Ensure that the project plan is comprehensive, with clear identification of critical paths and potential bottlenecks.</p> <p><b>Contingency Planning:</b> Develop contingency plans for high-risk activities, allowing for flexibility in case unexpected issues arise.</p> <p><b>Regular Monitoring:</b> Implement a monitoring system to track progress against timelines, enabling early detection of any deviations.</p> <p><b>Mitigation:</b></p> <p><b>Prompt Action:</b> If a timeline disruption occurs, initiate predefined contingency</p>

	<p>bottlenecks and inefficiencies.</p> <p><b>Stakeholder Implications:</b> Delays may affect stakeholders' expectations and satisfaction levels, potentially eroding confidence in the project.</p> <p><b>Mitigation Strategies:</b></p> <p><b>Robust Planning:</b> Conduct a thorough review of the project timeline, identifying critical paths and potential bottlenecks.</p> <p><b>Contingency Planning:</b> Develop contingency plans for high-risk activities, allowing for flexibility in case unexpected issues arise.</p> <p><b>Regular Monitoring:</b> Implement a monitoring system to track progress against timelines, enabling early detection of any deviations.</p> <p><b>Communication:</b> Maintain transparent communication with stakeholders, keeping them informed of any adjustments to the schedule and the reasons behind them.</p>	<p>plans promptly to minimize the impact.</p> <p><b>Resource Reallocation:</b> Consider reallocating resources strategically to address delays and maintain project momentum.</p> <p><b>Communication:</b> Maintain transparent communication with stakeholders, providing regular updates on adjustments to the schedule and reasons behind them.</p>
Unforeseen	Medium-Risk Scenario:	Prevention:

**Technical Issues:**

Challenge:  
Unexpected technical glitches or limitations in adopted technologies may disrupt our project's progress.

Mitigation: Rigorous testing, continuous monitoring, and maintaining flexibility in technology adoption can minimize the impact of unforeseen technical challenges.

**Increased Costs and Financial Losses**

**Challenge:**  
The risk of increased costs or financial losses represents a medium-level threat to the project. This could result from various factors, such as inflation, budget overruns, or unforeseen expenses.

**Impact:**  
**Budget Overruns:** Unanticipated costs could lead to exceeding the allocated budget, impacting the financial health of the project.

**Financial Strain:** Increased costs may strain available financial resources, affecting the feasibility of the project.

**Delayed Implementation:** Financial setbacks could potentially lead to delays in project implementation.

**Mitigation Strategies:**  
**Thorough Budgeting:** Conduct a comprehensive budget analysis, identifying potential cost factors and allocating funds accordingly.

**Risk Contingency Funds:** Set aside contingency funds specifically earmarked for unforeseen expenses to mitigate financial risks.

**Thorough Budgeting:**  
Conduct a comprehensive budget analysis, identifying potential cost factors and allocating funds accordingly.

**Risk Contingency Funds:**  
Set aside contingency funds specifically earmarked for unforeseen expenses to mitigate financial risks.

**Regular Financial Assessments:** Implement regular financial assessments to identify and address any emerging financial challenges promptly.

**Mitigation:**  
**Budget Adjustments:** If faced with increased costs, assess the budget and make necessary adjustments to control expenses.

**Contingency Fund Utilization:** Utilize the contingency fund to cover unforeseen expenses, preventing a financial strain on the project.

**Procurement Strategies:**  
Optimize procurement strategies to ensure cost-effectiveness and prevent unnecessary financial strain.

	<p><b>Regular Financial Assessments:</b> Implement regular financial assessments to identify and address any emerging financial challenges promptly.</p> <p><b>Procurement Strategies:</b> Optimize procurement strategies to ensure cost-effectiveness and prevent unnecessary financial strain.</p>	
<p><b>Challenges Related to Project Team:</b></p> <p>Challenge: Issues related to team availability, skills, or well-being can hamper project performance and timelines.</p> <p>Mitigation: Developing a skilled and diverse team, providing ongoing training, and having contingency plans for potential team disruptions can help manage this risk effectively.</p>	<p><b>Low-Risk Scenario: Compromises in Deliverable Quality</b></p> <p><b>Challenge:</b></p> <p>The low-risk scenario involves potential compromises in the quality of deliverables or project outcomes. While the impact is less severe than higher-risk scenarios, it still warrants attention.</p> <p><b>Impact:</b></p> <p><b>Reduced Effectiveness:</b> Compromised quality may diminish the overall effectiveness of the project's outcomes.</p> <p><b>Reputational Impact:</b> Lower-quality deliverables could have implications for the project's reputation and stakeholder satisfaction.</p> <p><b>Long-Term Consequences:</b> Quality compromises may</p>	<p><b>Prevention:</b></p> <p><b>Quality Assurance Processes:</b> Implement robust quality assurance processes to ensure that deliverables meet predefined standards.</p> <p><b>Continuous Monitoring:</b> Regularly monitor project activities to detect any early signs of compromised quality and take corrective actions.</p> <p><b>Stakeholder Feedback:</b> Solicit feedback from stakeholders throughout the project to identify and address quality concerns promptly.</p> <p><b>Mitigation:</b></p> <p><b>Corrective Actions:</b> If compromises in deliverable quality are identified, take immediate corrective actions to rectify the situation.</p>

have long-term consequences, affecting the sustainability and success of the project.

**Mitigation Strategies:**

**Quality Assurance**

**Processes:** Implement robust quality assurance processes to ensure that deliverables meet predefined standards.

**Continuous Monitoring:**

Regularly monitor project activities to detect any early signs of compromised quality and take corrective actions.

**Stakeholder Feedback:**

Solicit feedback from stakeholders throughout the project to identify and address quality concerns promptly.

**Adherence to Standards:**

Ensure that project activities adhere to established industry standards and best practices to maintain quality.

Addressing these risk scenarios involves a combination of proactive planning, ongoing monitoring, and adaptive management strategies to minimize the potential impact on the project.

**Reassess Processes:**

Conduct a thorough reassessment of project processes to identify areas for improvement and prevent similar issues in the future.

**Adherence to Standards:**

Ensure that project activities adhere to established industry standards and best practices to maintain quality.

## Budget Link:

<https://docs.google.com/spreadsheets/d/1CangfCAbqsAXx0g7mf5xFr3LyzqVDA/edit?usp=sharing&ouid=112009927572344834023&rtpof=true&sd=true>

[illegible]