



# Initial Report on the Zliten Workshop



September 4, 2024



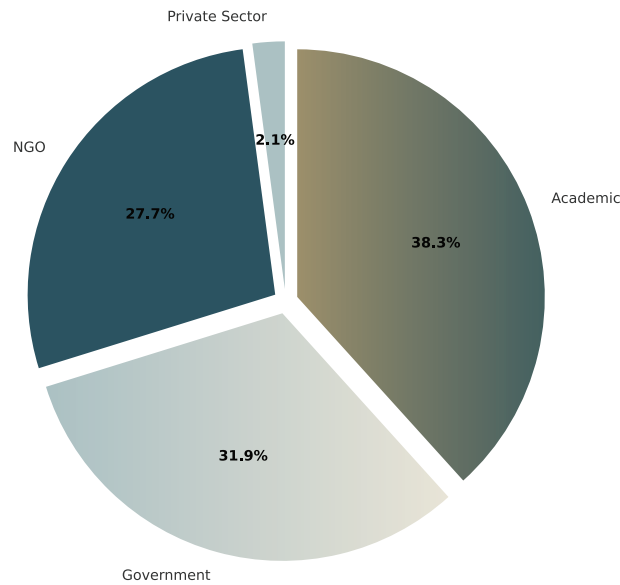
Co-building the Accelerator Labs as a joint venture with:



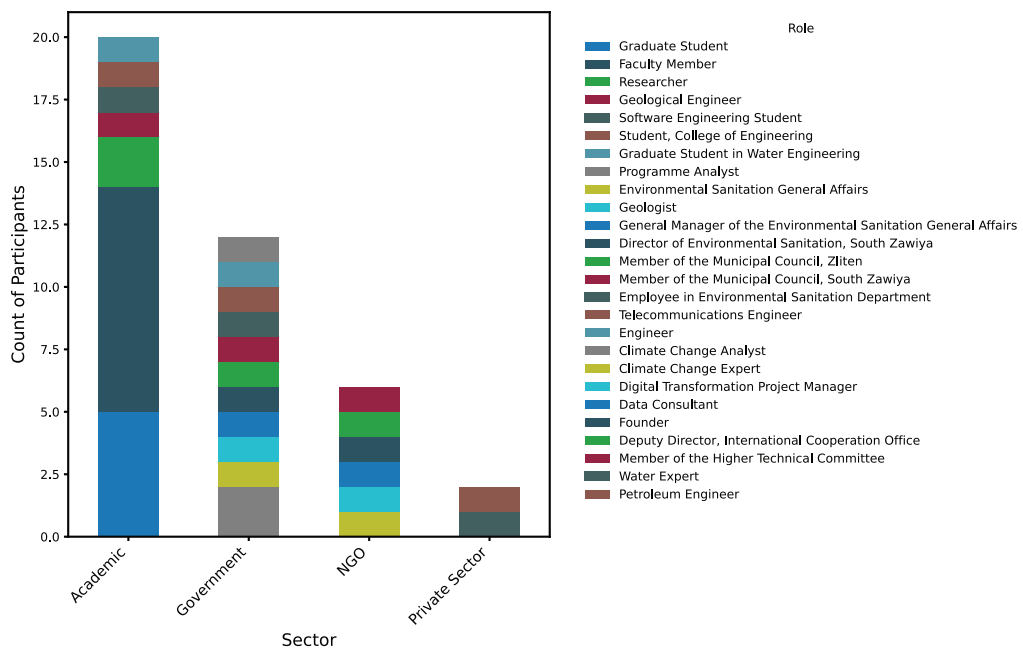
UNDP  
Core  
Partners



**Percentage Distribution of Participants by Sector**



**Role Distribution by Sector**



## Objectives:

### The workshop sought to:

- Explore the root causes of groundwater rise and earth cracks, particularly in coastal and non-coastal regions like Zliten and Bi'r al Ghanam.
- Showcase the potential of technology and innovation, including remote sensing, IoT, and data analytics, in monitoring and mitigating environmental issues.
- Identify opportunities to convert environmental challenges into opportunities for economic diversification, sustainable development, and resilience.



## Key Sessions and Findings:

### Session 1: Understanding the Environmental Challenges and Discussion on Potential Causes and Threatened Locations

The workshop opened with a comprehensive briefing presentations on the groundwater rise in Zliten and Bi'r al Ghanam, delivered by Dr. Salah Essadeg, Head of the High Technical Committee for Monitoring Groundwater Increase. Dr. Essadeg provided a detailed analysis of the hydrological and geological factors contributing to the rise of groundwater, emphasizing the role of seawater intrusion and leakages from infrastructure projects like the Man-Made River (MMR) pipeline. Participants analyzed the causes of rising groundwater levels in Zliten and then engaged in focused group discussion where they have identified several potential factors:

- Seawater intrusion into coastal aquifers.
- Water leakages from infrastructure projects like the MMR pipeline.
- Climate change and increased rainfall are exacerbating groundwater levels.
- Regions like Bir al Ghanam and Esbiaa, though non-coastal, exhibited similar groundwater rise, suggesting possible geological activities linking these phenomena.

The session emphasized the need community engagement and utilization of traditional knowledge systems to identify risk areas and manage responses.

Following the presentations, participants engaged in discussions to share their insights and reflections on the informative presentation led by **Dr. Salah Essadeg**, Head of the High **Technical Committee for Monitoring Groundwater Increase**. The discussions identified several potential factors contributing to the rising groundwater levels in the municipalities, including a) Seawater intrusion into coastal aquifers. b) Water leakages from infrastructure projects like the Man Made River pipeline. c) Climate change and increased rainfall exacerbating groundwater levels. d) Geological activities linking phenomena in regions like Bir al Ghanam and Esbiaa, despite being non-coastal areas.

During the session the participants underscored several key factors that are poised to contribute to the rise of groundwater levels in the area. These include the absence of modernized sewage systems within the municipality, the fragile state of existing infrastructure, the increase of the number of buildings in the municipalities without proper urban planning oversight, inadequate and irregular groundwater extraction practices, and the usual on desalinated water sources instead. Additionally, the absence of a comprehensive rainwater drainage network, coupled with improper sewage pipe use for rainwater disposal, further associated with the looming groundwater challenge. Addressing these pressing concerns will be critical in mitigating the potential risks associated with groundwater rise in the region.



There was a notable emphasis on the importance of enhancing community engagement through the utilization of digital tools. These tools enable communities to easily report issues to municipalities in the early stages, allowing for the identification of risk areas and the implementation of prompt responses. By integrating knowledge systems into this process, effective risk management strategies can be developed and implemented swiftly. This approach not only strengthens the collaboration between communities and local authorities but also enhances overall preparedness and resilience in the face of potential threats or challenges.

## 2 Session 2: Leveraging Technology for Monitoring Environmental Challenges

In addition to the local geological insights, Dr. Muhammed Imran, Senior Scientist at the Qatar Computing Research Institute, presented the use of remote sensing, computer vision, and social media analytics in enhancing emergency response systems. His discussion demonstrated how these tools could help in mapping environmental changes, resource allocation, and early detection of emerging issues.

Further insights came from Eng. Mohaned Merset, who introduced a precipitation model for Wadi Majer, south of Zliten, using advanced two-dimensional wadi hydraulics calculations. This simulation provided a scientific basis for understanding rainfall patterns and their impact on groundwater levels.

Finally, Teodoro Hunger, a Geospatial and Satellite Imagery Analyst from UNOSAT, concluded the session by showcasing the use of satellite imagery analysis to map groundwater rise in Zliten. He highlighted how these technologies could offer precise, large-scale monitoring capabilities, essential for long-term environmental management.

Discussions focused on the limitations of current technologies and the potential of IoT and remote sensing:

- Remote sensing is effective in surface-level monitoring, but has limitations in detecting deep groundwater changes.
- IoT sensors placed in monitoring wells could provide real-time data on groundwater levels.
- Data integration from remote sensing and IoT devices is key to developing predictive models for early warnings.



During the discussion, a key insight emerged suggesting the significance of early warning systems that are based on advanced technology and remote sensing techniques. Such systems that can be used to monitor regions that have similar geographical and geological characteristics even if these areas are not within close proximity. By doing so, similarities in changes affecting these areas may be identified, enabling early prediction of potential phenomena. This strategic approach underscores the importance of leveraging technological innovations for heightened preparedness and mitigation strategies, ultimately enhancing the ability to anticipate and respond to environmental shifts and challenges in a timely and effective manner.

Participants also identified the need for capacity building through training programs in GIS, remote sensing, and data analysis to equip local technicians.

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### 3 Session 3: Turning Challenges into Opportunities for Sustainable Development

The workshop concluded with a powerful discussion on how to transform environmental challenges into opportunities for sustainable development:

- **Agriculture:** Participants explored the use of rising groundwater for agricultural purposes, including the creation of artificial lakes for irrigation. These systems could be coupled with natural filtration techniques to improve water quality for agriculture, especially in areas like Zliten and Bi'r al Ghanam.
- **Tourism and Industrial Opportunities:** The participants brainstormed ideas such as developing geological parks and leveraging earth cracks and water features as tourist attractions. They also explored the possibility of using groundwater for industrial cooling, particularly in large factories, and hydropower generation.
- **Research and Development (R&D):** Emphasis was placed on further research into resilient crops that could thrive in regions affected by high groundwater levels. Participants proposed the development of new building techniques suited to the geological conditions in Libya.



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## Recommendations:

- Improved Monitoring and Early Warning Systems:
  - Implement IoT-based groundwater monitoring networks to provide real-time data on water levels and earth cracks.
  - Use satellite imagery and remote sensing for large-scale, continuous monitoring of environmental changes.
- Utilize Digital Reporting Systems to Enhance Community Engagement for Crisis Management:
  - Engage local communities in the use of digital platforms that enable real-time issue reporting and feedback to designated authorities, actively contributing to crisis management. By prototyping and experimenting with these systems, and integrating AI and predictive analytics to analyze the collected data, these innovative tools and solutions can significantly improve crisis mitigation efforts.
- Capacity Building:
  - Develop training programs in GIS, data analytics, and IoT technologies to build local expertise.
  - Provide hands-on training for technicians to operate monitoring systems and analyze environmental data effectively.
- Policy and Community Engagement:
  - Develop policies that promote the use of technology and collective intelligence in environmental management. Encourage community involvement by incorporating local knowledge and traditional practices.
  - Develop practical guidelines for eco-friendly septic tanks to help prevent groundwater contamination. These guidelines should focus on improving wastewater treatment, controlling leakage, and using natural, cost-effective solutions. The goal is to reduce the environmental harm caused by outdated or poorly maintained septic systems.
  - Develop department at the municipalities for water resources governance



- Agricultural and Industrial Innovation:
  - Invest in sustainable agricultural practices, such as the use of groundwater for irrigation and crop diversification.
  - Explore industrial applications for groundwater use, including cooling in factories and the development of eco-industrial zones .
- Tourism Development:
  - Promote the creation of eco-tourism sites in regions affected by earth cracks and groundwater rise, turning environmental challenges into opportunities for tourism-driven economic growth.

## Conclusion:

The Workshop underscored the importance of using technology and innovation to address pressing environmental challenges. By fostering collaboration between geologists, technologists, university students, local citizens and local stakeholders, the workshop successfully demonstrated a deep understanding of this phenomena and how tackle challenge using different Linces including the use of advanced tools like remote sensing, IoT, and collective intelligence can offer solutions to critical problems such as groundwater rise and earth cracks. By converting these challenges into opportunities for economic growth, resilience, and sustainability, the workshop laid a strong foundation for long-term environmental and economic resilience in Libya.