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Report on “Water & Climate Change” hackathons

CC WATER

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1 Introduction

Water scarcity and the need for efficient water management are among the most pressing issues of our time, especially as the impacts of climate change become increasingly pronounced. In response to these challenges, a series of hackathons were organized across Mongolia, China, and Sri Lanka in 2023 under the framework of the CCWater Project. These events aimed to encourage innovative, student-driven solutions to regional water management problems, with a focus on climate change adaptation, smart technologies, and sustainable practices.

The hackathons provided a platform for students from diverse academic backgrounds to engage with local water issues and propose forward-thinking solutions. Each hackathon focused on the unique environmental and socio-economic challenges of its host country, addressing topics such as water scarcity, the application of big data in water treatment, and the integration of policy and technology in water resource management. This report provides a comprehensive overview of these hackathons, highlighting key themes, solutions, and outcomes.

2 Background

Water resources are increasingly stressed by population growth, industrial demands, and changing climate patterns. Across the globe, communities face significant challenges in managing their water resources sustainably. These challenges vary from region to region, depending on environmental factors, governance structures, and socio-economic conditions.

The CCWater Project was launched to tackle these global challenges through a collaborative, educational approach. By engaging students in the process of identifying, analyzing, and solving water management problems, the project aims to raise awareness of climate change impacts and foster innovative solutions. Hackathons are central to this effort, as they bring together students, experts, and stakeholders to brainstorm and develop practical solutions.

3 Hackathon 1: Sri Lanka (9-11 May 2023)

3.1 Overview of the Event

The Sri Lanka hackathon, held from 9-11 May 2023, focused on addressing water scarcity and promoting water reuse in both urban and rural settings. The event emphasized the need for efficient water management practices in the agricultural, industrial, and household sectors, particularly in regions prone to seasonal droughts.

3.2 Water Scarcity and Reuse Challenges

Water scarcity in Sri Lanka is compounded by overuse, mismanagement, and climate change-induced variability in rainfall patterns. The hackathon aimed to tackle these issues by encouraging participants to propose solutions for improved water use efficiency and water reuse.

3.3 Group Presentations and Ideas

The student groups presented several innovative ideas:

- **Group 1:** Proposed smart irrigation systems and crop diversification strategies to optimize water use in agriculture.
- **Group 2:** Focused on household water reuse systems, such as graywater recycling for gardening and industrial water reuse through wastewater treatment.
- **Group 3:** Addressed water scarcity by proposing rainwater harvesting, groundwater recharge, and the implementation of community-based water management systems.

3.4 Proposed Policy Changes

Participants also emphasized the need for policy reforms, such as introducing tariffs to incentivize water conservation, and regulations to promote water reuse. The hackathon highlighted the importance of involving local communities in water management decisions and fostering public awareness about water scarcity.

Figure 1: Hackathon Sri Lanka Poster

4 Hackathon 2: China (25-27 June 2023)

4.1 Overview of the Event

The China hackathon, held from 25-27 June 2023, focused on the integration of big data technology into water treatment processes. Participants explored how data analytics could improve water quality monitoring, reduce operational costs, and enhance overall efficiency in water management.

4.2 Focus on Big Data in Water Treatment

Big data technology offers significant potential for improving water treatment by providing real-time monitoring, predictive maintenance, and optimized operational efficiency. The hackathon sought to apply these technologies to traditional water treatment processes in innovative ways.

4.3 Group Presentations

Students formed three groups, each focusing on a different aspect of big data in water management:

- **Group 1**: Discussed how big data could enable real-time monitoring and prediction in water treatment, reducing costs and enhancing efficiency.
- **Group 2**: Explored practical applications of big data in water quality management and water supply pipelines, with case studies from the real world.
- **Group 3**: Highlighted the challenges and future trends in the water treatment industry, such as the integration of AI, IoT, and data security concerns.

4.4 Challenges and Future Directions

Despite the potential of big data in water management, the hackathon revealed several challenges, including data privacy concerns, the need for integration with other emerging technologies like AI, and the educational gap in technical communication skills. The students' presentations provided valuable insights for future teaching and research in this area.

Figure 2: Hackathon China Poster

5 Hackathon 3: Mongolia (12-14 October 2023)

5.1 Overview of the Event

The Mongolia hackathon, held from 12-14 October 2023, focused on the water management issues in the Gobi region, one of the most vulnerable areas in the country due to its arid climate and limited water resources. The event was organized in collaboration with the Mongolian University of Science and Technology (MUST) and the National University of Mongolia (NUM).

5.2 Key Themes and Objectives

The primary goal of the Mongolia hackathon was to raise awareness of climate change adaptation in water resource management and to develop smart solutions tailored to the Gobi region's specific challenges. The hackathon focused on addressing water scarcity, inefficient water use, and mismanagement.

5.3 Participants and Teams

Graduate students from MUST and NUM participated in the hackathon, forming teams of 3-5 members. Each team was tasked with identifying key water management challenges in the Gobi region and proposing innovative solutions.

5.4 Innovative Solutions Presented

The teams presented a range of solutions, including:

- **Smart Irrigation Systems**: Proposals for automated irrigation using sensors to monitor soil moisture levels and optimize water use for agriculture.
- **Water Policy and Governance Proposals**: Ideas for improving water management policies, including new regulations on water usage and incentives for adopting water-efficient technologies.

5.5 Award and Next Steps

The winning team was awarded vouchers to attend the winter school "Climate Change and Water Management" in January 2024 in China. This provided students with the opportunity to further develop their solutions and gain deeper insights into water management practices.

Figure 3: Hackathon Mongolia Poster

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6 Common Themes and Solutions

6.1 Technological Innovations

Across all three hackathons, the role of technology in addressing water management challenges was a common theme. Innovations such as big data analytics, smart irrigation systems, and water reuse technologies were proposed as key solutions.

6.2 Policy Recommendations

Students in each country recognized the need for stronger policy frameworks to support sustainable water management. Recommendations included stricter regulations on water use, incentives for adopting efficient technologies, and community-based governance models.

6.3 Climate Change Adaptation Strategies

The hackathons underscored the importance of integrating climate change considerations into water management. Participants proposed strategies such as rainwater harvesting, groundwater recharge, and climate-smart agriculture to help communities adapt to changing environmental conditions.

7 Challenges Identified Across Regions

7.1 Water Scarcity and Climate Change

All three countries face significant water scarcity issues, exacerbated by climate change. Solutions proposed in the hackathons emphasized both technological innovation and local community involvement in managing water resources.

7.2 Resource Mismanagement

Inefficient use and mismanagement of water resources were recurring challenges. Participants called for better monitoring systems, updated policies, and education programs to address these issues.

7.3 Technology and Data Integration Gaps

While technology was seen as a critical tool, students also identified gaps in the integration of data-driven solutions, particularly in terms of infrastructure, training, and education.

7.4 Educational and Communication Barriers

In China, students noted the challenges of communicating technical concepts in English, highlighting the need for better language training in global educational programs.

8 Outcomes and Impact of the Hackathons

8.1 Student Participation and Innovation

The hackathons successfully engaged students in tackling real-world problems, encouraging creative thinking and collaboration across disciplines.

8.2 Knowledge Sharing Among Regions

Each hackathon provided valuable opportunities for knowledge sharing between students, educators, and experts from different regions. This cross-cultural exchange enriched the participants' understanding of water management issues.

8.3 Long-Term Impact on Water Management Practices

The innovative solutions proposed during the hackathons have the potential to inform future water management practices in each country. By continuing to develop these ideas, students and educators can contribute to long-term sustainability in water resource management.

8.4 Future Opportunities for Collaboration

The hackathons laid the foundation for continued collaboration among universities, research institutions, and governments. Future initiatives could build on these efforts by fostering ongoing research and innovation in water management.

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9 Conclusion

The hackathons in Mongolia, China, and Sri Lanka demonstrated the power of innovation and collaboration in addressing the complex challenges of water management in the face of climate change. By engaging students in the process of identifying and solving water-related issues, these events not only raised awareness but also generated practical solutions that could have a lasting impact. The CCWater Project, through these hackathons, has set the stage for continued research and development in sustainable water management.

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10 Appendices

10.1 Event Schedules

Table 1: Agenda - SriLanka Hackathon

Day 1 – 09 May 2023 (Tuesday) @ Orchid Room, East Lagoon, Batticaloa		
13.00-14.00	Arrival and Registration (East Lagoon, Batticaloa)	
14.00-18.00	CCWater Project Meeting with students/staff	
19.00-20.30	Joint Dinner	
20.30	SEUSL Team & Students of UoP & RUSL return to Oluvil	
Day 2- 10 May 2023 (Wednesday) @ Faculty of Engineering, South Eastern University of Sri Lanka, Oluvil		
08.45	Arrival at SEUSL	
09.00-09.15	Welcome/ Briefing on CCWater Hackathon – aims, tasks, methods, pitches, and results	Dr. A.M.A. Saja
09.15–09.35	Presentation on Theme 1: Increasing water-use efficiency	CCWater Project Team
09.35-10.45	Theme 1: Brainstorming solutions /designing project ideas	Hackathon Teams Mentors
10.45-11.00	Tea/coffee	
11.00-11.20	Presentation on Theme 2: Water Re-Use	CCWater Project Team
11.20-12.30	Theme 2: Brainstorming solutions /designing project ideas	Hackathon Teams Mentors
12.30-13.30	Lunch	
13.30-13.50	Presentation on Theme 3: Addressing water scarcity and its impacts	CCWater Project Team
13.50-15.00	Theme 3: Brainstorming solutions /designing project ideas	Hackathon Teams Mentors
15.00-15.30	Tea/coffee Participant Registration for the Guest Talk	
15.30-17.00	Guest Talk – “Climate Change Impacts on Water Services and Utilities”	Prof. Harsha Ratnaweera
17.30	Leaving to the hotels	
Hackathon teams will continue working to finalize solutions		
Day 3 – 11 May 2023 (Thursday) @ Faculty of Engineering, South Eastern University of Sri Lanka, Oluvil		
08.45	Arrival at SEUSL	
09.00-11.00	Finalizing solutions/project ideas and preparing presentations	Hackathon Teams Mentors
11.00-12.00	Final pitch and presentations by teams and comments from judges/panel members	Panel Led by: Prof. Harsha Ratnaweera Prof. S.B. Weerakoon
12.00-12.30	Closing event	Guests, Panel and participants
12.30	Lunch and depart from SEUSL, Oluvil	

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Table 2: Agenda - China Hackathon

Day 1 – 25th June 2023 (Sunday)		
Till 14.00	Arrival at Hohhot airport (Hohhot, China)	
14.30-16.30	CCWater Project Meeting with students/staff, Hohhot airport meeting room	
16:30-18:30	Departure to Hotel, Zhuozi, Ulanbucha	
19.00-20.30	Joint Dinner	
Day 2- 26th June 2023 (Monday)		
08.45	Kick-off session: Briefing CCWater Hackathon – aims, tasks, methods, pitches, and results (Xiaodong Wang)	
09.00-09.30	Phase I: Questionnaire- Impact of University-Enterprise cooperation on Education and research	Wei Chen
09.30–12.00	Phase II: Excursion- Green energy application and climate change	Wei Liu
12.00-13.30	Lunch Break	
13.30-16.00	Phase III: Brainstorming on adapting climate change to water management	Xiaodong Wang
16.00-18.00	Phase IV: Best Teaching materials from students' eyes: Big data application in the water sector – group work and presentation preparing	Hackathon Teams Mentors
18:00-19:00	Final pitch and presentations by teams comments from judges and panel members	Hackathon Teams Mentors
19:00	Dinner	
Day 3 – 27 June 2023 (Tuesday)		
07.00–08.00	Breakfast	
08.00–09.00	Phase V: Team building event	Hackathon Teams
09.00-11:00	Departure to Hohhot airport	

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Table 3: Agenda - Mongolia Hackathon

12 Oct Thursday		
Venue: Room 502, 5th floor, Student-teacher development center, NUM		
11:30-13:00	Registration	
13:00-13:30	Welcome guests	Batbayar Zeneemyadar, Director of Mongolian Water authority
13:30-13:50	Introduction of CCWater Project	Prof. Harsha Ratnaweera (NMBU)
13:50-14:00	Introduction to expert panel, and participants	Dr. Ayurzana B (MUST)
14:00-15:00	Briefing session on CCWater Hackathon – aims, tasks, methods, pitches, and results	Dr. Nasanbayar (MUST)
15:00-15:20	*Tea break*	
15:20-16:30	Lectures about Water management issues in Gobi region	Experts
16:30-17:00	Team building and selection of topics for Hackathon participants	Hackathon teams
18:00	*Participants are welcomed to Joint Dinner at Café park buffet restaurant*	
13 OCT Friday		
Venue: Room 502, 5th floor, Student-teacher development center, NUM		
09:00-12:30	Phase I: Clarifying ideas and sketching technical requirements	Dr. Munkhtsetseg Hackathon Teams
12:30-14:00	*Lunch break*	
14:00-16:00	Phase II: Brainstorming solutions and designing project	Hackathon Teams Mentors
16:00-16:15	*Tea break*	
16:15-18:00	Phase III: Finalizing project/solutions and preparing presentations	Hackathon Teams Mentors
14 OCT Saturday		
Venue: Building 8, 12th floor, International conference room, MUST		
09:00-10:00	Phase IV: Final pitch and presentations by teams Comments from judges and panel members	Panel Led by Prof.Harsha Dr. Ayurzana Badarch
10:00-10:30	Tea Break and Closing Hackathon	

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10.2 Participant Lists

Table 4: Participant List - Sri Lanka

University	**Name of the students**	
University of Peradeniya	1	Ms. Lakmini Perera
	2	Ms. Yashoda Ekanayake
	3	Ms. S. Ranwala
	4	Ms. Nadeeshika Jayaratne
Rajarata University of Sri Lanka	5	Mr. Mohammed Hamseen
	6	Mr. P Rasikaran
	7	Mr. Kapila Premarathne
	8	Mr. Amila Lankapura
South Eastern University of Sri Lanka	9	Ms. P. Hemapraba
	10	Mr. Vithushan Thurairadnam
	11	Mr. W.L.S. Jayalath
	12	Ms. T.P.A. Punyawardana

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Table 5: Participant List – china

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Hackathon – China session

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Day 1 – 25 June 2023

Hohhot, Inner Mongolia

#	Name	University	Signature
1	Xiaohan Wei	Qingdao University of Technology	
2	Haichen Liu	Qingdao University of Technology	
3	Xinhao Xv	Qingdao University of Technology	
4	Shichang Liu	Qingdao University of Technology	
5	Yazhe Ren	Inner Mongolia University of Finance and Economics	
6	Zeju Zhang	Inner Mongolia University of Finance and Economics	
7	Jianzhi Fan	Shenzhen Institute of Advanced Technology, CAS	
8	Peng Liu	Shenzhen Institute of Advanced Technology, CAS	
9	Qi Zhao	Shenz9hen Institute of Advanced Technology, CAS	
10	Jue Wang	Shenzhen Institute of Advanced Technology, CAS	
11	ShuaiBao Chen	Shenzhen Institute of Advanced Technology, CAS	

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Hackathon – China session

Under EU Erasmus+ CCWater Project

Day 2 – 26 June 2023

Hohhot, Inner Mongolia

#	Name	University	Signature
1	Xiaohan Wei	Qingdao University of Technology	
2	Haichen Liu	Qingdao University of Technology	
3	Xinhao Xv	Qingdao University of Technology	
4	Shichang Liu	Qingdao University of Technology	
5	Yazhe Ren	Inner Mongolia University of Finance and Economics	
6	Zeju Zhang	Inner Mongolia University of Finance and Economics	
7	Jianzhi Fan	Shenzhen Institute of Advanced Technology, CAS	
8	Peng Liu	Shenzhen Institute of Advanced Technology, CAS	
9	Qi Zhao	Shenz9hen Institute of Advanced Technology, CAS	
10	Jue Wang	Shenzhen Institute of Advanced Technology, CAS	
11	ShuaiBao Chen	Shenzhen Institute of Advanced Technology, CAS	

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Hackathon – China session

Under EU Erasmus+ CCWater Project

Day 3 – 27 June 2023

Hohhot, Inner Mongolia

#	Name	University	Signature
1	Xiaohan Wei	Qingdao University of Technology	
2	Haichen Liu	Qingdao University of Technology	
3	Xinhao Xv	Qingdao University of Technology	
4	Shichang Liu	Qingdao University of Technology	
5	Yazhe Ren	Inner Mongolia University of Finance and Economics	
6	Zeju Zhang	Inner Mongolia University of Finance and Economics	
7	Jianzhi Fan	Shenzhen Institute of Advanced Technology, CAS	
8	Peng Liu	Shenzhen Institute of Advanced Technology, CAS	
9	Qi Zhao	Shenz9hen Institute of Advanced Technology, CAS	
10	Jue Wang	Shenzhen Institute of Advanced Technology, CAS	
11	ShuaiBao Chen	Shenzhen Institute of Advanced Technology, CAS	

Table6: Participant List - Mongolia

	Name	Organization	Phone	Email	Topic	mentor
1	Shalsmaa Bekhbayar	MUST	99523278	shalsmaa999@gmail.com	Optimizing and improving water policy and management in the Gobi region	Bold
2	Chibish Damtsag	MUST	88081165	chibishd@gmail.com		Dolgorsuren
3	Munkh-Orgil Sainzorigt	NUM	80146774	orgioor9@gmail.com		Myagmarjav
4	Munkhgerel Nyamsan	MUST	99885885	munkhgerelzit@gmail.com	Rural population and new pasture irrigation technologies	Munkhtuya
5	Gan-Erdene Enkhbold	MUST	95234242	ganaa11d@yahoo.com		Nasanbayar
6	Gan-Ochir Gerelt	NUM	89989621	ganochir2433@gmail.com		Bold
7	Byambagerel Otgontuya	NUM	88787908	gerel2201@gmail.com		Soninkhishig

8	Baldangombo Ishginpil	MUST	88104778	Baagii870717@gmail.com	Scarcity of surface water resources	Nasanbayar
9	Tugsjargal Oldogch	NUM	88079589	Tugsuu.oldogch@gmail.com		Battsetseg

10.3 Photos From the Events

Figure 4: Hackathon - Sri Lanka

Figure 5: Hackathon - China

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Figure 6: Hackathon - Mongolia

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Registration open until 6/10/2023
12-14 October 2023 | Ulaanbaatar, Mongolia
HACKATHON
The better and adapted water resources management in the Gobi region
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