STEM EDUCATION AND CAPACITY BUILDING IN SOUTHERN MALDIVES

Small Island Research Centre (SIRC)

Foundation for Environment Climate and Technology-Maldives (FECT-MV)

United States Agency for International Development (USAID)

Maldives National University (MNU)

Huvadhoo School

G. Dh. Atoll Education Center

National Academy of Sciences (NAS)

SMALL ISLAND RESEARCH CENTRE/GROUP

About SIRC/G

Small Island Research Centre (SIRC) is a research institute with offices in Male with LaMER and a laboratory for marine research in Fares-Maathodaa. Established 4 years back as an NGO, it has facilities for marine and coastal research in Maathodaa. An automatic weather station was installed in collaboration with FECT and observations are available from October 2016.

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FOUNDATION FOR ENVIRONMENT, CLIMATE AND TECHNOLOGY

About FECT-SL

The Foundation for Environment, Climate and Technology in Sri Lanka builds on two decades of work in Sri Lanka in collaboration with the International Research Institute for Climate and Society (IRI), the Mahaweli Authority of Sri Lanka and a variety of partners. It was formally registered in 2003 as a non-profit charitable company dedicated to promote science for society and environment.

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FECT – MALDIVES

About FECT-MV

Capitalizing on the decade-long R&D work in the Maldives coordinated by Lareef Zubair between IRI and FECT-SL, FECT-MV was set up in 2018 as an NGO. This work was undertaken in collaboration with the Ministry of Environment, Maldives Meteorological Service, Maldives National University, Renewable Energy Maldives and other organizations.

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Acknowledgements

The support of the Principal and staff of the Huvadhoo School and Ghaafu Dhaalu Education Centre, Maldives National University and the Small Island Research Centre is gratefully acknowledged.

We thank the Maldives Meteorological Service (MMS), Maldives National University (MNU), Renewable Energy Maldives, Land and Marine Environmental Resources Group (Pvt) Ltd (LaMer), Ministry of Health, Ministry of Environment and Energy, and Malé Water and Sewerage Company for collaboration on the PEER projects.

This project was supported by the Program for Enhanced Engagement in Research (PEER) program of the US National Academy of Sciences supported by the United States Agency for International Development (USAID).

Key Partners

USG Supported Partners

- Prof. Adam Sobel
- Prof. Bradfield Lyon
- Dr. Randall Koster

Maldives National University

- Mr. Adam Shiham, Head, MNU, Thinadhoo Campus.
- Dr. Shazla Mohamed (Dean/Science Faculty, MNU)
- Mr. Ahmed Mafaz (IT lecturer, MNU)

Renewable Energy Maldives

- Ms. Hudha Ahmed
- Ms. Aishath Afaaf

Maldives Meteorological Service

- Dr. Zahid (Deputy Director General)

Male Water and Sewerage Company

- Mr. Mohamed Rasheed (late)

Contributing Staff – FECT-MV

- Ms. Hudha Ahamed
- Dr. Mizna Mohamed
- Ms. Aishath Afaaf

SIRC/LaMer

- Mr. Mohamed Aslam
- Mr. Hussein Zahir
- Ms. Shahaama Abdul Sattar
- Mr. Aishath Abdulla
- Mr. Ali Zuhair

G. Dh. Atoll Education Center

- Mr. Shifaz Mohamed (Principal)
- Ms. Aishath Luthfee – G.D.H. AEC (Teacher in-charge - Science)
- Mr. Ahamed Anne Ali - Leading Teacher
- Mr. Ahamed Ashraf – Leading Teacher

Huvadhoo School

- ROY
- Ms. Faleela Abdulla (Principal)

Contributing Staff - FECT

- Prof. Piyasena Wickramagamage
- Dr. Lareef Zubair
- Ms. Ashara Nijamdeen
- Ms. Rimza Zacky
- Mr. Tuan Hadgie
- Ms. Fathima Shakira
- Mr. Chayana Gunathilake
- Ms. Anuradha Athawuda
- Ms. Tharani Kailaivasan
- Mr. Ruchira Lokuhetti

Summary

Since 2009, the Foundation for Environment, Climate and Technology (FECT) has been conducting a research program in the Maldives with projects on climate and its impacts on water resources, drought, and hazards. It has also undertaken research on water scarcity, studies on dengue, and contributed to higher education. This program was supported by government and other organizations in the Maldives, the PEER program, Maldives Ministry of Environment (MoE), Maldives National University (MNU), Maldives Meteorological Service (MMS), Renewable Energy Maldives (REM), and the Land and Marine Environmental Resources (LaMER).

For a decade, three projects were sponsored by the PEER program of the National Academy of Sciences and USAID. With the encouragement of the PEER program to support, SIRC and FECT undertook a pilot project for middle and high school students of Maldives on STEM education.

As the project partner, the Small Island Research Centre (SIRC), has a research facility in Fares-Maathodaa Island, we chose to pilot our work on this equatorial island. Even though SIRC was only registered a few years back, the principals here have decades of expertise on Marine Research including Coral Bleaching, Coastal Ecological Research, Environmental Impact Assessments and Land and Marine Surveys.

FECT in Maldives too (FECT-MV www.climate.mv), while registered recently has principal officers with long expertise in Marine Sciences, Renewable Energy, Community Based Conservation, Environment Education, work in NGOs, Local Government and Sustainable Development. FECT-MV provided logistical support and guidance for the project.

We focused on the Huvadhoo (Primary and Middle) School located in Fares-Maathodaa. We also undertook work at the High School that students who graduate from Fares-Maathodaa go to - the Gaafu Dhaalu Atoll Education Centre (G.Dh.A.Ed.C) in Thinadhoo. Our partner, the Maldives National University (MNU) has a campus in Thinadhoo, which facilitated this work.

The program envisaged that we shall

(i) plan out the work in consultation with the schools and partners,

(ii) adapt the resources from our projects and that of others for use by teachers and students,

(iii) support school participation in environmental observation, research, and projects,

(iv) reach out to the community, local government and educational officials.

Through the consultations with the schools, we were encouraged

- to support local weather, air quality, water quality and soil observations, to support student projects that were required as part of the student curriculum,
- to help expose students to presentations by researchers, and
- to support a school science fair.

We also hoped to build a repository of data for Fares-Maathodaa and Thinadhoo Islands.

There were challenges along the way – turnover of principals and teachers at the Huvadhoo School, the turbulent political environment spilled into operations, the delays in obtaining permissions, national elections, and change in government. At the outset, the SIRC PI, Mohamed Aslam, relinquished duties as he was called on to be a Minister. His duties had to be taken over by SIRC

Director, Hussein Zahir, and the project was coordinated by Aishath Abdulla and Shahaama Abdul Sattar.

The work programs were undertaken largely as planned but over twice the planned duration.

Weather instruments were upgraded at Maathoda and two types of weather stations were established in Thinadhoo in the school premises. These instruments recorded all the weather variables every few minutes and we set it up via the school Wi-Fi and a local computer to be accessible to the students. Air pollution instruments and soil moisture instrument from the project was deployed with our partners: Maldives National University and Maldives Meteorological Services. These devices obtained data automatically and shall serve as a rich resource for future batches of students.

Instruments were also provided to support water quality analysis and microscopes were provided to support student research in biology including on dengue. Instructional videos on the use of these instruments were provided via videos available at the project portal.

Workshops for the students and teachers were conducted on four occasions at the Huvadhoo and Thinadhoo schools. Student and teacher workshops were conducted and facilities provided for students and teachers of the Huvadhoo school to access the facilities and expertise at SIRC. Thinadhoo school, to capitalize on the SIRC research and the support provided was taken up for extra-curricular activities led by the School Prefects, Nature Club, the Scouts and the Science, Mathematics and IT teachers. Those students exhibited models and posters at an inter school Science Fair held in September 2019.

The Co-PI served as a guest of honour and a judge for the Inter-School Science Fair. This Fair had the participation of parents, Island and Atoll Council and personnel and from organizations such as MNU, the telecommunication providers, local government officials and teachers from Male. The standard of the exhibitions was high. Among the posters presented, several had used the observations of the school weather stations. The one presented by the scouts compared the weather with dengue cases in a preliminary manner.

An introductory web portal on the topics of climate, water, disasters has been developed. STEM Project related material are presented as flyers, posters, videos for the students. This portal (stem.climate.mv) and this publication shall be widely freely shared.

Lessons learned from this project was written up for an International Conference on STEM Education conducted by the Non-Aligned Movement Science and Technology Centre in India. While the paper submitted by the Principal of the Thinadhoo School was accepted, and the paper submitted by the co-PI is under review, the conference itself was postponed with the concerns over coronavirus.

The high cost of travel to the islands also did constrain our engagement. What could have been done better without some of these challenges, was local data collection, engagement with students, outreach to the community and to the educational officers. While the weather stations in Thinadhoo and Fares-Maathodaa have been generating valuable data, the air quality and soil moisture instruments data have not been adequately fine-tuned.

Going forward, FECT and SIRC researchers shall stay engaged and seek to support and undertake related activities. We have also been encouraged to submit these and other findings for future scale-up in the Maldives.

1. Introduction

Foundation for Environment, Climate and Technology (FECT), and its partners, the International Research Institute for Climate and Society, the Columbia University Water Centre have undertaken a dozen projects in the Maldives. We have developed tools on climate monitoring, prediction and analysis specific to Maldives and have been providing a monthly climate bulletin for seven years. Recently, the partners working in the Maldives collaborated in establishing an organization called FECT-Maldives to sustain this work.

The majority of the island schools have limited opportunities for exposure of students to scientists and technologists. They have particular difficulties due to their remote locations. Thus, a project was proposed to support Science, Technology, Engineering and Mathematics (STEM) learning in the remote island schools in South Maldives. This project was catalysed by the encouragement of our Program for Enhanced Engagement in Research (PEER) program manager (Dr. Dalal Najib) to help develop STEM education by providing access for students and teachers to experts, scientific equipment, Information and Communication Technology (ICT) systems and knowledge obtained through the PEER projects. The project was executed by FECT, SIRC in partnership with FECT-MV, Maldives National University (MNU), in Fares-Maathodaa and Thinadhoo islands in the Gaafu Dhaalu Atoll which is by the equatorial passage in Southern Maldives.

This report provides some background, work program and lessons learned from this project. The remainder of this chapter details

- Science, Technology, Engineering and Mathematics (STEM)
- School Education in the Maldives
- Need in the Maldives for STEM Education

The chapters describe

1. Need for Research support for STEM education
2. PEER projects undertaken by FECT and its partners
3. STEM Project – Approach, Objectives, Work plan, Difficulties and Accomplishments
4. Highlights of Activities – Consultations with Schools and Partners, Instruments and Weather Stations, Flyers, Posters and Guides, Videos, the Science Fair, and Web Portal,
5. Lessons Learned and Future Plans
6. Appendices – Approximate Costs for Project Components. A Project Flyer and Institutional flyer was prepared.

1.1. The Need for STEM Education in the Remote Islands of the Maldives

In the Maldives, there were 374,775 residents in 212 inhabited islands out of the 1192 islands (National Bureau of Statistics, 2018). The islands span a distance of 800 km North- South with small islands sitting around 26 atolls (Ministry of Planning and National Development, 2007). These islands are small, low-lying and remote from each other (Ministry of Fisheries and Agriculture, 2019.) - as such it is difficult for students and teachers to access resources even within each atoll.

1.1. Education in Maldives

The school education system consists of three stages: primary education (grades 1-7, ages 6-12), lower secondary education (grades 8-10, ages 13-15) and higher secondary education (grades 11-12, ages 16-17). Primary education is preceded by a pre-primary stage of nursery and kindergarten education (Figure 1).

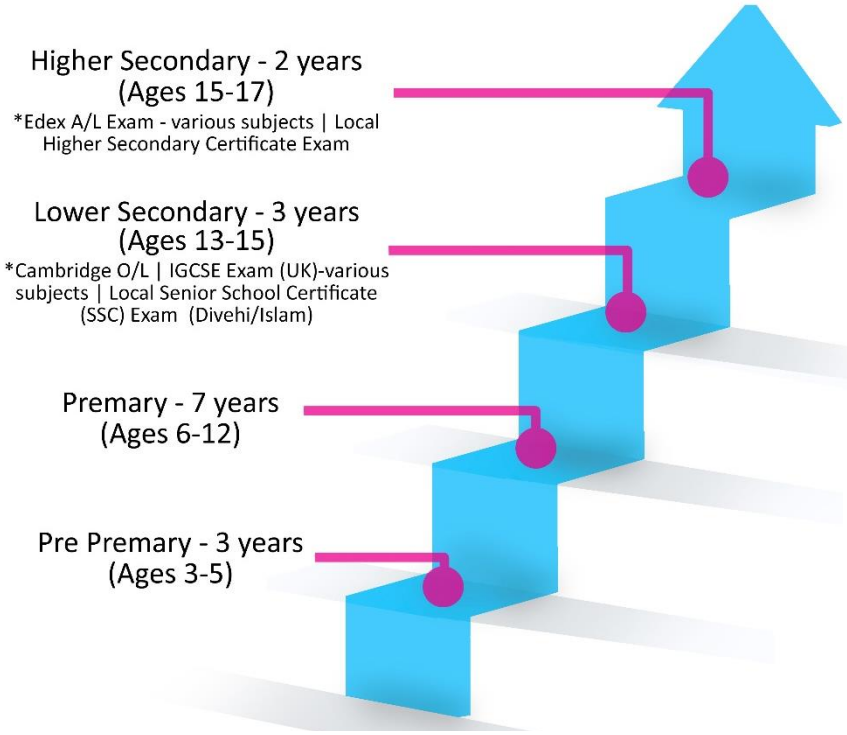


Figure 1: Different levels of Maldives School Education System. Adapted from MoE (2010a)

A survey of Maldivian schools in 1992 showed that the total number of pupils in Maldives was 73,642 and the number of students in government and private schools were 32,475 and 41,167 respectively. (Ministry of Education, 2020.).

The quality of the education has been improved throughout the past decades in the Maldives. Though there is a significant improvement in the education over the past two decades, yet there are many challenges impeding quality education in the Maldives.

1.2. STEM and Its Importance to the Maldives

STEM is an interdisciplinary approach to learn Science, Technology, Engineering and Mathematics where academic concepts are coupled with real-world lessons. The importance of STEM education is to support society's technological and scientific advancements. STEM education and its applications empower students to enhance their critical thinking analysis and creativity. Important transferable skills which can be fostered among children for work of the future are creative problem solving, communication, self-organization, and adaptability (OECD, 2017). These soft skills might not fall squarely within any given subject, but the STEM subjects are useful in pushing skills acquisition beyond literacy and numeracy. Students from rural areas were likely delayed in terms of progression through learning (OECD, 2016) and this applies to remote islands.

The need for STEM education is urgent due to the extraordinary challenges faced due to climate and other changes. These challenges include sea-level rise and erosion, ocean warming, coral bleaching, marine biogeochemical change and its impacts on fisheries and the ecosystem, contamination of the groundwater supply due to pollution and salination, and the spread of infectious diseases.

Most students and the teachers are keen to face up to the problems they already are alive to. The schools here are better resourced compared to other schools in the South Asia or Eastern African regions with teachers drawn locally and regionally; the schools have adequate laboratory facilities and supplies.

2. FECT Projects in the Maldives Including the PEER Projects

FECT, and its partners, the International Research Institute for Climate and Society, the Columbia University Water Centre, and its partners have been undertaking research for the Maldives since 2009 on the invitation of the Maldives Ministry of Environment. These activities and projects have been sponsored by the Ministry of Environment, the MacArthur Foundation, the US National Academy of Sciences and USAID, and the International Research Institute for Climate and Society. Five projects have been sponsored through peer-reviewed science grant programs. We have developed tools on climate monitoring, prediction and analysis specific to Maldives in collaboration with Maldivian partners. In collaboration with the Maldives Meteorological Service, we have been providing a monthly climate bulletin for seven years.

For these projects, we worked with the Ministry of Environment, the Maldives National University and its predecessor, the Maldives Meteorological Services, Renewable Energy Maldives, Land and Marine Environment Resources Group and the Health Protection Agency.

Some of the key partners working in the Maldives collaborated in establishing an organization in Maldives called FECT-MV to further advance climate-based research, development, and project, program and policy support for the Maldives.

Three of the more substantive projects are described below – these were

2.1 Intra-Seasonal Climate Predictions for Sri Lanka and Maldives for Water Resources Management (2012-2015)

PI: Dr. Lareef Zubair
Co- PI: Prof. P. Wickramagamage
Partner: Prof. Adam H. Sobel, Columbia University
Sponsor: US National Academy of Sciences

Climate fluctuations at intra-seasonal time scales (beyond a few days to a few months) have profound influences on management of water resources to generate hydroelectricity and irrigate agricultural lands. Any ability to anticipate these fluctuations is valuable. Recent improvements in understanding of intra-seasonal (IS) climate variability and the availability of real-time satellite-based observations have led to the emergence of methodologies for IS climate predictions from a few days up to a month. This project aimed to bring to bear climate variability insights from a

National Science Foundation-sponsored program called DYNAMO focused on the Western Equatorial Indian Ocean. Specifically, the researchers tested IS climate predictions and assessed their use for water management in Sri Lanka. The overall goal of the project was to promote better understanding of IS variability of rainfall around Sri Lanka and Maldives, refine prediction schemes, to translate this information to support water management, and upgrade local capacity for climate science and climate services. Even modest improvements in IS predictions can lead significant social and economic consequences from anticipatory water management. Because of the principal investigators' affiliation with the Mahaweli Authority of Sri Lanka, which is the nation's coordinating agency for water management, the project results were provided weekly for water management. For the Maldives, the impacts of the intra-seasonal variation due to the Madden Julian Oscillation (the objectives of the dynamo program) was characterized. In addition, we sponsored the Internship of an M.A student. We continued to provide a monthly and weekly climate report for Maldives and Sri Lanka respectively.

2.2 *Developing Monitoring Tools for Managing Drought Risk and addressing the riddle of Increased Drought Tendency amidst the Wetter Climate Change Projections in Sri Lanka and Maldives (2014-2017)*

PI: Dr. Lareef Zubair (FECT)
Co-PIs: Dr. Mizna Mohamed (Maldives National University)
Partner: Dr. Bradfield Lyon, (International Research Institute for Climate and Society, Columbia University, and University of Maine)

In Maldives, beach erosion, sea level rise and unsafe excavation is leading to deterioration of groundwater reservoirs which are critical for water security. Coral bleaching and adverse land use practices lead to impacts that shall aggravate. Although, the impacts on water scarcity and drought risk are of critical importance, the scientific understandings are not commensurate to the risk; nor are the available information accessed. Major policy decisions and large projects related to water scarcity are being undertaken without a robust basis in climate projections. Through this project we planned to assess the impacts of climate variability and change on water scarcity and the gap between demand and supply that shall help guide future planning. The climate change projections from 15 models from the IPCC Model Inter-Comparison program were tested for confidence. We have undertaken research on the climatic teleconnection to rainfall extremes, developed a water budgeting tool for each populated island, and are using the climate predictions to anticipate water scarcity in the islands. We developed a portal to present these information to experts, natural resources managers and undergraduates and school children in the Maldives. Research reports were prepared on these topics. Separately we co-organized a project conclusion workshop with the MNU's Faculty of Science bringing together University Heads, the national experts in water and the key officials from the Ministry of Environment including the state Minister and three officials of the USAID program for Maldives. The project was funded by PEER program of the US National Academy of Science sponsored by USAID program.

2.3 *Can Drought and Flood Hazard be Skilfully Assessed at Fine Spatial Resolution from Combining Constrained Streams of Observed, Remotely Sensed and Model Predicted Data in Sri Lanka and the Maldives? (August 2015 - July 2018)*

PI: Prof. Piyasena Wickamagamage (FECT)
Co-PIs: Dr. Lareef Zubair (FECT), Dr. Zahid (Maldives Meteorological Services)
Partner: Dr. Randall Koster (NASA Goddard Space Flight Centre – GSFC)

The project involves expanding, testing, and implementing a hazard analysis framework using data from satellite estimates for soil moisture and prediction products from NASA and NOAA, for combining multiple terrestrial indicators to estimate the probability of drought and floods in Sri Lanka and Maldives. The project was funded by PEER program of the US National Academy of Science sponsored by USAID program.

The severity of different types of hazards – floods, droughts, landslides, air pollution and dengue – were assessed for Sri Lanka. We undertook national level analysis of the role of climate on hazards in Maldives and Sri Lanka for floods, drought and dengue – establishing links to monthly averages and extremes. We extended our work on island level water budgeting and monitoring for scarcity assessment with additional data. Given our limitations, we focussed on specific sites – Male, Maldives for Water Scarcity, Pinga Oya, Kandy, Sri Lanka for Floods, Aranayake, Kegalla, Sri Lanka for Landslides, Kandy District for Mob Violence.

We realized that man-made hazards due to mob-violence and riots cannot be compartmentalized separately as communities have to deal with this for multi-hazard risk management and undertook a parallel project for that.

We published conference proceedings on Pinga Oya Flooding, Water Resources in Maldives, and prepared videos of the key presentations for online access. Project reports on our work on Aranayake and Norochcholai were published.

We continued to provide a monthly and weekly climate report for Maldives and Sri Lanka respectively.

We created a web-portal to disseminate our work in Maldives – climate.mv and a web-portal for disasters in Sri Lanka www.disaster.lk . The project was funded by PEER program of the US National Academy of Science sponsored by USAID program.

3. STEM Project

Formal Title: ***"STEM Education and Capacity Building for Resources and Risk Management in Remote Outposts capitalizing on PEER projects on water, drought and hazards: Gaafu Dhaalu Atoll in Southern Maldives (2018-2019)"***

3.1. Team and Partner Organizations

FECT
Co-Principal Investigators: Prof. P. Wickramagamage, Dr. Lareef Zubair
Coordinator: Ms. Ashara Nijamdeen,
Team: Mr. Tuan Hadgie, Ms. Tharani Kailaivasan, Ms. Fathima Shakira, Mr. Chayana Gunatillake, Mr. Dinaskar Sathyendra, Ms. Anuradha Athawuda

FECT-MV
Coordinator: Ms. Aishath Afaaf
Team: Ms. Hudha Ahmed, Dr. Mizna Mohamed.

SIRC
Principal Investigator: Mr. Mohamed Aslam, Mr. Hussein Zahir
Coordinator: Ms. Aishath Abdulla
Team: Ms. Aishath Abdulla, Ms. Shahaama Sattar, Mr. Hussein Zahir

MNU
Team: Dr. Shazla Mohamed (Dean, Faculty of Science), Mr. Shaheem Adam (Coordinator, Thiandhoo Campus)

Gaafu Dhaalu Atoll Education Centre
Principal: Mr. Shifaz Mohamed
Teachers: Mr. Ahamed Ashraf, Ms. Aishath Luthfee

Huvadhoo School:
Principals: Mr. Roy, Ms. Faleela Abdulla, Latheefa

National Academy of Sciences – PEER program:
Program Managers: Dr. Dalal Najib, Mr. Daniel Placht

FECT-SL

Foundation for Environment, Climate and Technology under a service oriented non-profit charitable organization with the Registrar of Company in Sri Lanka and is recognized by the Registrar as a Charitable Organization based on its objectives and charter. We work with partners locally and in the Maldives, Comoros, and Zanzibar coordinated by the Federation for Environment, Climate and Technology.

FECT- MV

FECT-MV is a registered organization in the Maldives, which was set up capitalizing on the work on FECT-Sri Lanka has undertaken in collaboration with the Ministry of Environment, Columbia University and other organizations which led to a unique capabilities in climate adaptation for Maldives.

SIRC

Small Island Research Centre (SIRC) is a Maldivian Research Institute with offices in Male and in the Fares-Maathoda islands. FECT has carried out weather and climate monitoring at SIRC Maathodaa.

MNU

Faculty of Science of the Maldives National University was inaugurated in August 2013 with the intention to establish a centre recognized nationally and internationally for quality teaching, scholarship and academic research in areas of science and information technology.

G.DH ATOLL EDUCATION CENTER

A Secondary and Higher Secondary school located in G.Dh. Thinadhoo, Maldives.

HUVADHOO SCHOOL

Huvadhoo School is Government School based in G.Dh.Faresmaathoda.

USAID

United States Agency for International Development (USAID) leads international development and humanitarian efforts to save lives, reduce poverty, strengthen democratic governance and help people progress beyond assistance.

NAS

The National Academy of Sciences (NAS) is a private, non-profit society of distinguished scholars. Established by an Act of Congress, signed by President Abraham Lincoln in 1863, the NAS is charged with providing independent, objective advice to the nation on matters related to science and technology.

3.2. Our Approach and Objectives

The approach taken was

- engaging schools and community to understand needs, resources and schedules
- supplementing available laboratory facilities
- installation of an automatic weather station with automatic download of data
- preparation of instruction videos on the use of microscopes, water quality equipment
- bringing scientists who visit for research to the schools
- customizing research reports for the students and teachers
- organizing educational material online and ensuring accessibility
- support for conducting workshops and science fairs
- learning lessons for adapting elsewhere

The objectives were:

1. Review information for water resources, drought and disasters with educational experts and teachers.
2. Develop a web-portal including interactive tools, introductory video, policy briefs, flyers and posters.
3. Enable the use of PEER outputs for STEM Education in Schools: Focus on Fares-Maathodaa in Gaafu Dhaalu Atoll and neighbouring islands.
4. Demonstrate the use of scientific information for resource management and hazard and infectious disease risk management by community groups and local government officials.
5. Collaboratively develop content and material to support citizen science and community resource management (water, coral reefs and fisheries) and risk management (natural hazards and infectious diseases).

3.3. Work Plan

To accomplish each objective, we set up a set of tasks – these tasks are listed against each objective.

1. **Need Assessment and Formatting and Reviewing Information**
   a. Needs assessments for middle and high schools
      - The principal partners arrange collaborations with partners and schools.
      - Key partners at MNU in Male' and Thinadhoo campus were consulted.
      - The Principal and the teachers at the Huvadhoo and Thinadhdhoo Schools were consulted through visits and phone calls.

   b. Existing reports on climate and water science were revised.
      - Reports on water and climate workshop were completed
      - The videos of presentations by experts are made accessible through the website.

   c. User guidelines on prediction tools
      - We have prepared user guides on the climate bulletin on a first step along with a video explanation.
      - The prediction and monitoring tools were less of priority for the schools.

   d. Fast online access for selected students and teachers
      - While fast online access was available to the teachers of the Thinadhdhoo school at SIRC, the internet access at the Huvadhoo school improved and there was no demand for this.

   e. Follow up through video conferencing
      - The remote and audio conversation was repeatedly held for project advancement with the Principal and officials at SIRC in Male and Maathodaa. However, we did not conduct video conferences.

2. **Make Information Accessible**
   - The work prepared on revising documentation, developing a web portal and developing introductory videos were carried out well.
3. **Conduct School Programs in Schools and Other Places.**
   - Presentations were undertaken on occasions for each of the schools by SIRC and FECT personnel.
   - Teachers and students were addressed.
4. **Collaboratively Develop Content and Material to Support Citizen Science and Community Resources Management and Risk Management.**
   - Even the modest scope of the proposal, we have engaged in consultation with NGOs, Telecom Agency, Island councils in Mathooda and Thinadhdhoo.
   - They are aware of the work of the project. We are making information available online. The main list is being manufactured. We have worked to improve accessibility of data and information through the internet.
   - We have introduced our work to the island councils and solicited their input.

   What we have done is a start and it is now up to the schools to develop data resources on inputs such as on dengue. We see evidence of this in the Thinadhoo school.

3.4. Difficulties

Obtaining permissions for this work was stymied due to political turbulences but eventually, after elections in October 2018, things stabled. We also had difficulties in the Maathodaa School as there were unusual changes in staffing including three principals, during the project particularly.

3.5. Accomplishments

The work programs were undertaken largely as planned (but over twice the planned duration); exhibitions were conducted; and facilities provided for students and teachers of the Huvadhoo School to visit the SIRC laboratory. For the Thinadhoo School, the support provided was taken up for the extra-curricular activities led by the Nature Club, the Scouts and others who conducted projects. Those students were able to present at an inter school science fair in September 2019.

One of our scientists served as a judge for the Inter-School Science Fair. This fair was attended by parents, Island and Atoll Council officials and personnel from organizations such as MNU, the telecommunication providers, local government officials and teachers from Male. The standard of the exhibitions was quite high.

Time Frame

01 APR 2017

Meeting Huvadhoo School principal and staff

Organized by: FECT

(Co-PI) Lareef Zubair, Ashara Nijamdeen and Dalal met with Huvadhoo School principal and staff with Aslam

G. Dh. Thinadhoo

01 APR 2017

Male

Meeting with MNU and MMS

Organized by: FECT

Ashara Nijamdeen and Dalal met with Dr. Shazla Mohommed, the Dean of Science Faculty MNU and handover the Air Quality equipment and Automated Weather Station.

03 APR 2017

Meeting with MMS

Organized by: FECT

Mr. Hussain Waheed, Mr. Ibrahim Humaid, Dr. Zahid, Dr. Dalal, Ms Ashara and Dr. Lareef at Maldives Meteorological Service (MMS) HQ

G. Dh. Thinadhoo

01 SEP 2018

G. Dh. Thinadhoo

Meeting at the SIRC

Organized by: SIRC and FECT

(Co-PI) Lareef Zubair met with Hussein Zahir (Director-SIRC), Aishath Abdulla (Project Coordinator) and Fara for the project planning.

01 SEP 2018

Meeting with staff of MNU

Organized by: FECT

(Co-PI) Lareef Zubair met with Dr. Shazla Mohommed, the Dean of Science Faculty.

Male

03 SEP 2018

G. Dh. Thinadhoo

Workshop for prefects of Thinadhoo School

Organized by: FECT

A workshop for the school prefects was conducted by (CoPI- FECT) Lareef and a weather station and some water quality instruments were handed over to the school. The weather station is set up.

04 SEP 2018

Meeting with Huvadhoo School Principal

Organized by: FECT

(Co-PI) Lareef Zubair met with the Principal of Huvadhoo School and discussed about the implementation of the STEM Project.

G. Dh. Thinadhoo

06 SEP 2018

G. Dh. Thinadhoo

Meeting of Project Partners

Organized by: SIRC and FECT

Minister Mohamed Aslam, Ali Wahid, Farah and Dr. Lareef had a discussion on the future steps of the project.

Male

Meeting at Ministry of Community Empowerment

Organized by: SIRC and FECT

(Co-PI) Lareef Zubair and Mr Tuan from FECT SL Met with the Minister Mohamed Aslam (Principal Investigator)

21 APR 2019

21 APR 2019

Meeting at the Maldives National University

Organized by: SIRC and FECT

Meeting with Dr. Shazla Mohamed (Dean of the Faculty of Science of the MNU), Ahmed Mafaz (Lecturer), Noor Khaleel (Lecturer), Dr. Lareef Zubair and Tuan Hadgie.(FECT)

Male

Male

Meeting with SIRC team

Organized by: SIRC and FECT

Lareef Zubair (Co-PI) and Mr Tuan from FECT SL met with Aishath Abdulla (Coordinator) Hussein Zahir (Director) Shahaama Sattar (Team) and discussed the work plans for STEM project and handed over some of the key documents

22 APR 2019

22 APR 2019

Meeting with Meteorological Department DG

Organized by: FECT

(Co-PI) Lareef Zubair and Mr Tuan from FECT SL Met with Mohamed Wahid (Director General MMS) and discussed regarding the weather data acquisition.

Male

G. Dh. Thinadhoo

Meeting with staff of Thinadhoo Gaafu Dhaalu Atoll – High School

Organized by: SIRC/FECT

(Co-PI) Lareef Zubair and Mr Tuan from FECT SL met with the schools staff-Shifaz Mohamed (Principal) Ahmed Ashraf (Teacher) Aishath Luthfee (Teacher) Ahmed Anne Ali (Teacher) and had discussions regarding the science fair.

23 APR 2019

24 APR 2019

Meeting at Huvadhoo School (Morning)

Organized by: SIRC and FECT

(Co-PI) Lareef Zubair and Mr Tuan from FECT SL held discussions about the science fair, providing support for student projectsand activities of Nature Club. The facilities of the science and IT laboratories were reviewed.

G. Dh. Thinadhoo

Huvadhoo

Meeting at Huvadhoo island Council

Organized by: SIRC and FECT

(Co-PI) Lareef Zubair and Mr Tuan from FECT SL had discussions with past and present Council Chairman and Officials

24 APR 2019

24 APR 2019

Meeting at Huvadhoo School (Afternoon)

Organized by: SIRC and FECT

(Co-PI) Lareef Zubair and Mr Tuan from FECT SL Met with Zalif Ahmed (Meteorological officer) and collected soil moisture data.

Huvadhoo

26 APR 2019

Male

Meeting at Maldives Meteorological Services, Male

Organized by: SIRC and FECT

(Co-PI) Lareef Zubair and Mr Tuan from FECT SL Met with Zalif Ahmed (Meteorological officer) and collected soil moisture data.

12 SEP 2019

One day workshop at Huvadhoo School

Organized by: SIRC

SIRC handed over water test pens plus soft version of teacher resource tool kit- presentations, videos and other resource materials they can use to develop project ideas.

Fares-Maathodaa

14 SEP 2019

G. Dh. Thinadhoo

Workshop at Thinadhoo School

Organized by: SIRC

- Half day workshop for students of G. Dh. Atoll Education Centre.
- Presentations on climate change impacts on various natural resources, food security, water, health and critical infrastructure.
- Workshop carried out as an interactive session.

25/26 APR 2019

Inter-School Science Fair

Organized by: SIRC

Supported the Inter School Science Fair organized be the G. Dh. Atoll Education Centre. Co-PI served as a judge and attended as a guest of honour.

G. Dh. Thinadhoo

25 SEP 2019

Male

Acquired climate.mv domain

Organized by: FECT

FECT MV acquired climate.mv domain from Dhiraagu (tele communication service provider) to host the STEM portal.

01 DEC 2019

Meeting with staff of MNU

Organized by: SIRC and FECT

(Co-PI) Lareef Zubair, Mizna Mohamed (FECT MV) and Nura Mohamed (MNU) reviewed about Air Quality data from Male obtained by MNU and plans for maintenance work on the AQ Instrument provided by the previous PEER project.

Male

4. Activity Highlights

FECT has contributed for the STEM project in the middle schools of Maldives in support of the award to the Small Island Research Group in the Maldives as illustrated below:

1. Instrumentation and Support
    I. Weather Stations
    We have set up four new weather stations at schools and SIRC. These are automatic weather stations which are kept online as long as the Wi-Fi is working. FECT has helped with troubleshooting problems that arose remotely.
    II. Equipment for Water Quality and Microscopic Analysis
    Provided light microscopes, water quality instruments to the SIRC facility in Maathodaa and the Thinadhoo High School.
    III. Air Quality Instrumentation
    Air Quality instruments were provided to SIRC and MNU. Soil Moisture Instrument provided to Maldives Meteorological Service was repaired during this project and is providing data.

2. Web Portal
    FECT has developed a website for middle school students and their educators. This portal includes scientific information on Islands, Environment, Water, Disasters, Climate and Impacts. It also has instructions for the instruments provided to the students.

3. Documentation
    I. Flyers on the project and the portal were developed
    II. Two abstracts have been prepared on the lessons learned from the project here for an International Conference on STEM Education organized in Sri Lanka by the Non-Aligned Movement Science and Technology Centre of India.
    III. This report on the STEM project and lessons learned was prepared by compiling material from the submissions to the STEM program.

4. Workshops and the Science Fair

    SIRC and FECT have supported four workshops in the Huvadhoo and Thinadhoo Schools each. These meeting drew the participation of visiting experts and provided an exposure to the students. There was follow up thereafter by phone. A science fair was organized by G. Dh Atoll education Centre and coordinated by SIRC, and a FECT scientist served as a judge and guest of honour.

4.1. Weather and Soil Moisture Instruments in the Maldives

FECT installed instruments for Weather, Soil Moisture and Air Quality in Central and Southern Maldives in partnership with the,

- Maldives National University (MNU)
- Maldives Meteorological Service (MMS)
- Small Island Research Centre (SIRC)
- Gaafu Dhaalu Atoll Education Centre
- Issues with the urls given – some are ugly, some are for SL, we should just have a media page for MV and refer to that outside the figure. Not LaMER but SIRC for AWS. Soil Moisture is only by MMS. MNU and SIRC have AQ instrument and weather stations.

still pending

Figure 2: The Ambient Weather Station mounted on top of the Thinadhoo School building

Air quality instrument provided to Maldives National University, used for training of students.

www.climate.mv/flyers

Automated Weather Station operated by Small Island Research Centre, Maathoda

www.climate.mv/weather

Weather, Air Quality and Soil Moisture Instruments provided through the project

Automated Weather Station provided to Thinadhoo School

www.climate.mv/weather

Soil Moisture and Temperature Measurement Instruments at 4 depths along with transmission and automated data-logging were provided. (Operated by MMS)

www.climate.mv/flyers

4.2. Supplementary Instruments Provided Through the STEM Project

FECT have donated,

- **Weather Stations**
- **Air Quality Instruments**
- **Water Quality Instruments**
- **Microscopes**

through STEM project to the schools and research centers in Maldives.

Ambient Weather Station

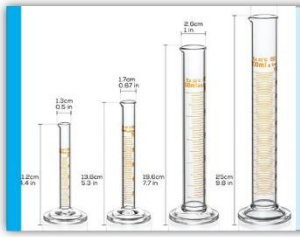
A comprehensive, local and remote monitoring package.
Provides free cloud hosting services at AmbientWeather.net.

Air Vissual Pro (IQ Air)

AirVisual Pro displays immediate, accurate air quality data both indoors and out, to help create healthier, more productive environments.

Coliform Test Kit

Easy-to-use, disposable 5-tube method to indicate the presence of total coliform bacteria in a water supply.



Graduated Cylinder Set

Graduated Measuring Cylinder measures volume of liquid.
Specifications at maximum capacity that can be measured (ml) and include 10 ml, 50 ml and 100 ml borosilicate glass cylinders.

Water Quality Test Meter 4 in 1 kit

Convenience to use. Portable and High accuracy make it Ideal for students.Includes four water quality meters.Can measure

- pH
- Electric conductivity
- Total Dissolved Solids
- Temperature

Water Monitoring Kit

The GREEN Low Cost Water Monitoring Kit includes an instructor's manual with clear instructions.
This portable kit can be easily packed for a day outdoors. Ideal for students from primary grades through college.

Digital TDS Tester (3 in 1) and pH meter

This kit has one digital TDS (3 in 1) tester and a pH meter.
TDS tester has EC, Temperature and TDS testers.

Digital pH Meter

Ideal for household or laboratory use; Suitable for testing pH balance of drinking water, pool, aquarium, RO system, Spa, or hydroponics; Appropriate for wide range of applications.

Water Quality Tester 3 in 1 kit

Combines TDS Meter (Total Dissolved Solids), EC Meter (Electrical Conductivity) and Temperature meter all in one ergonomically designed pen.

Microscope Slide Preparation Kit

This quality microscope kit is a perfect comprehensive kit for microscopy, including staining and preparing samples.
Ideal for students, teachers, etc.

Portable Digital Microscope

A multi-purpose product suitable for home, study and work.
It can be widely used in various fields.

Biological Compound Microscope

Ideal for classrooms, and homeschool environments.
Designed to understand science and nature by allowing them to peek into the microscopic world to inspire curiosity, encourage discovery, and allow for creativity.

4.3. Documentation

4.3.1. Posters

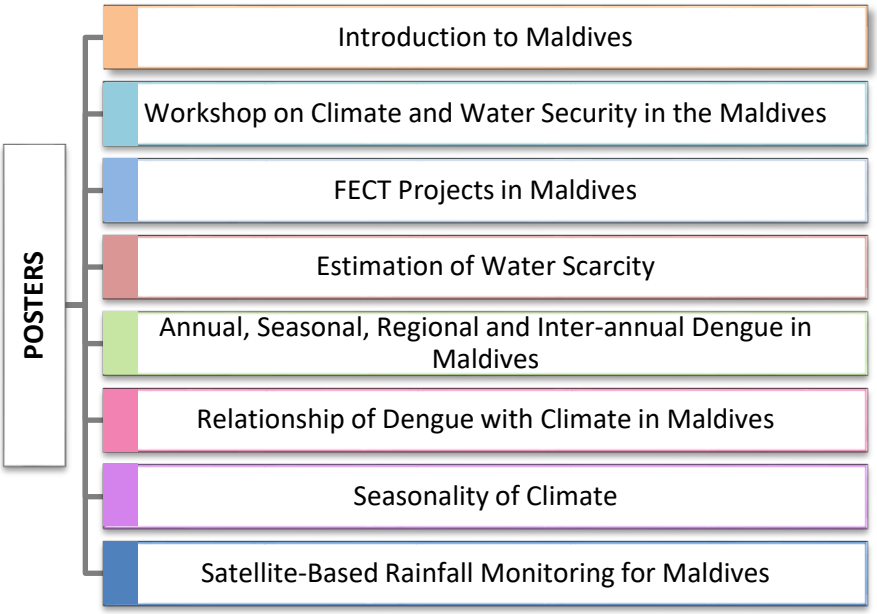


Figure 3: List of posters published during the project period

4.3.2. Flyers

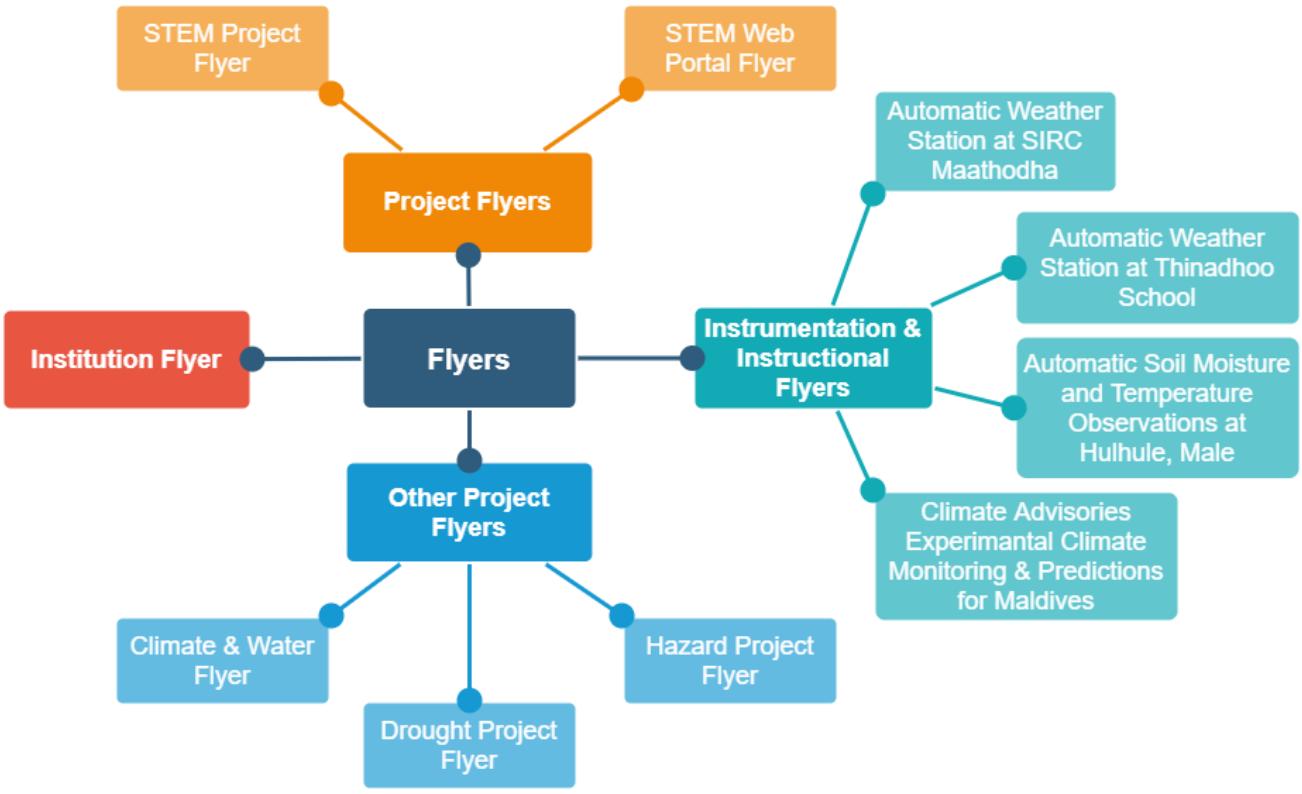


Figure 4: List of flyers prepared and distributed during the project period

4.4. Inter-School Science Fair

Figure 5: Participants from the different schools at the Inter-school Science Fair organized by the G.Dh. Atoll Education Centre held on 25th and 26th of September 2019

Figure 6: Students showing their talents during the Inter-School Science Fair organized by G.Dh Atoll Education Centre on 25th and 26th of September 2019

G. Dh. Atoll Education Centre organized a science fair on 25th and 26th of September 2019. FECT supported the Science fair and Co-PI served as a judge at the Science Fair.

Students had worked on the science fair projects after school hours. Therefore, most science fair entries were usually modified versions of existing experiments.

Goals

The goals of the science fair were:

- Enhance practical and theoretical exposure to STEM education.
- Enhance creativity of the students.

Students presented their science project results in the form of reports, display boards, and/or models that they havecreated.

Figure 7: Participants from different schools presenting their projects during the Inter- School Science Fair organized by G.Dh. Atoll Education Centre on 25th and 26th September of 2019

This Science Fair provided a mechanism for students with intense interest in the sciences to be paired with mentors from nearby colleges and universities, so that they can access instruction and equipment that is available at the local schools.

Figure 9: Resource Persons including FECT scientist who attended the Inter- School Science Fair organized by G.Dh Atoll Education Centre on 25th – 26th September 2019

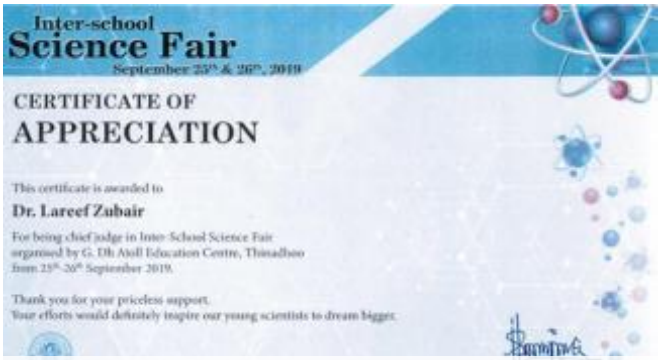


Figure 8: Certificate of appreciation awarded to the FECT Principle Scientist Dr. Lareef Zubair for being a Judge at the Inter-School Science Fair Organized by G.Dh Atoll Education on 25th – 26th September 2019

4.5. Web Portal

Figure 10: Web Portal Flyer prepared for the STEM website (www.stem.climate.mv) by FECT

Web portal (www.stem.climate.mv/) serves as a platform for the students and teachers who are directly involved in the project to obtain resources for learning and teaching purposes and for science related educational activities. Nurturing Science, Technology, Engineering and Mathematics (STEM) at school level is important in equipping students with knowledge and skills. This site aims in enhancing STEM education among middle school students.

Figure 11 : A screen capture of the homepage for www.stem.climate.mv

4.5.1. Navigation through the website

stem.climate.mv has a menu of Home, Climate, Water, Disasters, Impacts, Resources and About Us.

Home gives an introduction to STEM education and our initiative on enhancing STEM education in Southern Maldives. On 'Islands' page we provide a summary of our work in Fares-Maathodaa island, Thinadhoo island and the national capital islands of Male and immediate surroundings. The menu 'Environment' links submenus with information on Geography, Marine Environment and Coral Reefs of Maldives.

Under '**Climate',** the climatology describes rainfall, wind, regionalization and seasons. Under ***climate monitoring*** we provide access to our monthly climate bulletins. The submenu ***weather*** provides access to real time data from the weather stations installed in Thinadhoo and Maathodaa, Maldives Meteorological Service, and satellite rainfall. There is also information on vulnerability of various sectors to ***climate change*** distinguishing it from climate variability and terminology.

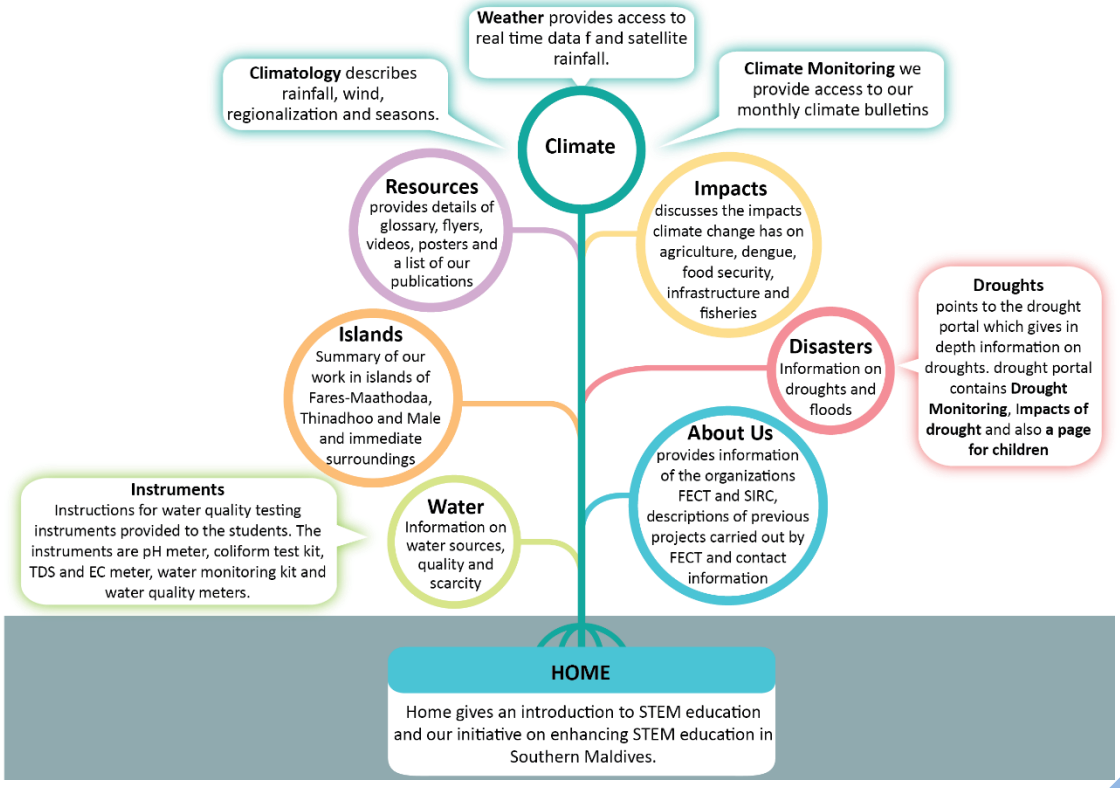
Under **'Water'** information on water sources, quality and scarcity. Submenu Instruments provides instructions for water quality testing instruments provided to the students. The instruments are pH meter, coliform test kit, TDS and EC meter, water monitoring kit and water quality meters.

The **menu 'Disasters'** gives information on droughts and floods. The droughts page points to the ***drought portal*** which gives in depth information on droughts. The ***monitoring*** section on the drought portal contains graphs of comparison of rainfall and temperature during the recent past years. ***Impacts of drought*** on coral bleaching, water scarcity, tourism, fisheries and agriculture, and public health are presented under the impacts tab. There is also a ***page for children*** – explaining drought in an easily understandable manner.

The **menu 'Impacts'** discusses the impacts climate change has on agriculture, dengue, food security, infrastructure and fisheries.

The **menu 'Resources'** provides details of glossary, flyers, videos, posters and a list of our publications.

The menu on **About Us** provides information of the organizations FECT and SIRC, descriptions of previous projects carried out by FECT and contact information.



4.6. Publications

Advancing STEM Education in a Middle and High School in Remote Islands o

Shifaz Mohamed,

Principal, Gaafu Dhaalu Atoll Education Centre, Thinadhoo, Maldives.

Ashara Nijamdeen, Tuan Hadgic, Lareef Zubair

Foundation for Environment, Climate and Technology, Maldives, Sri Lanka and USA.

Gaafu Dhaalu administrative district is half of the Huvadhoo Atoll which is the largest Atoll in the M
12690 and is located just North of the equator and 340 km South of the capital Male. There are 10
island - these islands may be traversed by ferry and it takes up to a 6 hours for the public ferry - in
primary (Grade k -6) and lower secondary (Grade 7-10) schools - these have science education and
for the Edexcel and Cambridge international Examinations in English. Students who advance to high
attend the Atoll Education Centre at the Atoll Capitol in Thinadhoo.

Science education for elementary, middle and high schools is facilitated by access to laboratory fa
teachers. These schools face the challenge of being remote with small populations and lack exposur
given some avenues for students to access resources from the capital. Internet resources are
misuse.

STEM education is enabled by the middle and high students taking on projects for the envi
geography subjects. In the last years, we seek to encourage and motivate students through projec

STEM Education in the Far-flung and Vulnerable small islands of Maldives. Can the Work of Scientists be beneficially harnessed?

Lareef Zubair, Ashara Nijamdeen, P. Wickramagamage, Tharuni Kaikavasan, Tuan Hadgic, Fathima Shakiru, Dinaskar Sathiyendru, Gunatillake, Anuradha Athawuda (Federation for Environment, Climate and Technology, Kandy, Sri Lanka) and Mohamed Shifaz (Gaa Atoll Education Centre, Thinadhoo, Maldives).

Why STEM education is vital especially in remote locations?

Important transferable skills which can be fostered among children for work of the future are creative problem
communication, self-organization, and adaptability (OECD 2017). These soft skills might not fall squarely within a
subject, but the STEM subjects are useful in pushing skills acquisition beyond literacy and numeracy. Students from ru
were likely delayed in terms of progression through learning (OECD, 2016).

The Need in the Remote Islands of the Maldives

In the Maldives, there were 338,434 residents in about 212 inhabited islands of the 1192 islands. (National Bureau of S
2014). The islands span a distance of 800 km North- South with small islands sitting around 26 atolls (Ministry of Plan
National Development, 2007). These islands are small, low-lying and remote from each other as such it is difficult for stud
teachers to access resources even within each atoll.

The need for STEM education is urgent due to the extraordinary challenges faced due to climate and other change
challenges include sea-level rise and erosion, ocean warming and coral bleaching, marine biogeochemical change and its
on fisheries and the ecosystem, contamination of the groundwater supply due to pollution and salination, and the s
infectious diseases such as dengue.

Most students and the teachers are keen to face up to the problems they foresee proactively. The schools are better r
compared to other schools in the region with teachers drawn locally and regionally and have adequate laboratory facil
school supplies.

Research in Maldives

Following an invitation of Maldives Ministry of Environment, The Foundation for Environment Climate and Technolog
has conducted a research program for the last decade with projects on Climate and its impacts on water resources, dro
hazards. It has also undertaken research on water scarcity, studies on dengue, and contributed to higher education. This
was supported by government and other organizations in the Maldives and the PEER program. The resources from this
be useful for STEM education.

Notwithstandin
of what we pla
project took tw

Sustainable dev
urgent manner,
are not in place

The setting up
Staff of G.Dh.Ed

The use of ICT
program by obtaining support of the Ministry of Education after some development.

Difficulties

Obtaining permissions for this work was stymied due to political turbulences but eventually, aft
things stabled. We also had difficulties in the Maathoda School as there were unusual changes in
during the project particularly.

The Implementation

The work programs were undertaken largely as planned (but over twice the planned duration); ex
facilities provided for students and teachers of the Huvadhoo School to visit the SIRC laboratory.
support provided was taken up for the extra-curricular activities led by the Nature Club, the Scou
projects. Those students were able to present at an inter school science fair September 2019.
One of our scientists served as a judge for the Inter-School Science Fair. This Fair had the participati
Council and personnel and from organizations such as MNU, the telecommunication providers, l
teachers from Male. The standard of the exhibitions was quite high.

This work required resource for travel and staffing which was possible with the small grant awarded by
grant enabled us to draw on the resources of the past projects, the support of networks and well-wisher
accessible for STEM Education in two schools and for others to draw on the resources made accessible via

5. Lessons Learned

Notwithstanding the remoteness, political turbulence, change of government, loss of the PI, and other challenges faced, we have been able to accomplish most of what we planned albeit over a longer period. Patience was needed to navigate the institutional and political variability and changes in personnel. The project took two years although we had planned only for a year. Some of the Lessons Learned were

- Sustainable development challenges benefit from a STEM type approach. Places that are vulnerable need such development.
- There is no shortage of motivation for STEM education – only that in some schools, the enrolment is not in place, due to lack of local facilities.
- The setting up of the weather station in the islands was valued and helped engage students with local observations.
- The use of ICT facility was a boon and the setting up of the IT resources via a portal was valued. There is potential to expand this program by obtaining support of the Ministry of Education after some development.
- Plans for providing internet access to the staff and students were moot as the Education authorities provided such facilities. After the project was over, however, there are strict rules on how Wi-Fi access was used, leaving the weather stations offline. Thus, there may be need for considering security more seriously.
- This work required resource for travel and staffing which was possible with the small grant awarded by the PEER program. The grant enabled us to draw on the resources of the past projects, the support of networks and well-wishers to make the research accessible for STEM education in two schools.

6. Future Plans

We plan to ensure that the products and lessons of this project are capitalized.

As the SIRC office and research centre in Maathodaa is close to the Huvadhoo school, SIRC colleagues shall continue their work of supporting students when scientists are visiting.

The Principal and staff of Thinadhoo School already sustains a science program. This has promise. His abstract on the topic was accepted for presentation in Colombo in June 2020.

The Principal of Thinadhoo School is also serving the Department of Education as one of the Advisors on the Huvadhoo school.

We hope to extend this work to schools in Male and also in Sri Lanka.

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Appendix

1. BUDGET FOR THE INSTRUMENTS

NO	DESCRIPTION	QTY	AMOUNT (USD)
1	Ambient Weather	3	914.52
2	IQ Air	1	269.00
3	Water Quality test meter (4 in 1 Kit -Blue)	1	21.17
4	Coliform test kit	2	33.72
5	Graduated Cylinder Set	1	15.38
6	Low Cost water monitoring kit	1	38.95
7	Cordless LED Student Biological Compound Microscope	1	87.00
8	Piece All-in-One Microscope Slide Preparation Kit	1	32.98
9	Water Quality Tester, TDS Meter, EC Meter & Temperature Meter 3 in 1	1	14.95
10	Portable Digital Microscope	1	54.99
11	Digital Water TDS Tester PH Tester 3 in 1	2	37.98
12	Water Quality test meter (4 in 1 Kit -Blue)	1	21.17
13	Digital pH Meter	1	13.99
14	Plain watch glass beaker cover	1	12.99
15	Extra-large magnifying glass	1	9.18
16	Microscope slide set	1	19.99
17	Microscope slide set	1	8.99
18	Micro glass borosilicate graduated beakers (5ml, 10ml and 15 ml)	2	11.9
19	Water Quality test meter - 4 in 1 Kit (Blue)	2	42.34
20	Water Quality Tester, TDS Meter, EC Meter & Temperature Meter	1	14.95
21	Thermometer and hygrometer with humidity gauge	1	11.99
22	Digital Water TDS Tester PH Tester	2	37.98
23	General hydroponics pH control kit for balanced nutrient solution pcs	1	14.95
24	Lab LED binocular microscope	1	207.00
	GRAND TOTAL		**1,951.06**

2. STEM EDUCATION FLYER

STEM Education and Capacity Building in Southern Maldive Islands

Goal : To develop STEM education in the Maldives by providing access to students to instrumentation, ICT systems and data.

Duration : July 2018 - December 2019

Foundation for Environment, Climate, and Technology [FECT] | Foundation for Environment, Climate, and Technology-Maldives [FECT-MV] | Small Island Research Centre [SIRC] | Maldives National University [MNU]

Sponsors: Partnerships for Enhanced Engagement in Research, undertaken by the US National Academy of Sciences with the support of USAID.

CONTACT INFORMATION

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Shahaama Sattar
shahaama.abdulsattar@sirg.ngo

FECT Coordinators:
Ashara Nijamdeen
ashara@tropicalclimate.org
Tuan Hadgie
tuan@tropicalclimate.org
Chayana Gunatillake
chayana@tropicaldimate.org

MORE INFORMATION

Student Portal:
www.stem.climate.mv

Project Site:
www.climate.lk/stem-education

SIRC:
www.smallislandlodge.com/small-island-research-centre/

FECT:
www.climate.lk

FECT-MV:
www.climate.mv

MNU Faculty of Science:
www.fsc.mnu.edu.mv

G.Dh. Atoll Education Centre
www.gdhaec.edupage.org

Summary :

The Small Island Research Centre/Group (SIRC/G) and the Foundation for Environment, Climate and Technology (FECT) are partnering on a project to promote Science, Technology, Engineering and Mathematics (STEM) education in middle and high schools in Southern Maldives.

Clarification - What is STEM Education?

STEM refers to the disciplines of Science, Technology, Engineering and Mathematics. The initiative on STEM education integrates these disciplines into a cohesive learning paradigm based on real-world applications. It focuses on practical work reaching the students who lack exposure to these disciplines.

Anticipated outputs

- Make information accessible through web portal
- Access for students to instrumentation, ICT systems and data
- Introductory videos on instrumentation
- Science workshop conducted in Schools
- Support for School Projects

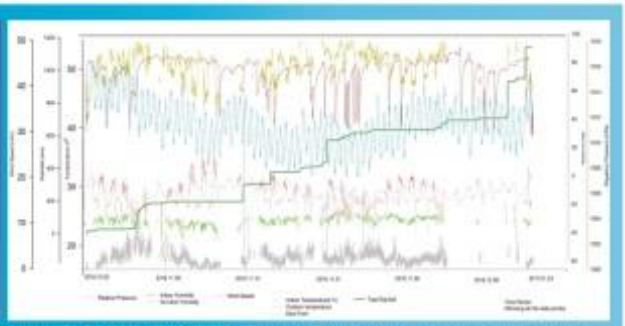
Education-created by pikisuperstar

Project Objectives

- Orient available information on water resources, drought and disasters for students.
- Develop a web-portal (including interactive tools, videos, policy briefs, flyers and posters)
- Enable the use of PEER outputs for STEM Education in middle schools: Focus on Gaafu Dhaalu Atoll.
- Demonstrate the use of scientific information resource management, hazard and dengue risk management.
- Support citizen science and community resource management and risk management.

Dr. Lareef Zubair talking to the parents at the Huvadhoo School

The Weather Station mounted on top of the Thinadhoo School building



Time series of Relative Pressure, Humidity, Wind speed, Temperature and Dew point - generated by data obtained from the Maathodha weather stations

What has been done?

- Planning based on consultation between SIRC, FECT, MNU and schools.
- Scientific information and weather data made accessible.
- Set up a STEM student portal – stem.climate.mv
- Workshops on research for Sustainable devolopment at schools.

Fares-Maathoda (Huvadhoo School - Primary and Middle School)

- Automatic Weather Station installed and setup online.
- Light microscopes provided to the SIRC Research Centre and FECT.
- Moderate Magnification Digital Microscopes provided to SIRC and FECT.
- Water Quality analysis equipment distributed to schools, SIRC and FECT.

Thinadhoo (G. Dhaalu Atoll Zonal Education Centre - High School)

- Automatic weather instrument installed and setup online.
- Water quality instruments provided to students.
- Co- Principal attended as judge for science fair at G. Dhaalu Atoll Zonal Education Centre.

Workshop at Thinadhoo school conduct by SIRC

Lareef Zubair hands over the Weather Station and Water Quality Meters to G. Dh. Atoll Education Center, Thinadhoo

PARTNER INSTITUTIONS

Small Island Research Centre

Coordinator: Aishath Abdulla

Team: Shahaama Sattar

Directors: Mohamed Aslam, Hussein Zahir

FECT and FECT-MV

Coordinator: Ashara Nijamdeen

IT Coordinator: Tuan Hadgie, Chayana Gunathilake

Co-Principal Investigator: Lareef Zubair

PARTNERS

Maldives National University (MNU)- Male and Thinadhoo.

Huvadhoo School, Fares-Maathoda, Gaafu Dhaalu Atoll.

Gaaafu Dhalu Atoll Zonal Education Centre, Thinadhoo.

About Small Island Research Centre (SIRC)

Small Island Research Centre (SIRC) is a Research Institute with offices in Male and Fares-Maathoda.

About Foundation for Environment Climate and Technology (FECT)

The Foundation for Environment, Climate and Technology (FECT) has carried out three PEER and other projects in the Maldives since 2009. Through these projects FECT has assembled useful data, scientific output, operational climate services and tools. These outputs shall be useful to support policy makers, resource managers and program managers. FECT has been registered in the Maldives.

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