

10th ANNIVERSARY REPORT

2009 – 2018

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FOUNDATION FOR ENVIRONMENT,
CLIMATE AND TECHNOLOGY
MALDIVES

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CLIMATE AND TECHNOLOGY-MALDIVES**

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Institutional Profile

Introduction

The Foundation for Environment, Climate and Technology builds on 11 years of work in Sri Lanka by the International Research Institute for Climate and Society, Columbia University in the City of New York, FECT, Inc., FECT Sri Lanka.

However, it was only formally registered as a non-governmental organization with the Ministry of Community Empowerment last year to support local funding.

Profile

Company Name: Foundation for Environment, Climate and Technology

DATE OF INCORPORATION: 21 August 2018

NGO REGISTRATION NUMBER: CR/48/2018

DIRECTORS: Ms. Hudha Ahmed

Dr. Mizna Mohamed

Web and Social Media

Website: <http://www.tropicalclimate.org/maldives/>

Facebook: <http://facebook.com/fectmv>

Twitter: <https://twitter.com/fectmv>

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Overview

Since 2009, personnel attached to Columbia University, International Research Institute, Foundation for Environment Climate and Technology (FECT) has undertaken work in climate science, impacts, adaptation and disaster risk management in the Maldives. Since 2011, we have been undertaking an operational monthly climate bulletin, which is circulated widely. Here, we summarize the events, projects, programs, partnerships, personnel, and outputs for the last decade.

Institutional History: FECT started working on climate related projects in the Maldives back in 2009. Formal registration of Foundation for Environment, Climate and Technology in Maldives took place in August 2018.

Climate Impact Work: We have demonstrated the use of hydro-climatic information with projects for water resources management, malaria and dengue risk assessment and disaster risk management.

Climate Work: We have undertaken climatic diagnostics, climate prediction, hydro-climatic analysis, modeling, prediction, and climate change assessments.

Information Technology: We have undertaken, website development, interactive map servers and software development for scientific computation. We are developing high-performance computing and web services.

Publishing: We have published in newspapers, scientific journals, magazines, Internet, posters, newsletters and books.

Education: Staff working on our Maldives projects have obtained experience as researchers, provided IT services, administrative services, GIS, writing and accounting services. Further in collaboration with the Maldives National University (and its fore-runners), we partnered with the University of Peradeniya to launch a Masters in Development Practice which led to students from Maldives taking the courses and with Interns from the course undertaking work in Maldives.

Training: Our staff has obtained experience on job training. One of them obtained the Masters in Development Practice at the University of Peradeniya. We have conducted workshops for the the Maldives National University, the Maldives Meteorological Service, Small Island Research Centre, Fares Human Improvement Society, Ministry of Environment. We have supported students who undertook the Bachelors of Environmental Management and IT in MNU with lectures and guidance on projects.

Funding: Our work has been funded through grants from the Office of Global Programs at US National Oceanic and Atmospheric Agency (NOAA), MacArthur Foundation, Chicago, USA, US National Academy of Sciences (NAS), United States Agency for International Development (USAID), and the University of Colorado. We hope to sustain our work through new partnerships and projects.

In later sections, we provide details on our climate adaptation projects, work on climate, hydrology and environment, science, environment and society, our partnerships, and staff, and a list of our outputs.

Acknowledgement

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, Malé Water and Sewerage Company, G. Dh. Atoll Education Center, Thinadhoo, Huvaadhoo School and Dinemore.

We thank our sponsors and collaborators at the International Foundation for Science, National Oceanic and Atmospheric Administration (NOAA), MacArthur Foundation, University of Notre Dame, US Office of Naval Research, United States Agency for International Development (USAID) and the US National Academy of Sciences, and the University of Colorado.

Key Partners

Maldives National University

Dr. Mizna Mohamed (Senior Lecturer)
Dr. Shazla Mohamed (Dean/Science Faculty, MNU)
Ms Majeeda Mohamed (Ministry of Environment)

Renewable Energy Maldives

Ms. Hudha Ahmed

Maldives Meteorological Service

Dr. Zahid

SIRC/LaMer

Mohamed Aslam
Hussein Zahir
Shahaama Abdul Sattar
Aishath Abdulla
Ali in SIRC Maathoda

Red Crescent Maldives

Ms. Aishath Afaaf

Male Water and Sewerage Ccompany

Mohamed Rasheed (late)

G. Dh. Atoll Education Center

Shifaz Mohamed (Principal)

Huvadho School

Faleela (Principal)

Partners

Maldivian Institutions

Ministry of Environment & Energy

Marine Research Centre
Ministry of Tourism Arts and Culture
Disaster Management Centre
Maldives National University
Renewable Energy Maldives
UNDP Maldives
LaMer (Pvt) Ltd
Maldives Meteorological Service
Male Water and Sewerage Company
Health Protection Agency
Ministry of Fisheries and Agriculture
Small Island Research Centre / Group

International Collaborators

National Aeronautical and Space Agency, USA (NASA)
Frontier Research System for Global Change, JAMSTEC, Japan (FRSGC)
Lamont -Doherty Earth Observatory (LDEO)
Columbia University (CU)
Center for Environmental Research and Conservation (CERC)
Center for International Earth Science Information Network (CIESIN)
Cochin University of Science and Technology, Kerala, India (CUSAT)

Sources of Financial Support

MacArthur Foundation, Chicago, USA
US National Academy of Sciences
National Oceanic and Atmospheric Administration, USA. (NOAA)
USAID
UNESCO-IHE
APCC- APEC Climate Center
Maldives Ministry of Environment

Projects

Sponsored Projects

1. STEM Education and Capacity Building in Southern Maldives, sponsored by USAID. (2018-2019)
2. Can drought and flood hazard be skillfully assessed at fine spatial resolution from combining constrained streams of observed, remotely sensed and model predicted data in Sri Lanka and the Maldives? Sponsored by US National Academy of Sciences. (August 2015 – July 2018)
3. 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, from the US National Academy of Sciences.
4. Intra-seasonal climate predictions for Sri Lanka and Maldives for water resources management, sponsored by USAID (2012-2016).
5. Launching a Masters in Sustainable Development Practice at the University of Peradeniya (2010 - onwards). Sponsored by the MacArthur Foundation, USA.

Internal Projects

6. Climate and Dengue in the Maldives (2014 Onwards)
7. Climate Predictions for Maldives (2011 onwards)
8. Planning for Capacity and Science Development in Climate in Maldives (2009-2011)
9. Climatological Analysis (2010-2011)
10. Satellite Rainfall Monitoring Tool (2009-2010)

Details on the Projects

1. STEM Education and Capacity Building in Southern Maldives (2018-2019)

Based on the suggestion of our PEER program manager (Dr. Dalal Najib), we proposed to support Science, Technology, Engineering, and Mathematics (STEM) learning in the remote island schools in Southern Maldives. The project is being undertaken in the Fares-Maathoda and Thinadhoo islands in the Gaafu Dhaalu Atoll by the equatorial passage.

We were able to prepare instruments and documentation and trialing procedures were undertaken. After obtaining permission to work with the Gaafu Dhaalu Atoll Education Centre and Huvadhu School, discussions were held with the principals, teachers to plan project implementation. So far,

- Weather stations have been installed in both schools are online
- Water quality instruments, microscopes and a weather station were made available to the students.
- Support for the upcoming science fair is anticipated
- A portal is being developed to provide access to students and their educators to resources at SIRC and FECT.

PI - Mohamed Aslam, Co-PI - Lareef Zubair. The US National Academy of Sciences sponsors this project.

2. Can drought and flood hazards be skillfully and robustly assessed at fine spatial resolution in Maldives and Sri Lanka? (2015-2018)

The project goals were to assess drought, and flood hazard risk using climate, terrestrial and societal information. So far, we have been able to

- Establish partnerships with government, private sector and civil society groups
- Compile climate and disaster data

- Provide a weekly, monthly and annual digest of climate diagnosis, monitoring and predictions.
- Set up data management systems
- Set up instruments for
 - Automatic weather stations with online access.
 - Air quality measurements in Male
 - Soil moisture
 - Used these data for real time monitoring
- Undertake case studies to diagnose the role of climate and other factors.
 - Drought and water scarcity in Greater Male
 - Water scarcity assessment by island in Maldives
 - Dengue risk in Maldives
 - Repeated flood disaster in Akurana in Sri Lanka
 - 2016 Landslide Disaster in Aranayaka in Sri Lanka
- Write research papers
- Develop information provision portals
- Communicate via newspapers, blogs and social media
- Provide in-service training and internships to about 12 junior scientists
- Contribute content for teaching at the Maldives National University and University of Peradeniya
- Undertake timely reporting of quarterly and annual project reports.

Project PI - Prof.P.Wickramagamage, Co-PI - Dr.Lareef Zubair and Dr.Zahid (MMS). This project was sponsored by US National Academy of Sciences, USAID.

What has been done?

- I. Climate Analysis and Tools-Progress
 - Compilation of climate predictions.
 - Ongoing weekly & monthly dissemination of climate reports.
 - Developed tools for drought monitoring
 - Drought Portals for Sri Lanka and Maldives, which are comprehensive resources on droughts, were launched.
- II. Dissemination and Training
 - Conference contribution.
 - Training of junior scientists.
 - Conducting University lectures at UoP Sri Lanka and MNU.
 - Web & social media dissemination of products.
 - Workshops, Media outreach.
 - Communication strategy.

III. Case Studies

Through case studies and the monitoring systems, the team has undertaken a detailed study of information to support decision making for

- Water Budgeting for each Islands in Maldives
- Flood Prediction without significant observation
- Drought Monitoring based on satellite data
- Air Quality impacts in an agricultural area affected by Industry
- Landslides and cyclone in Sri Lanka

3. 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)

Scientists from the Foundation for Environment, Climate and Technology, Maldives National University, Columbia University worked with others in Universities, Water Supply and Meteorological Services to develop monitoring and predictive tools for drought risk and to address a riddle in climate change projections which predict a wetter climate although what has been experienced is sustained drying. PI - Dr. Lareef Zubair and Co-PI - Dr. Mizna Mohamed (MNU). This project was sponsored under the PEER program of the US National Academy of Sciences and USAID program in Sri Lanka and Maldives.

What has been done?

- I. Climate Analysis and Tools-Progress
 - Developed tools for rainfall monitoring from Satellite data.
 - Compilation of climate predictions.
 - Ongoing weekly and monthly dissemination of climate reports.
 - Developed tools for drought monitoring.
- II. Drought Risk Assessment
 - Estimating water scarcity in Greater Male'.
 - Data analysis on disasters in Sri Lanka.
 - Seasonal climate reports for Sri Lanka.
 - Pinga Oya floods and environment assessment.
- III. Scientific Conferences and Publications
 - Conference contribution.
 - Book publications.
 - Journal publications.
 - Pinga Oya symposium proceedings.
- IV. Dissemination and Training
 - Training of junior scientists.
 - Contribution to University education.
 - Web and social media dissemination of products.
 - Workshops, Media outreach

4. Climate and Water in Sri Lanka and Maldives (2012-2015)

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 aims 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 will test IS climate predictions and assess their use for water management in Sri Lanka.

The overall goal of the project is to promote better understanding of IS variability of rainfall around Sri Lanka and Maldives, refine prediction schemes, 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 investigator's affiliation with the Mahaweli Authority of Sri Lanka, which is the nation's coordinating agency for water management, the project has potential for near-term impact as improved prediction models are developed and tested. PI - Dr.Lareef Zubair and Co-PI - Prof.P.Wickramagama. Sponsored by US National Academy of Sciences.

What has been done?

- I. Climate Analysis and Tools
 - Analysis of Impacts of El Nino on Climate by region and season.
 - Analysis of Impacts of Madden Julian Oscillation on Climate by region and season.
 - Developed Tools for Rainfall Monitoring from Satellite data.
 - Climate Prediction systems.
- II. Water Resources
 - Operational climate decision support for National Water Management by Mahaweli Authority Water Management Secretariat.
 - Small basin catchment management in Pinga Oya, a tributary of Mahaweli in Kandy.
 - Monthly Climate Analysis for Maldives.
 - Water Scarcity Assessment in Greater Male through Surveys.
- III. Training, Education and Outreach
 - Six staff members obtained in house training in Climate Research.
 - Contributed Course content for University of Peradeniya and Maldives National University on Climate and Water.
 - Sponsored and guided research of students
 - Had programs for schoolchildren on Climate, Water and Environment in Pinga Oya Catchment and in Male.

5. Masters in Development Practice, University of Peradeniya

The two year program has been designed to equip development practitioners to address sustainable development challenges across the sciences, health, natural, social and management. This cross-disciplinary academic curriculum promotes the development of knowledge, skills and other attributes of an effective professional. The curriculum at the University of Peradeniya has a focus on (1) Coastal Regions and Tropical Islands, (2) Millennium Development Goals and Poverty Measurement and Analysis, (3) Climate Change in South Asia, and (4) Technology for Sustainable Development.

After the first year, students may opt for a post-graduate diploma. A three month internship commences subsequently. Internships could be offered through the Foundation for Environment, Climate, and Technology, with availability depending on the host institutions

The Maldives has taken a leading role in promoting sustainable development and low-carbon growth internationally. Maldives is one of the most vulnerable countries on earth to global environmental

change. The Ministry of Housing and Environment was an early partner in the development of the Masters in Development Practice. The Ministry recognizes that education and training opportunities for Maldivian students, research programs and collaborations with international researchers and educationists are critical.

We are undertaking the following programs to prepare for greater collaboration.

- Outreach to Ministry of Environment and partners through visits.
- Investigate MDP student, internship and staff placement opportunities.
- Develop specific information for MDP on student enrolment and internship opportunities
- Develop local internship opportunities.
- Conduct Workshops or Joint Research Supervision

MacArthur Foundation, USA, sponsored this project.

List of Proposals

1. Adaptation to Climate Change, Disaster Risk Reduction and Climate Change Mitigation through improved management of Energy, Water and Coastal resources in Sri Lanka and Maldives - European Commission- 2009
2. Strengthening Civil Society Capacity for Community Based Adaptation to Climate Change and Climate related Hazards in Sri Lanka and Maldives – July 2010
3. “Assessing Water Scarcity and Alternative Mitigation options for the Maldives” to Sustainable Development Department, South Asia Region, World Bank. Although the proposal was accepted it was not undertaken due to inadequate budget. (Lareef Zubair (PI)) - July 2012
4. “Delineating Near-Term Climate Change, Water Sustainability and Drought Risk for Adaptation and Risk Management in the Maldives” to Partnerships for Enhanced Engagement in Research (PEER) Program. L. Zubair (PI) - December 2012
5. “Investigating Recent Trends in Seasonal Climate for Sri Lanka and Maldives for Water Resources Management using a Regional Climate Model” to USAID Small Grants Program (JianHua Qian (PI), L. Zubair (co PI)) - May 2013
6. 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. US National Academy of Sciences (PI– Lareef Zubair) - January 2014
7. Proposal for Supplementary Funding for Communication, Project: Intra-Seasonal Climate Predictions for Sri Lanka and Maldives for Water Resources Management. US National Academy of Sciences (PI: Lareef Zubair) - October 2014
8. Pre-proposal to the Partnerships for Enhanced Engagement in Research (PEER) Program entitled, “Predicting Dengue Risk from Environmental, Entomological, and Societal Information to aid public health management in Sri Lanka and Maldives”. Principal investigator: Dr. P.H.D. Kusumawathie - April 2015
9. Proposal on Dengue submitted to Asia Pacific Network sent by Swadhin Behera of JAMSTEC, Japan with us as a partner.
10. Mr. Zahir Hussein, Dr. Lareef Zubair, Ashara Nijamdeen a proposal on Coral Bleaching Studies in the Maldives: Towards developing Environmental and Economic Resiliency for Atoll Ecosystem was submitted to the US National Academy of Sciences in January 2018.

11. Improved Planning, Design and Operations of Renewable Energy Systems through the use of Advanced Climate Science and Technology in Maldives and Sri Lanka, submitted to the Islamic Development Bank.

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Awareness-2

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Climate change-1, 2, 4, 6

Communication-7

Coral bleaching-10

Coastal management-1

Dengue-8, 9

Disaster management-1, 6

Energy-1

Water resources-1, 3, 5

Timeline

2009

- Lareef Zubair presented a seminar on Climate Adaptation at the Ministry of Environment.
- Meetings with Ministry of Environment and Department of Meteorology, August 2009.
- Proposal on – “Adaptation to Climate Change, Disaster Risk Reduction and Climate Change Mitigation through improved management of Energy, Water and Coastal resources in Sri Lanka and Maldives” was submitted to the European Commission.

2010

- In March, Lareef Zubair held discussions on initiative on developing climate center and on internship placements with the Assistant Resident Representative and officials of Ministry of Housing, Transport and Environment, Department of Meteorology, Maldivian College of Higher Education and Renewable Energy in Male.
- Collaboration with Maldivian Ministry of Environment on Plans for Capacity Building
- Collaboration with Renewable Energy on Proposal Development, on “Strengthening Civil Society Capacity for Community Based Adaptation to Climate Change and Climate related Hazards in Sri Lanka and Maldives” (July 2010).

2011

- Visit to Maldives by Lareef Zubair focusing on setting up collaborative arrangements for the forthcoming Masters in Development Practice (MDP) at the University of Peradeniya, Sri Lanka and initiating capacity building programs.
- Website representing our work - <http://www.tropicalclimate.org/maldives> was launched.
- Proposal on “Intra-Seasonal Climate Predictions for Sri Lanka and Maldives for Water Resources Management” submitted to Partnerships for Enhanced Engagement in Research (PEER). (Nov 2011)
- Monthly Hydro-meteorological Advisory services were initiated.

2012

- Grant for “Intra-seasonal climate predictions for Sri Lanka and Maldives for water resources management” from the US National Academy of Sciences awarded. Investigators – Lareef Zubair and P. Wickramagamage (2012 -2013).
- Visit to Maldives by Lareef Zubair focusing on developing knowledge and capacity for setting up MDP, developing science of climate change and develop capacity in mitigation and adaptation.

2013

- Lareef Zubair carried out surveys in the islands Hulhumale and Villingili related to the project on water resources management.
- Yoosuf Ashraj and K. Wijeratna visited Maldives with the aim to understand and get involved with projects of Renewable Energy Maldives.
- Proposal on “Delineating Near-Term Climate Change, Water Sustainability and Drought Risk for Adaptation and Risk Management in the Maldives” submitted to Partnerships for Enhanced Engagement in Research (PEER) Program. (L. Zubair (PI)) (December 2012)
- Proposal on “Investigating Recent Trends in Seasonal Climate for Sri Lanka and Maldives for Water Resources Management using a Regional Climate Model” submitted to USAID Small Grants Program (JianHua Qian (PI), L. Zubair (co_PI)). (May 2013)

2014

- In August, Rimza Muhlees met with Ms. Hudha Ahmed of Renewable energy Maldives, Sri Lankan High Commissioner (Mr. W.G.N.H. Dias) and Ms. Mizna Mohamed – Maldivian National University, with regard to registering FECT in Maldives.
- In December, Lareef Zubair held discussions with partners.
- Twitter account <https://twitter.com/fectlmv> and a Facebook account were setup. Mail management system was implemented.
- The US National Academy of Sciences granted our proposal on “Drought Monitoring and Climate Change Assessment for Sri Lanka and Maldives”. Investigator – Lareef Zubair (2014 -2017).
- Concept notes were submitted to APN program by our collaborator from Japan. We were awarded a grant to investigate climate change and water resources in Sri Lanka and Maldives.

2015

- Our data resources were incorporated into the Data Library.
- Automated climate report generation was initiated for Maldives.
- Visit to Maldives by Lareef Zubair to have discussions with officials of MNU, National Disaster Management Center Meteorological Service and Renewable Energy Maldives.
- New posters for Maldives in particular were prepared and were compiled into a poster book that was sent to key partners.
- In September, Lareef Zubair, Prabodha Agalawatte, and Janan Viswanathan met with the staff of MNU and our partners in other organizations.
- Workshop on Climate and Water Security, at Maldives National University, Male’, 13th September 2015.

- Pre-proposal to the Partnerships for Enhanced Engagement in Research (PEER) Program entitled, “Can drought, flood and landslide hazard be skillfully assessed at fine spatial resolution from combining constrained streams of observed, remotely sensed and model predicted data in Sri Lanka and Maldives?” was submitted to PEER. Principal investigator: Dr. Piyasena Wickramagamage.
- Pre-proposal to the Partnerships for Enhanced Engagement in Research (PEER) Program entitled, “Predicting Dengue Risk from Environmental, Entomological, and Societal Information to aid public health management in Sri Lanka and Maldives” was submitted to PEER. Principal investigator: Dr. P.H.D. Kusumawathie.
- Completed the project on “Intra-seasonal climate predictions for Sri Lanka and Maldives for water resources management” from the US National Academy of Sciences. Investigator – Lareef Zubair (2012 -2015).
- Work on our project on “Can drought, flood and landslide hazard be skillfully assessed at fine spatial resolution from combining constrained streams of observed, remotely sensed and model predicted data in Sri Lanka and Maldives?” commenced. (PI – P. Wickramagamage, L. Zubair, Zahid, 2015 – 2018).

2016

- Udara Ratnayake had a meeting with Dr. Zahid of Maldives Meteorological Services to discuss about Water Scarcity and availability of Data, in February, in Colombo.
- Published articles on El Nino Impact for 2016 for Sri Lanka, and for Maldives, in the Climate Change Magazine by Dr. Mickey Glantz
- L. Zubair & P. Wickremagamage participated at the student workshop on GIS and Climate at the Maldives National University in May 2016.
- Lareef Zubair participated at the workshop on Research topics and plans for the Bachelor of Environment Management held at the Maldives National University, Male’, on August 2016.
- Prabodha Agalawatte attended the Maldives Marine Science Symposium held at the MNU in October 2016.
- New weather station was installed in Southern Maldives in collaboration with LaMer at Small Island Research Centre.
- Soil Moisture and Temperature measurement Instruments at 4 depths along with transmission and automated data-logging were provided for Maldives.
- Advice on setting up a Geographic Information Systems upon the request from the Director of Water Resources.

2017

- Lareef Zubair, Janan Visvanathan held meetings with ongovernment partners, private sector participants and USAID officials. Soil moisture instruments installed at the MMS. 24th - 25th of January 2017.
- In July, Lareef Zubair, Ashara Nijamdeen had meetings with collaborative institutes and organized a program for the students of Huvadho School.
- Lareef Zubair had meetings with MNU, Health Protection Agency, Marine Research Centre and nongovernment partners, private sector participants, Renewable Energy Maldives and LaMer on 9th to 11th of December 2017.

- 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 Principal Investigator: Lareef Zubair, Prof. Wickramagamage, PEER supplementary proposal submitted.
- Automatic weather station (AWS) was installed in Maathoda in collaboration with SIRC.
- Contributed to Educational programs at the Maathoda School in Gaafu Daalu Atoll in Maldives.

2018

- Initiated our project on 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 (PI – P. Wickramagamage Co PI - Lareef Zubair)
- FECT-MV was formally registered in August 2018.
- Dr. Lareef Zubair visited Thinadhoo Education Centre and Huvadho School with regard to the STEM project in September 2018. Automated Weather Station provided to Thinadhoo School.

2019

- Visit to Maldives by Lareef Zubair and Tuan Hadgie with regard to the STEM Project and for planning for the science fair which is to be held in the Thinadhoo School in July 2019.
- Developed a proposal on “Improved Planning, Design and Operations of Renewable Energy Systems through the use of Advanced Climate Science and Technology in Maldives and Sri Lanka” and submitted to Islamic Development Bank.

Operational Services

At FECT we have been undertaking and providing analysis for the last years on the climate in the Maldives. Since 2017, we have developed a drought portal. In 2019, we are developing a web portal for students to learn from the projects to advance STEM education. The links for these:

- **Climate Services:** In collaboration with the Maldivian Meteorological Services. Monthly Hydro-meteorological Advisory services to Maldives, via <http://fectmv.blogspot.com> and <http://www.tropicalclimate.org/maldives> , from 2011 onwards.
- 12 monthly reports distributed via email, posted on Facebook, and distributed via twitter
- **Drought Monitoring Portal:** Developed the Drought Monitoring Portal (www.tropicalclimate.org/maldives/drought/)
- Educational Portal for Middle and High School Students

Weather and Soil Moisture Instruments

We have helped set up instruments for weather, soil moisture and air quality in Central and Southern Maldives in partnership with the Maldives National University, Maldives Meteorological Service and Small Island Research Centre and the Gaafu Dhaalu Atoll Education Centre. These details are:

- Automated Weather Station operated by LaMer at Small Island Research Centre, Southern Maldives. Data reviewed in August of 2018. http://www.climate.lk/Media_page/automated-weather-station-sirc-mathota.pdf

- Automated Weather Station provided to Thinadhoo school
<https://disaster.lk/weathermonitoring>
- Soil Moisture and Temperature Measurement Instruments at 4 depths along with transmission and automated data-logging were provided. (Operated by SIRC, MMS and MNU.)
http://www.climate.lk/Media_page/soilMoisturerev7.pdf
- Air quality instrument provided to Maldives National University, used for training of students.

Workshops

Ministry of Environment, Maldives (2009)

Lareef Zubair presented a seminar on capacity building programs for the Ministry of Environment at the invitation of the Minister of Environment.

Climate and Water Security in the Maldives (September 2015)

Workshop on Climate and Water Security in the Maldives, at Maldives National University, Male, 13th September 2015.

- Zubair, L., “Introduction to the Workshop and Welcome”.
- Agalawatte, P., “The Monthly Climate Advisory from FECT/MMS/IRI: Monitoring Weather and Climate for Maldives”.
- Zubair, L., “Climate Science for the Maldives in Relation to Water Scarcity”.

GIS and Climate (May 2016)

L. Zubair & P. Wickremagamage participated at the student workshop on GIS and Climate at the Maldives National University.

Lectures

- May 2016 - Wickramagamage, P. Lecture on GIS to the Bachelor of Environment Management students and lecturers at the Faculty of Science.
- May 2016 - Zubair, L. - Lecture on Data Library, FECT work, and Global Data Access.

Research (August 2016)

Lareef Zubair participated at the workshop on Research topics and plans for the Bachelor of Environment Management held at the Maldives National University, Male’ on 29th August, 2016.

Publications

Technical Reports

2018

Banuka Wijerathne, (2018) Industrial Project Report, Quantifying Climate Impacts on Dengue in Maldives, Supervisor, Zubair, L. FECT Technical Report. Foundation for Environment, Climate and Technology, Digana.

2017

Rathnayake, Udara., Zubair, L., Wickramagamage, P. System Dynamic Model for Water Scarcity in Maldives, FECT Technical Report 2016-09, Foundation for Environment, Climate and Technology, Digana, December 2016.

Zubair, L., Lokuhetti, R. Visvanathan, J. Zahid, Michael, B. (2016). Climate Monitoring and Prediction for Maldives, FECT Technical Report 2016-11, Foundation for Environment Climate and Technology, Kandy

Wijerathne, K. and L. Zubair (2017). Survey of Water Use and Water Budgeting in Greater Malé Maldives (Villingili, Hulhumale & Hulhule). FECT Technical Report 2017-01 Foundation for Environment, Climate and Technology, (Pages 25)

Wickramagamage, P. (2017): Water Resources of the Republic of Maldives. FECT Technical Report 2017-03, (Pages 44) Foundation for Environment, Climate and Technology, Digana.

Lareef Zubair, Nishan Ahmed, Majeeda Mohamed, Zahid, (2017): Climate Drives the Seasonal and Regional Variation in Dengue Incidence in the Maldives, FECT Technical Report 2017-11, (Pages 15) Foundation for Environment, Climate and Technology, Digana

2016

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Websites, Social Media and Mailing Lists

We have maintained websites, social media and mailing lists for Maldives.

Subscriptions is included in <http://www.climate.lk/subscribe.html>

- **Websites:** <http://www.tropicalclimate.org/maldives>
- **Blogs:** fectmv.blogspot.com is being regularly updated. <https://maldivesclimate.wordpress.com/>
- **Twitter:** <https://twitter.com/fectmv>
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