



# FOUNDATION FOR ENVIRONMENT, CLIMATE AND TECHNOLOGY MALDIVES



# 15th ANNIVERSARY REPORT

2009 - 2024

[www.climate.mv](http://www.climate.mv)

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# HIGHLIGHTS AT A GLANCE

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15

Years of Climate Service  
2009 – 2024

6

Sponsored Projects  
Completed

5+

International Funding  
Organisations

14+

Maldivian Partner  
Institutions

12+

Junior Scientists  
Trained

180+

Monthly Climate  
Reports Produced

3

Countries of  
Collaboration

2

AWS Stations Deployed  
in Maldives

## Key Milestones

|      |   |
|------|---|
| 2009 | FECT begins climate work in the Maldives; seminar presented at the Ministry of Environment.   |
| 2011 | Operational monthly climate bulletin launched — still running today after 180+ consecutive editions.                                    |
| 2012 | US National Academy of Sciences grant secured for intra-seasonal climate predictions for water resources management.                    |
| 2014 | Drought monitoring and climate change assessment grant awarded; FECT-MV social media launched.  |
| 2015 | Maldives climate data incorporated into the Data Library; Workshop on Climate and Water Security at Maldives National University (MNU). |
| 2018 | FECT-MV formally registered as a Maldivian NGO. STEM project launched in Southern Maldives.   |
| 2019 | Air pollution monitoring systems and IoT weather infrastructure deployed in Maldives.   |
| 2022 | Maldives Chapter published in Springer book on El Nino Ready Nations and Disaster Risk Reduction.                                       |
| 2023 | FECT's Maldives work featured in the World Bank's Good Neighbors book.  |

|   |  |
|---|--|
| <p><b>Climate Monitoring &amp; Prediction</b><br/>Monthly climate bulletins, seasonal forecasts, drought monitoring systems, and hydro-meteorological advisory services supporting decision-making across the Maldives since 2011.</p>              | <p><b>Water Resources &amp; Hydrology</b><br/>Research, monitoring, and assessment of water resources, rainfall variability, groundwater systems, drought conditions, and climate impacts on water security.</p>   |
| <p><b>Disaster Risk Reduction</b><br/>Monitoring and analysis of weather and climate hazards, disaster risk assessments, early warning support, and resilience-building initiatives for vulnerable communities.</p>                                 | <p><b>Infectious Disease &amp; Climate Research</b><br/>Studies on the links between climate variability, environmental conditions, and infectious disease risks to support public health planning and preparedness.</p>   |
| <p><b>Research &amp; Publications</b><br/>Peer-reviewed journal articles, conference papers, technical reports, and scientific assessments covering climate, water, air quality, disaster risk, and environmental management.</p>                   | <p><b>Instrumentation &amp; Monitoring Systems</b><br/>Development and deployment of automated weather stations, air quality monitoring systems, hydrological instruments, and IoT-based environmental observation networks integrated with web-based data platforms.</p>  |
| <p><b>Education &amp; Capacity Building</b><br/>Training and mentoring of junior scientists, university teaching and guest lectures, professional development programs, and public awareness initiatives in climate and environmental sciences.</p> | <p><b>STEM Education &amp; Outreach</b><br/>Through STEM Climate Maldives, we inspire and empower students and young people through hands-on science education, environmental awareness programs, workshops, competitions, and community outreach initiatives focused on climate, weather, and sustainability.</p> |

## Profile

|                              |  |
|------------------------------|--|
| <b>Company Name</b>          | Foundation for Environment, Climate and Technology (FECT-MV) |
| <b>Start of Work</b>         | August 2008  |
| <b>Date of Incorporation</b> | 21 August 2018   |

|                              |  |
|------------------------------|--|
| <b>Date of Incorporation</b> | <b>President:</b> Ms. Hudha Ahmed<br><b>Vice President:</b> Dr. Lareef Zubair<br><b>Secretary:</b> Ms. Aishath Afaaf |
|------------------------------|--|

## Web and social media

| Websites   | Social Media   |
|--|--|
| <b>Main</b> : <a href="http://www.climate.mv">www.climate.mv</a>                               | <b>Facebook</b> : <a href="https://facebook.com/fectmv">facebook.com/fectmv</a> (Old)<br><a href="https://facebook.com/ClimateMaldives">facebook.com/ClimateMaldives</a> (New) |
| <b>STEM</b> : <a href="http://www.stem.climate.mv">www.stem.climate.mv</a>                     | <b>Twitter/X</b> : <a href="https://twitter.com/fectmv">twitter.com/fectmv</a>   |
| <b>Backup</b> : <a href="http://tropicalclimate.org/maldives">tropicalclimate.org/maldives</a> | <b>LinkedIn</b> : <a href="https://www.linkedin.com/in/fect-mv-119121281/">www.linkedin.com/in/fect-mv-119121281/</a>  |
| <b>Blog:</b> : <a href="http://fectmv.blogspot.com">fectmv.blogspot.com</a>                    |  |

## Contact Information

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|--|---|--|
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Fifteen years ago, a small team of scientists began quiet, determined work on one of the world's most climate-vulnerable nations. Today, the Foundation for Environment, Climate and Technology — Maldives stands as a recognised institution in climate science, capacity building, and environmental monitoring across the Indian Ocean region.

The Maldives faces climate challenges that are as urgent as they are complex. Rising seas, intensifying rainfall variability, prolonged droughts, and transboundary air pollution all demand a response grounded in evidence — yet for much of the past decade, the data needed to drive that response has been scarce. FECT-MV was established to help close that gap.

Building on 15 years of collaborative engagement with Columbia University, the Maldives National University, the Maldives Meteorological Service, and a wide network of Maldivian institutions and international partners, FECT-MV has developed a unique and proven capability in climate adaptation science for the Maldives. Our work spans climate prediction and monitoring, water resources management, dengue and health risk assessment, disaster preparedness, STEM education for remote island communities, and — most recently — air quality monitoring and source attribution across Sri Lanka and the Maldives.

Over these fifteen years, we have produced more than 180 consecutive monthly climate bulletins, trained over a dozen junior scientists, secured six major international grants, deployed automated weather and air quality instruments across the region, and contributed to peer-reviewed journals, Springer publications, and a World Bank book. We have done this through partnerships built on trust, scientific rigour, and a deep commitment to the communities we serve.

This anniversary report is both a record of what has been achieved and a statement of intent. The challenges facing the Maldives — and the Indian Ocean region — are growing. Climate change is no longer a distant threat; it is reshaping rainfall patterns, disrupting fisheries, and threatening freshwater security on islands with no margin for error. Our work must grow with that challenge.

We seek the support of partners, funders, and governments to expand our monitoring networks, deepen our analytical capabilities, and ensure that every policy decision affecting the Maldives and Sri Lanka is informed by the best available climate science. Fifteen years in, we are more certain than ever that this work matters — and more determined than ever to do it well.

**Ms. Hudha Ahmed**  
President, FECT-MV

**Dr. Lareef Zubair**  
Vice President, FECT-MV

**Aishath Afaaf**  
Secretary General, FECT-MV

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, Thinaadhoo, Huvaadhoo School and Dinemore. Our office bearers particularly Ms. Hudha Ahmed and Ms. Aishaath Afaaf helped to establish FECT-MV while contributing from other organizations. The committee of FECT-MV has been strengthened with the inclusion of Mr. Shifaz and Ms. Liusha Moosa. We also thank Dr. Shazla Mohamed (Dean/Science Faculty, MNU), Shaadiya (MNU lecturer), Dr. Naseer (MNU), Mr. Shameem Adam (MNU), Mr. Waheed (DG-MMS), Mr. Zahid, Mr. Muaz (Engineer - MMS) and Mr. Wahid (DG-MMS), Mr. Aslam (Director - LaMER), Hussein (Scientist – LaMER), Dr. Shiham Adam, Majeeda Mohamed, Nishan Ahmed and Dr. Naseer (Ministry of Health). We thank our sponsors and collaborators at the National Oceanic and Atmospheric Administration (NOAA), MacArthur Foundation, United States Agency for International Development (USAID) and the US National Academy of Sciences, Renewable Energy Maldives, and the University of Colorado. We had productive collaborations with personnel attached with Maldives National University, Land and Marine Environment (LaMER) and the Small Island Research Group (SIRC/G).

Since 2009, personnel attached to Columbia University, International Research Institute, Foundation for Environment Climate and Technology (FECT in New York and Sri Lanka) have undertaken work in climate science, impacts, adaptation and disaster risk management in the Maldives. Since 2011, we have been producing 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 with the Home Ministry took place in August 2018.
- **Climate Impact Work:** We have demonstrated the use of hydro-climatic information with projects for water resources management, 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. Two STEM education workshops were held for middle school students in Thinaadhoo and Fares Maathoda in Gaafu Dhaalu, Southern 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 Maldives National University, the Maldives Meteorological Service, Small Island Research Center, Fares Human Improvement Society and Ministry of Environment. We have supported students who undertook the Bachelors of Environmental Management and IT in MNU with lectures and guidance on projects.
- **Instrumentation:** A soil moisture instrument was installed in the grounds of the Maldivian Meteorological Service. Automatic weather station was installed at SIRC in Maathoda, G.Dh.A.Ed.C School in Thinaadhoo.
- **Funding:** Our work has been sponsored 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 partners, timeline, projects, operational services, instrumentation, workshops, publications, staff and outreach.

## Contributors

### Maldives National University

- Dr. Shazla Mohamed (Senior Research Fellow, MNU)
- Ms. Majeeda Mohamed (Formerly of Faculty of Science)
- Mr. Shameem Adam (Thinadhoo Campus)
- Ms. Noor Kaleel

### Independent Scientist

- Dr. Mizna Mohamed

### Maldives Meteorological Service

- Dr. Zahid (Until 2015)

### Ministry of Health

- Nishan Ahmed

### SIRC/LaMer

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

### Male Water and Sewerage Company

- Mohamed Rasheed (late)

### G. Dh. Atoll Education Center

- Shifaz Mohamed (Principal)

## Partners

### Maldivian Institutions

- Ministry of Environment & Energy
- Marine Research Center (MRC)
- Ministry of Tourism Arts and Culture
- Disaster Management Center (DMC)
- Maldives National University (MNU)
- Renewable Energy Maldives (REM)
- UNDP Maldives
- Land and Marine Resource LaMer (Pvt) Ltd

- Maldives Meteorological Service (MMS)
- Male Water and Sewerage Company (MWSC)
- Health Protection Agency (HPA)
- Ministry of Fisheries and Agriculture
- Small Island Research Center / Group (SIRC/G)
- Gaafu Dhaalu Atoll Education Centre (G.Dh.A.E.C)

### 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)
- International Research Institute (IRI)
- Botswana Meteorological Service
- Indian Institute of Science
- International Research Institute of Climate - and Society, New York

- Columbia Water Center
- Earth Institute at Columbia University
- UESIN
- Center for International Earth Science Information Network (CIESIN)
- Cochin University of Science and Technology, Kerala, India (CUSAT)
- Indian Institute of Tropical Meteorology
- University of Karachi, Pakistan
- Small Earth Nepal.

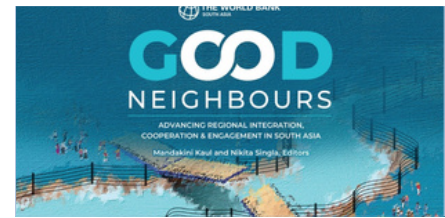
### Sources of Financial Support

- MacArthur Foundation, USA (Mac found)
- US National Academy of Sciences (NAS)
- National Oceanic and Atmospheric Administration, USA. (NOAA)

- USAID
- UNESCO-IHE
- APCC- APEC Climate Center
- Maldives Ministry of Environment (MME)

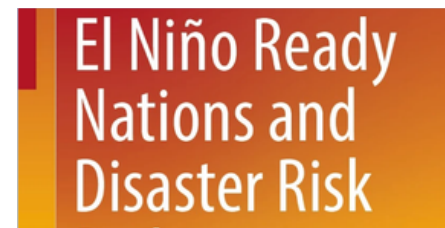
2023

- Nalaka Gunawardene's article on FECT in Sri Lanka helping establish FECT in Maldives included in World Bank's Good Neighbors book, Chapter 5, p47–57 – May
- Monthly Climate Reports for Maldives produced and distributed via social media – January to December



2022

- Maldives Chapter published in Michael Glantz's El Nino Ready Nations and Disaster Risk Reduction (Springer, USA), pages 45–62. Authors: Lareef Zubair, Ashara Nijamdeen and others at FECT
- Monthly Climate Reports produced and distributed via Social Media – January to December



2021

- Finalization of Maldives Chapter on El Nino effects in book edited by Michael H. Glantz



2020

- The Global Framework for Climate Services (GFCS) has teamed up with the Climate Services Partnership (CSP) to organize The Sixth International Conference on Climate Services, Pune, India – February.
- Climate Change Adaptation Project Informational Meeting was held with the participation of USAID project management specialists along with representatives of FECT-MV and MNU as an online meeting – September.
- Response to request for information USAID / Sri Lanka and Maldives Climate Change Adaptation (Reference Number: 2021/A) Hudha Ahmed, Aishath Afaaf, Mizna Mohamed, Shazla Mohamed, Lareef Zubair Foundation for Environment Climate and Technology-Maldives and Maldives National University, Malé – October.
- [www.climate.mv/](http://www.climate.mv/) was setup.
- The project on STEM education was completed.



2019

- Visit to Malé by Dr. Zubair and Tuan Hadgie with regard to the STEM Project and for planning for the Science Fair in the Thinadhoo School in July 2019.
- Completed projects on STEM education.
- Undertook projects on Dengue and Climate and Air Quality.
- Installed and maintained automated and web-enabled environment systems for weather, soil, moisture and air pollution at Thinadhoo island.
- Setting up a website to promote STEM education. We maintained operational climate impact services & generating content, disseminating regularly responding to queries and enabling the researchers both within and without.
- Maintained filing systems, library catalogs, internal blogs, Kanban boards and Wiki pages.



2019

- Continued to disseminate our weekly and monthly climate reports.
- Completed projects on PEER-Science, Technology Engineering and Mathematics (STEM).
- Mid-Year Review Meeting was held in July for FECT staff to mainly review the ongoing projects STEM education and Dengue project.
- Dr. Lareef Zubair and Tuan Hadgie participated in the STEM project planning meeting in April 2019.
- Dr. Lareef Zubair participated in a meeting regarding FECT-MV registration in August 2019.
- Dr. Lareef Zubair participated in a Science Fair and STEM Workshop at the Gaafu Dhaalu Atoll Education Centre and Huvadho School in September 2019.



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 – August.
- Dr. Lareef Zubair visited Thinadhoo Education Centre and Huvadho School with regard to the STEM project in September. Automated Weather Station provided to Thinadhoo School.



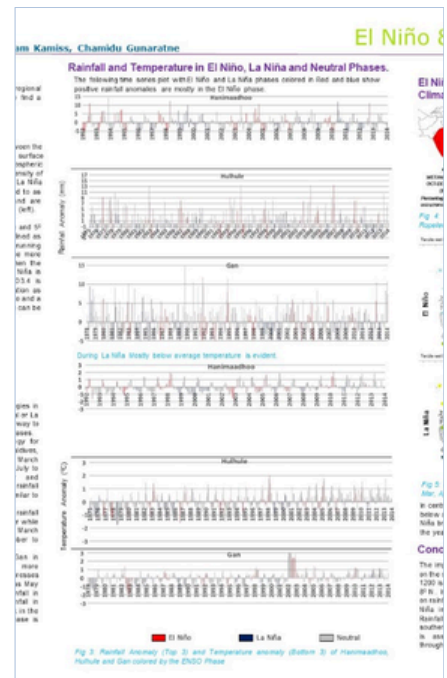
2017

- Meetings with non-government partners, private sector participants and USAID officials were held by Dr. Zubair and Janan Visvanathan.
- Soil moisture instruments were installed at the MMS on 24th and 25th – January.
- Dr. Zubair, Ashara Nijamdeen had meetings with collaborative institutes and organized a program for the students of Huvadho School in July.
- Dr. Zubair had meetings with MNU, Health Protection Agency, Marine Research Centre and non-government partners, private sector participants, Renewable Energy Maldives and LaMer on 9th to 11th of December.
- 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: Lareef Zubair, Prof. Wickramagamage). PEER supplementary proposal submitted.
- An Automatic Weather Station (AWS) was installed in Maathoda in collaboration with SIRC.
- Contributed to educational programs at the Maathoda School in Gaafu Dhaalu Atoll.



## 2016

- Mr. Udara Ratnayake had a meeting with Dr. Zahid of Maldives Meteorological Services on Water Scarcity and Availability of Data – February.
- Published articles on El Nino Impact for 2016 for Maldives, in the Climate Change Magazine by Dr. Mickey Glantz.
- L. Zubair & P. Wickramagamage participated in the student workshop on GIS and Climate at the Maldives National University in May.
- A workshop on Research topics and plans for the Bachelor of Environment Management was held at the Maldives National University, Male' – August.
- Mr. Prabodha Agalawatte participated in the Maldives Marine Science Symposium held at the MNU – October.
- 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.
- Setting up a Geographic Information Systems under the supervision of the Director of Water Resources.



## 2015

- Incorporating Maldives climate data resources into the Data Library
- Initiating the Automated climate report generation – Maldives
- Having discussions with officials of MNU, National Disaster Management Center, Meteorological Service and Renewable Energy Maldives
- Compiling New posters for Maldives into a poster book
- Dr. Zubair, Prabodha Agalawatte, and Janan Viswanathan had a meeting with MNU staff partners in other organizations – September
- Workshop on Climate and Water Security, was held at Maldives National University, Male', 13th September
- Completed the project on "Intra-Seasonal Climate Predictions for Sri Lanka and Maldives for Water Resources Management" in collaboration with the US National Academy of Sciences. (PI – Lareef Zubair 2012–2015).
- Work on our project "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).



## 2014

- A meeting held with the participation of Rimza Muhlees and Ms. Hudha Ahmed, the Director of Renewable Energy Maldives, Sri Lankan High Commissioner Mr. W. G.N.H. Dias and Ms. Mizna Mohamed – Maldivian National University – August
- Dr. Zubair held discussions with partners in December
- Twitter account <https://twitter.com/fectmv> and a Facebook account were setup and Mail management system was implemented



2014

- Proposal on "Drought Monitoring and Climate Change Assessment for Sri Lanka and Maldives" was granted. (PI – Lareef Zubair)(2014–2017)
- Proposal on Intra-Seasonal Climate Predictions for Sri Lanka and Maldives for the Water Resources Management (PL: Lareef Zubair) – October



2013

- Carrying out surveys in the islands Hulhumale and Villingili related to the project on water resources management by Dr. Zubair
- Visit to Maldives by Yoosuf Ashraj and K. Wijeratna for the projects of Renewable Energy Maldives



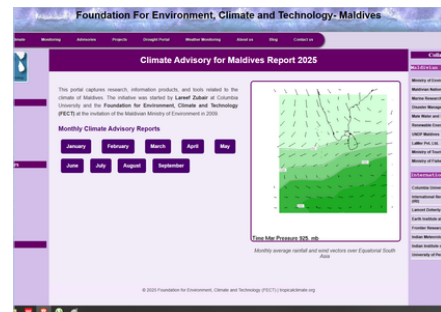
2012

- Dr. Zubair focuses on advancing climate change science and building capacity in climate change mitigation and adaptation, while supporting the development of MDP.
- The proposal on "Intra-Seasonal Climate Predictions for Sri Lanka and Maldives for Water Resources Management" selected for a grant (Lareef Zubair -PI) – May



2011

- Visit to Maldives by Dr. 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
- Launched the website – <http://www.tropicalclimate.org/maldives>.
- Proposal submission on "Intra-Seasonal Climate Predictions for Sri Lanka and Maldives for Water Resources Management" – November
- Conducting Monthly Hydro-Meteorological Advisory Services



2010

- Discussions were held on the development of a climate centre and internship placements with the Assistant Resident Representative and officials from the Ministry of Housing, Transport and Environment, the Department of Meteorology, the Maldives College of Higher Education, and the Renewable Energy Centre in Malé in March
- Collaboration with Maldivian Ministry of Environment on Plans for Capacity Building.



2009

- A seminar was held on Climate Adaptation at the Ministry of Environment
- Meetings was held with Ministry of Environment and the Department of Meteorology – August
- Launching a Masters in Sustainable Development Practice at the University of Peradeniya with a focus on Sri Lanka and Maldives, MacArthur Foundation, (co-PI - L. Zubair)



## Internal Projects

- Climate and Dengue in the Maldives (2014 onwards)
- Climate Predictions for Maldives (2011 onwards)
- Planning for Capacity and Science Development in Climate in Maldives (2009-2011)
- Climatological Analysis (2010-2011)
- Satellite Rainfall Monitoring Tool (2009-2010)
- Completed projects on PEER – Science, Technology, Engineering and Mathematics (STEM) (2018-2019 supplementary grants)

## Sponsored Projects

- STEM Education and Capacity Building in Southern Maldives, sponsored by PEER program of the National Academy of Sciences in collaboration with USAID. (2018-2019)
- 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 in collaboration with USAID. (August 2015 – July 2018)
- 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 in collaboration with USAID.
- Intra-seasonal climate predictions for Sri Lanka and Maldives for water resources management, sponsored by USAID (2012-2016).
- Launching a Masters in Sustainable Development Practice at the University of Peradeniya (2010 - onwards). Sponsored by the MacArthur Foundation, USA.
- Developing a Strategy for Developing Research in Climate in Maldives, Maldives Ministry of Environment (2008-2009).

## Details of the Sponsored 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- Mathoda and Thinaadhoo 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 Center and Huvadhoo 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 o Automatic weather stations with online access.
  - o Air quality measurements in Male.
  - o Soil moisture.
  - o Used these data for real time monitoring.
  - o Undertake case studies to diagnose the role of climate and other factors.
  - o Drought and water scarcity in Greater Male.
  - o Water scarcity assessment by island in Maldives.
  - o Dengue risk in Maldives.
  - o Repeated flood disaster in Akurana in Sri Lanka
  - o 2016 Landslide Disaster in Aranayaka in Sri Lanka o 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 for the Maldives?

#### 1. Climate Analysis and Tools-Progress

- Compilation of climate predictions.
- Ongoing monthly dissemination of climate reports.
- Developed tools for drought monitoring
- Drought Portals for Maldives, which are comprehensive resources on droughts, were launched.

#### 2. Dissemination and Training

- Conference contribution.
- Training of junior scientists.
- Conducting University lectures at MNU.
- Web & social media dissemination of products.
- Workshops, Media outreach.
- Communication strategy. Page12

#### 3. 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 Male

### 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.

**Investigators:** PI - Dr.Lareef Zubair and Co-PI - Dr. Mizna Mohamed (MNU).

**Sponsor:** 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 for the Maldives?

1. 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.
2. Drought Risk Assessment
  - Estimating water scarcity in Greater Male'.
  - Data analysis on disasters.
  - Seasonal climate reports.
  - Pinga Oya floods and environment assessment.
3. Scientific Conferences and Publications
  - Conference contribution.
  - Book publications.
  - Journal publications.
4. Dissemination and Training
  - Training of junior scientists.
  - Contribution to University education.
  - Web and social media dissemination of products.
  - Workshops and Media outreach.

### 4. Climate and Water in Maldives and Sri Lanka (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.

**Investigators:** (PI – Dr. Lareef Zubair and Co-PI – Prof. P. Wickramagamage.

**Sponsor:** US National Academy of Sciences.)

## What has been done?

### 1. 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.

### 2. 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.

### 3. 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 school children on Climate, Water and Environment in Pinga Oya Catchment and in Male.

## 5. Masters in Development Practice, University of Peradeniya (2009 to 2013)

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.

**Investigator:** Dr. Lareef Zubair

**Sponsor:** MacArthur Foundation through the University of Peradeniya.

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 enrollment and internship opportunities
- Develop local internship opportunities.
- Conduct Workshops or Joint Research Supervision
- (MacArthur Foundation, USA, sponsored this project.)
- STEM Project

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, we have undertake.

- Monthly Hydro-meteorological Advisory services to Maldives, via <http://fectmv.blogspot.com> and <http://www.tropicalclimate.org/maldives> , from 2011 onwards.
- Dissemination of drought monitoring for Sri Lanka and Maldives and automated climate report generation for Maldives were continued
- 12 monthly reports distributed via email, posted on Facebook, and distributed via twitter.
- Our website gave a running update on the current seasonal climate conditions.
- Drought Monitoring Portal: Developed the Drought Monitoring Portal ([www.tropicalclimate.org/maldives/drought/](http://www.tropicalclimate.org/maldives/drought/)). Educational Portal for Middle and High School Students. Data Assimilation: were obtained through our instruments and online sources assimilated for climate analysis through the Data Library.

## 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,

- Maathoda Automated Weather Station operated by LaMer at Small Island Research Centre, Southern Maldives. Data reviewed in August of 2018.
- Thinaadhdhoo Automated Weather Station provided to Thinaadhdhoo school.
- Soil Moisture and Temperature Measurement Instruments at 4 depths along with transmission and automated data-logging were provided. (Operated by SIRC, MMS and MNU.)
- MNU Male Air quality instrument provided to Maldives National University, used for training of students. We installed and are maintaining automated web-enabled environmental observations systems for weather, soil moisture and air pollution in Sri Lanka and Maldives. The automated soil moisture instrument was maintained in the observatory of the Maldivian Meteorological Service in Hulhule, Maldives. Data are uploaded automatically to the Internet for public access.

## Ministry of Environment, Maldives (2009)

- Dr. 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)

- FECT 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".
- Climate Change Adaptation in Sri Lanka & Maldives, Columbia University. March 2021 (PI: John Furlow)
- Characterizing and Mitigating COVID Impacts on STEM Education and Fisheries Operations in Remote, Far Flung and Low-Lying Islands of the Maldives, Maldives National University, Pre-Proposal. October 2021 (PI: Shazla Mohamed)

## GIS and Climate (May 2016)

- L. Zubair & P. Wickramagamage participated in the student workshop on GIS and Climate at the Maldives National University proposal. Climate Change Adaptation in Sri Lanka & Maldives, Columbia University. March 2021 (COP: Lareef Zubair) Page16
- Providing Lectures on Climate and GIS Page17
  - 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 Guidance Provided

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

We have been producing technical reports compilation, conference abstracts and extended abstracts. The details of them are provided below.

## Technical Reports

### 2020

- **Wickramagamage P., Zubair L., Nijamdeen A., Hadgie T., Kailaivasan T., Gunathilake C., Shakira F., Sathyendra D., Athawuda A.** (2020) Project Report, STEM Education and Capacity Building in Southern Maldives, Foundation for Environment, Climate and Technology (FECT).

### 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, U., 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

- **Lokuhetti, R., Agalawatte, P., Visvanathan, J., Zubair, L., Zahid and Bell, M.** (2016). Monthly Reports on Experimental Climate Monitoring and Prediction for the Maldives – (from January - December 2016). Technical Report. Foundation for Environment, Climate and Technology, Digana.
- **FECT.** Experimental Climate Monitoring and Prediction Highlights for the Maldives (produced fortnightly since June 2016). Technical Report. Foundation for Environment, Climate and Technology, Digana.

### 2015

- **Foundation for Environment Climate and Technology** (2015). Climate of Maldives and Its Impacts: Posters from FECT and Partners. Foundation for Environment Climate and Technology, Digana, FECT Technical Report 2015-04: November 2015.
- **Foundation for Environment Climate and Technology** (2014). Intra-Seasonal Climate Predictions for Sri Lanka and Maldives for Water Resources Management: Annual Technical Report: 2014. Foundation for Environment Climate and Technology, Digana, FECT Technical Report 2014-01: April 2014.

## Conferences

### 2020

- International Conference on Climate Services, Pune, India, February. Participant: Chayana Gunathilaka
- International Visitor Leadership Program, United States, March. Participant: Piushanai Ellegala
- American Geophysical Union Fall Meeting – Online presentations, December.

## Books

### 2023

- May 2023 **Nalaka Gunawardene** article FECT in Sri Lanka helping establish FECT in Maldives was included as a chapter in the Good Neighbors book by World Bank, Chapter 5, p47-57

### 2022

- Zubair , A Nijamdeen et Maldives in Michael H. Glantz, Ed EL Nino Ready Nations and Disaster Risk Reduction , Springer, publication 2022,pages 388

### 2018

- **FECT**, Proceedings of the Workshop on climate and water resources, Foundation for Environment, Climate and Technology, Maldives.
- **Wickramagamage, P.** (2018): Foundation for Environment, Climate and Technology, (Pages 44)

### 2018

- **FECT**, Proceedings of the Workshop on climate and water resources, Foundation for Environment, Climate and Technology, Maldives.
- **Wickramagamage, P.** (2018): Foundation for Environment, Climate and Technology, (Pages 44)

### 2011 - 2018

- **FECT**, Compilation of Monthly Climate Reports, Foundation for Environment, Climate and Technology-Maldives.

## Conference Abstracts

### 2021

- **N. Alahakoon, U. Adithya, A. Munas, L. Zubair**, Lessons from Developing and Sustaining Climate Services in Sri Lanka and Maldives for 15 years: Provision of Weekly/Monthly Bulletins, Advisory Services and Forensic Analysis, American Geophysical conference 2021

### 2020

- **Chayana G., Ruchira L., Nijamdeen A., Zubair L., Michael B.** (2020) Provision of Climate Advisory for Maldives for Disaster, Health and other Sectoral Management, International Conference on Climate Services, Pune, India, February 2020.
- **Shifaz. M., et.al.** (2020) Advancing STEM Education in a Middle and High School in Remote Islands of the Maldives. International workshop on 'Policy Making for Transforming Silo-Based Education to STEM Education for Developing Countries', Colombo, Sri Lanka, 10-12 June, 2020.
- **Zubair, L., et.al.** (2020) STEM Education in the far-flung and vulnerable small islands of Maldives. Can the Work of Scientists be beneficially harnessed? International Workshop on 'Policy Making for Transforming Silo-Based Education to STEM Education for Developing Countries', Colombo, Sri Lanka, 10-12 June, 2020.
- **Nijamdeen A., Zubair L., Wickramagamage P., Shifaz M., Hadgie T., Gunatillake C.** (2020) STEM Education in the far flung and vulnerable islands of Maldives: Can the work of Scientists be beneficially harnessed? American Geophysical Union Fall Meeting, 11th December 2020

## 2018

- **L. Zubair, R. Salih, A. Nijamdeen.** Climate drives the seasonal and regional variation in seasonality and epidemics across the scattered islands of the Maldives. Foundation for Environment Climate and Technology. American Geophysical Union Fall Meeting, Washington DC. December 2018.

## 2018

- **Zubair, L., Agalawatte, P., Viswanathan, J., Wijeratne, K., Zahid, M., Mizna Mohamed, Majeeda Mohamed, and Rasheed, M.** (2016). "Operational Island-Scale Water Scarcity Assessment for the Maldives". IPWE 2016 8th International Perspective on Water Resources and the Environment, workshop of the American Society of Civil Engineers; 4-6 January 2016, IPWE conference paper no: 264.
- **Agalawatte, P., Zubair, L., Zahid, Viswanathan, J. & Bell, M.** (2016). "The Monthly Climate Advisory for Maldives – a resource for marine Scientists". Maldives Marine Science Symposium; 27 October 2016, Maldives Marine Science Abstract Booklet, pp (39).

## 2015

- **L. Zubair,** Operational Island-Scale Water Scarcity Assessment for the Maldives. Eighth International Perspective on Water Resources and the Environment (IPWE) conference organized by the American Society of Civil Engineers (ASCE) and the Environmental and Water Resources Institute (EWRI) to be held in Colombo, Sri Lanka in January 2016.
- **L. Zubair,** Relative roles of climate and societal factors in water scarcity and flooding in Sri Lanka and Maldives and its implications. 2015 International Conference on Green Development in Tropical Regions, Andalas University, Indonesia. 28th – 31st October 2015.

## 2013

- **Chandrasekara, S.S.K., Agalawatte, P., Weerasekera, M., Zubair, L., Nawaratna, B. and Bell, M.** (2013). Experimental climate services for water management in Sri Lanka and Maldives. Sri Lanka Water Convention 2013. Conference Proceedings. National Water Supply & Drainage Board, Sri Lanka. ISBN 978-955-4731-00-4. P 37-41.
- **Zubair, L,** Intra-Seasonal Climate Prediction for Water Management in Sri Lanka and Maldives, US National Academy of Science, PEER PI Conference, Bangkok, September 30, 2013
- **Zubair, L,** Building International Bridges and Taking on Global Challenges Through Science: Lessons Learned from PEER and related projects in Sri Lanka and Maldives, US National Academy of Science PEER PI Conference, Bangkok, September 30, 2013

## E-poster presentations

**Nijamdeen A., Zubair L., Wickramagamage P., Shifaz M., Hadgie T., Gunatillake C.**(2020) STEM Education in the far flung and vulnerable islands of Maldives: Can the work of Scientists be beneficially harnessed?, American Geophysical Union Fall Meeting, e-poster session, 11th December 2020 (Link to poster- <https://agu2020fallmeeting-agu.ipostersessions.com/?s=B1-F5-87-AD-AC-14-0C-8B-60-BC-15-E0-2F-C1-4C-1B>)

## List of Flyers

### Institutional Brochure

- Informational flyer of Foundation for Environment Climate and Technology – Maldives.



## Project Flyers

- Informational flyer on Intra-Seasonal Climate Predictions for Sri Lanka and Maldives for Water Resource Management.
- Informational flyer on Monitoring Drought and Assessing Climate Change in Sri Lanka and Maldives.
- Informational flyer on "Can Drought and Flood Hazards be Skillfully and Robustly Assessed at Fine Spatial Resolution in Maldives and Sri Lanka?"
- STEM Education & Capacity Building in Southern Maldives Islands
- STEM Education & Capacity Building in Southern Maldives Islands (Website Flyer)

## Instrumentation Flyers

- New Automated Weather Station at SIRC at Mathoda Island in the Huvadho.
- Automated Moisture and Temperature Observations Soil in Hulhule, Male.

# STAFF & PARTNERS

## Key Partners

- P. Wickramagamage (FECT)
- Dr. Mizna Mohamed (MNU lecturer)
- Dr. Zahid (Maldives Meteorological Service)
- Mohamed Aslam (Director - LaMer)
- Dr. Shazla Mohamed (MNU)
- Ms. Majeeda Mohamed
- Hussein Zahir (MNU)
- Shahaama Abdulsattar
- Aishath Abdulla
- Mohamed Rasheed
- Shifaz Mohamed Principal at the G. Dh. Atoll Education Center, G. Dh. Thinadhoo, Maldives

## Contributing Staff

- Ashara Nijamdeen
- Tuan Hadgie
- Fathima Shakira
- Rimza Zacky
- Nipuni Alahakoon
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- Dilrukshi Kulasooriya
- Chathuri Ayodya
- Zahra Hilmy
- Maheshika Bandara
- Ishini Jayawardhana
- Dhulmy Bandara
- Devindi Bandara
- Kavindya Jayathilaka
- Clever Shawin
- Shifani Jaufer

We have maintained websites, social media and mailing lists for Maldives. Subscription link is included in <http://www.climate.lk/subscribe.html>

## Websites

- [www.climate.mv](http://www.climate.mv)
- [www.tropicalclimate.org/maldives](http://www.tropicalclimate.org/maldives)
- [stem.climate.mv](http://stem.climate.mv) (A STEM learning resource for middle school students and educators.)

## Blogs

[climatemv.blogspot.com](http://climatemv.blogspot.com)

## Twitter-X

<https://twitter.com/fectmv>

## Facebook

<http://facebook.com/fectmv> (Old)

<https://www.facebook.com/ClimateMaldives> (A new Facebook page was created due to loss of administrative access to the previous page.)

## Mailing List

Subscription : <https://www.climate.mv/subscribe/>



# 15<sup>th</sup> Anniversary



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