

**Abstracts of the International Roundtable on the Impact of Extreme Natural Events: Science and Technology for Mitigation, 13-15 December 2017, Colombo, Sri Lanka**

**Editors**

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## **Review Panel**

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**PROGRAMME**  
**13<sup>th</sup> December 2017**

**INAUGURAL CEREMONY**

- 8.00 – 9.00 am    Registration
- 9.00 – 9.15 am    Welcome Address by  
**Prof. Dr. M.J.S. Wijeyaratne**  
Chairman, National Science & Technology Commission
- 9.15 – 9.35 am    Address by  
**Prof. Dr. Arun P. Kulshreshtha**  
Director General, NAM S&T Centre
- 9.35 – 9.50 am    Introduction to the Roundtable by  
**Prof. Dr. M.M.M. Najim**  
Vice Chancellor, South Eastern University of Sri Lanka
- 9.50 – 10.20 am    Keynote Address by  
**Prof. Dr. Chandima Gomes**  
Universiti of Putra Malaysia
- 10.20 – 10.45 am    Address by the Chief Guest  
**Hon. Susil Premajayantha**  
Minister of Science, Technology & Research
- 10.45 – 10.50 am    Vote of Thanks by  
**Dr. Muditha Liyanagedara**  
Director, National Science & Technology Commission
- 10.50 - 11.00 am    Group Photo Session

## TECHNICAL SESSIONS

**13<sup>th</sup> December 2017**

### **Session I: Extreme Events I**

**Chairperson: Prof. Dr. M.M.M. Najim**

- 11.30 am Assessment of Desertification, (Extreme Natural Events) In Iran by ANN & IMDPA Model  
**A. R. N. Namagh** and Z. Golizadeh
- 11.45 am An Overview of Mauritius, the Hazards being faced due to Extreme Natural Events and the Counter Measures being undertaken.  
**D. J. Robin**
- 12.00 pm Long-term Temperature Trends in Climatological Zones of Sri Lanka  
**G. Naveendrakumar**, Meththika Vithange, J. Obeysekera, S. Pathmarajah and M.C.M. Iqbal
- 12.15 pm The Use of Remote Sensing and GIS for Drought Assessment: The Case of Southern Province  
**Lusekelo Kasunga**
- 12.30 pm Impact of Extreme Climate on Crop Production and Management Techniques in Batticaloa District, Sri Lanka: Review on Flood and Drought  
**A. Narmilan**, B.G.N. Sewwandi and S. Puvanitha
- 12.45 pm The Impacts of Extreme Natural Events: S&T Awareness, Development and Education in Myanmar  
**Myat Soe Aung**
- 1.00 pm Ensuring continuity of health service provision and promoting health of communities during drought situations: Circular guidelines by Ministry of Health.  
N.W.A.N.Y. Wijesekara and **T.T.S. Wickramarachchi**
- 1.15 pm **Lunch**

**Session II: Climate Change**  
**Chairperson: Dr. Kaushal Keraminiyage**

- 11.30 am Climate Change and Extreme Events in Afghanistan  
**Naqibullah Sediqi**
- 11.45 am Climate Change and Its Impact on the Economic Sectors in the Rural Areas of Karnataka - Need for Multi-Pronged Approach  
**B. C. Prabhakar**
- 12.00 pm Rural Communities' Response to Climate Change in Malawi: the case of Mzimba District  
**Gilbert Reginald Phiri**
- 12.15 pm Understanding Connections Between Climate, Extreme Weather, Air Quality, and Health with a Glance at Sri Lanka  
**H. K. W. I. Jayawardena**
- 12.30 pm Working Out Ways to find Commercially Viable Measures to Develop Water Resources in the Face of Climate Change and Recurring Droughts in India  
**K. N. Radhika, B.C. Prabhakar and B.N. Rashmi**
- 12.45 pm Seasonal Impact of Climate on Tea Production in Sri Lanka  
Ashara Nijamdeen, Lareef Zubair, Madura Dharmadasa,  
**Nushrath Najimuddin, Chalani Malge**
- 1.00 pm Results of the Study of Danger, Vulnerability and Risks in Coastal Municipalities  
**C. Norelis Peña Peña**
- 1.15 pm Coastal Morphodynamics of Natural Hazard: A Case Study of Oluvil Area in Ampara District, Sri Lanka  
**K. Nijamir and M.I.M. Kaleel**
- 1.30 pm **Lunch**

**Session III: Extreme Events II**  
**Chairperson: Dr. M. G. Mohamed Thariq**

- 2.30 pm Drought Monitoring for Sri Lanka: Spatial Extent and Temporal Evolution during the 2016-17 Drought  
**Ruchira Lokuhetti**, Lareef Zubair, Janan Visvanathan and Ashara Nijamdeen
- 2.45 pm Salinization of Agricultural Resources: A Natural Disaster in Irrigated Agriculture  
**M. Kafi**
- 3.00 pm Risk of Lightning and Mitigating its Impact in the Eastern Indian State of Odisha.  
**Bikasha Chandra Panda**
- 3.15 pm Lightning, an Extreme Natural Event causing Loss of Life and Property.  
**Ravindra Arora**
- 3.30 pm **Tea**

## 14<sup>th</sup> December 2017

8.30 am **Plenary Speech**

**Dr. Kaushal Keraminiyage**

Global Disaster Resilience Research Centre, University of  
Huddersfield, United Kingdom

### **Session IV: Assessment and Mitigation of Impacts of Floods**

**Chairperson: Dr. Lareef Zubair**

- 9.00 am Kelantan Big Yellow Flood 2014: Impacts and Mitigation  
**N. N. Nik Abdul Majid**
- 9.15 am Physical Flood Vulnerability Mapping using the Analytical  
Hierarchy Process Method and Geography Information System:  
Application to the Savannah Region, Togo (West Africa)  
**Komi Kossi**
- 9.30 am The Effects of Flooding in Kaluwanchikudy DSD: An Analysis  
Using GIS Application  
**Mathanraj, S** and M.I.M. Kaleel
- 09.45 am Issues Associated With Flooding of Malala Lagoon in  
Hambantota, Sri Lanka and Possible Solutions  
M.F.K.F.F. Banu, **N.W.B. Balasooriya** and V. Madha Suresh
- 10.00 am The Effect of Floods on Livestock in Ampara District in Sri  
Lanka  
**E. Pavithira**, M.G. Mohamed Thariq, M.L. Fowzul Ameer and K.  
Nijamir
- 10.15 am An Assessment of Flood Vulnerability Using Risk Matrix  
Method- A Case Study of Kanniyakumari District, Tamilnadu  
Vignesh K.S and **V. Madha Suresh**
- 10.30 am **Tea**



## **Session V: Earthquakes and Landslides**

**Chairperson: Dr. Biswajeet Pradhan**

- 10.45 am Laser Scanning Applications in Landslide and Flood Assessments  
**Biswajeet Pradhan**
- 11.00 am Landslide Risk Assessment and Real Time Monitoring for minimizing the Impact of Rainfall Induced Landslides in Indian Himalayas  
**Debi Prasanna Kanungo**
- 11.15 am Cyclonic Storm Roanu and the Orographic Rainfall Mechanism triggered the Landslide in Aranayaka in May 2016  
Ruchira Lokuhetti, Lareef Zubair, Janan Visvanathan,  
**Ashara Nijamdeen**
- 11.30 pm Case Study on Environment Monitoring Procedure for Landslide Disaster Protection Project of National Road Network; Lunugala Site of The Package 02 Sites in Badulle District  
**Gamini Subasinghe**
- 11.45 pm Seismicity Evaluation of Southern Iraq  
**Noor Adnan Jasim**
- 12.00 pm **Lunch**

## **Session VI: Disaster Mitigation Technologies I**

**Chairperson: Dr. Muditha Liyanage**

- 1.00 pm Mitigation of Natural Events Disasters in Egypt using Seismic and GPS data  
**Salah M. Mahmoud** and Abu-Elela A. Mohamed
- 1.15 pm Advanced Forecasting Capability of Hydro-Meteorological Disasters  
**Krushna Chandra Gouda**
- 1.30 pm Restoration Opportunities Assessment Methodology (ROAM) for Landscape Stewardship from Natural Disasters: A Way Forward  
**Rashmi Srivastava**
- 1.45 pm Role of Science and Technology Communication in Disaster Risk Reduction and Awareness  
**Finarya Legoh** and Udrekh
- 2.00 pm Amphibious Housing Structures for Flood-prone Areas: A Viable Way of minimizing Evacuation and Displacement  
**G. A. Chandima Gomes**
- 2.15 pm Mitigation Technologies for Disaster Risk Reduction in Nepal  
**Jiba Raj Pokharel**
- 2.30 pm Socio Economic Assessment of Surface Deformation due to Pasni Earthquake Detected by Optical and RADAR Remote Sensing  
**Muhammad Imran Shahzad**, Muhammad Ali and Ibrahim Zia
- 2.45 pm **Tea**

**Session VII: Disaster Mitigation Technologies II**  
**Chairperson: Prof. Dr. Chandima Gomes**

- 1.00 pm The Extreme Natural Events: Science & Technology for Mitigation in Palestine  
**Imadoiddin Al-Baba**
- 1.15 pm Use of traffic light signs to indicate status of emergency: An innovative visual management tool for health sector  
**N.W.A.N.Y. Wijesekara** and T.T.S. Wickramarachchi
- 1.30 pm Mitigation of Earthquake Risk in Sub-Saharan Africa  
**Raymond John Durrheim**
- 1.45 pm Influence of Matric Suction on Pullout Resistance of Soil Nails.  
**P. Rajeevkar** and Athula Kulathilaka
- 2.00 pm Applying Robust Decision Making (RDM) to ensure Robust Flood Management in Ho Chi Minh City, Vietnam.  
**Bach Tan Sinh**
- 2.15 pm A review on key challenges towards risk reduction science and innovation plans  
Georgina Clegg, **Nuwan Dias**, Dilanthi Amaratunga and Richard Haigh
- 2.30 pm Enabling Rapid Disaster Response using Artificial Intelligence and Social Media  
**Muhammad Imran**
- 2.45 pm **Tea**
- 3.00 pm Discussion

## **Message from the Vice Chancellor, South Eastern University of Sri Lanka**



Frequency of occurrence of extreme natural events has increased in the recent past due to climate change and manmade scenarios mainly contributed by improper handling and interaction with the natural environment. The impacts due to such extreme natural events are felt seriously by man, managers and Mother Nature. In order to face, mitigate, manage and control such extreme natural events, scientific approaches are required with a multidisciplinary blend based mainly on the geographical, meteorological, geological, technological and socio-economic aspects. Prevention, mitigation and resilience to such extreme events is now based on novel inputs from many different technologies.

International Roundtable on the ‘Impact of Extreme Natural Events: Science and Technology for Mitigation (IRENE)’ collectively organized by Centre for Science and Technology of the Non-aligned and Other Developing Countries (NAM S&T Centre), National Science & Technology Commission (NASTEC), Sri Lanka and the Research Centre-Technology for Disaster Prevention, South Eastern University of Sri Lanka (RC-TDP, SEUSL) is a timely platform that brings relevant professionals, policymakers and managers to collectively discuss and elaborate on finding practical solutions to prevent, minimize and mitigate such events.

I hope IRENE will be able to achieve its set objectives and come up with workable and practical solutions to the issues on extreme natural events. I also hope that network of professionals, policymakers and managers developed through IRENE would benefit the mankind and the environment with the outcomes achieved.

**Professor Dr. M.M.M. Najim**

**Vice Chancellor**

**South Eastern University of Sri Lanka**

## Message from the Chairman of the National Science and Technology Commission of Sri Lanka



All countries throughout the world are experiencing heavy adverse impacts due to extreme natural events in the recent times more frequently than in the past, which result in disrupting public life and damaging property as well as agricultural produce. These extreme natural events are attributed to climate change that we are experiencing today. One of the Sustainable Development Goals set out by the United Nations that are to be achieved by 2030 also deals with climate change. A main target identified under this goal is to strengthen resilience and adaptive capacity to climate related hazards and natural disasters.

Therefore, this International Roundtable on Impact of extreme natural events: Science and Technology for mitigation (IRENE 2017) will be very useful to all our countries.

As the Chairman of the National Science and Technology Commission (NASTEC), which is the Sri Lanka focal point for the Centre for Science and Technology of the Non-Aligned and Other Developing Countries (*NAM S&T Centre*), I am very happy to note that about 25 countries are participating at this conference. Deliberations made at this conference will help to improve our knowledge on the scientific and technological solutions available in different countries to mitigate the disasters occurring due to extreme natural events. Further, this will help to establish new links among researchers working in this field which would result in collaborative research and sharing knowledge.

I thank the Director General of the NAM S&T Centre, the Vice-Chancellor of the South Eastern University of Sri Lanka (SEUSL) for providing all the support for organizing this conference. Special thanks are due to the Coordinator of IRENE2017 of the SEUSL for her untiring efforts.

I thank the Director and the staff of NASTEC, Sri Lanka for their unstinted efforts in making this event a success.

I sincerely hope that the outcome of this conference will be very useful in mitigating the impacts of extreme natural events.

I wish this conference every success.

**Prof. Dr. M.J.S. Wijeyaratne**

**Chairman**

**National Science and Technology Commission of Sri Lanka**

## **Message from the Director General of Centre for Science and Technology of the Non-Aligned and other Developing Countries**



It is a great pleasure for me that the Centre for Science and Technology of the Non-Aligned and other Developing Countries (NAM S&T Centre) is organising this International Roundtable on “Impacts of Extreme Natural Events: Science & Technology for Mitigation (IRENE)” jointly with the National Science & Technology Commission (NASTEC) and the Research Centre-Technology for Disaster Prevention, South Eastern University of

Sri Lanka.

Sri Lanka has been a distinguished scientific partner of the NAM S&T Centre and a number of scientific activities have been organised by the Centre in the country on topics of high relevance to developing countries such as Science Policy, Small & Medium Enterprises, Rainwater Harvesting, Pesticides, Herbal Medicine, Disaster Mitigation and Lightning Protection in partnership with various Sri Lankan S&T institutions, each of which has visibly contributed to the progress of Sri Lanka as well as many other developing countries. Further, the NAM S&T Centre has the privilege of hosting two meetings of the Bureau of its Governing Council in 2004 and 2010. It is also a privilege to the Centre that Sri Lanka has recently been elected as one of the Vice Presidents of the Centre.

Disaster management has an inter-disciplinary dimension with developments in many fields of technology that helps in providing a variety of solutions to mitigate human disasters caused by extreme natural events. Even though some developed countries are extensively utilizing these technologies for disaster management, this knowledge has still not adequately percolated to the developing nations. In the present environment of escalating extreme natural events, it is essential that nations make collective efforts in searching for technical solutions to mitigate disasters, rather than acting individually. Since geographically similar regions often encounter similar types of disasters, sharing of technical experience of each country would save precious scarce resources as well as time.

In the IRENE, various stakeholders at national and international levels have been brought together to share experience for generating a roadmap for reducing the risk in real situations; sending across a message to the policy makers, environmentalists and other related authorities on disaster management on the need of a realistic, well-formulated action plan for risk reduction in events occurring due to climate change; and possibly initiating an international Joint Group to work out a common action plan with a primary focus on NAM and other developing countries for practical risk reduction in severe situations.

I wish a great success to the International Roundtable on IRENE.

**Prof. Dr. Arun P. Kulshreshtha**

**Director General**

**NAM S&T Centre**



## Message from the Coordinator/IRENE



The Research Centre - Technology for Disaster Prevention, South Eastern University of Sri Lanka is proud to be one of the organizers of the International roundtable on the Impact of Extreme Natural Events: Science and Technology for Mitigation (IRENE) in 2017.

The frequency of occurrence of extreme natural events has increased in the recent past leading to several disasters. IRENE 2017 will provide an opportunity for researchers, scientists, experts, managers and policy makers to discuss, share the experiences and Science and Technology of Migratory Measures taken in different situations as well as to develop regional collaborations to work together for similar problems in disaster management.

Organizing of IRENE 2017 would not be possible without the conscientious efforts of many individuals. The meticulous reviewing process helped to select the highest quality, relevant papers for the presentation at IRENE. I take this opportunity to thank the service rendered by the reviewers during this process.

The success of IRENE is a result of untiring efforts and dedication of many personnel. I take this opportunity to express my sincere gratitude to the Vice Chancellor, South Eastern University of Sri Lanka, organizing committee and the members of the Research Centre-Technology for Disaster Prevention for their continuous support. I am very much grateful to the Director, National Science and Technology Commission (NASTEC) and the staff of NASTEC and the Director General, NAM S&T Centre and the staff of NAM S&T Centre for their tremendous efforts to make this event a success. The support given by the key note speaker, plenary speaker, chairpersons and authors are also greatly appreciated.

It has been a great privilege for me to serve as the Coordinator of IRENE 2017 and I wish all the participants a fruitful and pleasant experience in IRENE 2017.

**Dr. B.G.N. Sewwandi**  
**Coordinator/IRENE 2017**  
**South Eastern University of Sri Lanka**

## Keynote Speech

### Living with Extreme Natural Events: Avoiding Disaster



**“There are no natural disasters. There are only natural extreme events and human disasters. The former is not within our control but the latter is”**

Time advancement, finer details of spatio-temporal event distribution and effectiveness of information reaching the target public play a vital role in the forecasting of natural extreme events to minimize human casualties. Thus, the R&D should focus on the technological enhancement and improvisation of sensing and monitoring devices, coordination & communication, prediction models and information dissemination modes. However, even with the best forecasting techniques, one can hardly prevent the property and socio-economic losses. The evacuation, maintenance and resettlement of the affected public incur a heavy toll on the government. Thus, it is the high time for the scientific community to give the utmost prominence to focus on technologies that develop disaster--resilient systems affordable to the mass public. These may come in various forms such as amphibious housing structures, flood-proof town planning, smart tunnels, retention-wall techniques, draught-resilient water supply, rainwater harvesting etc. A collective effort at both national and regional level should be made in this line, together with the support and collaboration from the international frontiers, to optimize the scientific and technological developments.

#### **Prof. Dr. Chandima Gomes**

Professor of Electrical Engineering

Former Head/ Center for Electromagnetics and Lightning Protection (CELP), Malaysia

Former Chief Adviser/ African Centres for Lightning and Electromagnetics (ACLENet)

Department of Electrical & Electronics Engineering

Universiti Putra Malaysia

## Plenary Speech

### **Mitigating the Impact of Extreme Natural Events: Achieving Success in Post Disaster Resettlements**



Internal displacement is an inevitable consequence of disasters, which is a key consideration in disaster mitigation strategies. In the recent decades, disaster induced internal displacements occur in greater number across the world. Internal displacements have extraordinarily diverse causes in different situations. Indeed, external shocks such as extreme natural events are major contributors to these internal displacements. However, solely these external shocks do not trigger displacements, but are extended to political decisions that revoke the population's choice to remain. This makes the repatriation not feasible for the displaced people and becomes one of the key reasons why governments assume the responsibility for resettlements.

Resettlement is a planned relocation of population with varying degrees of assistance, which is one of key stages of any post-disaster recovery process. Typically, resettlement schemes are constructed in large-scale, to accommodate more houses, to achieve economies of scale, and for the ease of management. These large-scale resettlement schemes have often been developed among a host environment. Compared to new developments, problems and predicaments are more in a condition where the new resettled community and their host community co-exist and share resources of the location.

Not all resettlements are successful. In fact, resettlement failures are not uncommon and fall under two categories. Firstly, project related failures, such as poor planning, implementation, coordination, and participation. Secondly, outcome related failures, such as culturally inappropriate houses, inappropriate materials and technology, and fail to meet needs and expectations of the community. Further, lack of institutional coordination, lack of planning and clear policy, inequitable distribution, corruption, inordinate construction delays, and financial mismanagement are also contributing for the shortcomings of resettlements. After all, these resettlements need to be long term solutions, not short term remedies. Long term satisfaction of disaster affected communities is a complex matter with so many interconnected variables. Success of a disaster affected resettlement programme not only depend on the expectations of the resettled communities, but also that of the host communities. This dynamic relationship makes the matter of long term satisfaction even more complex. To understand the

complexity of this issue, detailed studies were conducted in Sri Lanka as it has decades of experience in displacements and resettlements arising not only from natural disasters, but also from development projects and armed conflicts. More than 100 in depth interviews were conducted in five case study areas along with a series of questionnaire surveys with sample sizes of more than 385 of resettled families.

This particular study is an attempt to explain the nature of this complex phenomena, in a bid to help relevant authorities to make informed decisions on planning and implementing successful resettlement projects, based on a series of studies conducted in Sri Lanka. Thematic analysis and Agent Based Simulations were used to mimic and study the interaction between host and resettled communities, as well as the interaction between the communities and other agents such as infrastructure, buffer zones, etc.

Findings show that the precondition of the community, availability of infrastructure according to the population increase, issues/ pushing factors in the previous location are the factors affecting the communities at the initial phase of resettlement. After the resettlement, legal issues in ownership, climate adaptability and cultural appropriateness of the houses, livelihood, availability and affordability of social and physical infrastructure are determining the adaptability to the new environment. In the case of host communities, availability of social and physical infrastructure, usage of the land, community relationship, and the availability of the utilities are some of the factors that creates the adaptability to the new environment. Sri Lankan legislations and policies have already identified the responsibilities of the parties, and processes for bringing up a better coordination among communities. However, implementation agencies and institutional arrangements have witnessed practical difficulties in implementing the identified policies. These difficulties stem from classic disaster recovery project characteristics such as emergent strategies, uncertainty, time urgency, community vulnerability and stakeholder issues.

In conclusion, while resettlement projects play a major role in mitigating the impact of natural extreme events, the success of such projects depend on an array of complex interactions between the host community, displaced community and the environment (both natural and the built environment). Hence the policy makers should pay close attention to adopt a community based approach in planning the implementing resettlement projects.

**Dr. Kaushal Keraminiyage**  
**Global Disaster Resilience Research Centre**  
**University of Huddersfield, United Kingdom**