

AUGUST 23<sup>RD</sup> 2018 → ONE DAY SYMPOSIUM

# DISASTER RESILIENT INFRASTRUCTURE

The ICE West Indies Local Association (ICEWILA) presents a one-day symposium to feature innovative research in natural disaster monitoring and the design of resilient civil engineering infrastructure to resist the negative effects of natural disasters.



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SYMPOSIUM HOSTS

DON SAMUEL

DR. LEIGHTON ELLIS

[INSTITUTION OF CIVIL ENGINEERS]

KEYNOTE SPEECHES

DR. CARLOS ZAVALA

[WORLD FEDERATION OF ENGINEERING ORGANIZATIONS]

DR. EMILIO COLON

[WORLD COUNCIL OF CIVIL ENGINEERS]

MR. CRAIG COVIL

[ARUP NEW YORK]

EARTHQUAKES, VOLCANOES & TSUNAMIS

DR. ILIAS PAPADOPOULOS

DR. RICHARD ROBERTSON

[UWI SEISMIC RESEARCH CENTRE]

HURRICANES

MR. TONY GIBBS

[COUNCIL OF CARIBBEAN ENGINEERING ORGANIZATIONS]

TROPICAL STORMS

MR. ANTHONY FARRELL

[CONSULTANT]

FLOODS

MS. SAKTHY SELVAKUMARAN

[UNIVERSITY OF CAMBRIDGE]

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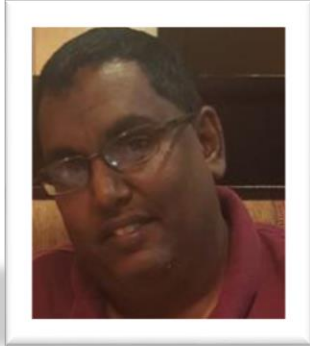
# PROGRAMME

**8.00AM TO 9.00AM: REGISTRATION AND LIGHT BREAKFAST**

**RECEPTION:**

- ❖ **Ms. Sasier Gokool – General Inquiries / Registration**
- ❖ **Ms. Susana Ramjit – General Inquiries / Registration**
- ❖ **Mr. Romel Ramarack – Ticketing**
- ❖ **Mr. Dwayne Brooks – Ticketing**
- ❖ **Andy Alleyne – Event Coordination**

**9.00AM TO 9.10AM: OPENING REMARKS BY ICE REPRESENTATIVE & SYMPOSIUM CHAIR**



**Don Samuel** is a Chartered Engineer (CEng MICE) with over 16 years of experience in the construction industry and over 6 years of experience in middle management. During his career he has been involved with over 80 civil engineering projects with a total net worth of TTD 370 million (USD 54 million). Don is currently pursuing a PhD in Construction Management and has published two conference proceedings and two journal articles. He has lectured in the area of project management. Don is the Institution of Civil Engineer's Representative for the West Indies. Don's area of expertise is in project management, construction management and facilities management for building and infrastructural projects.

**9.10AM TO 9.20AM: OPENING REMARKS BY ICEWILA CHAIR & SYMPOSIUM COORDINATOR**



**Dr. Leighton Ellis** is a Chartered Engineer (CEng MICE) with ICE, as well as an associate member of the CIArb. He possesses over 7 years' experience in the construction industry and 9 years' in academia. His diverse professional experience in design and construction spans various sub-disciplines of civil engineering, namely coastal, structural, highway and environmental. In academia, he leads in the development of future engineers through teaching and research. He also possesses BSc, MSc, and PhD in Construction Engineering. His PhD focused on developing leadership in graduate engineers. Leighton is the chairman of the ICE West Indies Local Association.

## KEYNOTE SPEAKERS

### 9.20AM TO 9.45AM: BREAKFAST KEYNOTE SPEAKER



**Dr. Eng. Carlos Zavala** has 32 years of professional experience. He obtained a doctoral degree from the University of Tokyo - Japan, specializing on buildings structures. His Master degree of Science with a major in Structural Engineering at the National University of Engineering (UNI) where he also graduated from the Faculty of Civil Engineering. Since 1987 he has been working as staff in the Faculty of Civil Engineering at UNI. In two opportunities he was director of the Japan Peru Center Earthquake Engineering Research and Disaster Mitigation (CISMID) on 1999 and 2007. He has extensive experience in Seismic Vulnerability and Seismic Risk Studies on Urban Areas. He developed vulnerability studies in main hospitals and evaluate hospitals in South America countries as consultant of GAMID group of PAHO / WHO. He has extensive experience in structural testing especially in on-line test of full-scale structures. As a designer, he has experience in the design of steel structures warehouse, malls and gymnasiums. Also, he designs hospitals and schools for private and government agencies. Between 2010 to 2015 he was the main investigator of the Peruvian counterpart of the JST-JICA SATREPS Project "Strengthening Technologies for Earthquakes and Tsunamis in Peru" with is developed in agreement with Chiba University of Japan. Also, as designer developed projects for retrofitting projects of schools, and actually is working in retrofitting project of hospitals in Lima city under agreement of Ministry of Health and UNI, shearing labors with the academia at UNICISMID and the job as designer.

### 12.35PM TO 1.00PM: LUNCHTIME KEYNOTE SPEAKER



**Dr. Emilio Colon** is WORLD COUNCIL OF CIVIL ENGINEERS) assumed the Presidency of the World Council of Civil Engineers (WCCE) at its 4th General Assembly held in Istanbul, Turkey during the last week of June. Colón, a worldwide recognized engineering professional from Puerto Rico will serve a two-year term for the period 2009-2011. Emilio Colón is succeeding José Medem Sanjuan, former WFEO president and founding President of the WCCE. Since WCCE foundation, Colón has chaired the Committee on Construction and in 2007 was elected Incoming President during our Second General Assembly held in Victoria Falls, Zimbabwe. His areas of expertise are water resources, water and wastewater management, environment, disaster response and crisis management. Emilio Colón holds Doctor and Master Degrees in Environmental Engineering from the Rensselaer Polytechnic Institute in Troy New York. Also, a Bachelor in Civil Engineer and a Juris Doctor Degree from the University of PR. Emilio Colón was born in Texas, USA, and lives in San Juan, Puerto Rico. He is a Professional Engineer and Licensed Professional Planner in Puerto Rico. Colón retired in 2005 from the United States Corps of Engineers where he held many positions, including International and National Projects Manager requiring extensive travel; also, water resources planning; construction management and disaster response, thus dealing with most of the areas of the federal agency. As cabinet member of the Government of Puerto Rico while directing the PR Aqueduct and Sewer Authority, one of the most complex water works in the U.S., he led the agency during very challenging times. He is President of Colegio de Ingenieros de Caminos, Canales y Puertos, the sectorial professional civil engineering organization from Spain.

### 5.00PM TO 5.25PM: COCKTAIL RECEPTION KEYNOTE SPEAKER



**Craig Covil** is a Principal of the global engineering firm Ove Arup & Partners (Arup), with working experience in the US, Canada, UK, Hong Kong, Monaco, the Caribbean, South Africa and Australia. Craig is a civil engineer with an MSc in soil mechanics and engineering seismology from Imperial College London. He has published and presented over 20 technical/conference papers. He is a professional engineer with more than 28 years' experience on major civil/infrastructure, tunnel, land reclamation, maritime, and building projects, transit infrastructures, and aviation projects specifically in site preparation, civil engineering, foundations, heavy civil structures and performance analysis. He is a member of the Moles and ember of the Design-Build Institute of America. His skills are in the management of multidisiplinary project and design teams on major infrastructure and building design-build and P3 projects. His approach is to provide practical advice that supports value engineering and promotes innovative thought and successful economic outcomes. He has acted as Lenders' Technical Advisor and Equity Advisor on major highway projects in Sydney. Craig is Arup's Principal in charge of \$4.5B Second Avenue Subway projects, \$1.4B Fulton Center, Toronto Transit Commission's Spadina Line York University and Vaughan Metropolitan subway stations, NYCT's Enhanced Stations Initiative (ESI) a \$1.3B program to modernize 33 existing NYCT subway stations, NYCT's post superstorm Sandy recovery works, as well as project director for the multidisciplinary design of the Dept. of Energy's Long Baseline Neutrino Facility (LBNF) in South Dakota for the past 10 years. Craig has lead the design of a number of projects in Antigua, Trinidad and Tobago, Puerto Rico, Barbados and British Virgin Islands. Craig is an Australian, resident in New York for the past 17 years.

## TECHNICAL SESSIONS

### 9.45AM TO 10.45AM: SESSION 1 [EARTHQUAKES, VOLCANOES & TSUNAMIS]



**Dr Ilias Papadopoulos** holds the position of Research Fellow in Engineering Seismology at The University of West Indies. Seismic Research Centre in St. Augustine since November 2015. He holds a BS in Physics (1999) from University of Ioannina, Greece and a M.Sc. in Geophysics from Aristotle University of Thessaloniki, Greece (2002). He has a PhD from Aristotle University of Thessaloniki in Geophysics and Engineering Seismology (2013). He has worked as a young researcher at the Aristotle University of Thessaloniki (2000-2004) and has been a lecturer at the Technological Institute of Crete (2004-2010). In 2010 he received tenure in the field of Geophysics and Natural hazards at the T.E.I. of Crete, Department of Environmental Engineering & Resources. His expertise and research focus in Applied Geophysics (electric methods, seismic methods, electromagnetic methods, ambient noise methods) and Seismology (seismic signal, seismological networks, seismological stations). He is the author or co-author of more than 10 papers in international journals and conference proceedings with referees. Currently he is investigating the Microzonation of Trinidad & Tobago conducting fieldwork measurements in 10 major cities of the country. He is also participating in various projects in Europe, funded by the European Union and Greek government.



**Dr. Richard Robertson** was born in St Vincent, Prof. Richard E. A. Robertson is a Geologist and Volcanologist whose interest in volcanology was inspired by his personal experience during 1979 eruption of La Soufriere volcano on the island of St. Vincent. He subsequently studied Geology at UWI, Volcanology at the University of Leeds in the UK (M Phil) and completed his PhD in Geology at Mona, Jamaica. He joined the staff at the Seismic Research Centre (SRC) in 1993 after serving for six years as Head of the Soufriere Monitoring Unit in St. Vincent. During the period 1995-1999 he served several tours of duty as Chief Scientist of the Montserrat Volcano Observatory and was its Director from October 1998 - March 1999. He was appointed Head of the Seismic Research Centre in July 2005 and Director of the Seismic Research Centre in July 2008. He has worked in most aspects of the SRC operations but has been most closely associated with the public education, hazards assessment, ground deformation and geothermal monitoring programs. He has a keen interest in the dissemination of scientific information to vulnerable island communities. He is an experienced field researcher as well as an academic and has authored over 35 papers in peer-reviewed scientific journals and books, co-edited 2 books and contributed to numerous technical reports, newspaper articles, radio and television programs. He has assisted with the field supervision and lecturing of undergraduate geoscience students and the supervision of postgraduate students. His research interests are in physical volcanology (particularly volcanic hazard studies), magma genesis and transport, crisis communications and risk perception of natural hazards. He is much sought after as a consultant on his area of expertise to, inter alia, UNESCO, the Organization of American States, the UK Foreign and Commonwealth Office, and United Nations Development Fund.

**Topic Description:** The Caribbean is one of the most hazard prone regions of the world with the potential for negative impacts from all of the major natural hazards that can affect human society. Building resilience to these impacts requires vulnerable island communities to fully integrate existing scientific knowledge of these phenomena into all aspects of their lives. A key element of such efforts is the design and construction of housing and infrastructure which are the remit of engineers. In this presentation we will provide an overview of the current state of knowledge with regards earthquakes, volcanoes and tsunamis in the Caribbean region paying special attention to aspects of these hazards that may be of particular interest to the engineering community. We will also review recent research done in the region that may also be of interest and relevance to this community.

### 10.45AM TO 11.00AM: TEA & COFFEE BREAK + NETWORKING



## TECHNICAL SESSIONS

### 11.00AM TO 12.00 AM: SESSION 2 [HURRICANES]



**Mr. Tony Gibbs** was a Commonwealth Scholar at The University of Leeds. He is Past President of The Barbados Association of Professional Engineers and a Past Vice President of The Institution of Structural Engineers (HQ in UK). Mr Gibbs was Associate Project Manager for the Caribbean Uniform Building Code; Director of the American Association for Wind Engineering; Member of The International Codification Forum of The International Association for Wind Engineering; Member of the Scientific Planning Group on Natural Hazard Risk Reduction of the International Science Council (Latin America and Caribbean) and Member of the Governing Board of the Global Earthquake Model. Mr Gibbs' special interests are in the fields of collaborative design in multi-disciplinary teams and designing against the natural hazards of hurricanes and earthquakes. He is particularly interested in the interrelationship between engineering and insurance and has assisted

RMS and AIR with the development of their Caribbean loss models. In 1991 he received the International Award *"For (his) Very Significant Contributions to Hurricane Loss Reduction and Hurricane Safety in the Caribbean"* at the US National Hurricane Conference; and an award *"In Recognition of (his) Contribution to the Advancement and Promotion of Structural Engineering in the Caribbean"* from The Barbados Association of Professional Engineers.

In 1998 he received the award of *"Career of Excellence in Engineering"* from the Association of Professional Engineers of Trinidad & Tobago. In 2003 Mr Gibbs received the *Lewis Kent Award* from The Institution of Structural Engineers (UK) for services to engineering and to The Institution. Mr Gibbs received the UN-ISDR *Sasakawa Award for Disaster Reduction* in 2007. In 2010 he was named as a *Caribbean Icon in Science, Technology & Innovation* by the National Institute of Higher Education, Research, Science and Technology (Trinidad & Tobago). In 2012 the status of *Honorary Member of the Trinidad & Tobago Institute of Architects* was conferred on Tony Gibbs "in recognition of (his) distinguished and outstanding record of achievements both in (his) field together with (his) support, recognition, encouragement and promotion of the profession and practice of architecture in Trinidad and Tobago, the Caribbean and internationally." In 2012 Tony Gibbs became the first person in the Caribbean to be elected a Fellow of the Royal Academy of Engineering.

**Topic Description:** A disaster is an event that so overwhelms a community that it needs to seek external assistance to recover. Resilience is the ability to recover. Resistant means that there is no need to recover. Scientific studies on the levels and frequencies of meteorological hazards (wind, rain, storm surge, waves) in the Caribbean Basin have been carried out during the past 50 years. These studies provide sufficient guidance to the engineering community to prevent those hazards causing disasters. A brief history of those studies will be presented. Examples will be given of damage to infrastructure, the causes of damage and measures to prevent or reduce damage. Recommendations will be provided for actions which could (should?) be taken to make Caribbean infrastructure more resilient and to move towards resistant infrastructure as a goal.

### 12.00 PM TO 1.00PM: LUNCH

## TECHNICAL SESSIONS

### 1.00PM TO 2.00PM: SESSION 3 [TROPICAL STORMS]

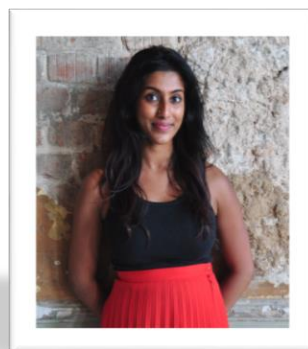


**Mr. Anthony Farrell** is currently a private consultant. He retired from the practice but with his wealth of knowledge and experience remains a consultant to CEP Limited (formerly Consulting Engineers Partnership). Mr. Farrell was formerly employed in various capacities with Consulting Engineers Partnership (formerly David Key & Partners) in Trinidad, Barbados and Dominica rising from Junior Engineer to Director and Senior Director in Trinidad. During his time with CEP Ltd he was responsible for many and varied structural projects including concrete shell structures, Bridges, Marine Structures and Tall buildings. He has also been an expert witness. Mr. Farrell is presently a check consultant with the PAHO sponsored SMART II hospitals and Health Centres project in the Caribbean. He is a member of the PAHO disaster mitigation group DiMAG. Mr. Farrell is an old boy of Queen's Royal College. He attended U.W.I, St. Augustine and was amongst the first set of U.W.I graduating class in Engineering in the year 1965. (Prior to that there was a University of London degree). He is a past president (2002) of the Association of Professional Engineers of Trinidad & Tobago (APETT) and was the Chairman of the Caribbean Division (now Caribbean Regional Group) of the Institution of Structural Engineers, (IStructE), 2007 through 2009. He remains active in The IStructE assisting with the organization of conferences, seminars, courses and the schools "Design and Build" competition. He was the local representative of IStructE as part of the Joint Board of Moderators (JBM) accreditation visit for the UWI's Department of Civil and Environmental Engineering which commenced in Nov 2011 and is also the local representative of the IStructE as part of the JBM accreditation visit in May 2016. In 2005 Mr. Farrell was honored with APETT's "Career of Excellence" Award and in 2010 IStructE awarded him the Keith Eaton International Award.

**Topic Description:** Over the recent past the island of Dominica has had more than its fair share of hurricanes. Recent examples are: 1979 – David in August; Frederick in September (not a direct hit); 1980 – Allen in August & 2007 – Dean in August (not a direct hit). Until hurricane Maria in Sept 2017, hurricane David was considered the worst to have hit Dominica. While TS Erika was not a hurricane its rainfall caused considerable damage to Dominica's bridge infrastructure also exposing Dominica's vulnerability to landslides. Following the passage of TS Erika in Aug 2015, and because of these landslides, there are areas of the island that remained without accessibility by road even before the advent of hurricane Maria in 2017. Dominica has one of the most rugged landscapes in the Caribbean with a multi-layered largely unexplored rain forest. Most roads are on the periphery of the island. The roads form the major connection between most of the population centres. The rugged landscape means that there are many bridges and damage to these bridges therefore means a significant loss of connection. The following presentation highlights examples of damage to bridges mainly caused by TS Erika and, further, shows some examples of landslide damage. The critical importance of hydraulics in the design of such bridges is highlighted while some design considerations are presented.

### 2.00PM TO 2.15PM: TEA & COFFEE BREAK + NETWORKING

### 2.15PM TO 3.15PM: SESSION 4 [FLOODS]



**Ms. Sakthy Selvakumaran** is a Chartered Civil Engineer who has worked across different countries and cultures in design, contracting and international development roles. She has also worked in R&D roles developing new solutions and technologies to change the way infrastructure is designed, constructed and maintained. She is currently undertaking PhD research at Cambridge University Engineering Department working on applying a rapidly advancing radar satellite imagery technology to reduce vulnerability of infrastructure within the urban environment. This work is sponsored by National Physical Laboratory with additional funding from Laing O'Rourke, and in collaboration with the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt, DLR) for which she spent 6 months in Munich working in the space and earth observation sector. Her achievements include being named on the Forbes 30 Under 30 Europe List, and being recently appointed to the Young Professionals Panel of the National Infrastructure Commission in the United Kingdom, who provide expert advice to the Government on the pressing infrastructure challenges facing the UK.

**Topic Description:** The widespread deterioration and recent collapses of bridges, dams, tunnels and other key services *due to floods* have highlighted the importance of structural health monitoring as well as monitoring of environmental surroundings. Traditionally, the condition and health of structures has been monitored by visual inspection, but the rise of new technologies can help provide new insights and opportunities to support resilient infrastructure. These technologies include the latest in sensors and in-situ monitoring, but rapid advancements in satellite monitoring can support civil engineers in monitoring for signs of failure, as well as support in recovery after disaster. This talk will discuss structural health monitoring, including advances in satellite observation and measurement technologies in order to understand their relevance, utilisation, and limitations to civil engineering applications.

3.15PM TO 4.15PM:      PLENARY SESSION WITH REPRESENTATIVES OF REGIONAL ENGINEERING ASSOCIATIONS



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5.00PM TO 6.00PM:      COCKTAIL RECEPTION

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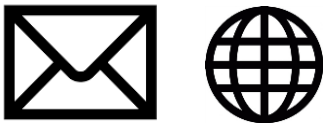


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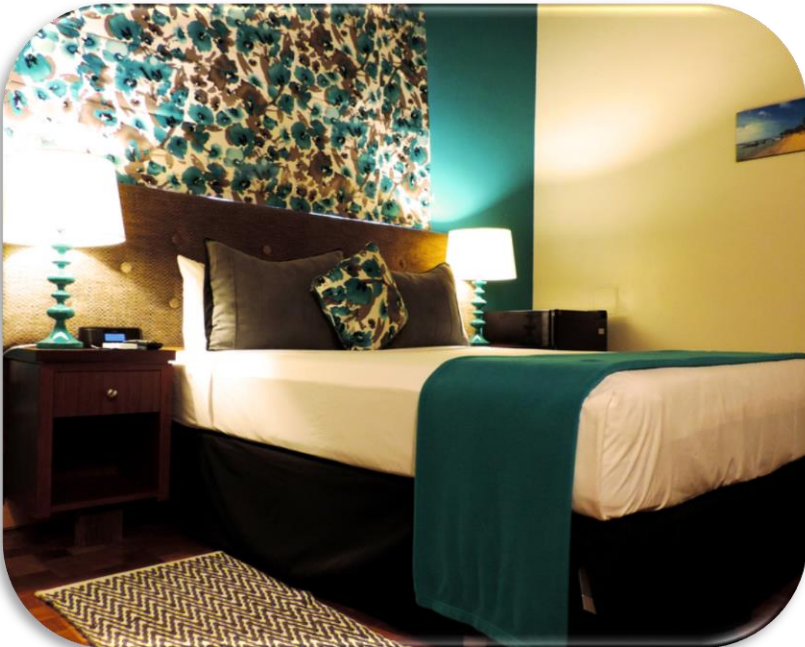


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