

# PARTNERSHIP DEVELOPMENT WORKSHOP

Urbanisation and Resilience against Natural and Man-made Disasters- Developing a Roadmap for Building Resilient Cities in India

13<sup>th</sup>-16<sup>th</sup> Dec 2021 | Wolverhampton

[www.ukieri.org](http://www.ukieri.org)

Lead Partner Universities:



## Purpose of the workshop

- 4-day scientific workshop at University of Wolverhampton addressed the aspects of structural resilience of building and critical infrastructure such as bridges, airport etc. The infrastructure destruction due to the terrorist attacks (such as bomb blast) or due to the natural disasters (such as earthquake, floods and hurricanes) not only results in loss of life, but has severe economic consequences as well.
- The cities in India are undergoing rapid urbanization and it is important that the concept of resilience is recognized and embedded in the development strategy.
- The strategy of resilient structures requires an integrated approach and a balance of measures that are durable, adaptable, inclusive, and reflective. These measures will protect and enhance the value of assets and improve the economic prospects. Resilient structures are resistant to extreme events and therefore, loss in terms of both life and finance is considerably reduced. The presence of resilient structures is a primary requirement to realize resilient cities.

## Highlights of the workshop

- Presentations by leading researchers, keynote lectures from academic and industry on aspects of resilience, urbanisation and structural design.
- Group discussion sessions to explore how the knowledge shared within the workshop can be applied to Indian context
- Site visit to University of Wolverhampton brand new Springfield campus and National Brownfield Institute
- Break-out session to explore collaborations between groups and develop research ideas and collaborative research proposals
- Virtual as well as face-to-face interaction between researchers
- Four day workshop engaged researchers from 13 universities from the UK, 4 universities from India and two UK industries.

## Main outcomes of the workshop

- A number of collaborative research ideas between the UK and India research groups on the topics related to the theme were developed which will be submitted for a suitable funding opportunity.
- Better understanding of the challenges of urbanisation and resilience in India particularly considering natural and man-made disasters was developed. Various case studies from different regions were discussed to realise the good practices which can then be applied to Indian context.
- Provided young researchers a unique opportunity to interact with mentors and experts from academia and industry.
- Various links and networks were developed which will help in generation of future collaborative opportunities.

## Key takeaways from the workshop

The presentations in the workshop were very absorbing and generated lot of discussion leading to exchange of ideas among the participants. These presentations covered practically all major aspects of sustainability and resilience which are of interest to engineering community in general and in particular to the community of Civil and Structural engineers. Over the course of 4 days many interesting ideas and case-studies were presented which highlighted the good practices and strategies adopted for dealing with disasters and mitigating its risks. In various discussion sessions, these ideas were extended to the Indian context.

Based on the technical presentations and research interests of the participants, four focus areas were identified on which participants in smaller groups had breakout brain storming sessions to identify research topics of mutual interest on which research groups from UK and India can collaborate in order to develop long term partnerships. These focus areas were:

- (A) Advanced Construction Materials
- (B) Resilient Infrastructure Systems
- (C) Data-Intensive Risk Assessment
- (D) Multi-Hazard Scenario-Based Designs

Fourteen projects as described in subsequent slides were identified for possible collaborative activities between UK and India research groups in the short and long term.



## Photos of the workshop





## Photos of the workshop





## Site visit at National Brownfield Institute





## Visit to Springfield campus and labs





# Highlights of workshop deliberations

**DAY 1 – discussion and summary**  
**(13<sup>th</sup> Dec 2021)**



# **Session 3 (Group Discussion)**

## **Resilience of Cities in Indian Context**

### **Urbanisation and Resilience against Natural and Manmade Disasters - Developing a Roadmap for Building Resilient Cities in India**

**Partnership Development Workshop (PDW)**

**UK-India Education & Research Initiative (UKIERI), British Council and  
Department of Science & Technology (DST), Government of India**

**Lead by**

**Professor Santosh Kapuria**, Indian Institute of Technology (IIT) Delhi

**Dr Suresh Renukappa**, University of Wolverhampton, UK

**Dr Shashank Gupta**, University of Wolverhampton, UK

**Professor Vasant Matsagar**, Indian Institute of Technology (IIT) Delhi

**Monday, 13<sup>th</sup> December 2021**

## ➤ Professor Chaminda Pathirage

- ❖ All are manmade hazards; nothing is natural hazards!

## ➤ Professor David Proverbs

- ❖ Flood resilience measures: new techniques/ approaches.

## ➤ Mr Valery Shchukin and Dr Konstantinos Skalomenos

- ❖ Earthquake resilience of urban areas, moving forward from individual structural vulnerability.

## ➤ Dr Ehsan Ahmadi

- ❖ Use of shape memory alloy in bridge pier for increased seismic resilience.

## ➤ Ms Amy Macdonald

- ❖ Multiple hazards that communities are exposed to - building resilient and sustainable cities.

## ➤ Dr Zuhal Ozdemir

- ❖ Site-specific seismic risk assessment - Turkish experience.

## ➤ Dr Donya Hajializadeh

- ❖ Performance indicators, multi-hazard resilience quantification, resilience-based interdependency assessment.

## ➤ Dr Georgios Papavasileiou

- ❖ Retrofit in building for damage to structural member to prevent collapse under earthquake and blast.

### Chairs: Session 1

Professor Chaminda Pathirage  
Dr Shashank Gupta

### Chairs: Session 2

Dr Marina Bock  
Dr Rohit Adhikari

### Leads: Session 3

Professor Santosh Kapuria  
Dr Shashank Gupta  
Dr Suresh Renukappa  
Professor Vasant Matsagar

**What are the prospective research collaboration opportunities (topics/ areas, industry engagement, etc.) do you foresee in your domain of research?**



## ➤ Flood Hazard

- ❖ Flood levels even rise to two stories above ground level in some cities in India, e.g., in Mumbai.

## ➤ Sea-Level Rise

- ❖ Use of shape memory alloy in bridge pier for increased seismic resilience.

## ➤ Earthquake Hazard

- ❖ Several cities are highly vulnerable seismically, e.g., Delhi.
- ❖ Individual structures (buildings and bridges) are possibly undertaken for vulnerability assessment; however, community resilience requires vulnerability assessment of urban areas.

## ➤ Terrorist Attack

- ❖ Earthquake resilience of urban areas, moving forward from individual structural vulnerability.

## ➤ Sustainability

- ❖ “Circular Economy”. Smart construction materials. Innovative materials and technologies in structures.

## ➤ COVID Pandemic

- ❖ “Health Infrastructure” and approaching (reaching) to the hospital in minimum time (transportation infrastructure).

## ❖ Infrastructure Management

- ❖ “Ageing infrastructure” issues adversely affecting resilience of built infrastructure?
- ❖ Asset management in different sectors? For example, healthcare infrastructure.

## ➤ Multi-Hazard Vulnerability

- ❖ “Multi-Hazard Risk Assessment” under multiple hazards anticipated for prioritizing redressal of the hazard consequences.
- ❖ Scenario definition - a challenge?

## ➤ Extreme Events

- ❖ Risk analysis under: Wind; Cyclones; Landslides; Snow; etc.
- ❖ Electricity Distribution Network (Energy)
- ❖ Drinking Water Distribution Network
- ❖ Transportation Network (Railways, Roads, Waterways, etc.)

## **National Health Systems Resource Center (NHSRC)**

Technical Support Institution with National Health Mission

Ministry of Health & Family Welfare, Government of India

Medical Oxygen (O<sub>2</sub>) Supply Infrastructure



# DAY 2 – discussion and summary

## (14<sup>th</sup> Dec 2021)

# Session 6 (Group Discussion)

## Seismic Excitation & Extreme Loading on City Infrastructure

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Lead by

**Professor Santosh Kapuria**, Indian Institute of Technology (IIT) Delhi

**Dr Alessandro Palmeri**, University of Loughborough, UK

**Dr Shashank Gupta**, University of Wolverhampton, UK

**Professor Vasant Matsagar**, Indian Institute of Technology (IIT) Delhi

**Tuesday, 14<sup>th</sup> December 2021**



## ➤ Professor Terrance Fernando

- ❖ GCRF Project: “Mobilise”; living labs; digital twins; data and warning systems.

## ➤ Professor Sriman Kumar Bhattacharyya

- ❖ Indian perspective: earthquake hazard, multi-hazard, drones, 3-D printing, landslides, alternative (engineered) materials, retrofitting, risk-based design.

## ➤ Ms Ahsana Parammal Vatteri

- ❖ School systems under combined flood and seismic hazards.

## ➤ Dr Meini Su

- ❖ Corrosion issues in reinforced concrete; non-corrosive alternative construction materials; carbon emissions; recycled aggregate; CFRP manufacturing and recycling.

## ➤ Dr Alessandro Palmeri

- ❖ Seismic performance; dampers; secondary systems; nuclear power plants; offshore structures; new and existing buildings; multiple hazards.

## ➤ Dr Marina Bock

- ❖ Aluminum in structural applications; design issues; quasi-static studies.

## ➤ Dr Georgios Kamaris

- ❖ Aluminum alloy column tubes with concrete infill; connections?

## ➤ Professor Manmohan Dass Goel

- ❖ Blast-resistant design of underground infrastructure; extreme loading.

### Chairs: Session 4

Dr Ehsan Ahmadi  
Dr Suresh Renukappa /  
Dr Oladinrin Olugbenga

### Chairs: Session 5

Dr Irwanda Laory  
Prof. Konstantinos Skalomenos

### Leads: Session 6

Professor Santosh Kapuria  
Dr Alessandro Palmeri  
Dr Shashank Gupta  
Professor Vasant Matsagar

**What are the prospective research collaboration opportunities (topics/ areas, industry engagement, etc.) do you foresee in your domain of research?**

## ➤ Seismic Hazard

- ❖ Major hazard, of concern to large population across different countries - requires significant research efforts.
- ❖ Early warning systems (EWS)?

## ➤ Type or Categories of Infrastructure

- ❖ School buildings; hospitals; lifeline structures definition.

## ➤ Retrofitting of Structures

- ❖ Protocols; assessment/ need/ cost-effectiveness/ alternatives/ sturdiness; equipment and devices.

## ➤ Unmanned Aerial Vehicle (UAV or Drone) Technology

- ❖ Approaching inaccessible areas after a disaster hits certain locality.

## ❖ Construction Materials

- ❖ Aluminum (and its alloys) is an excellent energy absorbing material - high potential to use in resilience against loads imposed due to blast and impact events.
- ❖ Requires mechanical characterization (stress-strain relations: constitutive laws) at high strain rate of loading.
- ❖ Elevated temperature behavior of the construction materials; thermo-mechanical characterization.
- ❖ 3-D printing of construction materials, speed of construction.
- ❖ Recycling of construction materials; demolition waste; carbon footprint; advanced (engineered) materials.
- ❖ Corrosion, carbonation and alike environmental factors causing deterioration / ageing of structures.

## ➤ Multi-Hazard Vulnerability

- ❖ How would structures designed earthquake-resistant would perform against exposure to blast?

## ➤ Probabilistic Design of Structures

- ❖ Living laboratories; digital technologies - data-driven approaches; Bayesian networks; cater for uncertainties.



# DAY 3 – discussion and summary (15<sup>th</sup> Dec)

# Session 8 (Group Discussion)

## Roadmap for Resilient Cities in India

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**Professor Santosh Kapuria**, Indian Institute of Technology (IIT) Delhi

**Dr Shashank Gupta**, University of Wolverhampton, UK

**Professor Vasant Matsagar**, Indian Institute of Technology (IIT) Delhi

Wednesday, 15<sup>th</sup> December 2021

## ➤ Dr Rohit Adhikari

- ❖ Global Library of School Infrastructure: Hazard resilience of school buildings.
- ❖ Multi-hazard vulnerability assessment.

## ➤ Dr Irwanda Laory

- ❖ Artificial intelligence (AI), sensors, health monitoring, disaster resilience, data-intensive assessment tools, future generation technologies!

## ➤ Professor Chaminda Pathirage

- ❖ “Mobilise”: quantification of disaster resilience; community resiliency.

## ➤ Dr RuiRui Sun

- ❖ Design of structures against fire; industry perspective.

## ➤ Professor Sandip Kumar Saha

- ❖ Buildings on slopes, major Indian cities and infrastructure development on hills, multiple hazards in Northern Indian cities, mitigation measures.

## ➤ Dr Mohamed Shaheen

- ❖ Enhance robustness of steel connections by improving bolts contribution

### Chairs: Session 7

Dr Alessandro Palmeri  
Dr Georgios Kamaris /  
Prof. Sandip Kumar Saha

### Leads: Session 8

Professor Chaminda Pathirage  
Professor Santosh Kapuria  
Dr Shashank Gupta  
Professor Vasant Matsagar

**What are the prospective research collaboration opportunities (topics/ areas, industry engagement, etc.) do you foresee in your domain of research?**



### ➤ Identification of Communities at Risks

- ❖ Schools and related infrastructures to be adequately resilient; patients in hospitals have dilapidated mobility.
- ❖ Especially, in developing and underdeveloped countries the issues pertaining to school infrastructure require serious attention, so also the hospital (healthcare) infrastructure under multiple scenarios of hazards.
- ❖ Trustworthy information and data about schools/hospitals requiring attention against their hazard resilience.

### ➤ Uniform Assessment

- ❖ Variety of risk assessment models and approaches are available, however there is no uniformity among their quantification.
- ❖ Is some benchmarking possible?
- ❖ How does local (on-site) conditions affect the risks involved and their interlinkages (corelated)?

### ➤ Built-Infrastructure in Fire

- ❖ Building typologies and construction materials are changing rapidly; how do they perform in fire?
- ❖ Newer materials used in construction sector need thermo-mechanical characterization: smoke and toxicity.

### ❖ Habitat in Difficult Terrains

- ❖ Need of infrastructure development in difficult terrains; hazard resilience; new technological solutions for unusual circumstances that are particularly relevant to the locality and practices adopted.

### ➤ Performance-Based Models

- ❖ Need of performance-based models, codes and standards, region-wise data for structural assessment.

### ➤ Data Analytics

- ❖ Data-intensive regression-based method; machine learning (ML) approaches; deep-learning (DL) algorithms; artificial intelligence (AI).
- ❖ Unavailability of reliable data is a major hindrance in employing the latest data analytics tools.

# DAY 4 – discussion and summary (16<sup>th</sup> Dec)

# **Sessions 9, 10, and 11 (Technical, Break-Out, Discussions)**

## **Research Themes, Impact, Collaboration, and Roadmap**

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Lead by

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**Professor Santosh Kapuria**, Indian Institute of Technology (IIT) Delhi

**Dr Shashank Gupta**, University of Wolverhampton, UK

**Professor Vasant Matsagar**, Indian Institute of Technology (IIT) Delhi

**Wednesday, 16<sup>th</sup> December 2021**



## ➤ Dr Shashank Gupta

- ❖ Smart materials for structural response modification and abatement under multiple hazards, e.g., facades.

## Chairs: Session 9

Dr Georgios Papavasileiou  
Dr Shashank Gupta

## ➤ Professor Santosh Kapuria

- ❖ Piping systems and pipelines are crucial lifeline structures; their health assessment.
- ❖ Lamb waves for damage detection in structures; structural health monitoring, SHM.

## ➤ Dr Chris Wyatt

- ❖ Research Impact: policies, challenges, influencing factors, opportunities in disaster / emergency management.

## ➤ Dr Suresh Renukappa

- ❖ Digital world; experience and lessons learnt from the pandemic; economic activities; challenges and redressal.

## Groups: Session 10

All delegates: both from in-person and online modes

## ➤ Dr Tim Ferris

- ❖ Community resilience, multiple threats, informed technological interventions.

## ➤ Professor Georgia Thermou

- ❖ Steel-reinforced grout, structural performance enhancement.

## Leads: Session 11

Dr Shashank Gupta  
Professor Vasant Matsagar

## ➤ Professor Vasant Matsagar

- ❖ Multi-Hazard Analysis and Design of Structures: development of multi-hazard resilient built-infrastructure; hazard categories; scenario-based; site-specific; life-cycle factor of safety.

Professor Santosh Kapuria  
Professor Chaminda Pathirage

**What are the prospective research collaboration opportunities (topics/ areas, industry engagement, etc.) do you foresee in your domain of research?**

## ➤ Smart Materials

- ❖ Shape memory alloy (SMA), magneto-rheological (MR) fluids in structural resilience.

## ➤ Structural Health Monitoring (SHM)

- ❖ New techniques; continuous monitoring; utilization of the data generated; robustness in resilience.

## ➤ Sensors

- ❖ State-of-the-art and robust sensing devices, autonomous systems, energy harvesting.

## ➤ Disaster / Emergency Management

- ❖ New tools to meet emerging challenges, their effectiveness and impact, adaptability by the communities.
- ❖ Community resilience and decision making; standard operating procedures (SOPs).

## ❖ Built-Infrastructure

- ❖ Buildings, bridges, wind turbines, railways, nuclear installations, offshore structures and installations, etc.
- ❖ Modernization of infrastructures (retrofitting): new threats and challenges, e.g., COVID Pandemic?

## ➤ Dampers and Devices

- ❖ Optimization of effective performance under multiple hazards.
- ❖ Multi-criteria / multi-objective optimization on durability scale and affordability of the technology.

## ➤ New Design Approaches

- ❖ Developments of codes and standards: performance-based design; probabilistic methods; reliability scales.

## ➤ Rupert Avis

- ❖ Funding Opportunities; Call for Proposals; Agencies/ Organizations; Joint Calls(?); Focused Thematic Calls(?)

## ➤ Focus Groups

- A. Advanced Construction Materials
- B. Resilient Infrastructure Systems
- C. Data-Intensive Risk Assessment
- D. Multi-Hazard Scenario-Based Designs

(A) Materials	(B) Systems	(C) Assessment	(D) Multi-Hazard
Marina Bock	Georgios Papavasileiou	Irwanda Laory	Alessandro Palmeri
Georgios Kamaris	Tim Ferris (1)	Ehsan Ahmadi	Konstantinos Skalomenos (2)
Meini Su	Sandip Kumar Saha (1)	Chaminda Pathirage	Mohamad Shaheen
Sriman K. Bhattacharyya	Santosh Kapuria	Donya Hajializadeh	Tim Ferris (2)
Manmohan Dass Goel (1)	Georgia Thermou	Terrance Fernando	Sandip Kumar Saha (2)
Konstantinos Skalomenos (1)	Zuhal Ozdemir	Suresh Renukappa	
Yong Sheng	Manmohan Dass Goel (2)	Rohit Adhikari	
		Ahsana Parammal Vatteri	



# Future Plans and New Ideas

## Future Research Collaboration on the Advanced construction material (Group A)

*Possible research proposals*

**(i) Sustainable design of civil structures in India** - Develop construction materials with reduced carbon footprints to improve sustainability for both existing and new structures; Development of green concrete using waste material including natural fibres.

*Deliverables* - Experimental results for new sustainable material; Design guidance for using the developed sustainable material in civil construction.

**(ii) Development of material with energy absorption characteristic for resilient design of structures** - with focus on Aluminium components at high strain rates and elevated temperatures.

*Deliverables* - Experimental results for various aluminium components; Design guidelines.

**(iii) Future of 3-D printing for resilient and sustainable structures** - Identify challenges and prospects of using 3-D printed components in construction; Explore the difference in properties of the 3-D printed material with conventional material.

*Deliverables* - Gain understanding of differences in 3-D printed material and conventionally-made material, and its usage in civil construction.

## Future Research Collaboration on the Theme of Resilient Infrastructure Systems (Group B)

*Possible research proposals*

**(i) Is our critical infrastructure accessible, Social impact prioritization of bridge maintenance -**

Interdependency of different facilities, cost impact of the bridge failure, develop methodology for social valuation of the bridge function.

*Deliverables* - A framework to determine the resilience of the current network based on the social impact of its failure.

**(ii) Building envelop/façade design for structural resilience, energy efficiency and aesthetics – use of smart materials (e.g., shape memory alloys and polymers) and devices (piezo actuators/sensors, MR fluid dampers etc.).**

*Deliverables* - Better understanding of multiple smart material applications for resilient design of building envelops/facades; Development of improved resilient designs of building envelops and facades.

**(iii) Resilient design of civil structures in India in hilly regions prone to high seismicity** - has relevance to Himalayan region in Northern India requiring review of design codes, construction materials and practices for resilient design of civil infrastructure; Focus will be on residential and school infrastructure.

*Deliverables* - Improved understanding of design and construction practices for infrastructure in hilly regions of India subjected to seismic excitation; Modifications and improvements in design codes.



## Future Research Collaboration on the Data-intensive Risk assessment (Group C)

*Possible research proposals*

**(i) AI-based rapid risk assessment framework for infrastructure in India** - Data collection and labelling; Development of risk assessment framework using AI; Evaluation and validation of proposed framework; Mobile app development.

*Deliverables* - Build and develop database; Development of Rapid assessment tools/framework and Mobile App.

**(ii) Enhancement of critical civil infrastructure resilience in India via intelligent real-time monitoring** - Implementation of various structural health monitoring (SHM) techniques; Understand the challenges associated with real-time monitoring and investigate how to overcome them.

*Deliverables* - Strategy for real-time monitoring of different civil infrastructure.

**(iii) Data-driven decision making framework for asset management in India** - Identify challenges associated with digital twinning of the infrastructure; Adoption of building information modelling (BIM) and system modelling in Indian context.

*Deliverables* - Framework for decision-making process based on data; Mobile App.

## Future Research Collaboration on the Multi-hazard scenario based designs (Group D)

*Possible research proposals*

**(i) Multi-hazard performance-based engineering of high speed bridges and enhance resilience of high-speed railway network** - Optimal design solutions; Would require experimental work in the UK + Application of AI technologies in India (including hybrid simulations).

*Deliverables* - Strategies for resilient and sustainable design of high-speed railway network.

**(ii) Application of smart materials in risk mitigation of civil infrastructure in India** – Use of multiple smart materials and devices for development of smart structures that shall adapt to extreme loads and exhibit resilience.

*Deliverables* - Better understanding of use of multiple smart materials and smart devices; Development of improved resilient designs of buildings (e.g., high rise buildings) and structures.

**(iii) Identification and analysis of existing vulnerable built city structures, and development of residual life assessment and retrofit strategies** - Study of vulnerability of high rise buildings, old conventional as well as heritage structures in a city like Delhi under multi-hazard (earth quake, fire, blast, impact loads) conditions; Propose retrofit strategies to improve their life and resilience; Residual life estimation of critical infrastructure.

*Deliverables* - Vulnerability and residual life assessment of critical infrastructure; Development of retrofit strategies to improve their resilience.

## Other possibilities of collaboration explored during the workshop

- Joint publications between UK and Indian institutions (already 2 papers in progress between University of Wolverhampton and IIT Delhi)
- Joint research proposals on the aspects of resilience and urbanisation – 4 discussion themes identified and 12 different research ideas developed.
- Student (undergraduate as well as post-graduate) and staff exchange program for capacity building discussed
- Joint supervision of PhDs as well as split site PhD options explored.



## List of Participants

Lead coordinators		
Prof Vasant Matsagar	Face-to-face	Indian Institute of Technology, Delhi
Dr Shashank Gupta	Face-to-Face	University of Wolverhampton

UK delegates		
Suresh Renukappa	Face-to-Face and online	University of Wolverhampton
Georgios Papavasileiou	Face-to-Face and online	University of Wolverhampton
Marina Bock	Face-to-Face and online	University of Wolverhampton
Chaminda Pathirage	Face-to-Face and online	University of Wolverhampton
Mohamed Shaheen	Face-to-face	Loughborough University
Meini Su	Face-to-Face and online	University of Manchester
Ahsana Vatteri	Face-to-Face and online	University college London
Rohit Adhikari	Face-to-Face and online	University college London
Ehsan Ahmed	Face-to-Face and online	Birmingham City University
Irwanda Laory	Face-to-Face	Warwick University
Kostas Skalemenos	Face-to-Face and online	University of Birmingham
Georgios Kamaris	Face-to-Face and online	Liverpool John Moores University
Alessandro Palmeri	Face-to-Face and online	Loughborough University
Tim Ferris	Face-to-Face and online	Cranfield University
Georgia Thermou	online	University of Nottingham
Donya Hajializadeh	online	University of Surrey
Zuhal Ozdemir	online	University of Sheffield

Indian delegates		
Prof Sandip Saha	online	Indian Institute of Technology, Mandi
Prof M.D. Goel	online	Visvesvaraya National Institute Of Technology
Prof Santosh Kapuria	online	Indian Institute of Technology, Delhi
Prof Sriman Kumar Bhattacharyya	online	Senior Professor, Former director, Indian Institute of Technology, Kharagpur

Keynote speakers		
Prof David Proverbs	online	Dean of FSE, University of Wolverhampton
Prof Chaminda Pathirage	Face-to-face	Associate head (Research) of SoABE, University of Wolverhampton
Prof Vasant Matsagar	Face-to-face	Indian Institute of Technology, Delhi
Prof Santosh Kapuria	online	Indian Institute of Technology, Delhi
Prof Sriman Kumar Bhattacharyya	online	Senior Professor, Former director, Indian Institute of Technology, Kharagpur
Prof Terrance Fernando	online	University of Salford
Dr Alessandro Palmeri	online	Loughborough University
Amy Macdonald	online	Principal and Resilience Practice lead at Thornton Tomasetti (US office) – Industrial speaker
Dr Ruirui Sun	online	Director Fire Safety Division at Hydrock - Industrial speaker
Other invited talks to discuss research impact and funding base		
Dr Chris Wyatt	Online	Research office, University of Wolverhampton
Rupert Avis	Online	Research office, University of Wolverhampton

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Kostas Skalemenos	Face-to-Face and online	University of Birmingham
Georgios Kamaris	Face-to-Face and online	Liverpool John Moores University
Alessandro Palmeri	Face-to-Face and online	Loughborough University
Tim Ferris	Face-to-Face and online	Cranfield University
Georgia Thermou	online	University of Nottingham
Donya Hajializadeh	online	University of Surrey
Zuhal Ozdemir	online	University of Sheffield

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Prof M.D. Goel	online	Visvesvaraya National Institute Of Technology
Prof Santosh Kapuria	online	Indian Institute of Technology, Delhi
Prof Sriman Kumar Bhattacharyya	online	Senior Professor, Former director, Indian Institute of Technology, Kharagpur

Keynote speakers		
Prof David Proverbs	online	Dean of FSE, University of Wolverhampton
Prof Chaminda Pathirage	Face-to-face	Associate head (Research) of SoABE, University of Wolverhampton
Prof Vasant Matsagar	Face-to-face	Indian Institute of Technology, Delhi
Prof Santosh Kapuria	online	Indian Institute of Technology, Delhi
Prof Sriman Kumar Bhattacharyya	online	Senior Professor, Former director, Indian Institute of Technology, Kharagpur
Prof Terrance Fernando	online	University of Salford
Dr Alessandro Palmeri	online	Loughborough University
Amy Macdonald	online	Principal and Resilience Practice lead at Thornton Tomasetti (US office) – Industrial speaker
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Rupert Avis	Online	Research office, University of Wolverhampton

# Workshop Program and website

UKIERI  
UK-India Education  
and Research Initiative



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University of Wolverhampton, UK

[www.ukieri.org](http://www.ukieri.org)

Lead Partner Universities:



<https://www.wlv.ac.uk/research/research-initiative/>

To be updated with workshop key outputs, photos etc

### LinkedIn posting



Dr. Vasant Matsagar • 1st

Dogra Chair Professor at Indian Institute of Technology (IIT) Delhi  
5d •

"Urbanisation and Resilience against Natural and Manmade Disasters - Developing a Roadmap for Building Resilient Cities in India", a Partnership Development Workshop being held during 13th to 16th December 2021 at the University of Wolverhampton in the United Kingdom (UK), sponsored by the UK-India Education and Research Initiative (UKIERI), British Council and Department of Science and Technology (DST), Government of India. For the detailed technical programme please visit: <https://lnkd.in/dAXRrb4> [University of Wolverhampton](#) & [Indian Institute of Technology, Delhi](#)

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Alessandro Palmeri (He/Him) • 1st

5d •

Reader in Structural Engineering & Dynamics at Loughborough University

Looking forward to contributing and delivering a keynote tomorrow's afternoon. Thanks a lot to you and [Shashank](#) for organising this important and timely event in such difficult circumstances.

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# Acknowledgements

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