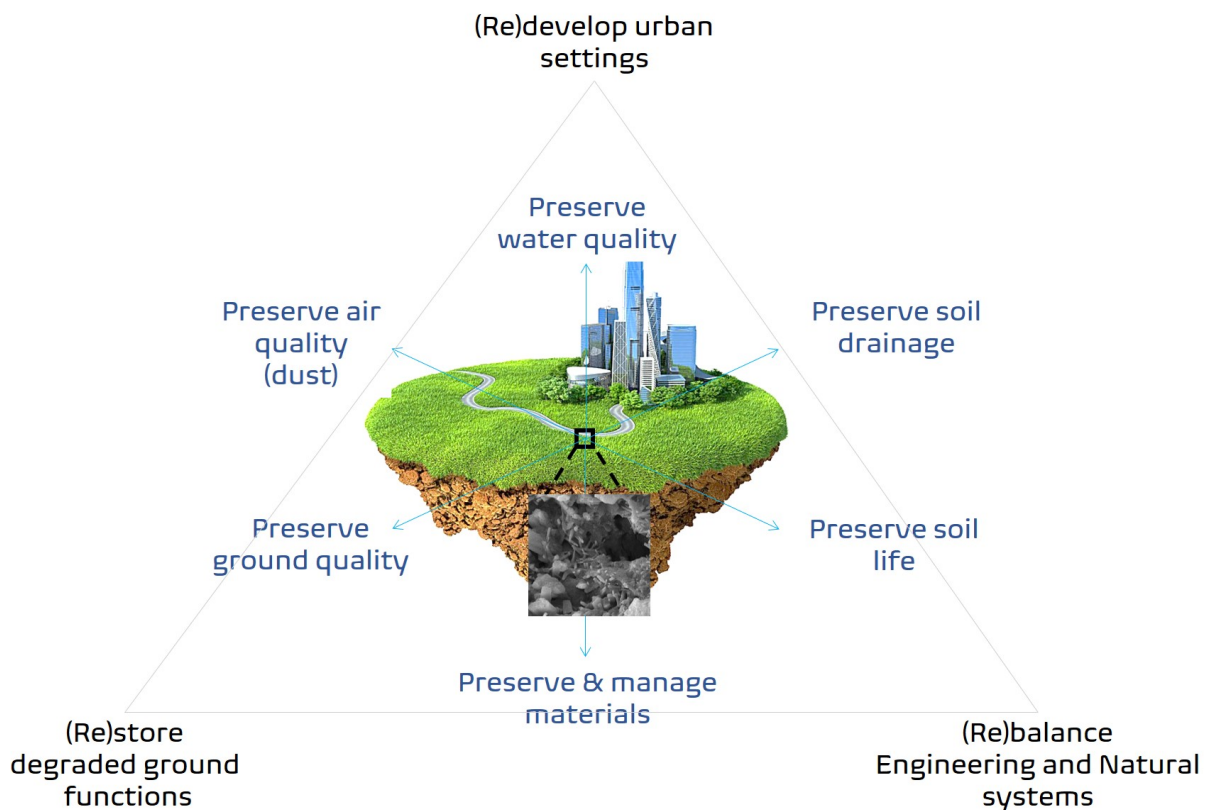


Nature Inspired Solutions for the built Environment (NISE 1): integrated natural and engineered systems

<http://geohazards.co.uk>

11-12 February 2021
Online and informal sandpit event





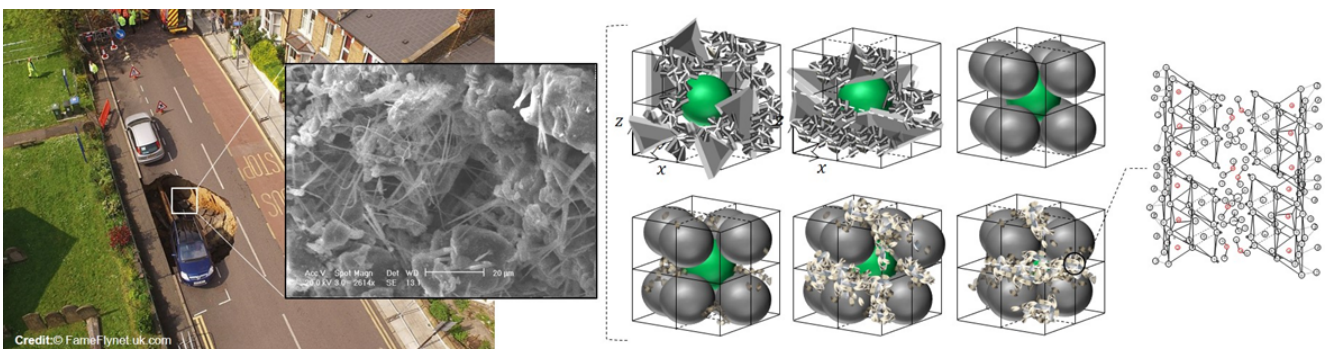
Nature Inspired Solutions for the built Environment (NISE 1)

integrated natural and engineered systems

As Engineers, our relationship with the ground is usually one-way and with a single objective in focus: the ground exists and we will improve it and/or exploit it to provide whatever functional service we seek - a strong, stiff foundation on which to found our buildings and structures, a cutting with sufficient long-term strength to accommodate infrastructure, a subsurface space for burial of wastes, a source of heat, a subsurface space to exploit for living or conveying traffic, a source of minerals, a free-draining material to enable water to pass, or an aquiclude to prevent the movement of water. In this, the ground has been historically undervalued and overexploited, degraded and blighted by this narrow minded approach to engineering design.

Conventional ground engineering methods and materials disrupt the soils' biogeochemical cycles which are reliant on soils' intertwining pore network and driven by interaction of the living organisms – flora and fauna - a perspective commonly overlooked by engineers. In making provision for an engineered crust that satisfies the demands of cities and the built environment, whilst remaining in symbiosis with natural ground systems, this sandpit meeting exchanges ideas on prospects of development and deployment of nature inspired less-intrusive technologies and materials.

Talks are centred around making cities more sustainable (through material, resource and life cycle management; and through a new generation of engineering interventions that takes ground as a system of systems), resilient (i.e. continuing to function in the face of change); and adaptable (e.g. by offering functions for future exploitation), all contributing to enhanced societal wellbeing.





What is it all about?

The ground exists; we exploit it to provide whatever functional service we seek. The ground has been undervalued and degraded. We will discuss how mathematicians, artists and architects were first inspired by nature, and how ground engineering research is making provision for an engineered ground in symbiosis with natural ground systems. At a larger scale, how asset management, digital and robotic technologies are paired with ground engineering research in shaping the future cities.

Why does it matter?

Without any exception, we are all living in cities and settlements on ground. A disrupted ground, with compromised sub-surface environment, a hell for living organisms – flora and fauna. Regardless of our background, discipline and whereabouts, we have a role to play in making cities – that sit on the ground - more sustainable (we need to understand ground is a system of systems, has functions well beyond a source of heat, water, minerals, and stiff foundation), resilient (ground needs to continue function in the face of extreme climates); and adaptable, all contributing to enhanced societal wellbeing.

And what is happening in February 2021?

A group of like-minded academics are coming together to give short 15-20 minutes talks on their research and how it contributes or can potentially contribute to development of next generation of ground intervention. The talks will be in three themes, technical and informal. Talks will conclude with 'closed-door' sandpit meetings, where we try to establish a Working Party for future collaborations.

What things the Working Party might be doing in future?

- Potential collaborations, partnerships & networks
- Future funding opportunities and collaboration
- Convening 'Thematic Meetings' on topical issues
- Exploiting large-scale testing opportunities across East London
- Collaborative research impact generation

Theme 1: 3Ms: Materials, Methods & Models

1. Polymers, biopolymers, fibres and nanofibers
2. Biogenic, biologic, and biocomposite materials
3. Role of size, shape, form, texture, grading and packing
4. Role of internal defects, structural and geometric anisotropy
5. Role of time, ageing and fatigue
6. Defects and internal imperfections

Theme 2: Adaptability to Emerging Environments & Climates

1. Extreme climates
2. Mineralisation, biomineralization, sequestration and decarbonation
3. Desertification, erosion and dust efflux
4. Granular flow and softening

Theme 3: Technologies, Implementation and Governance

1. Implementation & Governance: Materials, Methods, Models
2. Non-intrusive technologies, big data analytics and visualization
3. Cost-benefit analysis
4. Procurement, life cycle thinking and life cycle management
5. Circular Economy

Cross-cutting: 3Ms and Environmental Adaptability





Nature Inspired Solutions for the built Environment

11th and 12th February 2021

Times in GMT

Main Convener: Dr Arya Assadi-Langroudi, UEL, England

Dr Sohrab Donyavi, UEL, England

Co-Conveners: Dr Brendan O'Kelly, Trinity College Dublin, Ireland

Dr Mehdi Mirzababaei, Central Queensland University, Australia

Dr Soheil Ghadr, National Cheng Kung University, Taiwan

0900–0940 hrs. **Welcome!** e-tea/coffee & uploading of presentations

0940–1000 hrs. **Opening** *Prof. Hassan Abdalla* - Provost, University of East London

Dr Arya Assadi-Langroudi - Convener, University of East London

Morning session: Work Stream 1 : 3Ms - Materials, Methods, and Models

Chair: Dr Brendan O'Kelly and Dr Arya Assadi-Langroudi

1000-1030 hrs. **Keynote:** *Prof. Catherine O'Sullivan*, Imperial College London, UK.

How can fundamental modelling and observation inform NISE?

1030-1050 hrs. **Dr Mehdi Mirzababaei**, School of Engineering and Technology, Central Queensland University, Australia.

Advances in soil fibre reinforcement

1050-1110 hrs. **Dr Brendan O'Kelly**, Trinity College Dublin, Ireland.

Recent Trinity College Dublin environmental-geotechnics research and collaborations, with focus on greener economy by sustainable technologies

1110-1130 hrs. **Dr Vito Tagarelli**, Politecnico di Bari, Italy.

Prof. Federica Cotecchia, Politecnico di Bari, Italy.

Preliminary field data of selected deep-rooted vegetation effects on the slope-vegetation-atmosphere interaction: results from an in-situ test.

also contributions received from: **Dr Daniel Barreto**, Edinburgh Napier University, UK.

Prof. Ching Hung, National Cheng Kung University, Taiwan.

Chair: Dr Brendan O'Kelly and Dr Arya Assadi-Langroudi

Afternoon session: Work Stream 2: Adaptability to the Environment

1235-1305hrs. **Keynote:** *Dr Henry Dicks*, Centre for the History and Philosophy of Science, University of Leeds, UK.

Imitating Natural Materials: A Philosophical Perspective

1305-1325 hrs. **Dr Grainne El Mountassir**, University of Strathclyde, Scotland, UK.

Influence of fungal mycelial networks on soil behaviour

1325-1345 hrs. **Prof. Volodymyr Ivanov**, National University of Food Technologies, Kiev, Ukraine.

Dr Viktor Stabnikov, National University of Food Technologies, Kiev, Ukraine.

Design of a spectrum of affordable biocements and biocementation processes

1345-1405 hrs. **Dr Helen Mitrani**, Newcastle University, UK.

Designing and constructing using Microbially-Induced Calcium Carbonate Precipitation

1405-1425 hrs. **Dr Xueyu Geng**, Warwick University, UK.

Eco-friendly ground improvement techniques for transport infrastructure earthwork

1425-1435 Break

SANDPIT Session 1 1435 - 1515 hrs.

also sitting: **Prof. Federica Cotecchia**, Politecnico di Bari, Italy.

Dr. Gaetano Elia, Politecnico di Bari, Italy.

Prof. Shahaboddin Yasrobi, Enscon&Geomaple Geotechnics, Canada.

Prof. Elizabeth Theron, Central University of Technology, Free State, South Africa.

Prof. Ching Hung, National Cheng Kung University, Taiwan.

Dr. Vivi Anggraini, University of Monash, Malaysia.

Dr. Pouyan Abbasimaedeh, Cementys, Paris, France.



Corss-cutting PM: CCWS - Cross-cutting: Materials, Methods, Modeling & Resilience [Canada-US-Mexico special]

Chair: Dr Arya Assadi-Langroudi

1540-1600 hrs. **Prof. Balasingam Muhunthan**, Washington State University, USA.

Microbial Biofilm in Porous Sediments: Effects on Soil Behavior

1600-1620 hrs. **Dr Enrico Masoero**, University of Newcastle, England.

Simulating the chemo-mechanical behaviour of minerals at the nano-to-micro mesoscale

1620-1640 hrs. **Dr Michael Harbottle**, School of Engineering, Cardiff University, Wales.

Geoenvironmental services for geoengineering solutions

1640-1700 hrs. **Dr Arya Assadi-Langroudi, Dr Soheil Ghadr**

University of East London UK and National Cheng Kung University, Taiwan

On mechanics of porous granular matters

1700-1720hrs. **Dr Pooneh Maghoul**, University of Manitoba, Canada.

How to characterize permafrost in the context of climate change? -

1720-1740hrs. **Prof. Liz Varga**, University College London, UK.

Dr Evangelia Manola Loughbrough University, UK.

Eco-design technical characterisation of mineral-based construction materials in infrastructure systems

1740-1800hrs. **Dr. Abdullah Ekinci**, Middle East Technical University, Cyprus.

Aerial close-range photogrammetry to quantify deformations of geotechnical assets

1800-1820hrs. **Dr. Estéfan Garcia**, University of Michigan, USA.

Granular systems modelling

Recorded Dr Aryan Hojjati, University of Birmingham, UK.

ARLI (Alternative Raw Materials with Low Impact)

Dr Ravindra Jayaratne, University of East London, England.

Dr John Walsh, University of East London, England.

Doctoral researcher, Seth Tawiah, Washington State University, USA.

Armin Karami, Politecnico di Milano, Italy

1900 - 1930

SANDPIT 2

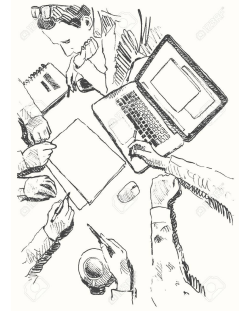
Next steps - Mapping out discussions



Welcome back! e-tea/e-coffee & uploading of presentations

Morning session: Work Stream 3 - Technologies and Governance & Natural Hazards

1300-1330 hrs. **SANDPIT: Session 3** Inputs from SANDPITs 1 & 2
Mapping out, Mind-map & potential pathways



Chair Dr Arya Assadi-Langroudi & Dr Sohrab Donyavi

Models perspective

1510-1530 hrs. **Dr Gil H Ochoa Gonzalez**, Instituto Tecnológico y de Estudios Superiores de Occidente ITESO, Mexico
Groundwater level decline: Overexploitation and related subsidence and soil fracturing
1530-1550 hrs. **Dr Jose Manuel Ramirez Leon**, Instituto Tecnológico y de Estudios Superiores de Occidente ITESO, Mexico
Hydro-geo-morphological modeling of urban flood events: Guadalajara, Mexico

Methods perspective

1550-1610 hrs. **Dr. Bilal Kaddouh**, University of Leeds, UK.
Robotics and autonomous systems in cities
1610-1630 hrs. **Dr. Munsamy Logan**, Central University of Technology, South Africa
Social constraints in Disaster risk reduction models
1630-1650 hrs. **Dr. Mehran Eskandari Torbaghan**, University of Birmingham, UK.
Intelligent Asset Management

Materials perspective

1630-1650 hrs. **Prof. Darryl Newport**, Sustainability Research Institute, UEL, UK.
Dr. Bamdad Ayati, Sustainability Research Institute, UEL, UK.
Materials & Implementation: sustainable infrastructure materials
1650-1710 hrs. **Dr. Leon van Paassen**, Arizona State University, USA.
Centre for bio-mediated and bio-inspired geotechnics

Honorary guests

Prof. David P Ngidi, Central University of Technology, Free State, South Africa
Prof. Albert Strydom, Central University of Technology, Free State, South Africa

1730–1740 hrs. **Closing:** Next steps, announcements and future meetings



Scopes and backbone philosophy in

Followed by [tbc] 17th March '21 talk in

& an opening for the subject in



Industrialist guests

