Introduction to Civil Engineering

10th November 2023

Speakers

- **Dr Daniel McCrum**
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  - Programme Director BE & ME in Civil, Structural & Environmental Engineering

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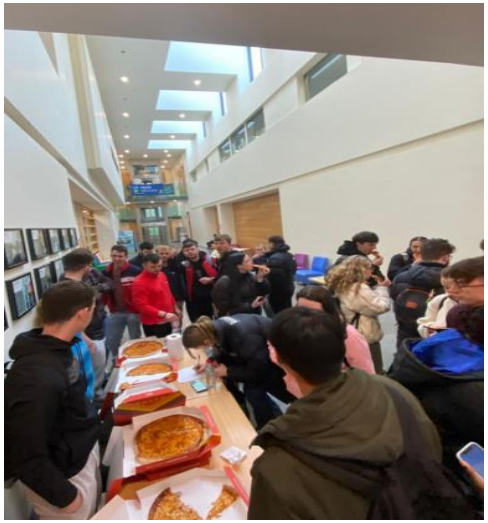
- **Dr Katarzyna Nikonowicz**
  - Senior Associate Water, RPS Consulting UK & Ireland

A TETRA TECH COMPANY

About the School

Community

- Very proud of our community spirit
- Newstead Staff Student Forum
- Civil Engineering Society
- Bridging the Gap



Presentation layout

- Introduction
- Civil engineering and global challenges
- Civil engineering sub-disciplines – diversity of opportunity
- Employment opportunities

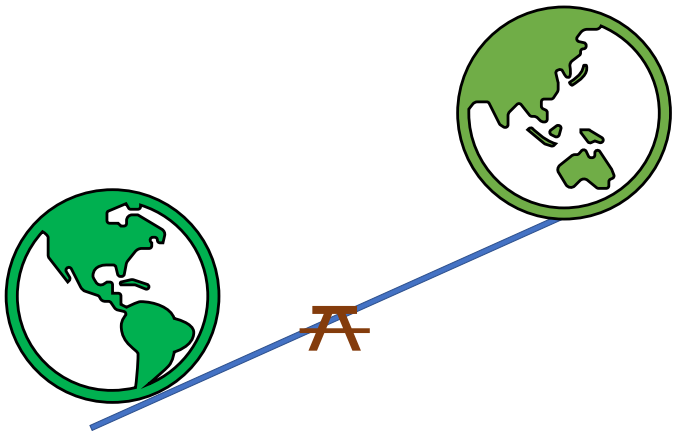
Global challenges and civil engineering

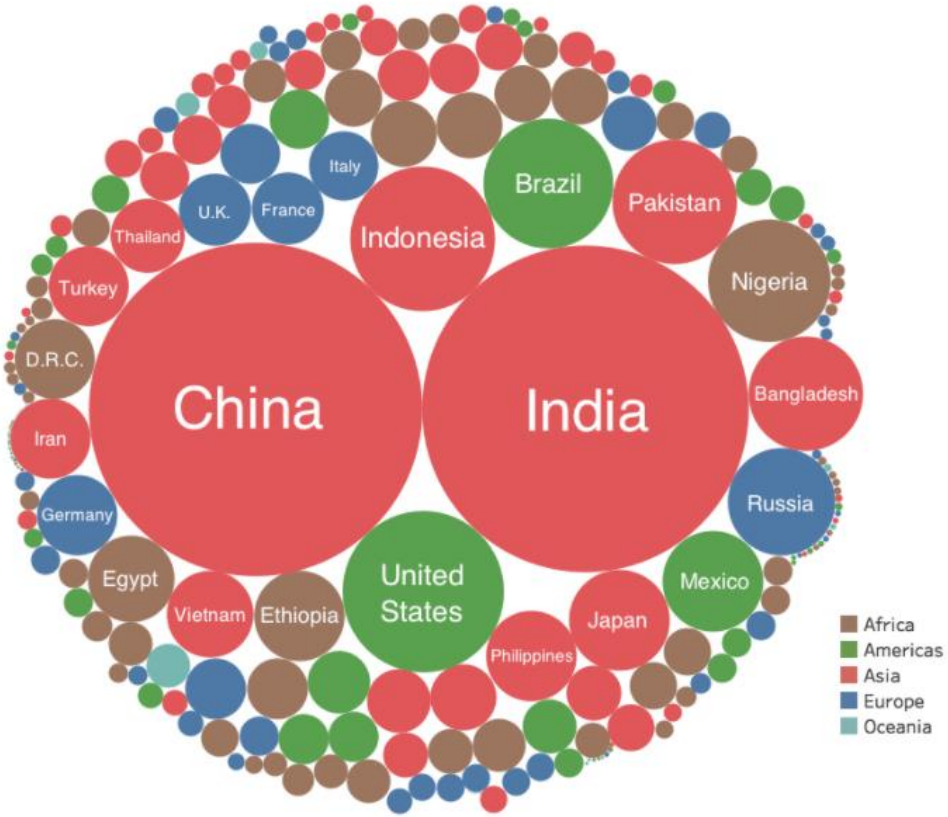
Increasing population

- Growing world population
- 10 billion people by 2060

Global challenges and civil engineering

- Population growth unbalanced
- A third of the global population live in India or China





Global challenges and civil engineering

Urbanisation

- 50% of population live in ill-prepared MEGA-cities
- 75% by 2060

Global challenges and civil engineering

Global warming and climate change

- Rising sea levels
- Unbalanced water resources
- Impacts on society and biodiversity

Global challenges and civil engineering

United Nations Sustainability Goals

Civil engineering … family tree

Structural

Environmental

Geotechnical (soil)

Hydraulic

Construction

Natural Hazards

Transportation

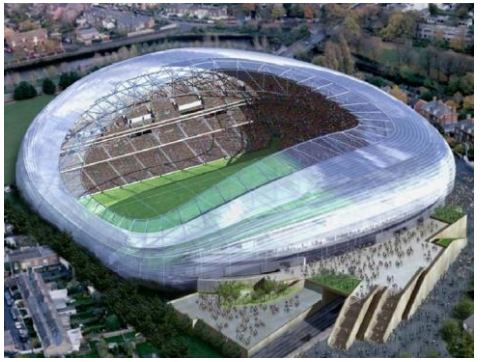
Habitat Restoration

Tunneling

Civil engineering … what is it?

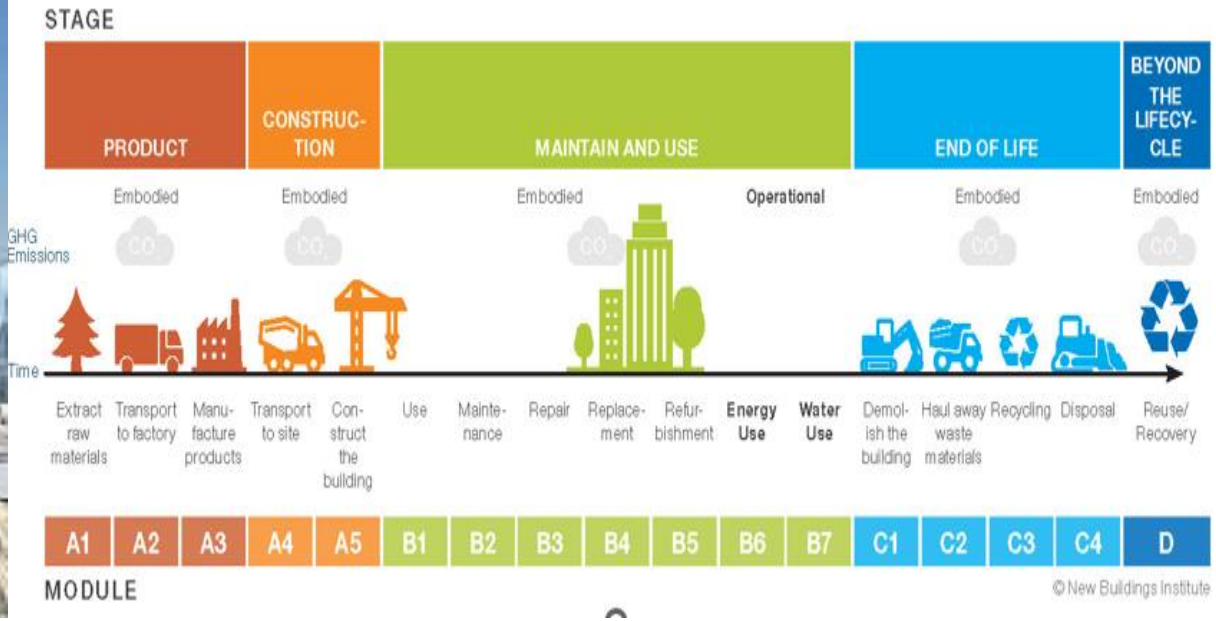
Planning, construction, and maintenance of:

- Structures
- Water & Environmental
- Highway and transportation systems
- Other activities (e.g. project management, financial services).



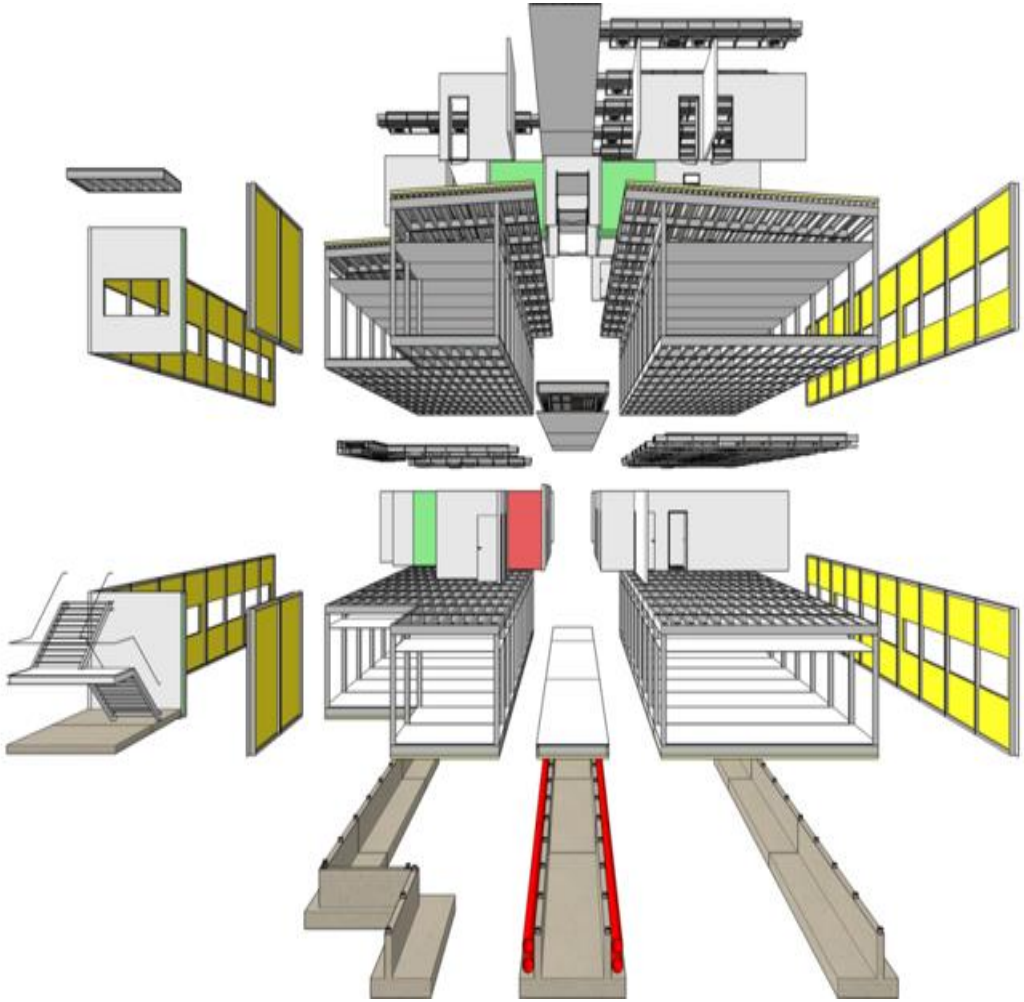
Civil engineering sub disciplines

Structural Engineering



Civil engineering sub disciplines

Design for Manufacture and Assembly & Design for Deconstruction



Civil engineering sub disciplines

We Test to Understand

Civil engineering sub disciplines

Water Resources

- Water treatment & supply
- Wastewater treatment & disposal
- Hydropower
- Flood alleviation

Water resources

Civil engineering sub disciplines

Environmental Engineering

- Nature based solutions
- Air quality
- Sustainability – environmental, economic and social
- Biodiversity restoration

Environmental

Civil engineering sub disciplines

Highway and Transportation Systems

- Smart cities
- Road construction/ maintenance
- Transport planning
- Modelling transport behaviour

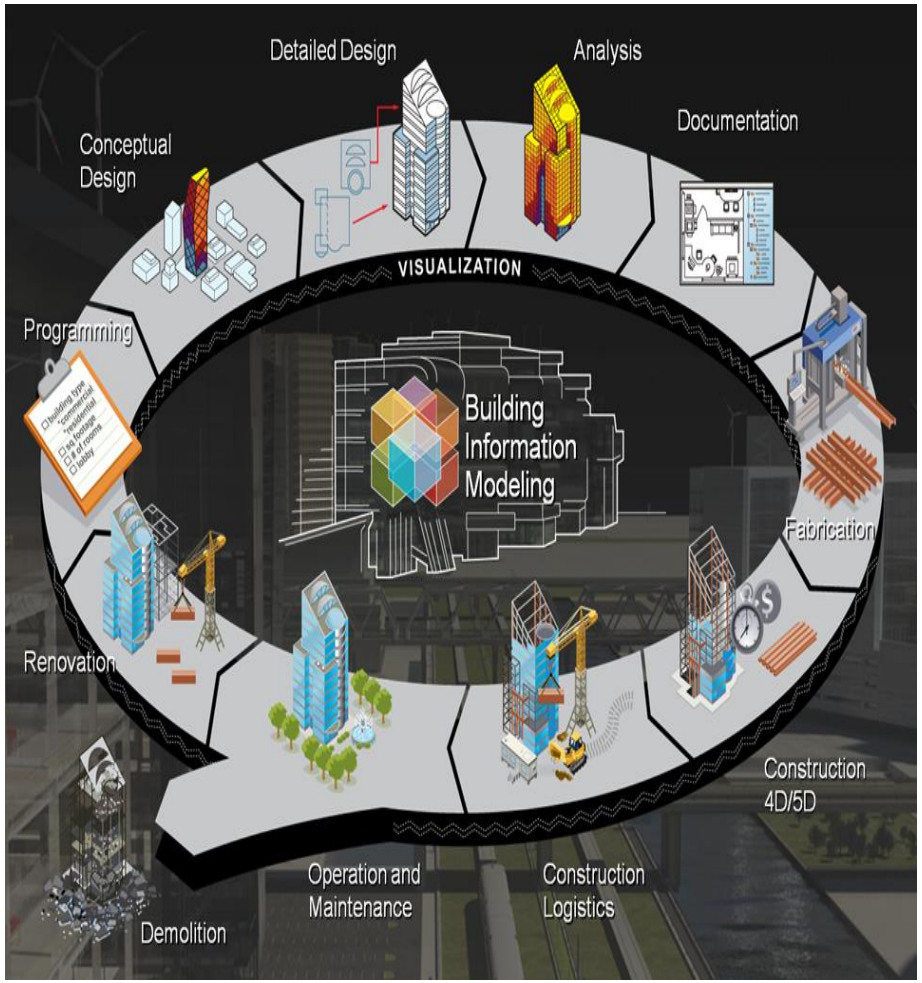
Civil engineering - technology

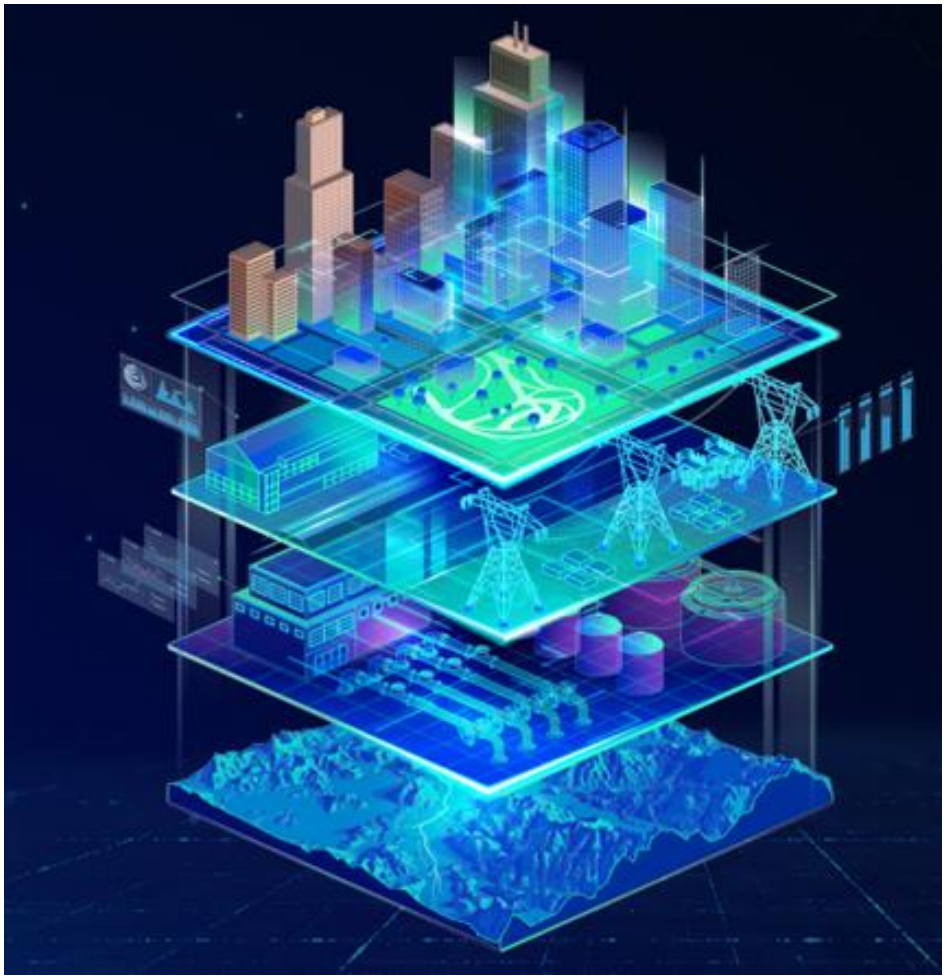
Boland’s Mills

Civil engineering - technology

Civil engineering - technology

Building Information Modelling (Digital Twins)





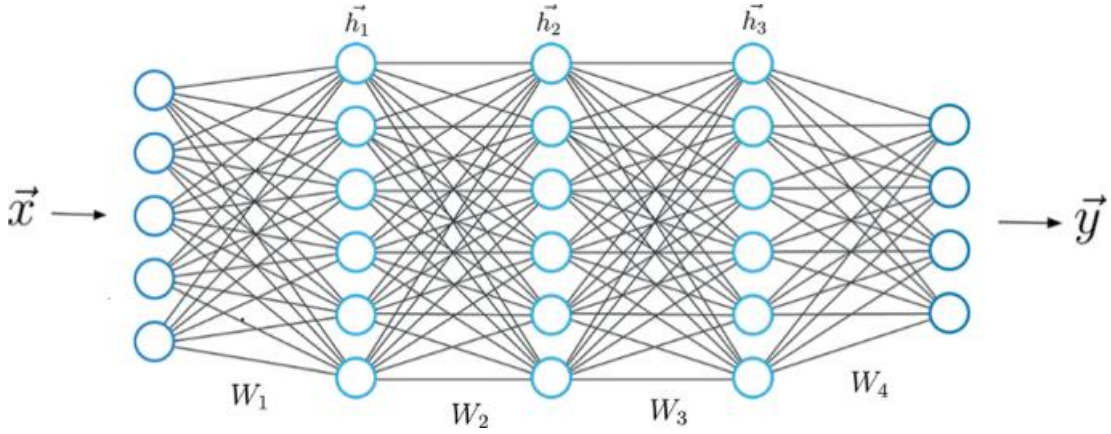
Civil engineering - technology

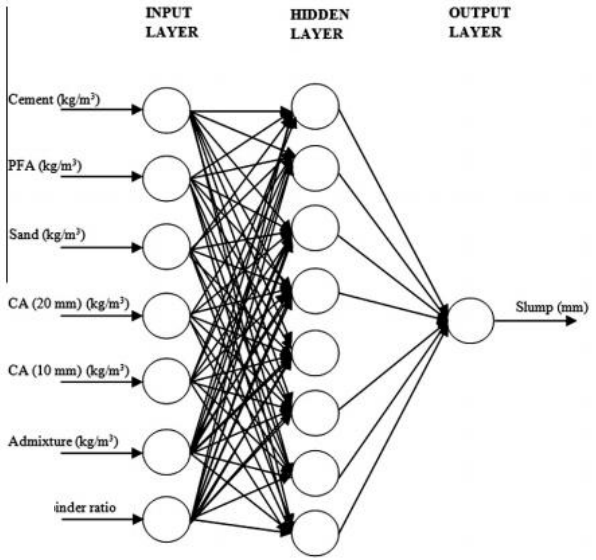
Civil engineering - technology

Can you imagine the sound of a new railway?

HS2 Railway, UK

Civil engineering - technology





Construct Innovate
Built Environment Research Ireland

Civil engineering - technology

Pollution modelling Dublin Bay

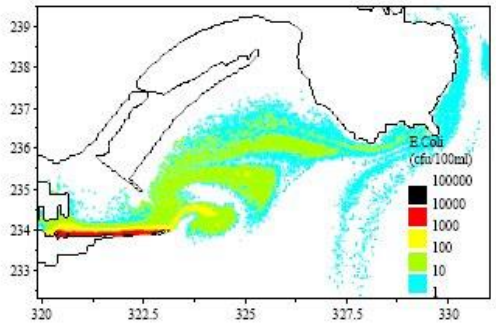


Figure 10: 1500 Particles per hour

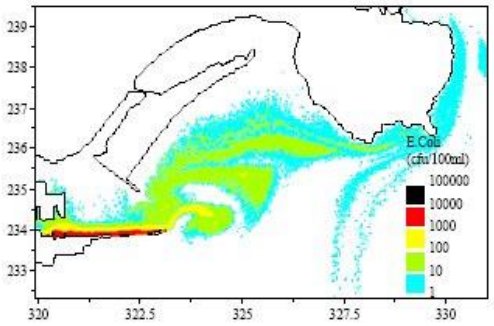


Figure 11: 2500 Particles per hour

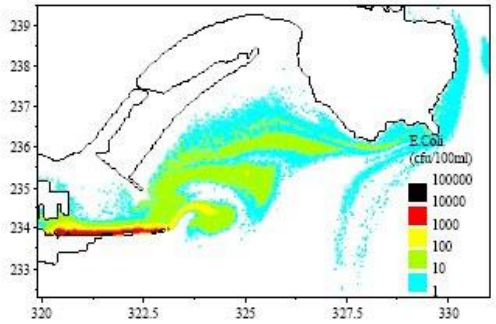


Figure 12: 3500 Particles per hour

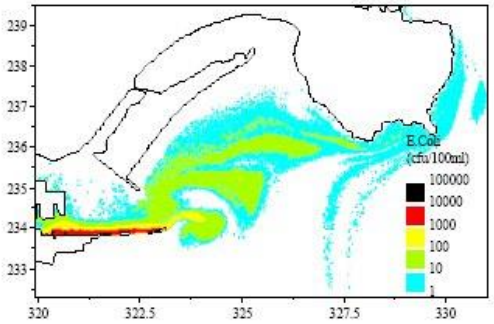
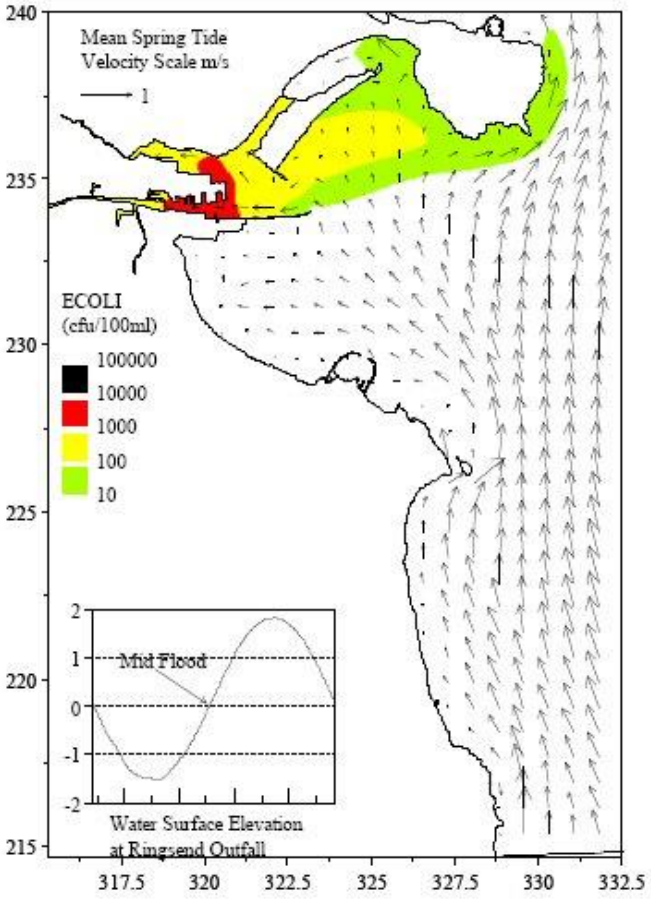


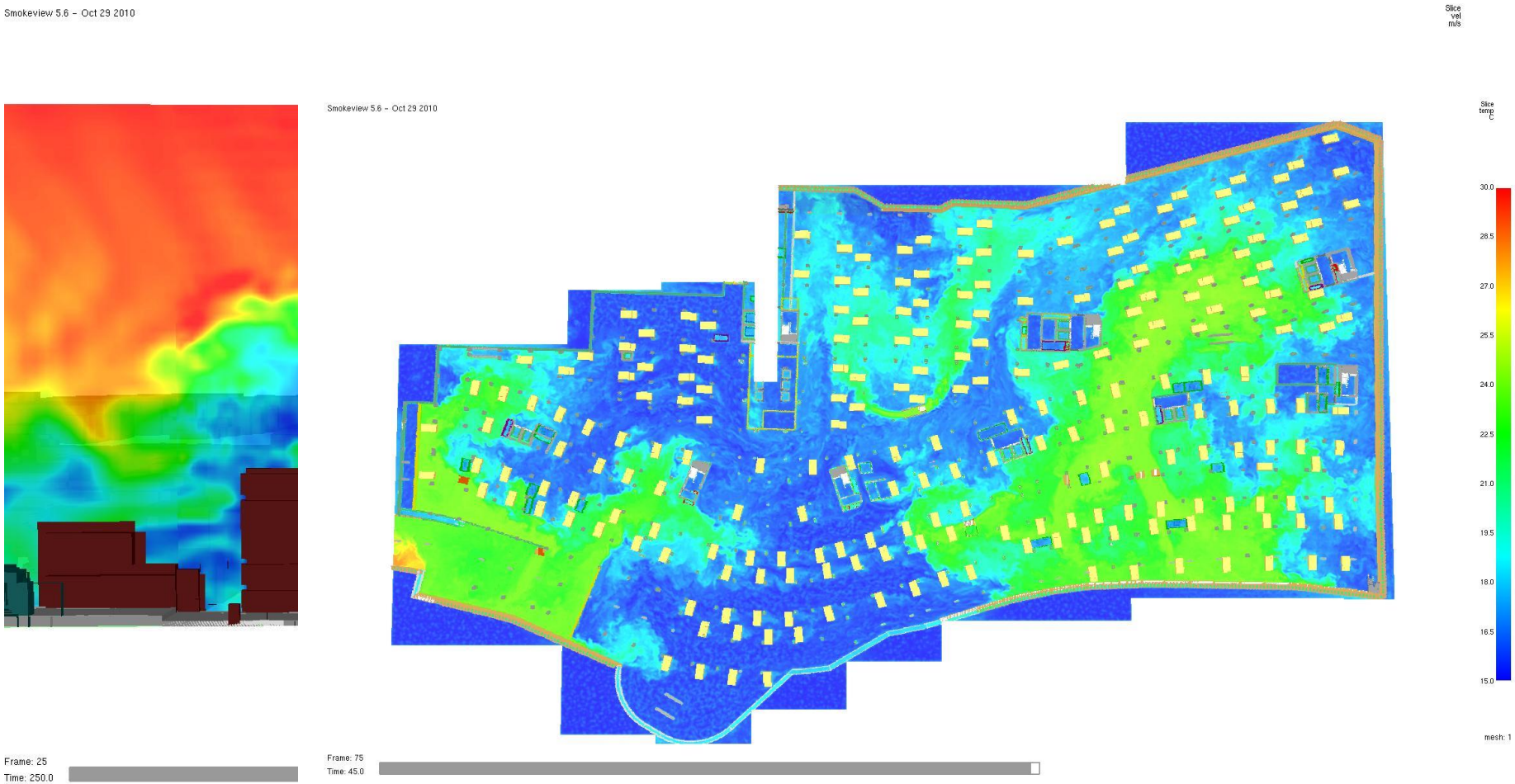
Figure 13: 4500 Particles per hour



(c) Mid Flood

Civil engineering - technology

Wind flow around buildings



Civil engineering job opportunities

Significant…… €116 billion

- **Climate action**
- **Urban regeneration**
- **Sustainable mobility**
- **Public transport**
- **Affordable housing**
- **Sustainable water resources and environmental resources**

Project Ireland 2040
Building Ireland's Future

Civil engineering job opportunities

Consulting Engineers

AECOM
ARUP
RPS
A TETRA TECH COMPANY
JACOBS

Contractors

BUILDERS SISK CONTRACTORS
bam
HEGARTY
walls
PAUL

Energy

ESB International
ESBI Energy Innovation
EDF ENERGY
EIRGRID
res

Management

accenture
High performance. Delivered.
Deloitte.
pwc
EY
Building a better working world
PM GROUP

Gov/Regulatory

An Roinn Iompair, Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport
seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND
epa Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil
Uisce Éireann Irish Water

Quantitative

Willis RSA
Google
Microsoft

Career journey?

David Regan

CEO, Concern

Dervilla Mitchell

Deputy Chair, Arup Group

Seamus Kearney

COO, Valeo Group

Anne Graham

CEO, National Transport Authority

Donal Hutchinson

MD, PM Group

Why Civil Engineering?

- Rewarding, well-paid career (30-40K starting salary)
- Significant job-opportunities (100% ME students offered job)
- 9 months after graduation; 91% employed, 4.5% further education, 4.5% seeking employment
- Shortage of graduate Civil Engineers
- Variety of work, on-site & office based, and scale
- Work in multi-disciplinary settings

INTRODUCTION TO CIVIL ENGINEERING

Katarzyna Nikonowicz MEng, Ph.D., CEng MIEI
Senior Associate, RPS
10/11/23

Scarce Resources

Clean/drinking water resources are scarce
Growing population
Increased pollution
Global challenge

Climate Change

Limiting impact on climate change
Carbon footprint reduction
Resilience to changes
Minimising impact of changes

Sustainability

UN SDG 6
Biodiversity
Asset whole life cycle
Environmental Impact
Sustainable market

Water Resources

Health & Safety

Key consideration
Safety of workers
Impact on users and communities

Technology

Modelling & Calculations
CAD/GIS, BIM
Monitoring and control
AI
MS Excel
Office 365

Multidisciplinary

Multidisciplinary projects
Multidisciplinary considerations
Co-operations
Brainstorming
Competing needs

We solve
PROBLEMS THAT MATTER

Skill Set

Technical
Legal
Financial
Management
Soft skills

International

International project
Multinational teams

Job Opportunities

Employee market
Internships
Graduate programmes

Career Paths

Client	Consultancy	Contractor	Other
• public • private • policy makers	• multi-disciplinary • specialists • PMO • client's rep • D&B • private sector • international	• site work • main contractor • specialists • management • commercial support	• academic • laboratory • supply chain • materials • technology

Projects - Brewery Road Watermain Repair

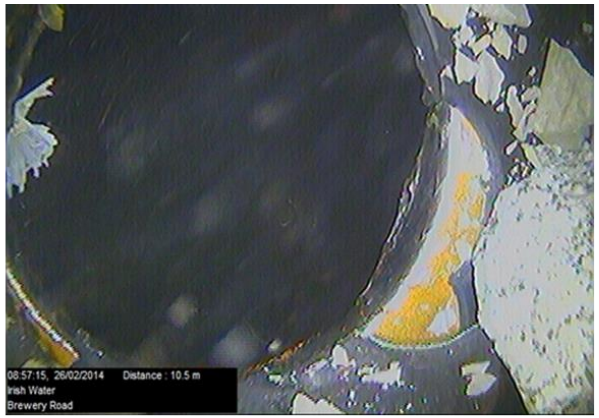
Location: Stillorgan, Leopardstown Inn pub's land

Time: Monday morning 10th February 2014

Projects - Brewery Road Watermain Repair

The 1200mm steel pipeline was constructed in tunnel in a very hard granite rock, using drill and blast technique.

Projects - Brewery Road Watermain Repair



- The damage location about 180m from the reservoir, 10m below the ground. Status unknown.
- The level of water in the reservoir (78m) and the invert level of the pipe (61.58m). >16m static pressure.
- Only one valve between the reservoir and the damage location.
- Inflatable packer used as a temporary plug. It is typically used for sealing boreholes during tests.
- On 26th February the valve was partly closed, the rig was removed, the borehole was surveyed, the plug was successfully inserted and inflated with nitrogen gas.

Projects - Brewery Road Watermain Repair

There were two options initially considered for the permanent repair: internal and external one.

Permanent repair:

- Excavation of a shaft approx. 4m by 4m.
- Assessment of the damage, cleaning, coating.
- welding on a stub with a blank flange.
- In case of any accident the pipe would be arrested.

The contractor pre-drilled granite rock to a depth of approx. 8m before he started breaking the rock. The pressure in the plug was monitored all the time.

Projects - Brewery Road Watermain Repair

- The last 2m of rock was excavated very carefully. The pipe was depressurised. A mini digger was lowered down. A plug and feathers method was used as well.
- Overall it took the contractor almost 7 weeks to get down to the pipe.
- The plug had to be taken out but as the shut off window was closing there was no time to weld the stub on properly. A temporary patch was welded on instead and the pipe was recharged.
- The final bit of the repair works required a man entry. The stub was welded on.
- Once the pipe was emptied an entrance hole was cut out to allow for internal repair.
- The pipe was cleaned, coated and a blank was bolted on the stub.
- The repair was successful. The shaft was backfilled and the site was restored to its original condition.

Projects - Saggart Reservoir Project

Once completed by the end of 2023, this covered reservoir will hold up to 100 million litres of water, which is equivalent to 40 Olympic swimming pools, 3 Croke Parks or almost 300,000 homes daily water usage.

Projects - Uisce Éireann National Water Laboratory

New Uisce Éireann water and wastewater testing laboratory at Ballysimon in Limerick.

The facility will develop further the sampling and testing of water and wastewater from samples across Ireland and is to be capable of testing over one million samples a year.

Services: preliminary design, planning, detailed design, construction and handover phases, acting as Employer's Representative and Assigned Certifier, delivering civil, structural, mechanical, electrical, fire engineering, and PSDP services.

Projects - Metrolink

Atkins/RPS were appointed to carry out the Advance Works Design Services for the innovative Metrolink project.

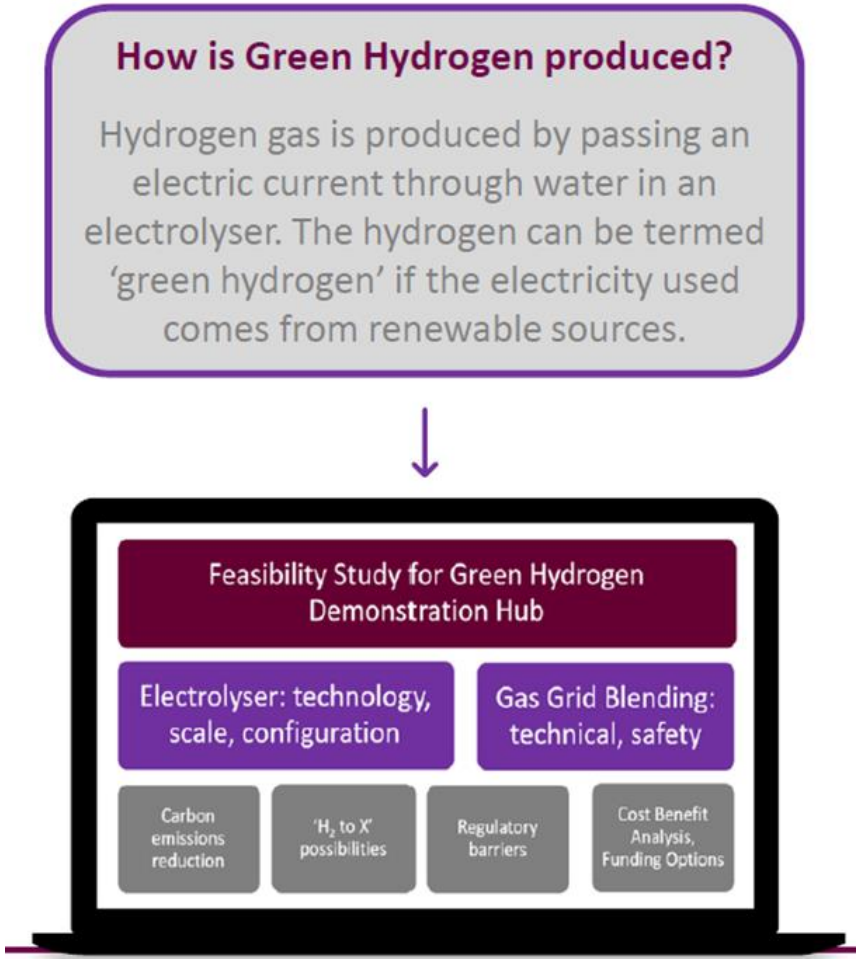
Metrolink will comprise a high-capacity, high-frequency, modern and efficient metro railway, with 16 new stations running from Swords to Charlemont.

Projects - Kerdiffstown Landfill Remediation Project

Transformation of the site from a former waste management site to a safe EPA licenced facility and multi-use public park which includes playing pitches, a playground and other recreational amenities.

Winner of the ‘Civil Engineering €10m to €20m’ category at this year’s Irish Construction Excellence Awards on 27th April 2023.

Projects - Green Hydrogen



RPS have been appointed as project manager by North Offaly Development Fund to carry out a feasibility study on Green Hydrogen production in the midlands of Ireland.

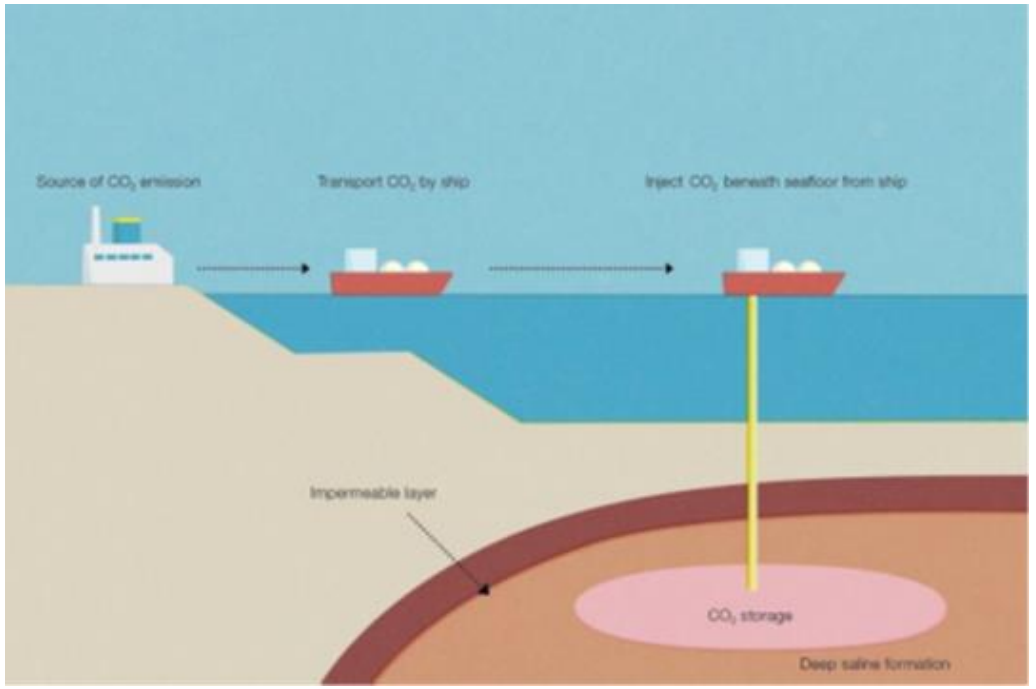
The study analyses the potential for hydrogen to enable a larger amount of renewable energy to be utilised in the electricity system.

The surplus electricity from renewables may be used to make green hydrogen and could be stored until converted back to electricity when needed, in times of insufficient supply.

Projects - Carbon Capture and Storage (CCS)

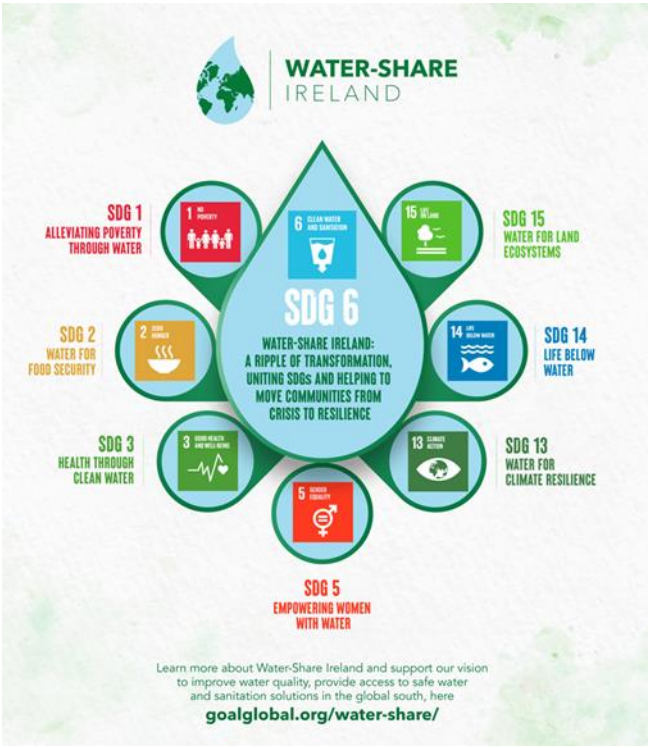
A study on Carbon Capture and Storage (CCS) in support of Ireland's Climate Action Plan, involves gathering and conditioning CO2 captured from large-scale emitters in Cork and Dublin, which represent 5% of Ireland’s overall CO2 emissions.

Project of the Year at this year’s ACEI Engineering Excellence Awards.



Projects – Water-Share Ireland

Supporting Water-Share Ireland – alliance of Irish water sector stakeholders collaborating with GOAL to deliver sustainable water, sanitation and hygiene (WASH) programmes to vulnerable communities in developing countries.



Projects - Other

- Ballymore Eustace Water Treatment Plant
- Uisce Éireann various projects and support
- OPW various projects and support
- Flood Alleviation Schemes
- DAPs
- Dublin Airport projects
- Corrib Onshore Gas Pipeline
- Celtic Interconnector
- Power Up Dublin
- Dart+ South West Railway Order
- Road, Cycling and Greenway Schemes

Career in RPS

- Long relationship with UCD
- Internships
- Graduate Development Programme (rotation)
- Tetra Tech – 26,000 employees across the globe
- Flexible working hours/hybrid working
- Training
- Paid Professional Membership
- Annual Leave (23-28 days)
- Paid Sick Leave
- Maternity/Paternity Leave
- Pension
- PHI
- Death in Service Benefit

Thank You

Any questions?