PRACTICAL APPLICATIONS FOR CONSTRUCTION AND THE BUILT ENVIRONMENT

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IN THIS ISSUE

Tools to improve planning for flood emergencies

Work done in the UK on decision support for flood emergency planning has so far been limited. The "Risk to People" method is the most commonly used tool in the UK to assess flood fatalities. However, it is an empirical, generalised model that does not use detailed information on each individual receptor in its "broad scale" estimates of loss of life. To provide a more accurate assessment of loss of life, an agent-based model is required.

HR Wallingford

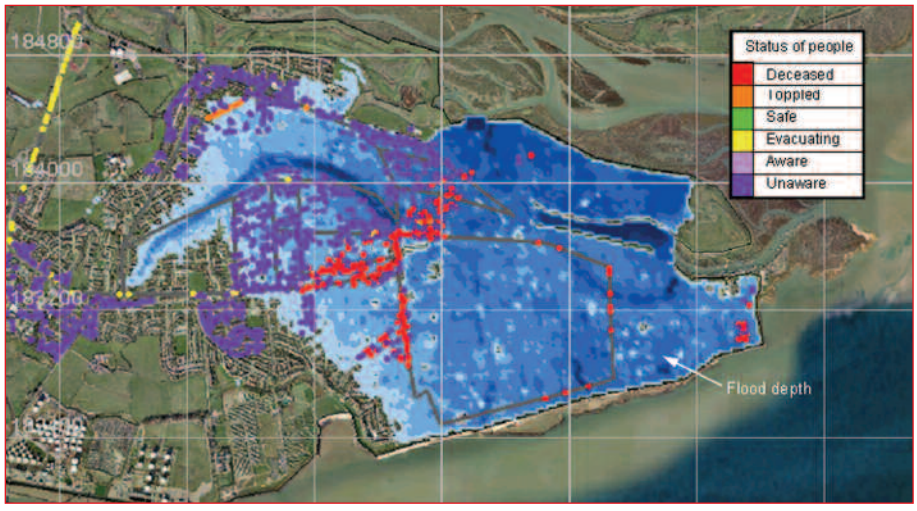
An agent-based model is a computational model that simulates the interactions of autonomous agents to assess the overall system, in this case a flood incident. It can model the simultaneous operations of multiple agents (in this case people and vehicles) with the flood wave, to re-create and predict the actions of complex phenomena such as those that occur in flood emergency.

HR Wallingford has been piloting a prototype, agent-based Life Safety Model (LSM). The LSM models individual receptors (e.g. people, buildings and cars) and their dynamic interaction with the floodwater. It is currently the only emergency planning model for floods currently available that allows this important interaction to take place. The LSM estimates deaths from drowning, exhaustion, building collapse and from vehicles being swept away, as well as individuals' evacuation times to reach safety.

The LSM offers a scientifically robust method of assessing residual risk to life in areas at risk of flooding and from dam breaks. The algorithms used in the life safety simulator are based on the latest research results. Importantly, the LSM allows comparison of different emergency management strategies (e.g. use of shelters, improved warnings, changes to escape routes) that can assist in reducing the loss of life during future floods. Local authorities' emergency plans for floods often do not identify evacuation routes and safe havens. The LSM is a tool that can help emergency planners both improve their plans and carry out simulation exercises with the blue light services.

The LSM has been validated against historical data from the Canvey Island flood in 1953, during which 58 people lost their lives, and was found to give accurate estimates of what actually occurred during this disaster. Over the next 24 months HR Wallingford will be further developing the LSM both to improve its user-friendliness and its functionality via the introduction of improved modelling methods such as random walk models for pedestrians.

For further information please contact Darren Lumbroso, Principal Engineer, Water Group, HR Wallingford Ltd (01491 822383; E-mail: d.lumbroso@hrwallingford.co.uk).



Life safety modelling of the 1953 Canvey Island flood showing the status of people during the event.

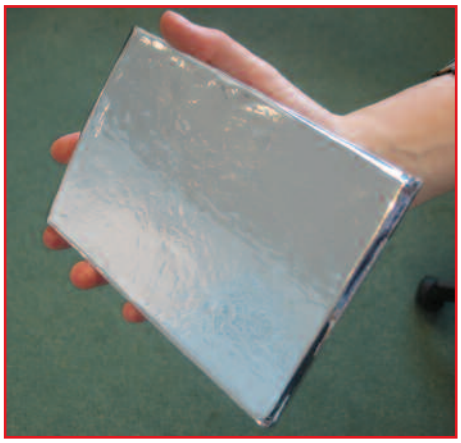
Developments on the path to zero carbon buildings

The Concrete Centre

Looking forward to 2016 and beyond, the aspiration for what are termed 'zero carbon buildings' will require levels of heat loss around half to one third of those currently permitted. This is placing greater demands on the performance of the building fabric and the insulation products that are used.

The challenging CO_2 emission targets for buildings are driving development of new and improved insulation materials. This has generated interest in the transfer of vacuum insulation technology from the refrigeration and logistics sectors, where it is used in packaging, vehicles, and appliances such as freezers.

With a thermal conductivity around 1/7th to 1/8th of that for glass wool and polystyrene, vacuum insulation panels in construction could greatly reduce the thickness of external walls, which must otherwise increase to accommodate ever greater amounts of conventional insulation. However, bringing the technology to the construction sector is not without its challenges, which will be among the topics explored at the 2009 International Vacuum Insulation Symposium. More details of this event are on page 3 opposite. An important milestone on the path to zero carbon will be the 2010 edition of Part L of the Building Regulations which, along with a requirement for higher standards of insulation and airtightness, will also take fuller account of thermal mass. This is in response to the greater influence of thermal mass on energy efficiency as we move towards very low energy design. It is also an issue that is reflected in changes to the Energy Performance of Buildings Directive.



Sample of a 6mm vacuum insulated panel (VIP), which is equivalent to approximately 80mm of glass fibre insulation.

Proposed changes to the Directive will require that thermal capacity provided by the building fabric is accounted for in national calculation methodologies, such as the SAP (standard assessment procedure) tool used in the UK to check Part L compliance of new dwellings. Alongside this, the Concrete Centre has published a short guide that introduces the subject of thermal mass, explaining what it is and how it can be used to enhance year-round thermal performance. Included in the guide are straightforward explanations of related topics such as admittance, decrement and passive solar design. This can be downloaded from the Concrete Centre website (www.concretecentre.com/publications).

For further information please contact Tom De Saulles at The Concrete Centre (01276 608714; E-mail: info@concretecentre.com).

Improving transport and rural infrastructure services in developing countries

DFID Department for International Development

The World Bank and DFID are joining forces in a collaborative programme for knowledge management and dissemination that focuses on issues affecting transport and rural infrastructure services in developing countries. The aim of the Transport Research Support (TRS) programme is to fully utilise transport research initiatives that promote sustainable infrastructure. The principles include appropriate, value-for-money investments that use fundamental engineering concepts, local know-how, local materials, labour and ownership, and are targeted particularly at meeting the needs of the poor.

In the new, jointly operated programme, these approaches will be linked to training and capacity building, and are supported by the World Bank's Transport Sector Strategy that advocates economic, financial, environmental and social sustainability in transport policies and systems.

The Programme will assemble and disseminate the lessons of research and experience in high priority areas of transport and development to decision-makers in developing countries and to a range of administrators, advisers, civil society and others involved in the development process, including World Bank and DFID-funded programmes.

The TRS Programme has started recently and will run for 5 years with a budget of £5.375 million. The Programme will be managed by the World Bank, and has five primary work streams.

- **Development of discrete knowledge products based on lesson learning from within World Bank operational and advisory programmes** – an example of these projects would be the development of a sustainability audit for transport programmes.
- **Development of flagship knowledge products focusing on high priority issues of a more complex nature than the discrete knowledge products in the first work stream –** initial projects have been identified as facilitating freight transport, transport and climate change, and transportand social responsibility, especially in light of the economic downturn.
- **Support for a Lead Infrastructure Specialist seconded by DFID to the Bank**
- **Improving World Bank advice to deal with transport planning in a time of uncertainty**
- **Maximising the contribution of transport investment to long-term sustainable growth.**

Peter O'Neill and Mark Juhel of the world Bank will be managing the Washington side of the transatlantic partnership.

Marc Juhel, the World Bank's Transport Sector Manager, and Peter O'Neill, the Bank's Lead Infrastructure Specialist, will operate the Programme with Gareth Aicken, the DFID Research Growth Team Leader, coordinating the UK effort.

For further information please contact Gareth Aicken E-mail: g-aicken@dfid.gov.uk).

Ramp metering: delivering significant benefits to both the Highways Agency and road users

HIGHWAYS AGENCY

Ramp metering is a highly effective traffic management tool that controls the rate at which vehicles join a motorway during busy periods, the purpose being to prevent or delay breakdown in the flow of motorway traffic.

The benefits of ramp metering include:

- greater throughput of vehicles during peak periods;
- less congestion and improved traffic flows;
- more-reliable journey times;
- reduced risks of accidents;
- environmental improvements due to noise reduction and improved fuel consumption.

(Top) *Metering the flow at M1 J39.*
(Above) *Short reds split Vehicles into small groups on the M1.*

Part-time traffic signals using the familiar red, amber and green lights come into operation at times of peak traffic flows to control the rate at which vehicles are released from a slip road onto a main carriageway.

How does it Work?

With ever increasing volumes of traffic, many motorways become so busy at peak times that traffic slows down significantly and can come to a standstill, a situation known as flow breakdown. There are many locations across the country where the amount of traffic joining a motorway at a junction causes this flow breakdown to occur, usually just after the junction.

Ramp metering works on the principle of carefully controlling the rate at which traffic is allowed to join a motorway. By doing this, the motorway can be kept flowing for longer and, if flow breakdown does still occur, ramp metering can ensure traffic starts moving freely earlier than it would have done otherwise, resulting in improved journey times for drivers.

The system makes use of detectors buried in the road to monitor traffic conditions and, when the main carriageway starts to become busy, the lights switch on and start controlling (or "metering") the rate of vehicles released from the slip road. This control is achieved by modifying the amount of time for which the red and green lights are on. The same sort of detectors are also buried in the slip road and are used by the system to manage the length of the queue on the approach to the lights. This is essential to ensure that the system doesn't cause traffic to back up onto the roads leading to the motorway junction, which would of course be detrimental to vehicles not using the motorway.

The lengths of time that the traffic signals display red and green are generally far shorter than for traffic lights at a typical road junction. This is done deliberately so that small groups of vehicles are released from the slip road (quite often only four vehicles at a time). This arrangement makes it easier for these small groups to merge into the flow of traffic already on the motorway, which is one of the fundamental reasons why the system works.

How do we know it works?

Evaluation of the first 30 ramp metering sites installed confirmed a reduction in journey times of up to 40%, with an average improvement of 13%. These results were better than expected, and translate to a much better driving experience for people both on the main carriageway and joining at junctions with ramp metering.

What's next?

Based on these positive results, the Highways Agency decided to deliver more sites across England, bringing the total to approximately 80 by March 2009.

A trial linking a ramp metering system with the traffic signals at junctions approaching the motorway (controlled by an Urban Traffic Control system) has shown a combined journey time saving of 14.7% on the mainline motorway; as well as significant improvements for the local roads in the vicinity of the motorway. This Integrated Traffic Management provides a holistic solution to traffic management problems and requires the Highways Agency and local authorities to work in partnership to achieve improved results across the combined network.

Ramp Metering Task Force

In April 2008, the Highways Agency formed the Ramp Metering Task Force to ensure that best practice is shared across all ramp metering projects in the country.

The task force maintains a panel of experts from the Highways Agency and industry whose activities include reviewing the performance of existing sites, providing technical direction for consistency across all schemes, and coordinating future development of the ramp metering system.

Given the continual development and deployment of ramp metering sites across the UK the next few years will certainly be busy for the Task Force.

For further information please contact the Highway Agency (08457 504030; website: www.highways.gov.uk/rampmetering). You can also contact the RMTF directly at rmtaskforce@highways.gsi.gov.uk.

Vacuum insulation

The 2009 International Vacuum Insulation Symposium, mentioned in the BCA article opposite, is to be held at the Royal Institution in London on 17 and 18 September 2009. Further details are at www.ivisnet.org.

The Modern Masonry Alliance is sponsoring Ian Abley on an Engineering Doctorate at the Centre for Innovative and Collaborative Engineering (CICE) at Loughborough University. CICE is committed to advanced training and research in engineering and construction management. To be completed in 2011, the theme of the EngD is *The future for masonry construction in Britain and the role of vacuum insulation technology*.

For further information please visit www.ivisnet.org or contact Ian Abley via the CICE Sponsor contact on page 8.

Benefitting from Industrial Secondments

The Royal Academy of Engineering

The Royal Academy of Engineering's Industrial Secondment Scheme enables academic staff teaching any aspect of engineering in UK universities to spend three to six months (on a full-time basis or for longer on a part-time basis) in industry with a view to improving the quality and industrial relevance of their UK undergraduate and postgraduate teaching, leading to engineering graduates better suited to the needs of industry.

The secondments have numerous benefits to the secondee, his or her university and the host company. These include:

- an opportunity for the university to introduce new or revised industrially-relevant modules, programmes and/or short courses;
- new case studies;
- new student/research projects and/or to secure collaborative proposals for funding;
- publications and patents;
- guest lecturers from industry;
- student visits to the company;
- student placements and industry-sponsored PhDs;
- help with the accreditation of engineering programmes; and
- enhanced credibility of academic staff.

There are numerous benefits to host companies too, including opportunities to:

- work with a highly qualified academic/expert at no (major) cost;
- acquire access to the secondee's university staff, students, laboratories and workshops;
- make an input to the design of the engineering curriculum thus influencing the next generation of engineers;
- offer placements to students;
- select and recruit suitable graduates;
- build long-term collaborative links involving research or consultancy work; and
- donate software and/or equipment.

Vidin-Calafat Bridge

Dr Kevin Stone of the University of Brighton's School of Environment and Technology spent a six-month Royal Academy of Engineering-supported Industrial Secondment with HPR Limited (formerly High-Point Rendel). His aims were to develop and enhance the content of his existing modules by incorporating up-to-date design practice and case study material, to strengthen industry-academia links, and to initiate collaboration in ground engineering research.

Kevin was a member of the geotechnical team and his secondment work was primarily focused on the £260m New Tyne Crossing project, which involves a complex tunnelling operation beneath the Tyne. The project is particularly interesting as it involves three different tunnelling technologies – cut and cover, immersed tube units, and several small sections of a sprayed concrete-lined tunnel.

In addition to the New Tyne Crossing, Kevin also worked on the geotechnical aspects of the Vidin-Calafat Bridge project. This structure is a multi-span, cable-stayed bridge crossing the Danube from Bulgaria to Romania.

The secondment resulted in many benefits to HPR Ltd as well as to Kevin's teaching and research and acted as a catalyst in renewing his enthusiasm for geotechnical engineering.

For further information on the Industrial Secondment Scheme please contact Dr Imren Markes at The Royal Academy of Engineering (020 7766 0600; E-mail: imren.markes@raeng.org.uk).

For further information on this project please contact Dr Kevin Stone at The University of Brighton (01273 642283; E-mail: kevin.stone@brighton.ac.uk).

MATERIALS & STANDARDS

Towards a brand new structural material standard

The Institution of Structural Engineers

Good design is synonymous with sustainable construction. The newer structural material of fibre reinforced polymer (FRP) provides construction with a range of mechanical and other properties that are well-suited for structures possessing a low life-cycle environmental cost. In 2007, the American Society of Civil Engineers (ASCE) and the American Composites Manufacturers Association (ACMA) signed a three-year agreement to develop a pre-standard for the *Load Resistance Factor Design (LRFD) of Pultruded Fiber Reinforced Polymer Structures.* This future LRFD standard for this newer structural material is expected to help structural engineers and architects use pultruded FRP composites in building and transportation designs and bring benefits – such as its strength-to-weight ratio, resistance to corrosion, low maintenance and long life cycle – to infrastructure.

The class of construction to be designed by the ASCE standard is for simple fames that have simple shear connections between members and bracing to transfer lateral loads to the ground. The draft standard will consist of mandatory provisions and commentary containing guidance on the application of the provisions of the standard. This standard is to provide design criteria for engineering grades of FRP pultruded rod, plates, and shapes used as structural members in construction. It will be applicable to the design of buildings and other structures where public safety is the key consideration and rational design criteria are required.

American academic teams are responsible for drafting the eight chapters in the standard. However, there is strong UK support to these teams, and Toby Mottram of the IStructE Research Panel and Warwick University is using knowledge and understanding gained from research with pultruded FRP shapes to support the preparation of a chapter for the design of bolted connections. Additional UK support to the American project is being made through publications from research at the Universities of Cardiff, Lancaster and Warwick. Research funded by EPSRC has provided results from coupon and full sized specimens that are required in the calibration process of the strength formulae.

Cooling tower structure of pultruded FRP shapes

At the completion of the project in Autumn 2010, the draft standard will be submitted to the ASCE Standards Committee on Structural Composites and Plastics for further action in accordance with the ASCE consensus process.

For further information on the Institution of Structural Engineers' Research Panel please contact Ben Cresswell Riol (020 7235 4535; E-mail: ben.cresswellriol@istructe.org; or visit www.istructe.org/research).

Big Ideas for a changing world: fresh perspectives on company competitiveness in UK construction

BERR

For decades, firms in the UK construction industry have been bombarded with reports urging improvements in competitiveness. Business process re-engineering, lean construction, partnering and key performance indicators, to give a few examples, have been promoted as panaceas for the industry's supposed performance problems. Many people feel that all of these initiatives have failed to live up to their promise, with limited impact on company performance. Firms are invariably faced with unique challenges shaped by the path they have travelled, and generic 'best practice' recipes advocated by outsiders can often detract attention from the issues that are really important.

A collaborative research project called the BIG IDEAS Project has been exploring the reality of the challenges on the ground facing those working in the industry. Involving industry and the EPSRC's Innovative Manufacturing Research Centres (IMRCs) at Loughborough, Reading and Salford Universities, the project has been careful to engage closely with a range of organisations including those whose voices normally go unheard. The work has included numerous interviews with company directors, multiple in-depth case studies, futures workshops held with groups of companies, and hands-on strategic planning exercises creating possible future trends. These practical exercises have provided valuable new insights into the ways in which company strategy is determined and implemented in practice.

THE BIG IDEAS for a changing world

The problem addressed by the research may be old; but it has not given the same old answers.

The message is that firms rarely maintain competitiveness by continuing to do what they have done in the past. There is little point in striving to do the wrong thing more efficiently. In increasingly dynamic environments, competitiveness depends upon a firm's ability continuously to re-configure existing capabilities. Success therefore depends on responding successfully to constant change rather than copying 'best practice' from others.

Firms often make the mistake that they need to make the business case for doing things differently on the basis of how they currently operate; but what they need to do is to focus on how they might operate in the future. Companies need to be alert to the danger that decisions made today can easily disable its ability to make some future desirable changes.

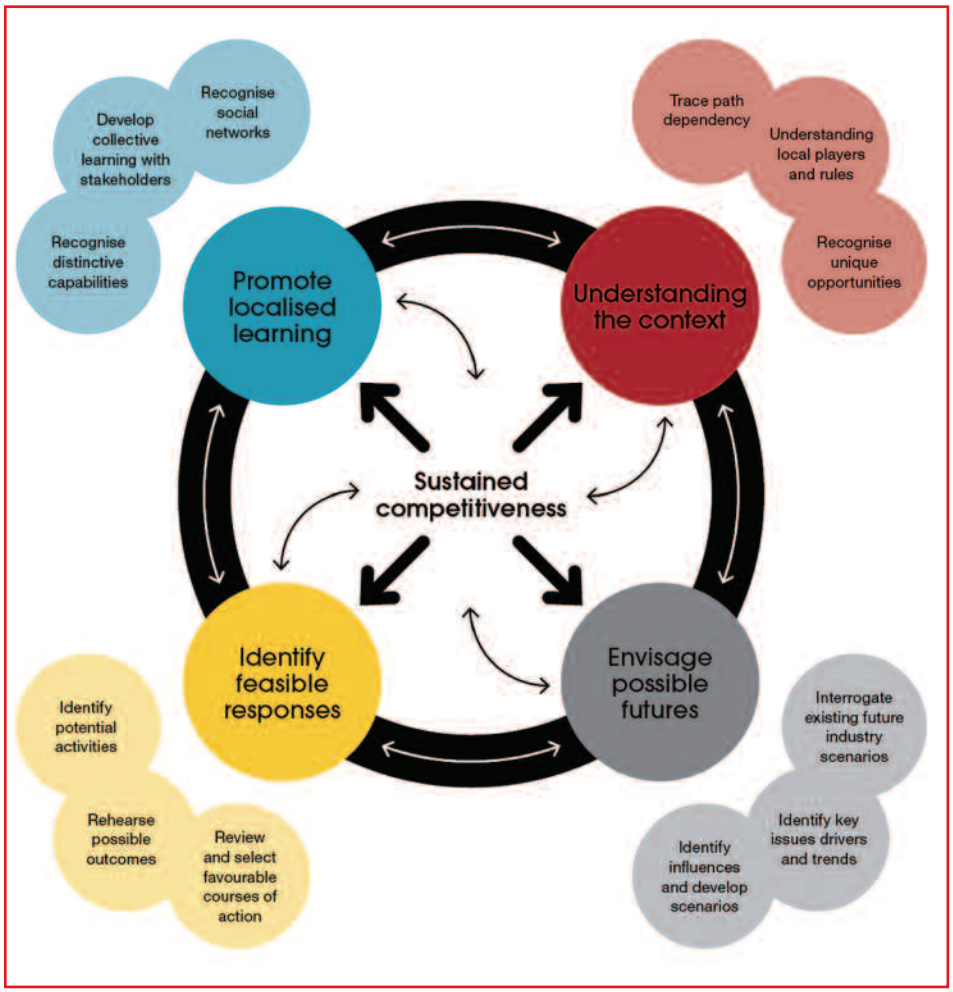
Organisations need to develop their ability to recognise, create and exploit fruitful opportunities. Part of this ability includes raising awareness and looking further ahead. Scenario development can extend horizons, help you to recognise the factors that might influence your future success. The results can be brought alive by creating dynamic simulations that can reveal hidden effects, interdependencies and sensitivities.

The project has also concluded that it is crucial that companies are fully embedded in the market niche within which they operate – the importance of establishing and sustaining credibility within localised networks cannot be over-emphasised. Long-term relationships with clients and suppliers within communities are key. They provide the context within which firms learn and innovate. They provide the unique and valuable social capital that competitors cannot easily copy.

The practice of open innovation is also key to sustained competitiveness. Innovation is not something that construction companies do on their own: it transcends organisational boundaries. And there is convincing evidence that successful firms choose to work with clients and suppliers who share this commitment.

Support is available to help you learn more about how to tap into the BIG IDEAS resources and enable your organisation, people and projects to benefit. These are presented as a set of Tools for Thinking. Detailed information, insights from the research, futures drivers, scenarios and sample system dynamics models are available on the BIG IDEAS website.

For further information visit: www.the-bigideas.org.uk or contact one of the project partners who can offer advice or run interactive workshops:
Loughborough University: Simon Austin (01509 222608; E-mail: s.a.austin@lboro.ac.uk);
University of Reading: Stuart Green (0118 378 7174, E-mail: s.d.green@reading.ac.uk);
University of Salford: Peter McDermott (0161 295 4808; E-mail: p.mcdermott@salford.ac.uk).



Ideas is based around four key elements of sustained competitiveness.

Violent flows: physical modelling of tsunami

HR Wallingford

Tsunami waves travel across oceans with quite small vertical displacements (0.5 – 2 m) and long wavelengths (5 – 20 Km). When they reach the shallow depths of coastal and nearshore waters, they shoal up dramatically. Physical modelling of correct tsunami processes is important in predicting the impact of flows and forces on the resilience of coastal zone structures and on the risk to local population. However, the movement of tsunami waves in nearshore waters is difficult to re-create in physical models because the very long wavelengths are beyond the capacity of conventional wave paddles.

HR Wallingford, working with Dr Tiziana Rossetto at University College London (UCL), has developed a 'Tsunami Generator' that can simulate multiple tsunami waves, and can ensure realistic representation of wavelength and initial drawdown. The Tsunami Generator wave flume (see schematic illustration), recreates the arrival of tsunami waves over coastal sea-bed, shore-line and inland inundation.

Several stages of modelling have been carried out by HRW and UCL researchers to validate the facility's design and its control system. Recent tests by the UCL team then measured wave loadings on representative (model) buildings.

Tsunami wave impacts on structures are being assessed in the physical experiments.

Schematic of the Tsunami Generator flume

Loads from these measurements will be used in the structural analysis of newly designed 'tsunami-proof' buildings and reinforced concrete moment-resisting frames, with and without infill walls, are being used quantify tsunami wave effects on structures. They may also, potentially, be used to assess the validity of existing design guidance.

The Violent Flows project is being undertaken by HR Wallingford, Arup and UCL under Dr Tiziana Rossetto's Earthquake and People Interaction Centre (EPICENTRE) – see http://www.epicentreonline.com. The work is funded by EPSRC via its 'Challenging Engineering' scheme.

For further information on the Tsunami Generator please contact Professor William Allsop, Technical Director, Engineering Hydraulics and Structures Group, HR Wallingford (01491 822230; E-mail nwha@hrwallingford.co.uk).

Low-carbon infrastructure: request for evidence

ice Institution of Civil Engineers

The Institution of Civil Engineers has had remarkable success in recent years in highlighting issues to Government and the media through their State of the Nation Reports. In 2009 the State of the Nation projects are being carried out using an Inquiry Format. The inquiry will examine the policy changes needed to facilitate the delivery of infrastructure for the transition to a low-carbon economy, and consider the changes to engineering practices required to deliver this vision.

The background to the project is that a significant amount of new infrastructure is being constructed in the UK to support existing towns and cities. These infrastructure networks support the provision of services that underpin civilised life and the efficient functioning of the economy.

The design, construction, maintenance and operation of this infrastructure will have a significant impact on the UK's levels of greenhouse gas emissions and the government's ability to meet its ambitious carbon reduction targets of at least 80% below 1990 levels by 2050. More crucially, these networks will influence personal behaviour and business decisions for decades to come, further affecting the UK's ability to meet those targets.

Furthermore, the carbon performance of the UK built environment will come under increased scrutiny in the lead up to the Copenhagen Summit in December this year, at which a successor to the Kyoto protocol is due to be signed.

The inquiry findings will be used as the basis for a major ICE report to be issued in autumn 2009, which will identify where changes to the design, construction, maintenance and operation of infrastructure can lead to large reductions in UK emitted CO_2. This in turn will provide a low-carbon vision for the future including priority actions for the next 40 years.

The ICE report will offer an apolitical, authoritative and objective comment on the current environmental impact infrastructure has on society, and promote leading edge thinking on how to significantly reduce infrastructure related emissions and change individual behaviour. It will focus on the UK but where possible draw conclusions that can be applied globally. The ICE also intends to use case studies from other countries to illustrate best practice.

The inquiry will address the following questions.

- Which low-carbon engineering solutions have the potential to deliver the greatest reductions in emissions over the next 50 years?
- Which available low-carbon engineering solutions are being effectively implemented?
- How can standardised low-carbon practices be rolled-out across infrastructure sectors?
- How can government and industry move to low-carbon procurement practices?
- How can low-carbon infrastructure create behaviour change?
- What legislation, regulation and/or market incentives are needed to deliver wholesale change?
- What are the barriers (political, social, economic and institutional) to the delivery of low-carbon infrastructure and, in turn, a low-carbon economy?

ICE would also like to promote the use of examples to illustrate any points, particularly examples of past events that highlight current flaws and/or create obvious security concerns, as well as examples of good practice in managing those events. ICE would also be very interested in existing reports or studies that you feel should be considered as part of this project. Please mark any sensitive material 'Confidential'.

The ICE is inviting written submissions of no more than 3,000 words from interested parties. Organisations and individuals interested in making written submissions are invited to do so by Wednesday 20th May 2009. Oral evidence sessions will be held in the first two weeks in June.

Submissions should be sent by e-mail to evidence@ice.org.uk and marked 'Low-Carbon Infrastructure Inquiry'.

For further information please contact Simon Whalley, Institution of Civil Engineers (020 7665 2210; E-mail: simon.whalley@ice.org.uk; Website: www.ice.org.uk/evidence).

Improving integrity management of safety-critical systems on North Sea oil & gas installations

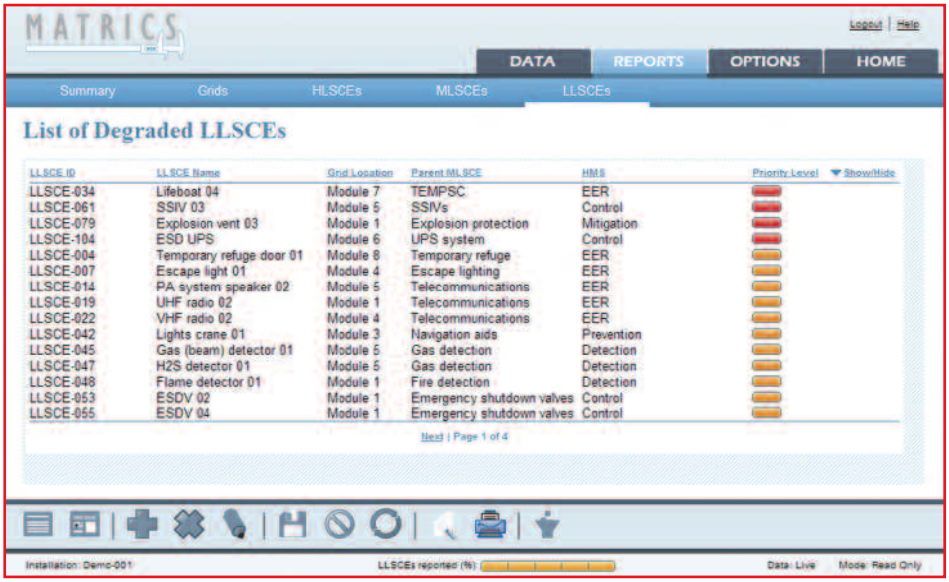
SCI has recently released a safety audit and monitoring software tool aimed at helping North Sea operators to manage more effectively the safety and integrity of their oil & gas installations, most of which are operating close to or beyond their original design life. Since the 1990s, the continuous demands to reduce costs has led to a reduction of the offshore workforce, which in turn has resulted in a reduction of the levels of maintenance impacting on the overall integrity of some installations. The need for enhanced integrity assurance has been recognised by the offshore industry and the recent final report on the HSE Asset Integrity Key Programme 3 (KP3) indicated that the physical state of installations was considered to be poor for more than 50 percent of the inspected installations.

MATRICS has been developed in response to the key issues and recommendations identified in the HSE KP3 to provide operators with a simple and efficient means of managing the integrity of safety-critical elements throughout their operational lives. It is designed to complement maintenance management systems by providing an overall view of the integrity of installations and their systems via performance indicators and highly visual reports, which can be used by the senior management as an input for decision making.

MATRICS, which stands for **M**anagement **A**udit **T**ool for **R**apid **I**nvestigation of **C**ritical **S**ystems, is a very versatile software tool, which can be used for assessing and monitoring the condition of critical systems and components against their performance standards, for prioritising remedial actions, and for compliance demonstration. It facilitates the assessment of the technical risks arising from continued operation with degraded safety critical elements, which could potentially lead to critical situations.

The assessment method used within MATRICS is flexible and can be tailored to the specific needs of individual operators. It enables them to assign a Priority Level to each safety critical component based on a quick assessment of the consequences of failure and the actual condition of each component. The assessment of the integrity at the system level is facilitated by the reporting of the number of degraded components within each critical system via a traffic light alert system.

The software has been designed as a web-based and multi-user tool to enable companies to share information effectively and can be easily integrated within existing IT systems. Relevant existing data can also be transferred from existing system to MATRICS to ease the initial population of data.



(Top) *Screen shot showing list of degraded components*
(Above) *Screen shot showing detailed report for a system.*

For further information, please contact: Guillaume Vannier, Senior Engineer at SCI (01344 636 550; E-mail: g.vannier@steel-sci.com).

ENVIRONMENT

CEEQUAL update

CEEQUAL, the Assessment & Awards Scheme for improving sustainability in civil engineering and public realm projects has passed three significant milestones recently.

- The total construction value of all the projects that have applied for a formal verified assessment has passed £7 billion.
- The first application of a £1 billion package of civil engineering work has been received.
- More than 50 Awards have now been made.

Details of CEEQUAL can be found at www.ceequal.com, and details of most projects that have received Awards can be found by clicking on the Awards button on the home page.

For further information please contact Melanie Manton of the CEEQUAL Scheme Management Team at support@ceequal.com.

Life-cycle assessment-based tool for civil infrastructure projects

Initially developed in the late 1960s and early 1970s, Life-Cycle Assessment (LCA) has become a recognised and valued tool for the assessment of environmental impacts, and especially for major projects. Most assessments are carried out using dedicated software packages by expert practitioners and it remains a relatively specialist field. LCA is most commonly used for 'Cradle to Grave' assessment, but partial stages of the life cycle can also be studied in isolation. Procedures of LCA are harmonised in the ISO14040 series, which itself sits within the widely applied ISO14000 series of environmental management standards.

The use of LCA in the selection and specification of building materials is becoming more widespread in building construction owing to the growing popularity of the Building Research Establishment Environ--mental Assessment Method (BREEAM) and its use of the Environmental Profiles Methodology through the Green Guide to Specification. The success is due to general market uptake and through the integration of the concepts and methodologies into policy frameworks such as the Code for Sustainable Homes (CSH).

Road re-surfacing project in Northall, Buckinghamshire

Such developments in civil infrastructure have been far slower in their uptake, even though the CEEQUAL Scheme for environmental assessment of civil engineering and public realm projects includes questions that promote the benefits of life-cycle environmental assessments of infrastructure projects.

To further the agenda Aggregate Industries, Loughborough University and BRE are collaborating on a joint Engineering Doctorate (EngD) research project. The work is being lead by Shamir Ghumra with the aim of refining existing LCA methods and datasets to the needs arising in infrastructure projects. The final outcomes may include a database and dissemination platform for environmental impact information for the civil engineering sector and, potentially, a green guide to civil engineering specification.

A wide range of research methodologies will be employed in the course of the programme including:

- communicating with stakeholders and other associated organisations;
- application of the Environmental Profiles Methodology and database to civil infrastructure scenarios;
- development of the concept for new tools specific to civil infrastructure;
- forging links and cooperation with existing market tools and methods such as CEEQUAL.

From the research programme it is hoped that the industry will benefit from the availability of a comprehensive and independent LCA platform on the embodied environmental impact of specifications and materials used in civil infrastructure.

For further information please contact Shamir Ghumra (01530 816600; E-mail: Shamir.ghumra@aggregate.com; website: www.lboro.ac.uk/cice).

SPONSORING ORGANISATIONS

GOVERNMENT

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