

CONFERENCE HANDBOOK

2008

PROGRAMME AND BOOK OF ABSTRACTS

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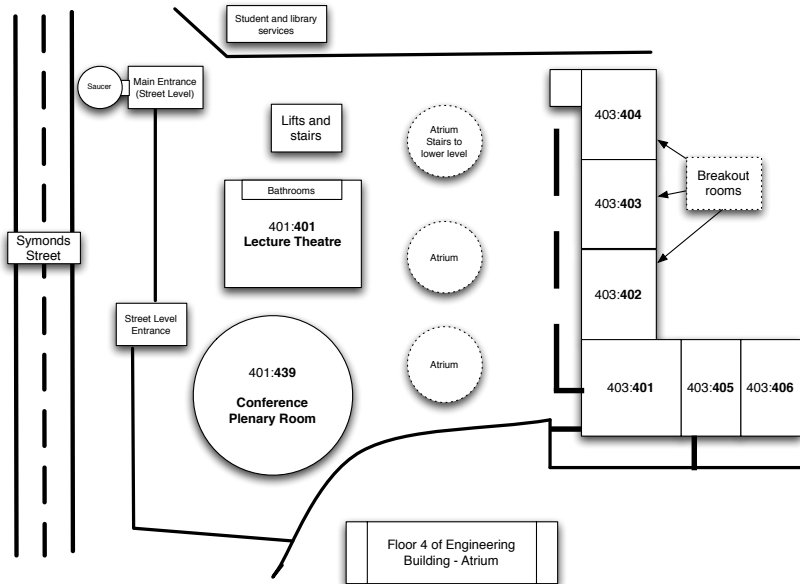
Acknowledgements

SHORT PROGRAMME

SHORT PROGRAMME

CONFERENCE VENUE LOCATIONS

Faculty of Engineering 4th Floor Layout.



CONFERENCE DINNER VENUE

The Maritime Room, The Viaduct, Auckland Central
(upstairs above the Maritime Museum)

Please Note:

You need to confirm your attendance at the Conference Dinner

Please ensure that when you sign in at the Registration Desk that you have your name on the Conference Dinner list,
If you are not on the list you may be refused entry at the venue.

GENERAL INFORMATION

The **Conference Proceedings** are provided on the USB stick, sponsored by BECA, included with this Handbook. Printed proceedings are not available.

Keynote speakers presentations and speeches will be available for downloading from the website post the conference.

Parallel Paper Presentations will be available from the website post the conference for downloading.

Carbon Market Solutions will be assisting NZSSES offset the conference carbon emissions.

If you wish to offset your personal travel and accommodation emissions, **Carbon Credits** are available for purchase from the Registration Desk. Verification of the transfer will appear on our website post the conference

A **secure lock up** area is available should anyone wish to use it. Contact Vicky

Carparking concessions are available in the Business School Carpark, Grafton Road. Enter the carpark in the normal way (turn at the lights half way down Grafton Road). Collect your ticket and exchange it with Vicky for a \$10 all day pass

PUBLIC LECTURE - Wednesday 10 December 2008

Dr Jean Venables

The Climate Change Challenge and the Water Cycle

*In association with ICE Transtasman
At the Auckland War Memorial Museum*

Buses are available to take delegates who wish to attend this lecture from the University of Auckland to the Auckland War Memorial Museum

RSVP

To Vicky or

Nicky Egyed, ICE Transtasman Administrator
Email: transtasman@ice.org.uk | Ph: 04 566 4798

**The New Zealand Society for Sustainability Engineering and Science
(NZSSES)**

are the hosts of the *Blueprints for Sustainable Infrastructure* 3rd International Conference on Sustainability Engineering and Science

NZSSES is a Technical Interest Group operating under the auspices of The Institution of Professional Engineers of New Zealand (IPENZ) and is an Affiliate member of the Royal Society of New Zealand.

The 2008 committee are:

Dr Carol Boyle Chair,
Director, ICSEER,
Civil and Environmental Engineering, The University of Auckland.
Email: c.boyle@auckland.ac.nz

Zoe Burkitt MWH NZ Ltd.

Yasenko Krpo DuffillWatts/TSE Group,

Misty Mossman Ministry of Agriculture and Forestry.

Dr Ir Ron McDowall, The University of Auckland.
Management and International Business

Dr John Peet (retired) Canterbury University, Ex-Officio.

Members of the organising committee and NZSSES staff are wearing orange names labels.

Should you require any assistance during the conference, please contact someone with an orange name label, the registration desk, or Vicky - phone: 027 2305 365

The **AGM** and **Member's Christmas Function** in Friday 19 December.
If you are interested in becoming a Member see Vicky for details and Membership forms.

The Organising Committee would like to take this opportunity to thank the respective employers of each Committee Member for supporting that member's commitment to the Society and to this conference.

PROGRAMME

Tuesday - 9 December

The Sinclair Knight Merz Welcome Reception		
5.00pm	Registration Desk opens	
6.00pm	Powhiri	Haka the Legend
	Refreshments Served	
6.30pm	Welcome	Professor Michael Davies, Dean of Engineering, University of Auckland
	Guest Speaker	Jeanette Fitzsimons, Co-Leader of the Green Party <i>"What if everyone did this?"</i>
	Thanked by	Michael Shirley, Sinclair Knight Merz
7.00pm	Music by SCOTT	
8.30pm	Function ends	

Wednesday - 10 December

Wednesday 10 December - Morning Session		
	KEYNOTE PRESENTATIONS	Plenary Room 401:439
8.00am	REGISTRATION DESK OPENS	
8.45am	Welcome	Dr Carol Boyle, Chair NZSSES
9.00am	Official Opening: Dr Jan Wright Parliamentary Commissioner for the Environment <i>Sustainability: Visions, Definitions, Realities</i>	
9.30am	Keynote Address: Dr Jean Venables Crane Environmental / President of the Institution of Civil Engineers (ICE) <i>Sustainable Infrastructure and the Climate Change Challenge</i> <i>Sponsored by ICE</i>	
10.00am	Keynote Address: Professor Peter Guthrie Centre for Sustainable Development, University of Cambridge, England <i>Sustainable Development in Urban Environments – Research into Practice</i>	
	10.30 am - 11.00 am Morning Tea Break	

	Wednesday 10 December	
	KEYNOTE PRESENTATIONS	Plenary Room 401:439
11.00 am	Professor Peter Newman The CUSP Institute in Curtin University, Australia <i>Blueprint for Sustainable Transport Infrastructure</i>	
11.30 am	Professor Terry Collins Carnegie Mellon University, USA <i>Iron-TAML activators: highly successful mimics of peroxidase enzymes for green chemical applications</i>	
12 noon	Professor James Mihelcic University of South Florida (Tampa) <i>Water and Sanitation in the World's Cities: Global Challenges in a Dynamic World</i>	
	12.30 - 1.30 pm Lunch Break	
1.30pm	WORKSHOPS	
Room 401.439	Workshop 1 Sustainable Communities - Design Professor Jorge Vanegas <i>sponsored by Timbertank Enterprises Limited</i> <i>An Integrated Approach to Sustainable Urbanism, Civil Infrastructure Systems, and Facilities: A Response to the Needs of Disadvantaged Communities</i>	
Room 401.401	Workshop 2 Managing Your Footprint (Carbon Trading) Chair: Nick Main , Deloitte with Jo Silver , TZI and Wayne King Carbon Market Solutions Ltd.	
	3.00 - 3.30 pm Afternoon Tea Break	
3.30pm	PARALLEL PAPER SESSION I	
Room 403.401	Designing Sustainable Communities Chair Professor Paul Anastas Ian Boothroyd , Golder Associates <i>Mind the Gap! Frameworks for urban sustainability</i> Mik Dale , University of Canterbury <i>An Ecological Planning Approach To Community Based Sustainable Development</i> Jane Puddephatt / Viv Heslop , MWH NZ / Vivacity Consulting Ltd <i>Shifting with the times: The emergence of low impact approaches in building sustainable communities</i> Hanna Taylor presented by Nathanial Miller , Synergine Group Limited <i>At the Coal Face of Sustainability Implementation: Balancing the Environmental, Social and Economic Bottom Line in Urban Developments</i>	

Wednesday 10 December	
Room 403.402	<p>Designing Global Solutions: Climate Change Chair: Professor Ian Lowe</p> <p>Mohammed Hassan presented by Zhian Qian, Manukau City Council. <i>Review Of Rainfall Intensity Curves And Sea Levels In Manukau City Making Provisions For Climate Change</i></p> <p>Dr Lionel Lyles, Southern University, Baton Rouge, LA <i>Human Carbon Life Footprint And Co₂ Emissions Placed In The Earth Atmosphere</i></p> <p>Dr Ian Mason, University of Canterbury <i>An analysis of the role of the carbon neutral public sector in reducing greenhouse gas emissions in New Zealand</i></p> <p>Michael Nolan, Maunsell AECOM <i>Adapting Infrastructure for Climate Change Impacts</i></p>
Room 403.403	<p>Designing Global Solutions: Resource Depletion Chair: Professor Peter Guthrie</p> <p>Anthony Jessup presented by Dr Gavin Mudd Monash University <i>Environmental Sustainability Metrics for Nickel Sulphide Versus Nickel Laterite</i></p> <p>Andrew Hope / Jade Gibson, The University of Auckland <i>CO₂ Offsetting for Conferences</i></p> <p>Dr John Peet, University of Canterbury <i>Resource Scarcity - a Physical, not an Economic Issue</i></p> <p>John Stanger, University of Canterbury <i>Green Industrialization for Developing Nations</i></p>
Room 403.404	<p>Delivering Sustainable Infrastructure: Waste Water Chair: Yassenko Krpo</p> <p>Valerie Fuchs, Michigan Technological University <i>Delivering sustainable wastewater infrastructure in an urbanizing world</i></p> <p>Richard Taylor, Waitakere City Council, <i>What is the Infrastructure Leakage Index (ILI) and how did Waitakere City Council manage to achieve an ILI of 1.0.</i></p> <p>Thomas Haarhoff, Harrison Grierson Consultants <i>Sustainability Assessment for First Time Wastewater Scheme</i></p>
5.00pm	<p>Final Session - wrap up: questions and answers Plenary Room 401.439</p>
	5.30pm - 6.30pm Morphum Environmental Cocktail Function
7.00pm	<p>Dr Jean Venables: Public lecture - Auckland War Memorial Museum <i>The Climate Change Challenge and the Water Cycle</i> <i>In association with ICE Trans Tasman</i></p>

Thursday - 11 December

	Thursday 11 December	
8.45am	KEYNOTE PRESENTATIONS MC Day 2 Professor Peter Guthrie	Plenary Room 401:439
9.00 am	Dr Carol Boyle, International Centre for Sustainability Engineering Research, The University of Auckland. <i>Elements of Sustainable Infrastructure</i>	
9.30 am	Professor Paul Anastas, Yale University, USA <i>Green Chemistry: The Molecular Basis of Sustainable Infrastructure</i>	
10.00 am	Professor Roger Venables, CEEQUAL Limited <i>Teaching Engineering Design for sustainable Development</i>	
	10.30 - 11.00 am Morning tea Break	
11.00am	PARALLEL PAPER SESSION 2	
Room 403.401	Developing Sustainable Communities: Measurement, Metrics & Modelling Chair: Dr Jean Venables Kerry Griffiths , URS New Zealand <i>Getting down and dirty</i> Ellen Greenberg presented by Dr Susan Handy , University of California Davis, <i>Sustainable Street Design</i> Dr Mitra Emami , Maunsell NZ <i>Turning a Red Building into a Green Building</i> Dr Annie Pearce , Virginia Tech, USA <i>Measuring the Sustainability of Infrastructure Systems: Information Requirements and Desiderata</i>	
Room 403.402	Designing Global Solutions - Climate Change (b) Chair: Dr Gavin Mudd Scott Losee , Maunsell AECOM <i>Accounting for Climate Change and Peak Oil in Planning and Infrastructure Development in South-east Queensland</i> John Russell , La Trobe University, Australia <i>Engineering the Global Thermostat Part A - Humanity's Dilemma</i> Gabriel Weber presented by Martin Nowack , Technische Universität Dresden <i>Application of real options thinking for the management of climate change risks</i> Sarah Sinclair and Ana Krpo , Sinclair Knight Merz <i>Developing a Climate Change Toolkit – Lessons Learned, and the Importance of a Spatial Approach</i>	

Thursday 11 December	
Room 403.403	<p>Developing Sustainable Communities: Government, Policy and planning Chair: Dr Susan Krumdieck</p> <p>Abdul Samad Hadi presented by Shaharudin Idrus, Universiti Kebangsaan Malaysia <i>Health and Green Infrastructures for the Livable City</i></p> <p>Dr Anna Johnson, Opus International Consultants, <i>New Zealand Approaches to Growth Management</i></p> <p>Tze-Chin Pan, Institute of Environmental Engineering, National Chiao Tung University, Taiwan <i>Environmental Sustainability based Budget Allocation System</i></p> <p>Dr Michelle Ziebots, Institute for Sustainable Futures, University of Technology, Sydney <i>Sustainability and Alliancing: a case study of new governance practices that emerged from the Roe 7 Highway in Perth</i></p>
Room 403.404	<p>Delivering Sustainable Infrastructure: Water (1) Chair: Professor Roger Venables</p> <p>Dr Maggie Lawton, Braidwood Research and Consulting and Beacon Pathway, <i>Developing the blueprint for urban water use efficiency</i></p> <p>Jan Heijs, North Shore City Council, Auckland, <i>Implementing Sustainable Water Management In North Shore City</i></p> <p>Caroline Nyugen presented by Dr Marc Edwards, Virginia Tech, USA <i>Resolving conflicts between water conservation and high quality water in premise plumbing</i></p> <p>Christine McCormack presented by Emily Botje, MWH NZ <i>From Zero to Hero – Queenstown Lakes District Council Faces up to the Challenge of Water Demand Management</i></p>
12.30 - 1.30 pm Lunch Break	
1.30 pm	WORKSHOPS
Room 401.439	<p>Workshop 3 - Future Thinking Scenarios <i>Visioning and Backcasting future cities without pipes.</i> Dr Ir Ron McDowall, University of Auckland A. Idil Gaziulusoy, ICSEr, University of Auckland</p>
Room 401.401	<p>Workshop 4 - MWH Infrastructure Management <i>How Sustainable Is Your Network – Tools and Techniques for Asset Managers</i> Neil Cook (Wairoa District Council) Scott Losee (Australian Green Infrastructure Council) Charles Ainger (Director of Sustainability, MWH, UK)</p>
3.00 - 3.30 pm Afternoon Tea Break	

Thursday 11 December	
3.30pm	PARALLEL PAPER SESSION 3
Room 403.401	<p>Developing Sustainable Communities: Other Chair: Mark Smith, NZSSES</p> <p><i>Business</i> Ron Shaw Sempre Avanti Consulting <i>Delivering sustainability through the SME business sector</i></p> <p><i>Education</i> Dr Patricia Kelly, University of Tasmania <i>Wise global citizens or McGraduates? Engineering as a civilising influence</i></p> <p><i>Aid</i> Hanna Taylor presented by Rebecca Sanders, Synergine Group <i>Acknowledging the White Elephant in the Room, and Making Aid Work</i></p>
Room 403.402	<p>Designing Global Solutions: Mixed Chair: Dr John Peet, NZSSES</p> <p>Dr Gavin Mudd, Monash University, Australia <i>Will Sustainability Constraints Cause 'Peak Minerals'?</i></p> <p>Dr Osamu Saito Waseda University, Tokyo <i>Restructuring existing rural resorts as a sustainable infrastructure for basin socio-ecological systems in Japan: A case of redundant golf courses in the Tokyo Metropolitan Area</i></p> <p>Dr John Russell, La Trobe University, Australia <i>Engineering the Global Thermostat Part B- Creating the Permacclimate</i></p> <p>Dr Maya Trotz, University of South Florida, USA <i>Diaspora Communities and Sustainable Urban Development: Lessons from floods in Guyana</i></p>
Room 403.403	<p>Developing Sustainable Communities: Government, Policy and planning Chair: Professor Jim Mihelcic</p> <p>Shaharudin Idrus Universiti Kebangsaan Malaysia <i>Spatial Urban Metabolism for Livable City</i></p> <p>Paul McGimpsey, Beca Carter Hollings & Ferner Ltd <i>Strategic Environmental Assessment and Regional Transport Planning: Opportunities in New Zealand</i></p> <p>Peter Ollivier, Duffell Watts Group <i>Nelson Regional Sewerage Scheme – A Sustainable Solution?</i></p> <p>Dr Kayoko Yamamoto, National University of Electro-Communications, Tokyo Japan <i>City Planning based on Green Space Development in Major Asian Cities</i></p>

Thursday 11 December	
Room 403.404	Delivering Sustainable Infrastructure:Water (2) Chair: Professor Terry Collins Paula Hunter , MWH NZ, <i>A New Policy Framework for the Allocation of Water – Implications for Municipal Suppliers</i> Dr Anna Robak Opus International Consultants <i>Charting relationships between water supply and community livelihood and national economic welfare</i> Damian Young , Morpium Environmental Ltd. <i>Stormwater Ponds more than meets the Eye</i> Dr Kevin Winter , University of Cape Town, South Africa <i>Let's fix it: Managing greywater in shanty settlements, South Africa</i>
5pm	Final Session - wrap up: questions and answers Plenary Room 401.439
	Conference Dinner Maritime Room, The Viaduct 7.pm Pre-dinner drinks Music by: Scott 7.30pm Seated for dinner 9.00pm Special Guest Tama Waipara on guitar

Friday - 12 December

Friday 12 December	
8.45am	MC Day 3 Professor Jim Mihelcic Plenary Room 401:439
9.00am	
Room 401.439	Global Responses to Climate Change Em.Prof. Ian Lowe (Chair) Griffiths University, Brisbane Dr Gerda Kuschel Emission Impossible Ltd. Dr David Wratt NIWA
Room 401.401	Case Studies Alec Couchman , Warren & Mahoney, NZ Stuart Chapman & Simon Wilkinson , Fletcher Construction, NZ Mark Reardon , Connell Wagner, Australia
10.30 am - 11.00 am Morning Tea Break	

	Friday 12 December
11.00am	PARALLEL PAPER SESSION 4
Room 403.401	<p>Delivering Sustainable Infrastructure: Buildings (I)</p> <p style="text-align: right;">Chair: Zoe Burkitt, NZSSES</p> <p>Jeremy Gabe, Landcare Research, <i>Design versus Performance: Lessons from Monitoring an Energy-Efficient Commercial Building in Operation</i></p> <p>Dr Kenfield Griffith presented by Ayodh Kamath Massachusetts Institute of Technology <i>Digital fabrication technologies: An endogenous approach to global production within developing countries</i></p> <p>Dr Annie Pearce, Virginia Tech, USA, <i>Sustainability at the Installation Scale: A Comparison of LEED-ND and Systems-Based Sustainability Assessment</i></p>
Room 403.402	<p>Delivering Sustainable Infrastructure: Energy</p> <p style="text-align: right;">Chair: Professor Terry Collins</p> <p>Timothy Anderson, University of Waikato <i>Development of a Building Integrated Photovoltaic/Thermal Solar Energy Cogeneration System</i></p> <p>Tim Armitage Windflow Technology Ltd <i>Sustainable Wind Energy Projects for New Zealand</i></p> <p>Samuel Gyamfi presented by Dr Susan Krumdieck, University of Canterbury <i>Demand Response in the Residential Sector: A Critical Feature of Sustainable Electricity Supply in New Zealand (Demand)</i></p> <p>Dr Shannon Page, University of Canterbury <i>Carbon Capture and Storage: An applicable technology for New Zealand</i></p>
Room 403.403	<p>Delivering Sustainable Infrastructure: Other</p> <p style="text-align: right;">Chair: Professor Jim Mihelcic</p> <p>Justin Jordan, Timbertank Enterprises Ltd. <i>Designing Infrastructure to be reused</i></p> <p>Brian Kouvelis, MWH <i>Engineering Best Practice - Where are we at? "Climate Change in Context"</i></p> <p>Dr Gabrielle Torkington presented by Veronica Ulfves, MWH <i>Using greenhouse gas inventories and life cycle analysis to deliver meaningful environmental profiling for infrastructure: Case studies for learning.</i></p> <p>Andrew Camenzuli, presented by Dr Gavin Mudd Monash University, Australia <i>Towards Comparative Sustainability Metrics for Geothermal Energy</i></p>

	Friday 12 December
Room 403.404	<p>Developing Sustainable Communities: Innovative Design</p> <p style="text-align: right;">Chair: Professor Peter Guthrie</p> <p>Caleb Clarke, Morpium Environmental Ltd <i>Roy Clements Treeway Boardwalk – Urban stream management and community involvement</i></p> <p>A. Idil Gaziulusoy, ICSEER, University of Auckland <i>Planning for System Innovation in Product Development Teams of Manufacturing Companies: Criteria Development for a Scenario Methodology</i></p> <p>Ella Lawton, Blekinge Institute of Technology, Karlskrona <i>A Needs Based Approach to Urban Design and Planning</i></p> <p>Jeff Vickers, ICSEER, University of Auckland <i>A New Approach for Sustainable Product Development Using Scenario Network Mapping and Eco-design</i></p>
	12.30 - 1.30pm Lunch Break
1.30pm	PARALLEL PAPER SESSION 5
Room 403.401	<p>Delivering Sustainable Infrastructure: Buildings (2)</p> <p style="text-align: right;">Chair: Mark Smith, NZSSES</p> <p>Aniruddha Nene presented by Dr Doug Matson, Tufts University, USA <i>Use of an insulation-dispersion adobe composite in green building construction</i></p> <p>Dr Chris Riedy, University of Technology, Sydney <i>Urban infrastructure for long-term climate change response</i></p> <p>Greg Slaughter, Holcim (NZ), <i>Sustainable Concrete: Fact or Fiction?</i></p> <p>Zeb Worth, Opus International Consultants <i>Combined life cycle cost assessment of roof construction</i></p>
Room 403.402	<p>Delivering Sustainable Infrastructure: Mixed</p> <p style="text-align: right;">Chair: Professor Ian Lowe</p> <p>Dr Heather Cruickshank, Cambridge University <i>Application of Sustainable Development Concepts in Backbone Infrastructure Provision</i></p> <p>Neil Harrison, Living Energy Ltd <i>The Contribution of Woodfuel to Delivering the Sustainable Society of the Future</i></p> <p>Ben Kneppers, Braidwood Research and Consulting and Beacon Pathway <i>A principle-based decision making framework for sustainable electricity infrastructure</i></p> <p>Dr Kerry Mulligan presented by Dr Shannon Page, University of Canterbury <i>Reforestation of the Built Environment - a Practical Feasibility Case Study in Christchurch</i></p>

	Friday 12 December
Room 403.403	<p>Delivering Sustainable Infrastructure: Transport</p> <p style="text-align: right;">Chair: Dr Gavin Mudd</p> <p>Stephen Eagle, Fraser-Thomas Limited, <i>The Use of Lime Stabilization for Rural Road Rehabilitation in Cambodia</i></p> <p>Dr Peerapong Jitsangiam presented by Komsun Siripun <i>Sustainable Use of a Bauxite Residue (red sand) as Highway Embankment Materials</i></p> <p>Professor Jay Yang presented by Soon Kam Lim <i>Reality Check – the Identification of Sustainability Perception and Deliverables for Australian Road Infrastructure Projects</i></p> <p>Catherine Yung and Sachi Koddipily University of Auckland <i>The Sustainability of Permeable Road Pavements – The North Shore Experience</i></p>
Room 403.404	<p>Delivering Sustainable Infrastructure: Mixed</p> <p style="text-align: right;">Chair: John Peet</p> <p>Dr Susan Krumdieck, University of Canterbury <i>The Visioning Project: Part of the Transition Engineering Process</i></p> <p>Ahmad Fariz Mohamed, Institute for Environment and Development (LESTARI), Universiti Kebangsaan <i>Infrastructure for Sustainable Industrial Wastes Recovery in Malaysia</i></p> <p>Julie Anne Genter, McCormick Rankin Cagney <i>How minimum parking standards underpin car dependence: the new parking management paradigm</i></p> <p>Roger Loveless, Odyssey Energy Limited <i>Street Lighting: A Visible Sign of Commitment to Sustainable Electricity Use</i></p>
	3.00 - 3.30 pm Afternoon Tea Break
3.30pm	PANEL DISCUSSIONS
Room 401.439	<p>Visions of the Future <i>Delivering Longer Term Visions For Sustainable Infrastructure</i></p> <p>Chair: Dr Susan Krumdieck Members: Ian Lowe, Jean Venables, Terry Collins, Paul Anastas</p>
Room 401.401	<p>Business Reality of Today - <i>Transitions From Current Methods Of Infrastructure Development And Management</i></p> <p>Chair: Yassenko Krpo Members: Kerry Griffiths, Peter Guthrie, Roger Venables, Jim Mihelcic</p>
4.30pm	<p>Closing Session Presentation on next conference and wrap up</p> <p style="text-align: right;">Plenary Room 401.439</p>

ICSER one page

CAMBRIDGE - one page

BLUE CARDBOARD DIVIDER HERE

KEYNOTE SPEAKERS

SPEECH ABSTRACTS and PROFILES

In order of programme

Dr Jan Wright

Parliamentary Commissioner for the Environment

Sustainability: Visions, Definitions, Realities

Profile:

Dr Jan Wright was sworn in as Commissioner for a five-year term on 5 March 2007. She originally graduated in physics from the University of Canterbury, and later gained a Masters degree in Energy and Resources at the University of California at Berkeley.

On her return to New Zealand she continued working on energy research and broadened her interests to environment and transport issues. Her next move was to Harvard University where she gained her doctorate in public policy. Back in New Zealand, Jan worked as an independent policy and economic consultant, and taught policy analysis at Victoria University. Later she chaired the board of Land Transport NZ and Transfund NZ, and was a director of Transit New Zealand, ACC, and the Energy Efficiency and Conservation Authority.

A skilled communicator, Jan can apply intellectual rigour to complex matters affecting ordinary people, and she enjoys thinking about big picture and long-term problems.

She comes to the position of Commissioner at a time of escalating public and political interest in environmental issues, and is particularly interested in the growing alignment between environmental and economic interests.

Office of the Parliamentary Commissioner for the Environment

PO Box 10-241, Wellington

Email: Kay.Baxter@pce.govt.nz | Phone 04 495 8354

Dr Jean Venables

OBE FREng ONDSc MSc BSc(Eng) CEng CEnv FICE MCIWEM MCIArb FCGI
President of The Institution of Civil Engineers | Crane Environmental Ltd |

Sponsored by The Institution of Civil Engineers

Sustainable Infrastructure and the Climate Change Challenge

Abstract

In the Keynote Address Number 1 – *Sustainable Infrastructure and the Climate Change Challenge* – Dr Jean Venables, President of the UK Institution of Civil Engineers will set down the fundamentals of the climate change challenge and the broad implications for the provision and operation of infrastructure. She will address the need for carbon accounting alongside financial accounting and the potential changes this would bring about to decision-making on infrastructure. She will stress the need for step changes in practice. She will conclude with the implications and application of climate change effects to Flood Risk Management and in particular to the Thames Estuary 2100 Project, which is planning for flood risk management in the Thames Estuary through to the Year 2100."

Profile

Crane's Chairman, Jean Venables, is a Chartered Civil Engineer and Chartered Environmentalist with an MSc in Public Health Engineering and a long involvement in water and wastewater engineering, water pollution control, water resources issues and flood risk management.

In addition to her consultancy work through Crane, Jean's current appointments include being Chairman of the Thames Estuary Partnership and Chairman of the Expert Panel for the Thames Estuary 2100 Project, which is developing plans for flood risk management in the Estuary until the year 2100.

Jean is a President of the Institution of Civil Engineers (ICE) from November 2008. She is also a member of the ICE's Environment and Sustainability Board, as well as a member of the ICE Council in her role as Vice President. In addition, she chairs the ICE Membership Committee and is a member of the Professional Conduct Committee.

Professor Peter Guthrie

Centre for Sustainable Development, University of Cambridge

Sustainable development in urban environments – Research into Practice

Abstract

In the built environment sector; and particularly for new construction, the pace of change of legislation in UK towards more sustainable practice has been rapid and, in many respects, radical. Whilst there is always much still to do, the industry has witnessed the tightening of Building Regulations, the introduction of many pieces of legislation in relation to waste, building performance, drainage, vehicle duty, and the Code for Sustainable Homes. This rate of change makes the challenge for innovators more demanding, as the compliance standard increases annually.

At the same time the imperative for the rapid and dramatic improvement in performance of buildings and the urban environment, against a backdrop of worsening predictions of the effects of climate change, demands even greater savings in emissions, better efficiencies and more equitable use of resources.

These parallel pressures point to a more efficient and effective connection between research and practice. The historical delays between research outcomes and their adoption in mainstream practice are no longer acceptable. The construction industry has at best a modest record of uptake of new technology especially in the domestic buildings sector. This paper describes initiatives to improve the connections between academic research in the built environment and the practice of development of urban environments. A major programme of research into Sustainable Urban Environments (SUE) funded by the Engineering and Physical Sciences Research Council (EPSRC) has now added a programme of enhanced dissemination to be additional to the dissemination called for under each of the component projects.

Early work has shown high variability. On the one hand excellent levels of contact have been found where researchers are intimately connected with industry partners, and where research is informed by experience and feedback from practice in real time. In contrast there are cases where there is a complete absence of connection of what is often fine research to any practice, and the means of dissemination are poor.

The paper describes this work, and the sometimes novel methods for increasing the dissemination, as well as describing the key findings of the research and the applicability in the pursuit of more sustainable urban environments.

Profile

Professor Peter Guthrie leads the Centre for Sustainable Development, Department of Engineering at Cambridge University. He is the first Professor in Engineering for Sustainable Development in the UK. A civil engineer with geotechnical specialisation by background, Peter has worked on roads in countries such as Nigeria, Lesotho, Sudan, Philippines Ethiopia, and Botswana, and on major infrastructure projects such as Channel Tunnel Rail Link, CrossRail, West Coast Mainline Route Modernisation and Birmingham, and Manchester Airports, and major building projects such as Eden Project Phase 4, and large scale schemes for the Prison Service and the Ministry of Defence. He has advised on policy matters related to waste and environment in Russia, Mauritius, Seychelles, Romania and Portugal.

Contact details:

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Email pmg31@cam.ac.uk

Professor Peter Newman

Professor of Sustainability at Curtin University, Perth WA.

Blueprint for Sustainable Transport Infrastructure

Abstract

The need for sustainable transport infrastructure is obvious from a simple assessment of the economic and social issues of making good cities but has now become critical due to climate change and peak oil. The crash has highlighted how these matters are now linked as toxic loans were generally due to toxic land development that was totally car dependent. Overcoming car dependence and fuel vulnerability is now driving transport policy and an overview is given of what we must do in our cities and regions. The role of Infrastructure Australia will be elaborated as it tries to provide Federal Government leadership in this area. The presentation will be used to launch the new book 'Resilient Cities: Responding to Peak Oil and Climate Change' by Newman, Beatley and Boyer.

Profile:

Dr Peter Newman has also just been appointed to the Board of Infrastructure Australia. In 2001-3 Peter directed the production of WA's Sustainability Strategy in the Department of the Premier and Cabinet. It was the first state sustainability strategy in the world. In 2004-5 he was a Sustainability Commissioner in Sydney advising the government on planning issues. In 2006/7 he was a Fulbright Senior Scholar at the University of Virginia Charlottesville where he completed two new books 'Resilient Cities: Responding to Peak Oil and Climate Change' and 'Cities as Sustainable Ecosystems'. In Perth, Peter is best known for his work in saving, reviving and extending the city's rail system. Peter invented the term 'automobile dependence' to describe how we have created cities where we have to drive everywhere. For 30 years since he attended Stanford University during the first oil crisis he has been warning cities about preparing for peak oil. Peter's book with Jeff Kenworthy 'Sustainability and Cities: Overcoming Automobile Dependence' was launched in the White House in 1999. He was a Councillor in the City of Fremantle from 1976-80.

Contact details

Professor of Sustainability

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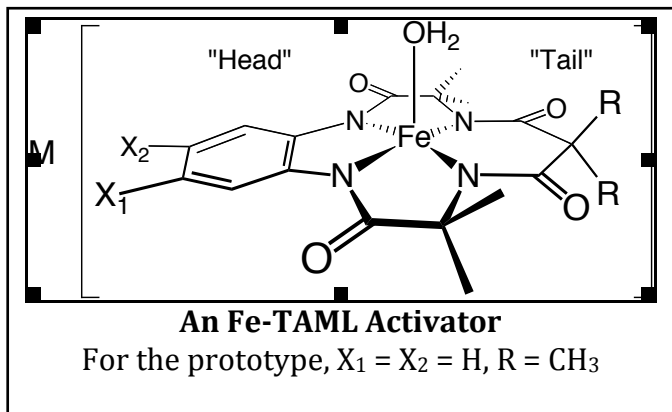
Professor Terry Collins

Carnegie Mellon University

Iron-TAML activators: highly successful mimics of peroxidase enzymes for green chemical applications

Abstract

Research in Carnegie Mellon's Institute for Green Science is focused on the further development, mechanism of action, and myriad uses of Fe-TAML (Tetra-Amido-Macrocyclic-Ligand) activators. Iron-TAML activators are miniaturized replicas of the peroxidase enzymes, which activate hydrogen peroxide throughout nature. Fe-TAML molecular weights are usually <0.5 kDa compared with 40 to 250 kDa for the enzymes making them eminently more suitable for commercial deployment.



The key to the Fe-TAML discovery and development has been the Collins iterative design protocol. This protocol is focused primarily on obtaining strongly electron-donating ligand systems where derivative complexes will be able to resist both hydrolytic and oxidative degradation under the aggressive conditions of peroxidase-like processes. After being pursued for 15 years, the protocol yielded the prototype Fe-TAML. Further advancement via the protocol to higher generation Fe-TAML activators has led to over 20 Fe-TAML activators that exhibit varying reactivities (with H_2O_2 and other peroxides), selectivities and lifetimes.

Toxicity testing to date reinforces the idea that Fe-TAMLs and their processes are green. Designed to be environmentally benign, Fe-TAMLs are signature green oxidation catalysts. Fe-TAMLs have the fundamental chemical properties to enable numerous new green chemical technologies. Ferric-TAML complexes with peroxides produce extremely reactive intermediates, probably several separately or jointly depending on the conditions, one of which is likely to be an iron(V)-oxo complex that has been trapped at low temperature. Fe-TAML catalysis is distinguished by low catalyst requirements (nM to low μM), efficacy under ambient conditions over a broad pH range (especially neutral to highly basic), rapidity, high efficiencies and turnover numbers, and flexibility for both selective and non-selective processes; the latter can be described as “fire-in-water”. Fe-TAML/ H_2O_2 can be used to purify water of numerous recalcitrant pollutants, including many endocrine disrupting chemicals (EDCs), as well as hardy pathogens.

Profile:

Terrence J. Collins, Ph.D. is the Thomas Lord Professor of Chemistry at Carnegie Mellon University (CMU) where he has taught since 1987. Professor Collins is one of the founders of the field of Green Chemistry. He is the Director of the Institute for Green Oxidation Chemistry at CMU and also an Honorary Professor at the University of Auckland, New Zealand. Among his many research awards is the 1998 Presidential Green Chemistry Challenge Award. The Institute for Green Oxidation Chemistry is highly acclaimed for its defining leadership in Green Chemistry and for its development of small molecule catalysts that activate natural oxidants such as hydrogen peroxide to clean water of numerous pollutants and pathogens. Professor Collins developed the first university course in Green Chemistry starting in 1992. He writes and lectures widely about the importance and promise of chemists turning their prodigious inventive talents towards eliminating hazards from chemical products and processes.

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Professor James R. Mihelcic

University of South Florida

Water and Sanitation in the World's Cities: Global Challenges in a Dynamic World

Abstract

Hundreds of millions of urban dwellers around the world have inadequate provisions of water, sanitation, and drainage. This contributes to a very large disease burden and hundreds of thousands of premature deaths every year. In fact, less than half of most urban dwellers in Africa, Asia, and Latin America have water piped to their home and less than one third have quality sanitation.

Meeting this immense global challenge of human needs within the context of the built environment is further complicated by issues of protecting precious water resources. This is because the majority of 3 billion people added this century will be in urban areas, 21 of world's 33 mega-cities are located in coastal areas, and the average population density in coastal areas is twice the global average, while the biodiversity of aquatic ecosystems continues to decline.

One challenge to providing beneficial infrastructure that meets human needs while protecting scarce water resources is the large number and integrated impact of global stressors such as population and consumption, demographic and land use changes, urbanization, and climate change. Another challenge is the rapid rate of change projected for all of these stressors and their resulting impacts that are expected to accelerate even further over the next century.

The common shape to all these stressors and resulting impacts is the shape of a "hockey-stick." The dynamic world we now live in raises broader questions of why we continue to design solutions that have an extended lifetime without considering the dynamic global conditions and the increasing rate of that change.

The large number of stressors, their unknown inter-relations, and the observed rapid change must all be considered when selecting and adapting new technology and governance structures for sustainable water and sanitation systems that make up the built environment.

Profile

Dr James R. Mihelcic is a Professor of Civil and Environmental Engineering and State of Florida 21st Century World Class Scholar at the University of South Florida. He is the founder (and current director) of the Master's International Program in Civil & Environmental Engineering. This program has allowed engineering graduate students to combine education and research with engineering service in the U.S. Peace Corps. To date, students have served and performed research in over 24 countries.

Dr Mihelcic is the immediate past president of the Association of Environmental Engineering and Science Professors (AEESP) and is a member of the EPA Science Advisory Board for Environmental Engineering. He is the author of two new textbooks coming out in print over the next 6 months that have as a focus environmental engineering, sustainable development, and globalization of engineering education.

Dr Mihelcic has published extensively about sustainability and global issues of water supply and scarcity, sanitation, and solid waste management. He has traveled extensively in the developing world working on projects related to water supply and treatment, sanitation, solid waste management, and community health.

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Dr Carol Boyle

International Centre for Sustainability Engineering Research (ICSER)
The University of Auckland

Elements of Sustainable Infrastructure

Recent catastrophes around the world have highlighted some of the major problems facing those who design, construct and maintain our infrastructure. Unprecedented populations in cities have forced some infrastructure systems to become larger, more complex and more interdependent. The decisions that are made today on delivering services to cities can have long term consequences, affecting the economics and resources of the city in the future. New technologies are also changing the way we can deliver infrastructure services, thus redefining some of our basic premises about infrastructure needs and creating clashes between old, now inefficient but built in technologies and new, completely different and much more efficient technologies. In addition, infrastructure, including the built environment, is a major consumer of funding, energy and material resources, during both construction and maintenance. Yet healthy and functioning infrastructures are the key to a sustainable city as they deliver the essential services to fulfil the needs of both current and future generations. A new vision for sustainable infrastructure is needed, which will recognise the long term future of our cities and the need to deliver basic services to all inhabitants. This paper presents some of the elements which will have to be taken into consideration in that new vision.

Profile

Dr Carol Boyle has been working in the field of sustainability engineering for the past 9 years, both as a researcher and as a lecturer at the University of Auckland. Her main focus on research is understanding and applying the science and engineering needed to achieve sustainability.

Carol and her postgraduate students are currently working with a number of companies including Formway Furniture Ltd., Actronic Technologies and Fisher & Paykel Ltd. to move their products towards sustainability.

Carol is the Chair of the New Zealand Society for Sustainability Engineering and Science (NZSSES), Director of the International Centre for Sustainability Engineering and Research (ICSER), a member of the IPENZ Practice Board, and a Board member of Sustainable Aotearoa New Zealand.

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Professor Paul Anastas

Yale University, USA

Green Chemistry: The Molecular Basis of Sustainable Infrastructure

Abstract:

As we consider the design of our buildings, bridges, water distribution and transportation systems, it is essential to consider that all of these are made from molecules. Those molecules become the materials used in our products and processes that are the basis of our society and our economy. Each of these molecules and materials have properties that determine to a large extent whether our infrastructure will be truly sustainable. Too often we have seen examples of approaches to sustainable design that seek to be thoughtful about the manner in which we put our materials together in order to achieve goals such as energy efficiency, water conservation, or reduction of carbon footprint that wind up using toxic or scarce or depleting materials that are inherently unsustainable. For synthetic chemicals or naturally-occurring materials that need to be processed for use, the manner in which they are manufactured can be wasteful and degrading to human health and the environment.

Enter Green Chemistry. The Green Chemistry approach has been demonstrated since the mid-1990's as a way of designing our products, processes, and systems that are intrinsically benign for human health and the environment throughout their life-cycle. The field has followed the roadmap of the Twelve Principles of Green Chemistry as a design framework and this framework has been applied to sectors including building materials, adhesives, coatings, paints, energy systems, water purification, agricultural products, cosmetics, pharmaceuticals, electronics and much more. The excitement about Green Chemistry throughout these industry sectors is that they are able to achieve their performance, both functional and economic, at the same time they are meeting their environmental and human health goals.

Some of the design approaches that green chemists are bringing to the world of sustainable infrastructure include bio-inspired materials for enhanced function, new atom efficient materials that provide and expected service with a fraction of the material needed, as well as transformative innovations that allow for the realization of desired function while completely eliminating that product that has historically provided that function. By looking at the Twelve Principles of Green Chemistry as a holistic and integrated system, designers are being inspired to new levels of sustainable design of infrastructure.

Profile

Dr Paul T. Anastas is Professor in the Practice of Green Chemistry, Yale University. Paul is known as "The Father of Green Chemistry," having coined the term in 1991. Anastas has worked to develop the field over the past 17 years. He joined the Yale faculty in 2007, where he serves as Director of the Center for Green Chemistry and Green Engineering, which advances the sciences, education and use of sustainable technologies. Paul was honored on May 4, 2007 by the Council of Scientific Society Presidents with their Leadership in Science award.

Paul Anastas focuses his research on the design of safer chemicals, bio-based polymers, and new methodologies of chemical synthesis that are more efficient and less hazardous to the environment. He has published nine books and numerous papers on the subject of science and technology for sustainability.

Before coming to Yale, Anastas was the director of the Green Chemistry Institute, headquartered at the American Chemical Society in Washington, D.C., where he established 24 green chemistry chapters in countries around the world, including China, Ethiopia, India, Japan, and South Africa. In a prior position with the White House Office of Science and Technology Policy, he spent five years as the principal supporter within the administration for governmental programs related to the environment.

Anastas holds joint appointments at Yale in the School of Forestry & Environmental Studies, the Department of Chemistry, and the Department of Environmental Engineering. He received his B.S from the University of Massachusetts and his Ph.D from Brandeis University.

Among his numerous awards are the John Jeyes Medal from the Royal Society of Chemistry, the H. John Heinz III Award for the Environment and the U.S. Environmental Protection Agency's™ Joseph Seifter Award, their highest scientific recognition.

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Professor Roger Venables

Managing Director, Crane Environmental Ltd

Royal Academy of Engineering - Queen's University, Belfast
Visiting Professor in Engineering Design for Sustainable Development

Chief Executive, CEEQUAL Ltd

Teaching Engineering Design for Sustainable Development to enable new graduates to deliver more-sustainable infrastructure: Some lessons from the UK Royal Academy of Engineering Visiting Professor Scheme

Abstract

The Royal Academy of Engineering has been supporting Visiting Professors in Engineering Design in UK Universities for many years. After an initial cohort of VPs in the overall subject area of Engineering Design, they appointed Visiting Professors in Engineering Design for Sustainable Development to 26 Faculties of Engineering or individual departments within such faculties. The overall objective has been to work towards embedding the concepts of sustainability and sustainable development in the engineering curricular so that engineering graduates go out into the world understanding those concepts and the role of their chosen specialism in helping to deliver sustainable development. A range of mechanisms was envisaged and have been used, but a major sub-objective was to develop case-study-based teaching materials to leave with the full-time staff once the Visiting Professor's 5-year term was completed.

The paper will review the formation, objectives and outcomes so far from the Scheme, with particular reference to:

- firstly, the preparation and publication of the Royal Academy of Engineering publication *Engineering for Sustainable Development: Guiding Principles*, for which the author of this paper was Editor and which is based on the collective experience of the Visiting Professors in Engineering Design for Sustainable Development and the Academy's Sustainable Development Education Working Group, and
- secondly, the author's particular experience so far at Queen's University Belfast.

The paper will conclude with some pointers for how other engineering faculty could adopt some of these outcomes to their courses and individual modules to enhance graduates' understanding of and ability to apply the principles of sustainability and sustainable development to the design of more-sustainable infrastructure.

Profile

Professor Roger K. Venables, BSc(Eng) DipM CEng CEnv FICE MCIM ACGI is a Chartered Civil Engineer, Chartered Environmentalist and Member of the Chartered Institute of Marketing, with 30 years' wide-ranging experience of civil, marine and offshore engineering, and research and development in those fields. He has the distinctive combination of qualifications and experience in both civil engineering and marketing.

Roger is Managing Director of Crane Environmental Limited and a Royal Academy of Engineering Visiting Professor in Engineering Design for Sustainable Development at Queen's University, Belfast. He has also led the team that developed the The Civil Engineering Environmental Quality Assessment CEEQUAL Assessment & Award Scheme that assesses the environmental quality of civil engineering projects and publicly recognises the achievement of high environmental performance. The Scheme is managed jointly by Crane and CIRIA on behalf of CEEQUAL Ltd, with Roger Venables acting as Chief Executive.

Roger is editor of Innovation & Research Focus, the quarterly ICE-newsletter that promotes the application of innovation and research in construction and the built environment, and was Project Manager for the Technology Support for Civil Engineering Exports Project led by the Institution of Civil Engineers. After his early career at George Wimpey & Co, he worked with CIRIA (the Construction Industry Research & Information Association) before joining Jean Venables in Venables Consultancy, Crane Environmental's parent company.

He was Technical and Coordinating Editor for The Rosehaugh Guide to Buildings & Health published by RIBA in November 1990 and, in 1992, led the team that wrote and produced the CIRIA Environmental Handbooks for Building and Civil Engineering Projects. He and John Newton were co-authors of A Client's Guide to Greener Construction, published by CIRIA in 1995 and completed the update of the CIRIA Environmental Handbooks in 1999.

Roger is Vice-Chairman of the Global Network for Environmental Science and Technology. In 2001/02, he delivered the third ICE Brunel International Lecture at venues around the world, including New Zealand, on the subject of 'Delivering Sustainable Development'.

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WORKSHOPS & CASE STUDIES

Abstracts and speaker profiles

WORKSHOP I

Sustainable Communities - Design

Wednesday 1.30pm

Professor Jorge Vanegas

An Integrated Approach to Sustainable Urbanism, Civil Infrastructure Systems, and Facilities:

A Response to the Needs of Disadvantaged Communities

Abstract

Governments, together with stakeholders in the public and private sectors, must work collaboratively at local, national, regional, and international levels to pursue integrated solutions both to alleviate poverty and to provide Sustainable Facilities and Civil Infrastructure Systems (SFCIS) for the most disadvantaged sectors of the population.

In addition, public and private sector initiatives to plan, finance, develop, and deliver SFCIS solutions need to address formally, explicitly, and proactively, in an integrated way, the three dimensions of sustainability (environmental, social, and economic), as well as the elimination, reduction, and mitigation of risk and vulnerability to natural hazards. These initiatives also cannot afford to continue following the same strategies, mechanisms, and processes that have been used to date. Rather, 21st century challenges require new approaches that are bold, innovative, systems based, and contextually sensitive given the interrelationships, interdependencies, and complexity of the external factors affecting the delivery of SFCIS solutions. Furthermore, government officials, policy makers, regulatory agencies, finance institutions, community leaders, planners, architects, engineers, suppliers, builders, or end-users cannot overcome these challenges alone. Rather, all stakeholders must link, coordinate, and integrate their efforts as a single cohesive critical mass, pooling, leveraging, and sharing their resources, within public/private partnerships at any level, from local to international, in the pursuit of SFCIS initiatives of common interest and benefit to all.

This workshop will present an interdisciplinary and integrated approach to sustainable urbanism, sustainable civil infrastructure systems, and sustainable facilities, which attempts to solve urban, suburban, and rural problems by building bridges among sustainability, cities, and the professions involved in the delivery of the built environment. This approach

aims to build sustainable urban places by synthesizing and filling the gaps between sustainable development and urban planning, design, and construction; and explores sustainability within a rapidly urbanizing world by focusing on the form of the built environment – i.e., land developments, built landscapes, civil infrastructure systems, and facilities – that collectively make up human settlements at various spatial scales.

The workshop will discuss fundamental principles for sustainable urbanism, and basic strategies for the planning, design, procurement, construction, and commissioning of SFCIS, which can be applied, in an integrated way, to ensure built environment sustainability within the context of responding to the needs of disadvantaged communities.

Profile

On August 1, 2008, Dr Jorge Vanegas began an appointment as Interim Dean of the College of Architecture (CARC) at Texas A&M University (TAMU). In addition, he also holds the Sandy and Bryan Mitchell Master Builder Endowed Chair in CARC, appointment that became effective on September 1, 2008. Since January 2006, Dr Vanegas serves as Director of the Center for Housing and Urban Development, and as Professor in the Department of Architecture, in the College of Architecture at Texas A&M University. Previously, he held faculty appointments in the Construction Engineering and Management (CEM) Program of the School of Civil and Environmental Engineering at the Georgia Institute of Technology (1993-2005), and in the School of Civil Engineering and the Division of CEM at Purdue University (1988-1993). Dr Vanegas is an Architect from the Universidad de los Andes, Bogotá, Colombia (1979), and holds a M.S. degree (1985) and a Ph.D. degree (1988) from the CEM Program of the Department of Civil and Environmental Engineering at Stanford University. His primary areas of expertise include built environment sustainability, advanced strategies, tools, and methods for integrated capital asset delivery and management, and creativity, and innovation and entrepreneurship for the AEC industry, among others.

Interim Dean, College of Architecture

Director, Center for Housing and Urban Development

Sandy and Bryan Mitchell Master Builder Endowed Chair

Professor, Department of Architecture

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WORKSHOP 2

Managing your Carbon Footprint

Wednesday 1.30pm

Chair: Nick Main, Deloitte

Nick Main, Chairman Deloitte

Carbon to Business:

The practical considerations of carbon measurement (the accepted methods and protocols), management (emission reduction strategies and opportunities) and mitigation (offsets and how they work).

This workshop will examine the role of validation and verification on voluntary and Kyoto markets.

Joanna Silver, Executive Director, TZI

Carbon Markets: An Overview

This presentation will present an overview of the global carbon market including the difference between the voluntary and compliance markets, how the markets operate, trends, challenges, opportunities and the role of infrastructure including standards and registries.

Wayne King, Carbon Market Solutions Ltd.

Buying and selling carbon credits, it's all about risk and price

Once you know you need to buy or sell your carbon credits, the question arises, how do you do this, with whom, and for how much. Will New Zealand's penchant for DIY be a successful approach to carbon trades, or is there a role for an exchange and for carbon brokers

Profiles

Nick Main is Chairman of Deloitte in New Zealand and leads that firm's Climate Change and Sustainability Practice Group. He commenced his career in London over 30 years ago and transferred to New Zealand in 1983. He was appointed Chief Executive for Deloitte in 2000 having served as managing partner Auckland and Wellington for the two preceding years. He was elected Chairman in 2005. Nick holds a Bachelor of Science degree from Durham University and is a Fellow of the New Zealand Institute of Chartered Accountants and of the Institute of Chartered Accountant in England and Wales. He is also Chairman of the New Zealand Business Council for Sustainable Development, member of the Government's Climate Change Leadership Forum.

Joanna Silver has a strong legal and financial markets background. Her last two roles at the Bank of New York and more recently in the NZX prepared her well to take the helm of the carbon market development project in NZX and now as Executive Director of TZI. Joanna's current focus is on building the opportunity for TZI to create a liquid carbon trading platform and also more broadly in developing the role and profile of TZI in the voluntary carbon market and more recently in biodiversity markets.

Wayne King has a background in forestry having worked for the NZ Government during the 1970-80's. Since then, Wayne has worked for the World Bank under an international climate program as a Manager advising a range of developing countries on their Kyoto obligation, as well as assisting those countries at the Kyoto Protocol negotiations from the early 1990's to 2001. Wayne also worked with the Asian Development Bank (ADB) in Manila, setting up a mainstreaming climate program and CDM facility inside the Bank. He returned to NZ and formed part of Carbon Market Solutions Ltd in 2004. Wayne has been active in assisting a range of clients establish their carbon portfolios and transacting a number of international carbon sales, under Kyoto through the Joint Implementation mechanism between NZ and buyers in the EU-ETS, as well as on the Chicago Climate Exchange where the company is a member.

WORKSHOP 3

Future Thinking Scenarios

Thursday 1.30pm

Dr Ir Ron McDowall

A. Idil Gaziulusoy

Visioning and Backcasting future cities without pipes.

Sustainability will only be achieved by nothing less than a radical change at systemic levels: a transformation of the socio-technical system. This indicates a need, not only to invent new technologies, but also to adopt different behaviour which enables diffusion and efficiency of those new technologies in the new socio-technical system. Simply put, collectively, we need to create a new future; a future which is not a projection of today.

Substantial research in the futures studies area has proven that forecasting is not useful when the problem in hand is complex, affecting many sectors and levels of society, when there is a need for major change since dominant trends are part of the problem and, when the time horizon is long enough to allow considerable scope for deliberate choice.

In this workshop, the facilitators are going to introduce the visioning and backcasting approach as a means of creating a desirable future scenario and identifying innovation paths to achieve that vision through backwards reasoning.

The workshop will commence with a brief presentation to explain the essence of backcasting process and will continue with group work. In the group work, the groups will be given future stories of a hypothetical city with huge limitations on certain resources which are abundant today. Based on these future stories, the groups will develop visions of a desirable future, will identify technology-behaviour matches suitable for those visions and develop short backcasting scenarios of "how did we get there".

Profiles

Ron McDowall joined the University of Auckland in 1997 as the Director of the International Centre for Sustainability Engineering and Research located in the Faculty of Engineering. He has a conjoint BBS/BSc in Physics, Business Management and Marketing from Massey University and a PhD in Economics from the Graduate School of Management, Waikato University. In addition he is a Chartered Professional Engineer with CPEng and a member of the International Professional Engineers register. He is a Fellow of the New Zealand Institute of Management (F.NZIM), a Fellow of the Institution of Professional Engineers New Zealand (F.IPENZ) and a professional member of the Royal Society. He is a UN specialist scientist/engineer working in the area of sustainable development in developing countries and travels the world on UNEP missions. Ron is currently a senior lecturer with the University of Auckland Business School and teaches Sustainability and Complexity in the MBA program.

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A. Idil Gaziulusoy has research, teaching and practical experiences in areas of sustainable design and industrial sustainability. She holds a M.Sc. degree from Department of Industrial Design, Middle East Technical University, Turkey and is currently a Ph.D. student at ICSEER Sustainability Engineering Programme, University of Auckland, New Zealand. Her current research topic is system innovation for sustainability and she is developing a scenario method for product development teams of manufacturing companies.

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WORKSHOP 4

MWH Infrastructure Management Workshop

Thursday 1.30pm

How Sustainable Is Your Network – Tools and Techniques for Asset Managers

The **MWH Infrastructure Management Workshop** focuses on established and emerging techniques for the assessment of the sustainability of infrastructure networks. Three eminent speakers from New Zealand, Australia and the UK will present on the following relevant topics.

Neil Cook – Infrastructure Manager, Wairoa District Council,

Neil will speak on using a risk based approach for sustainable decision making to meet the four well beings requirements of the LTCCP process and the RMA. This process is being developed to promote the management of public infrastructure such that it can be demonstrated to stakeholders how decisions have met the building blocks of sustainability, and how tomorrow will be more sustainable than today if the risk treatments are applied.

Scott Losee – Director, Australian Green Infrastructure Council (AGIC)

Scott will speak about the ongoing development of a “Green Star” rating and assessment system and tools for infrastructure development in Australia.

Charles Ainger – Director of Sustainability, MWH UK

Charles will speak on the development and application of tools and regulation for sustainability management for water and wastewater infrastructure in the UK including the mixture of regulated and voluntary approaches by the privatised water companies.

Following the presentations there will be facilitated discussion on the potential advantages and disadvantages for these three techniques / approaches to assist asset managers in ensuring their networks support and complement the four well beings for the benefit of existing and future generations. This discussion will allow shared learning to occur between workshop participants.

After discussions and feedback wrap up statements will be agreed for presentation to the wider conference at a later session. A short paper with more detail will also be developed for publishing on the NZSSES website.

Profiles

Neil Cook has a degree in Resource Engineering from the University of Auckland. After graduating in 1999 he spent several years with Opus International Consultants where he started developing applied risk management tools for use on local government engineering projects. Following his move to Wairoa District Council in 2005, Neil has spent the past few years developing an integrated risk management framework that allows meaningful comparison of risk across the spectrum of local government activity, within the context of sustainability.

Neil is heavily involved in the infrastructure sector within New Zealand. He is a board member of Ingenium (Association of Local Government Engineering New Zealand), secretary of the local Institute of Professional Engineers New Zealand (IPENZ) and represents the local government sector on a number of central government committees and working parties.

In 2007 his work in the risk management field was recognised by the industry when he was selected as a finalist for the Young Engineer of Year Award at the New Zealand Engineering Excellence Awards.

Outside of work Neil is involved in many community activities, with a focus on youth development and support. His latest initiative 'Great Expectations' is a programme focussing on one-on-one mentoring of young people who are not supported by the mainstream education and social systems.

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Charles Ainger is Sustainable Development Director at MWH UK, acting as an internal and external facilitator for innovation, strategy development and organisational change for sustainability and Corporate Responsibility. He also educates in change for sustainable development, as a Visiting Professor at Cambridge University, and through the Cambridge Programme for Industry.

His 42 years of experience started with planning, design, construction and management of water and environmental engineering projects, working in 16 countries from Europe to Asia, including Brunei, Singapore and Hong Kong. After 1984 he took regional Business Direction and then Strategy Development roles for MWH, and from 1995 he developed his skills in facilitating team-working, objective-setting and performance measurement.

Since 2001, he has focussed these skills on enabling organisational change for sustainability. He helped define MWH's first formal Environmental Policy from its start through full ISO 14001 certification, and led the team that produced MWH's first CSR reporting to GRI standards in 2003. At Cambridge, he is helping educate graduates and Environmental/CSR staff from a range of organisations, to implement sustainability strategies.

Since late 2006, he has been leading MWH's EU and UK Climate Change Commitment, helping MWH and clients engage with adapting to and mitigating climate change, through innovation

Scott Losee has 18 years experience as a professional in environment, energy, transport and resources, including senior executive roles and extensive interaction with politicians and stakeholders. Scott focuses on incorporating holistic sustainability concepts into large scale infrastructure, building and planning projects. He also provides specialist sustainability services in climate change, sustainable energy, carbon management, corporate sustainability and water resource management.

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WORKSHOP 5

Global Responses to Climate Change

Friday 9.00am

Chair: Emeritus Professor Ian Lowe,

Emeritus Professor Ian Lowe, Griffiths University, Queensland
Blueprints for Mitigation - how much should we be reducing emissions by?

Abstract

Climate change is a global problem, caused by the total human addition of greenhouse gases to the atmosphere. So, it demands a global approach. The only basis that could be politically sustainable is some form of “contract and converge”, a global agreement to allocate the total permissible release of greenhouse pollution much more equitably than current practice.

The Kyoto Protocol to the Framework Convention was a first step in that direction, requiring the end of growth in emissions from wealthy countries. Unfortunately, some of the worst polluters have failed to meet their Kyoto obligations or interpreted them to justify inaction. The 2007 Bali conference produced a commitment to develop a post-2012 approach, requiring wealthy communities to achieve significant reductions by 2020.

Unless there is agreement to such cuts at Copenhagen in 2009, there is little prospect of persuading China, India, and the majority world to be part of a global approach. The next year is a crucial test for the wealthy countries. We must agree to rein in irresponsible consumption and develop cleaner energy supply and use. Catastrophic climate change is inevitable if we fail. That would be an appalling legacy to leave our descendants.

The first crucial task is to develop a credible trajectory for rapid reduction of carbon dioxide release. The second is to achieve political support for the changes this will demand. We cannot fail: the survival of civilisation

Dr David Wratt, NIWA, NZ

Blueprints for Adaptation - how much should we be planning to adapt to?

Some changes are inevitable (even with the best possible efforts to reduce emissions), so that we also need to plan for adaptation. This presentation will briefly discuss global projections for various emission scenarios, and what these are likely to mean for temperature, rainfall, river flows and coastal hazards in New Zealand

Dr Gerda Kuschel, Emission Impossible Ltd.

Blueprints for Action - what are we actually doing?

Case study around the Auckland Regional Council, and other regional council's, responses to climate change, including Ministry for the Environment's guidance manual, policies and actions

Profiles

Dr Ian Lowe AO is emeritus professor of science, technology and society at Griffith University in Brisbane, an adjunct professor at Sunshine Coast University and QUT, and an honorary research fellow at the University of Adelaide.

Professor Lowe was made an Officer of the Order of Australia in 2001 for services to science and technology, especially in the area of environmental studies. In 2002, he was awarded a Centenary Medal for contributions to environmental science and won the Eureka Prize for promotion of science. His contributions have also been recognised by the Prime Minister's Environment Award for Outstanding Individual Achievement, the Queensland Premier's Millennium Award for Excellence in Science and the University of NSW Alumni Award for achievement in science. Professor Lowe was named Humanist of the Year in 1988.

Professor Lowe studied engineering and science at the University of NSW and earned his doctorate in physics from the University of York. He is the author or co-author of 10 Open University books, 8 other books, more than 50 book chapters and over 500 other publications or conference papers.

David Wratt is Chief Scientist (Climate) at NIWA , Director of the New Zealand Climate Change Centre , Chair of the Royal Society's New Zealand Climate Committee, and a Bureau member of the Intergovernmental Panel on Climate Change (IPCC).

David has been involved in national and international climate change research and assessment since the mid-1980s. His work has included collaborating with colleagues to develop regional climate change projections, preparing material to help Local Government staff identify climate change impacts and adaptation options, and contributing to IPCC climate change assessments.

David completed a PhD in upper atmosphere physics at Canterbury University in 1974. Since graduating, topics on which he has worked in the United States, Australia and New Zealand include radio communications, air quality, mountain meteorology, and various aspects of applied climatology, as well as climate variability and change.

Gerda Kuschel is a co-director of Emission Impossible Ltd - a consultancy which deals with the management of air quality and vehicle emissions. However, until recently she was the Manager – Environmental Sustainability at the Auckland Regional Council, responsible for coordinating the regional response to Climate Change and Energy issues.

Gerda is the immediate past President of the Clean Air Society of Australia and New Zealand and has published more than 250 technical research papers, workshops proceedings, reports, general articles, submissions and public appearances on air quality and environmental sustainability issues.

WORKSHOP 6

Case Studies

Friday 9.00am

Chair: Dr John Peet

Alec Couchman, Warren & Mahoney

East Auckland Initiatives – An alternative Vision leading the World Beyond Sustainable Built Environments

The future belongs to those who give the next generation reason to hope'
-Treilhard de Chardin

Abstract

The East Auckland area within the Auckland City Council environs has recently been the focus of a number of planning and transport initiatives. The land involved includes the University of Auckland Tamaki campus and surrounding areas, the Mt. Wellington quarry development, the associated transport interchanges and the largely public housing suburbs along the East Coast of the Auckland Isthmus. The underlying goal of all these related initiatives has been to transform the area into an economically viable and socially vibrant model for the entire Auckland region. Currently the overlapping but parallel initiatives envisage incorporating housing renewal (TTP), transport improvement (AMETI), innovation centre (NZIC), and an academic business park (TIPP). (1)

Each of the initiatives however assumes the current fossil fuel based economy and infrastructure including business, transport, education and housing will continue indefinitely with merely token nods towards 'sustainability'. Whilst the aims of a sustainable future were laudable and a realistic goal in the 1960s, the time for businesses and academia being just 'less bad' is over. A more fundamental re-think of the way we operate as a city needs to be investigated. In order for Auckland (and Manukau) City to be truly world class cities, the initiatives currently underway in East Auckland require a 'creative-leap' mentality. For example the idea of a science park centred around 'buzzy clusters'(2) of knowledge-based businesses is simply an extension of the carbon based strip mall mentality. Mono-cultural business parks are an outdated concept that arose out of cheap land, cheap fuel and an assumption of 100% car ownership. As a model of 'sustainability' this very premise is fundamentally flawed. A 'creative-leap' mentality would ask how such

developments could become mutually reliant yet independent, integrated yet unique.

By moving beyond sustainability, the 'creative-leap' would allow East Auckland to become a truly regenerative project actively repairing and restoring the natural environment. Such an approach would re-think the way we plan and design our cities, reducing and even eliminating complicated transport systems and the tyranny of horizontal zoning. Boundaries between zones and activities would become blurred and fuzzy. Spaces and facilities would be fully occupied and utilised. Harvesting the uniquely human concept of waste and naturally occurring energy sources would be a further key part of this model. This regenerative approach could be the world class city model for the next century that Auckland (and Manukau) City are so desperately seeking.

Profile

Canadian born and New Zealand educated, Alec spent many years as a globetrotting architect in a career spanning work in Canada, USA, Germany and the UK, working for practices including Hamilton Associates, Devereux and Partners and DEGW.

Alec is the only NZGBC and GBCA Accredited Professional in New Zealand and leads the growing commitment to Environmentally Sustainable Design (ESD) throughout the practice. He has worked on a wide variety of projects, including an office building in St. Mary's Axe, London; a clinic for Kings College Hospital; a hotel in Jena, Germany and retail shops across Europe and the USA.

Since joining in 1997, he has been Project Architect for some of the most complex, award-winning projects, including the University of Waikato Academy of Performing Arts, the University of Auckland Information Commons, Baradene College Auditorium, the University of Waikato Information Commons and several Auckland libraries. Alec lectures locally and overseas to business organisations, universities and the architectural profession on matters relating to ESD and construction.

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Mark Reardon

Connell Wagner, Brisbane

The Village - Successful outcomes and what was learnt.

Abstract

Kelvin Grove Urban Village (the Village) is a demonstration of “Smart Queensland” created by an innovative partnership between the Department of Housing and the Queensland University of Technology.

The Village will provide a new centre of services for the much wider inner urban Brisbane neighbourhood (to which it will physically, socially and economically connect) and is an attractive destination for the larger district or regional community who will visit the shops, university, theatre, clinics and recreational facilities. The physical construct of the Village (and the social and economic environment it facilitates) creates the high-quality interesting mixed-use lifestyle and learning context in which economic generators are expected to thrive.

Ecologically sustainable development (ESD) principles have been achieved by adopting a holistic approach to all aspects of development. The Village presents an opportunity to deliver buildings that achieve benchmarks for environmental and sustainable design. Many of these principles have since been integrated into the project Development Guidelines and Local Plan.

Successful outcomes in the face of many obstacles can produce a design that can demonstrate best sustainability practice whilst incorporating benefits for the community and as a model for others - Kelvin Grove Urban Village is such a project. To overcome these constraints, the design had to be carefully constructed, practical, proven and robust to achieve the ecological balance between economic, social and environmental sustainable benefits.

Water, wastewater, stormwater, waste management, road access and mobility were the main infrastructure areas targeted to implement various sustainable measures. To achieve effective and practical measures, most applicable to the site, several opportunities and constraints were identified that influenced the choice of these measures.

Whilst noble ideas are held, often ‘reality bites’. Some of the objectives from the menu of ESD strategies in the village could not be achieved for numerous reasons. Overall, the designs have to be completed within regulatory

acceptable boundaries, however, these should be challenged to allow better implementation of ESD outcomes.

Why is it winning so many awards for sustainability? The Village is the result of a creative collaboration of a group of professional consultants and clients, with the engineering consultants at the centre of the planning, documentation and implementation phases. It reasserts the need for interdisciplinary teamwork and leadership for creating better Australian cities.

Profile:

Mark Reardon having a career spanning over 25 years is a Senior Associate with Connell Wagner and manages the Urban Development section in the Brisbane office. His career to date has covered work for both private and the public sector, including a role of Development Control Engineer for Ipswich City Council prior to joining Connell Wagner.

Mark's key experiences are in planning, coordination, design, documentation and management of civil/municipal infrastructure engineering works. Mark has experience in planning and implementation of large urban works through his association in the development of towns associated with the mining industry in Central Queensland. Recently he has held the role of Principal Consultant for Kelvin Grove Urban Village that has been recognised by the following industry groups: RAPI Awards (State, 2001 National, 2002); UDIA Sustainable Urban Development (State, 2002); Premier's Awards; Landscape Institute of Australia; Planning Institute Australia (PIA) (State, 2003 and National, 2004), ACEA Awards (National 2004) and Engineers Australia (State, 2004 and National 2004). Currently Mark is Principal Consultant on Boggo Road Urban Village and Motorline City Precinct and Lead civil engineer on the Queensland Government's new Police Academy where he is applying lessons learnt from Kelvin Grove Urban Village.

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Stuart Chapman

Environmental Manager, Fletcher Construction,

and

Simon Wilkinson

Director, Wilkinson Environmental Ltd

Waste Minimisation On The Northern Busway and Esmonde Road Interchange Project: A Case Study From A Large Civil Construction Site

Abstract

Transit New Zealand's Northern Busway and Esmonde Road Interchange Project ('Northern Busway') is New Zealand's first purpose-built road dedicated to bus passenger transport and forms a key part of Auckland's rapid transit network.

At the beginning of 2007 Fletcher Construction (Engineering), the main contractor constructing the Busway, elected to implement a waste minimisation project. While Fletchers were already diverting concrete and metal waste for recycling, they wanted to go a step further:

Systems were put in place to measure waste being collected from across the site and a waste audit was conducted to characterise the waste streams. Site-wide waste diversion systems were put in place for significant materials, including wood, plastic and organic waste.

In the twelve months of 2007 the Busway waste minimisation project diverted 717m³, or an estimate 108 tonnes, of waste away from landfill. This recycled material represented 23% of solid waste generated from the site.

This case study presents a review of the practical challenges faced when setting up a recycling project on a large civil engineering project and provides some practical ideas to increase waste awareness amongst the contracting industry. It also looks at the barriers that still exist for contractors when setting up recycling initiatives.

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PANEL DISCUSSIONS

Friday 3.30pm

Room 401.439

Visions of the Future

Delivering Longer Term Visions for Sustainable Infrastructure

Chair: Dr Susan Krumdieck

Members: Professor Ian Lowe, Dr Jean Venables,
Professor Terry Collins, Professor Paul Anastas

Dr Krumdieck will lead the group into developing a picture focused on the future visions part of the picture, based on the audience's area of work, and outcomes.

The session will finish with a brainstorm about how these visions can be generated, and what should be done with them.

Room 401.401

Business Reality of Today

Transitions from Current Methods of Infrastructure Development and Management

Chair: Yassenko Krpo

Members: Kerry Griffiths, Professor Peter Guthrie,
Professor Roger Venables, Professor Jim Mihelcic

Pre-prepared questions will be put forward by the Chair, with a short statement in response from each of the panel members..

Delegates are asked to drop their written questions in the box at the registration desk by the end of the lunch time break.

Ads here

Duffill watts

Fletchers

Genesis

Carbon Market Solutions

BLUE CARDBOARD DIVIDER HERE

BOOK OF ABSTRACTS

Index listed in alphabetical order of lead author; followed by co-authors
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ALPHA LIST OF PRESENTATIONS ETC.... 6 pages

AUTHOR: Timothy Anderson

Co-authors: Sunil Bura
Dr Mike Duke
Dr James Carson
Dr Mark Lay

Presenter: Tim Anderson

Title: Development of a Building Integrated Photovoltaic/
Thermal Solar Energy Cogeneration System

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Abstract

Using renewable energy sources for onsite cogeneration from structural building elements is a relatively new concept and is gaining considerable interest. In this study the design, development, manufacturing and testing of a novel building integrated photovoltaic/thermal (BIPVT) solar energy cogeneration system is discussed.

Adhesives (ADH), resistance seam welding (RSW) and autoclaving (ATC) were identified as the most appropriate for fabricating BIPVT roofing panels. Of these manufacturing methods ADH was found to be most suitable for low volume production systems due to its low capital cost.

A prototype panel, fabricated using ADH methods, exhibited good thermal performance. It was also shown that BIPVT performance could be theoretically predicted using a one-dimensional heat transfer model and showed excellent agreement with experimental data. The model was used to suggest further design improvements. Finally, a transient simulation of the BIPVT was performed in TRNSYS and is used to illustrate the benefits of the system.

AUTHOR: Tim Armitage (BE, CPEng, MIPENZ, IntPE (NZ))

Presenter: Tim Armitage

Title: Sustainable Wind Energy Projects for New Zealand

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Tim Armitage

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Abstract

New Zealand is at a turning point as it sets out to achieve the target in the New Zealand Energy Strategy of 90% renewable electricity by 2025. Wind energy is one of the most favoured technologies in terms of its relatively low impact, speed of installation and range of project sizes. It is also one of the more cost-effective electricity generation options and is becoming part of most electricity generator and distribution companies' portfolios.

The way in which New Zealand develops its wind energy resource is also at a turning point as the different players involved have different ideas on what is the best option – a small number of very large wind farms connecting to the transmission grid or a higher number of smaller wind farms distributed around the country and supplying local communities.

This paper discusses the economic, social and environmental benefits of the 'smaller and smarter' Distributed Generation approach to wind farms compared to the recent trend towards very large wind farms. Examples are used to show that the 'smaller and smarter' approach to wind energy is the most sustainable.

AUTHOR: I. K. G. Boothroyd ^{1,2},
Co-author: M. J. Drury¹
Presenter: Ian Boothroyd
Title: Mind the Gap! Frameworks for urban sustainability

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Abstract

The majority of New Zealanders live in urban environments and models of sustainability applied to urban environments need to capture the human-ecosystem relationship. It is through this relationship, and modified behaviour of humans, that sustainability will be achieved. We look at the real and perceived driving forces and pressures contributing to the sustainability of the natural resources of urban (including peri-urban) environments and explore how to overcome the real and perceived human, social (including cultural) and economic contexts that are critical to achieving sustainability. Gaps in the human-ecosystem relationship lead to misconceptions of the quality of the environment and may hamper attempts to achieve more sustainable and resilient communities. We discuss the limitations of these frameworks as they are currently formulated for use in New Zealand including known pressure-state relationships applied at different scales.

AUTHOR: Andrew Camenzuli
Co-author: Dr Gavin M. Mudd
Presenter: Gavin Mudd
Title: Towards Comparative Environmental Sustainability Metrics for Geothermal Energy

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Abstract

The spectre of climate change is a fundamental driver of sustainability policy, technology and associated research – especially so in the primary energy sector. At present, many industrialised countries obtain the majority of their energy from fossil fuels, mainly coal, oil and gas, with a variable extent from nuclear power or renewables such as hydroelectricity, wind power and biomass.

The use of fossil fuels is a major contributor to greenhouse emissions and climate change, and low carbon intensity and renewable energy sources are being viewed more favourably for the future. Although not widely utilised at present, geothermal energy for electricity is clearly well positioned to meet this opportunity. However, there are very few assessments of the environmental sustainability metrics for geothermal electricity to facilitate sound comparison to other electricity sources, such as the embodied water costs or effective greenhouse emissions of geothermal versus wind energy.

This paper will present a detailed literature review of the environmental sustainability metrics for geothermal electricity, including research on aspects such as water costs, greenhouse emissions and energy costs. The sustainability metrics are then compared to the various estimates for other renewable energy sources, fossil fuels and nuclear power, thereby providing a unique basis for assessing the sustainability of geothermal electricity.

AUTHOR: Caleb Clarke (BE (ENV))

Presenter: Caleb Clarke

Title: Roy Clements Treeway Boardwalk – Urban stream management and community involvement

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Abstract

This paper presents a case study of the Roy Clements Treeway (RCT) Boardwalk project implemented by Metrowater, Auckland City's water and wastewater utility. This project represents an innovative solution to urban drainage management that involves changing land use and community expectations to address infrastructure issues.

The Roy Clements Treeway is located alongside the Meola Creek in Mount Albert, Auckland. A highly trafficked public walkway provides a pedestrian link through the Treeway. The stream often floods the Treeway with contaminated waters, putting public health and safety at risk. Conversely litter such as rubbish and shopping trolleys enters the Creek from the Treeway. Watercourse Management Planning (WMP) underway for the Meola Stream has developed a solution to address these issues with the RCT boardwalk project.

The project consists of providing a raised boardwalk elevated above the floodplain through the Treeway. This allows transition of land use from a high maintenance park to more natural and lower maintenance re-vegetated riparian zone. This has been undertaken in a manner that integrates access, security and transitional maintenance considerations. This project provides benefits for community education and urban renewal. The restored riparian zones provide a greenbelt in the urban environment, and represent a key opportunity to enhance the water cycle through targeted restoration. Natural environments located within urban areas also have the opportunity to benefit many by providing an opportunity to experience nature on their doorstep. The boardwalk project also integrates with community activities including:

- Waicare stream care groups
- Community Planting Days
- An adjacent community driven wetland restoration project
- Education of students from the adjacent Mount Albert Grammar School

This is an opportunity to help and harness community involvement, and creates an example process that can be a blueprint for other watercourse management projects with a community focus within Auckland City.

AUTHOR: Michael Dale

Co-authors: Dr Shannon Page
Dr Kerry Mulligan
Stacey Rendall
Associate Professor Susan Krumdieck

Presenter: Michael Dale

Title: TransitionScape – Oamaru: A Case Study in Community-Based Sustainable Development

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Abstract

This paper outlines a participatory community planning methodology with the aims of:

- (1) providing the facts about Peak Oil, Global Climate Change, Electric Power System;
- (2) help community members explore their individual and group responses;
- (3) provide a forum to generate projects in the community for sustainable value, resilience and adaptation, and
- (4) stimulate increased community connectivity and the creation of organisational structures appropriate to these challenges.

This method was trialled at the "Climate Disruption. Transition Towns. One Response" weekend forum organised by the Natural Heritage Society Oamaru for a number of participants from the town of Oamaru, New Zealand and surrounding communities.

AUTHOR: Stephen Eagle (BSc., MSc)¹

Co-authors: Christopher Tolley²
(BSc, MBA, MIPENZ, MICE, MIHT, CPEng, IntPE)

Presenter: Stephen Eagle

Title: The Use of Lime Stabilization for Rural Road
Rehabilitation in Cambodia

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Abstract

Since the signing of the Paris Accord in 1991 there has been intense investment and effort in road rehabilitation, of primary, district and rural roads throughout Cambodia. All too often, pavements have failed in the space of a year or two. In the case of rural roads, which amount to over 40,000 km in total, the cost of sealing is rarely justified and the norm is to use laterite, which can be distant and expensive, and always requires intensive maintenance and re-grading after each rainy season. The laterite soil is subject to wind erosion and the extra dust caused from this material causes major health problems. Lime is available in Cambodia and the authors secured New Zealand Government funding to establish and demonstrate its value for rural roads, prepare standards and training manuals, and train a cadre of professionals to lead its wider adoption in the country. Potential benefits include greatly reduced road life cycle costs, ability to use more locally available materials, and reductions in dust emissions. The paper presents the background, findings from the trials, and outlook for the greater use of lime stabilization in the Cambodia road sector in general.

AUTHOR: Dr Mitra Emami (Ph.D.Architecture, ANZIA)

Presenter: Dr Mitra Emami

Title: Turning a Red Building into a Green Building

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Abstract

Commercial buildings consume more energy than other building types in the cities. The number of new sustainable offices constructed each year is far less than the number of existing buildings. Therefore it is important to understand that exploring cost effective ways of modifying existing office buildings into green buildings for the future; is a great challenge for architects, engineers and authorities.

This paper will deal with the question of transforming an existing conventional office building into a sustainable green building and the barriers associated with this transformation. The major differences in design, between office and residential building type will be described in the first part of study. It is more expensive to "modify" an existing building, than to "construct" a new sustainable building. This is an important barrier which will be described in the second part. Despite the barriers for modifying an office building to a green office, there are always opportunities for application of energy efficient design. The third part includes information about methods to minimize energy use for artificial lighting and air conditioning through smart design of building components; in this case study office windows. This review will only include the solar passive design opportunities and innovative design approach of windows, which was missed or ignored through design and the construction process. The review will be supported by exploring renovations to an example building, and the lessons learned from that experience. It will conclude that modifying an existing building into a green building is not always more expensive than a conventional design approach, but requires knowledge, experience and attention to details.

AUTHOR: Valerie J. Fuchs¹

Coauthors: Lauren M. Fry¹
Dr James R. Mihelcic²

Presenter: Valerie Fuchs

Title: Delivering sustainable wastewater infrastructure in an urbanizing world

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Abstract

For the first time in human history, urban population exceeds rural population. The rapidly urbanizing population is at a major health risk due to lack of adequate sanitation facilities, drainage systems, and piping for clean water. As urbanization and climatic change occurs, water scarcity may become a limiting factor in water and wastewater infrastructure design while at the same time, the world struggles to provide safe drinking water and sanitation to large populations without access. As urbanization and population growth continue, it is important to consider water and wastewater infrastructure designs that minimize water use while being cost-effective and health-beneficial. We examine the sanitation systems of 6 Bolivian communities which are quickly growing. Analysis of system type, management type, costs, and community perceptions are made in order to determine the appropriateness of the sanitation system to the capacity of the community. Our discussion of these issues concludes with new considerations in sanitation design, imperative for a sustainable future in a water-scarce and urbanizing world.

AUTHOR: Jeremy Gabe

Presenter: Jeremy Gabe

Title: **Design versus Performance: Lessons from Monitoring an
Energy-Efficient Commercial Building in Operation**

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Abstract

Although they are commonly used to promote completed energy-efficient commercial buildings, building energy simulations poorly predict actual consumption. Empirical studies of buildings in operation routinely demonstrate high variability between design-stage energy modelling results and actual energy consumption. Furthermore, energy-efficient commercial buildings with high energy use (e.g., data centres and laboratories) more consistently perform poorly relative to their energy simulations than office-only buildings.

The Landcare Research building in Auckland, New Zealand, is one example of this trend. This high energy use building, completed in 2004 under a design philosophy of reduced resource consumption, has a complex mix of laboratories built to containment specifications, archival collections with stringent environmental requirements, and office space. It is consuming approximately double the amount of energy that design-stage models suggested, although it still outperforms benchmarks of energy intensity for conventional construction of its type and best-practice, energy-efficient laboratory/office buildings in the United States. The findings suggest that modelling assumptions in NZS 4232:1996 for office buildings underestimate continuous plug loads when used for high energy use buildings. They also highlight how building managers can have difficulty in controlling and managing complex building services (which are common in energy-efficient buildings), leading to further energy wastage. This study suggests great potential for increasing energy-efficiency of commercial buildings through better integration of building services design with typical building management behaviour in operation

AUTHOR: A. Idil Gaziulusoy

Co-authors: Dr Carol Boyle
Dr Ir. Ron McDowall

Presenter: Idil Gaziulusoy

Title: Planning for System Innovation in Product Development
Teams of Manufacturing Companies: Criteria Development
for a Scenario Method

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Sustainability, Complexity and Decision

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Abstract

Due to the complexity embedded in the socio-technical system and associated long planning periods, system innovation has become a research topic to remain mainly in the science and technology policies area and not much effort has been put into investigating the means of involving companies and product development teams in planning for system innovation. This paper presents results of ongoing research which proposes to develop a scenario method to help companies and product development teams in planning for system innovation. This paper presents the criteria which need to be met by the scenario method. Firstly, a brief overview of the theory around system innovation is given. This is followed by a critical analysis of dynamics and levels of innovation to set a background for criteria development. Then, a discussion clarifying the relevance of companies and product development teams to system innovation is provided prior to criteria development. Following this discussion, six criteria which must be met by the scenario method being developed are identified.

AUTHOR: Julie Anne Genter
BA (1st class), MPlanPrac (1st class), GNZPI, MIPENZ (Transport)

Co-authors: Lorelei Schmitt BA, MPlan (Dist), GNZPI, MIPENZ (Trans)
Stuart Donovan BA/BE(Hons), ME (1st Class), GIPENZ

Presenter: Julie Anne Genter

Title: How minimum parking standards underpin car dependence: the new parking management paradigm

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Abstract

District plans continue to mandate the provision of vast amounts of parking for most new developments. Parking standards are based on the demand for free parking at the peak hour of each individual site, which creates an oversupply and fails to recognise the value of land used for car parks. This approach reduces the supply and thus drives up the price of urban land available for economically productive uses (residential, commercial and retail) and distributes the costs throughout the economy. Minimum parking standards undermine sustainable city development by inhibiting compact growth and subsidising single-occupant vehicle trips. In this paper, we outline the history of minimum parking requirements and their unintended consequences on our sprawling urban form. We refer to a case study in a New Zealand town centre, and explain the negative impacts – economic, social and environmental – of the current approach to parking management, including how district plan parking requirements act as a barrier to the goals of sustainable growth and transport strategies. We present a number of regulatory responses that can reform parking standards and result in low cost, “win-win” approaches to parking management – which will facilitate smart growth and sustainable transport modes, reduce compliance costs, and provide a range of modest benefits to everyone, even those looking for a convenient car park. Finally, parking is often a contentious political issue. We consider the difficulties of implementing parking reform in an environment where people are accustomed to ample free parking. Public education and involvement in the process of instituting new parking management policies will be essential to ensure that communities understand the benefits and welcome a sustainable approach.

AUTHOR: Ms Ellen Greenberg
Co-author: Dr Susan Handy
Presenter: Susan Handy
Title: Sustainable Street Design

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Abstract

Concerns over sustainability and climate change have spurred local governments to create new practices that promote sustainability in street design. This paper reports on the results of the Sustainable Streets Project, which set out to document and assess the emerging practice of sustainable street design in the U.S. We define sustainable streets as encompassing three themes: movement, ecology, and community. A search for sustainable street examples in the U.S. yielded 50 examples, for which available documentation was collected and compiled. Our analysis of this database shows that few of these examples comprehensively address all three sustainable street themes, though they illustrate many different ways that local agencies are incorporating multiple objectives into street design. We identify four categories of projects: Neighborhood Plus, involving new and redesigned neighborhoods that seek to foster community values, reduce transportation impacts, and preserve natural resources; Downtown Revitalization Plus, for projects in older communities that are using street design as a tool to spur economic activity and support compact and infill development downtown; Stormwater Plus, including projects designed with implementation of stormwater management features as a primary design objective; and Movement Plus, for projects in which arterial streets are re-designed to meet sustainability goals ranging from improving bike parking to supporting high-density residential infill. Advancement of the practice of sustainable street design in the U.S. depends on an improved knowledge base, design innovation, and new planning tools. A comprehensive approach to sustainable streets offers can create harmony among the goals of community, the demand for mobility, and the mandate for environmental stewardship.

AUTHOR: Kenfield Griffith

Co-author: Ayodh Kamath

Presenter: Ayodh Kamath

Title: Digital fabrication technologies: An endogenous approach to sustainable buildings within developing communities

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Design and Computation

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Abstract

This paper investigates a novel layered manufacturing process for the production of building components. The solution introduced in this paper is a system of computed layered manufactured molds. The goal is to create a system that will be influenced and tailored to incorporate aesthetic preference, geographical location, and cultural innovation.

Based on the Global Fab Lab initiative (Neil Gershenfeld, MIT), that offers tools and technology to developing countries, and the United Nations Millennium Development (2000-2015) goals for empowerment, this research investigates technology systems for building infrastructures with the impact of community intervention. The current research is twofold: it derives a systematic process that can be locally and globally repeated; and investigates the principle of sustainability through community empowerment using digital fabrication technologies.

AUTHOR: Kerry Griffiths (MA, MBA, MSc),

Presenter: Kerry Griffiths

Title: Getting Down and Dirty

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Abstract

In the last five years we have seen the emergence of sustainability issues within the engineering design and the construction industry in New Zealand.. These issues have been reflected in industry relevant legislation and guidance at a central and local government level, and in the establishment of organisations such as the New Zealand Green Building Council, and in Australia the Green Infrastructure Council. Many existing industry organisations have run conferences related to sustainability and climate change and are developing industry guidance and training to increase capacity within their target groups. In parallel green products and design approaches are coming onto the market. Questions of sustainability are no longer confined to the realms of academia, advocacy groups and policy think tanks. These are moving into the marketplace.

The case studies in this paper share examples of how learning is taking place and in particular how tools and frameworks along with appropriate support are starting to raise the level of engagement around more sustainable solutions by the construction industry. The two case study examples considered are the use of carbon foot-printing as a tool for emissions reduction in the construction process – both for designers and for contractors - and the use of the REBRI guidelines and related waste minimization initiatives to reduce construction waste.

The paper will share the methodologies and outcomes as well as the processes used to engage the workforce at a practical level. The case studies demonstrate that when the transition is made from concepts and principles to tangible outcomes and practical action, engagement occurs and thinking shifts.

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Presenter: Susan Krumdieck

Title: Demand Response in the Residential Sector: A Critical
Feature of Sustainable Electricity Supply in New Zealand

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Abstract

The world summit on sustainable development in Johannesburg concluded that changing unsustainable patterns of energy use is a key area for global action to ensure survival of our planet. Demand response in the residential sector can play a key role in ensuring a secured and sustainable electricity supply by reducing future investments in generation and interconnection capacity and hence reducing the growth of electricity price and the development impacts on land and CO₂ emissions. Further, demand response capability would increase the resilience of the power supply system to shortages, thus improving the security of supply and energy services. Demand side management has been used successfully over several decades to manage base-load demand growth, and to shift loads from peak to off-peak times. Demand response to reduce consumption at peak times on the network has been largely aimed at large industrial and commercial users. Information barriers and the lack of understanding of residential consumer behavior in responding to price signals has impeded development of effective response strategies and new enabling technologies in the residential sector. In this paper, we discuss some of the key social and behavioral issues that are being explored in order to achieve effective demand response. The research objective of the present work is to explore the peak hours demand response elasticity to price, environmental impacts (CO₂ intensity of generation), and social factors (risk of brown-outs and black-outs). These three elasticities are being measured by surveys of different residential households using a survey designed for the purpose. The project aim is to use this information, plus modelling of household activities and energy services to develop concepts for innovative engineering solutions to demand response through targeted communication of information about the supply system.

AUTHOR: Mr Thomas Haarhoff (BE, MEngSt, MIPENZ, CPEng)

Presenter: Thomas Haarhoff

Title: Sustainability Assessment for First Time Wastewater Scheme

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Abstract

Point Wells is a small residential settlement located approximately 80km north of Auckland's CBD on a flat headland within the Whangateau Harbour. All wastewater was treated by private septic tanks and soakage field systems. However, these septic tank systems were not functionally and caused both human health and environmental impacts.

It was determined by the Rodney District Council to replace the unsustainable wastewater system with a centralised collection and disposal system. The Rodney District Council, with the assistance of Harrison Grierson Consultants undertook a Sustainability Assessment of possible wastewater servicing schemes for Points Wells.

For Point Wells an EIA Driven Integrated Assessment based on Triple Bottom Line methods was selected. The EIA Driven Integrated Assessment identified a low pressure sewer system as the best wastewater servicing solution for Point Wells. For this assessment methodology to be successful, sustainable objectives and the project boundary conditions needed to be understood to allow the appropriate option to be selected.

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Presenter: Abdul Samad Hadi

Title: Health and Green Infrastructures for the Livable City

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Abstract

The livable city research program at the Institute for Environment and Development (LESTARI) for the intermediate city of Seremban in Malaysia was initiated to evaluate the extent to which the city has responded to rapid development in the past twenty years. An important component of the research program is to assess the provision and impacts of health infrastructures.

This paper presents some findings on place use and the behaviour of people in major green areas, as well as at more localized neighborhood areas in an increasingly fast paced urban life. These findings are then related to potential impacts of these green areas on generating a healthier way of living in an increasingly busy city. Among the findings include local methods of adapting green areas for general use, recreation and exercise that fit local culture and needs, as well as the temporal aspect of these uses given changing lifestyles.

The study also linked the green areas to environmental health indicators including ambient temperature and pollutants. Seremban began as a colonial city with several green areas that provided the identity for the city, but the city is changing and many questioned the current functionality of these area.

AUTHOR: Mr Neil Harrison

Presenter: Mr Neil Harrison

Title: The Contribution of Woodfuel to Delivering the Sustainable Society of the Future

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Abstract

Wood fuel has come and gone throughout the ages, but its current use amounts to nearly a billion tonnes of oil equivalent, a level comparable to the consumption of natural gas or coal. This makes it the largest renewable energy resource in use today.

With spiraling oil costs, concerns over security of supply and the impacts of global warming looming, a number of developed countries have made great strides in increasing the use of wood as a fuel, with some seeing startlingly rapid increases in uptake of the technology at a commercial and industrial level. In the EU in particular, woodfuel now plays a significant role in heat markets. Of the total energy used across the EU, 8% of this is classed as renewable, and 60% of this is derived from woodfuel and other forms of biomass.

This paper will explore the journey of the UK woodfuel sector from a handful of systems in 2003, to over 300 commercial and industrial installations in 2008. The paper will examine the environmental and economic credentials of woodfuel, and detail its application to a range of industrial and commercial uses.

New Zealand grows wood fibre as fast as anywhere in the world, has a mature and well-distributed forestry industry and has a relatively heat-intensive primary sector. Case studies and learnings from Europe will be explored to demonstrate how this abundant and sustainable energy source could provide New Zealand heat users with a large percentage of their energy requirements cost-effectively, whilst also providing many manufacturers with a competitive advantage to off-set the food/product miles debate.

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Presenter: Zheng Qian

Title: Review of Rainfall Intensity Curves and Sea Levels in
Manukau City making provision for Climate Change.

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Abstract

Manukau City Council, under the Resource Management Act 1991 and the Local Government Act 2002, has the responsibility to promote the sustainable management of natural and physical resources, to avoid or mitigate natural hazards and to have particular regard to the effects of climate change.

Under the Manukau Operative District Plan 2002, Council developed and maintains a set of Engineering Quality Standards (EQS) which outlines the functional requirements and design standards that land development within the city has to comply with. The EQS requires specifically the minimum building floor levels for properties along the coastline to avoid possible coastal inundation; it also sets forth design rainfall intensity curves on which the design of stormwater infrastructure and road drainage works relies.

The Intergovernmental Panel for Climate Change (IPCC) released its Fourth Assessment Report in April 2007, it confirmed that "Warming of the climate system is unequivocal", that extreme precipitation events are very likely to become more frequent and that sea level rise would continue throughout the 21st century.

In light of the consequences of global climate change and associated impacts, Council decided to review the current standards to ensure that infrastructure and buildings built today can cope with the effects of climate change and still provide the desired level of service within their expected useful lives.

Regional frequency analysis was used to derive the design rainfall intensity duration curves from historic rainfall records. The rainfall patterns were then projected for the 2050s and 2080s for low, moderate and high temperature rise scenarios. Based on detailed assessment, projections on rainfall intensity curves for the 2080s for moderate temperature rise scenario are recommended for adoption in the EQS.

For sea level, the variability in astronomical tide levels and storm surge were assessed along both the Manukau Harbour and Waitemata Harbour coasts. Climate change impacts on Mean High Water Spring and 1% Annual Exceedance Probability water levels were determined for the 2050s and 2080s relative to the present day. For planning purposes a sea-level rise allowance towards the upper end of the IPCC Fourth Assessment Report projections has been adopted.

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Title: Implementing Sustainable Water Management in North Shore City

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Abstract

The North Shore community is very attached to its natural environment and has made it very clear to their Council that they want to protect and where possible enhance its natural environment, including its beaches and streams. There is also a huge pressure on North Shore City to cater for growth. The city needs to accommodate another 100,000 people and some 40,000 jobs in the next 50 years. Greenfields are rapidly running out and most of this growth has to be accommodated through intensification. Many people see this as a threat, but this change could also be seen as an opportunity to meet the city's objectives looking at all four wellbeings: social, cultural, economic and environmental (natural environment)

This paper will focus around a number of themes related to the management of the wastewater, water supply and stormwater (3 waters) and the lessons learned. In the connect of this report, sustainability means meeting the city's objectives under the four wellbeings with specific attention to the quality of our streams and beaches as well as solutions that will last well into the future. One of the lessons is, that it has become clear that in order to meet objectives in the areas of water management, integration with other areas and disciplines within council and its community it is essential to these sustainable outcomes beings.

The paper will also address a number of institutional barriers and difficulties with the legal framework that provide barriers for councils wanting to do the right thing. Because the RMA is an enabling act and effects based, it is not always helpful to assist councils in meeting the four wellbeing-outcomes in an efficient way. Processes are prohibitively expensive and have uncertain outcomes. Leadership and changes in the legal framework are needed to facilitate brown-field redevelopment initiatives.

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Title of Paper: Carbon Dioxide Offsetting for Conferences

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Abstract

This paper covers the methodology of a calculative model to obtain the carbon footprint for a New Zealand conference, and provides information to aid the conference organisers in choosing an appropriate emission offset program. The New Zealand Society for Sustainability Engineering and Science (NZSSES) 2008 Blueprints for Sustainable Infrastructure conference is used as a case study. Emission factors have been ascertained for transportation to and from the conference, delegate accommodation, venue energy usage, conference consumables such as food, beverages and printing, and waste produced. These are obtained from New Zealand and international sources with preference given to local factors across all areas where possible. Standards for carbon offsetting projects are discussed and a selection of offset companies is presented. It is hoped that this calculator will aid other conference organisers in quantifying their carbon footprint, and the paper will assist them with the selection of a carbon offset scheme.

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Presenter: Paula Hunter

Title: A New Policy Framework for the Allocation of Water –
Implications for Municipal Suppliers

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Abstract

New Zealand's fresh water resources are coming under increasing pressure to meet growth in demand, particularly from the agricultural sector. The Ministry for Agriculture and Forestry and the Ministry for the Environment recently projected a 202% increase in demand for irrigation water in the Waikato Region by 2010. In addition, there is an increasing demand for water for community supplies, industry and stock water supplies.

The Resource Management Act 1991 ("RMA") confers on regional councils jurisdiction to allocate the taking and use of water through provisions in regional plans. In recent times the Waikato Regional Council (Environment Waikato) has been criticised over the approach it has thus far adopted under the Waikato Regional Plan for the allocation of the Region's fresh water resources as it was perceived to be failing to adequately deal with the level demand and increasing competition for water. In response to these issues Environment Waikato notified a Variation (Variation 6) to its Regional Plan that introduces a new approach to the protection, allocation and use of the Region's fresh water resources. Variation 6 to the Proposed Waikato Regional Plan was notified in October 2006, the hearings have been completed and decisions are expected to be notified mid 2008. At the time of writing this paper no decisions have been notified.

An important feature of the Variation (as notified) is that it introduces policies designed to ensure the availability of water to meet the requirements of municipal supply authorities and rules to give priority to municipal supply, provided municipal suppliers use the water efficiently. To demonstrate that these objectives will be achieved, the Variation requires that applications for takes for municipal supply must be supported by comprehensive Water Conservation and Demand Management Plans. These plans will substantiate

the volumes of water sought, set out the methods and mechanisms to minimise the use of water; and identify the applicant's specific initiatives and objectives in terms of water conservation and demand. Many regional councils around the country are watching with interest the progress of this Variation, possibly with a view to adopting similar models for their regions.

This paper will discuss:

- the background to Variation 6;
- what Water Conservation and Demand Management Plans will need to address;
- how these plans will fit within the context of the RMA and the Local Government Act 2002;
- legal issues as regards the scope of the powers of regional councils in the context of such instruments; and
- the implications of Variation 6 for municipal water suppliers.

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Title: Spatial Urban Metabolism for Livable City

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Abstract

'Livable city' involves many interdependent factors contributing to the quality of life in the urban area. The urban forms with their complete physical and social infrastructures are an essential base to enhancing the quality of life of the urbanites. The livable city imperative is important for Malaysia today because the urbanization process in Malaysia is moving towards harmonizing with the principles of sustainable development. The concept of livable city is used as the representation of sustainable city. The urban metabolism concept is mobilized to show both the livability and also the vulnerable areas of the city.

This paper examines a conceptual city metabolism framework, and then goes to consider the various factors that are involved in making the city livable for all ethnic groups in Malaysia. The Seremban municipality area – a growing and prosperous spaces situated in Negeri Sembilan about 80 kilometers south of Kuala Lumpur, Malaysia is the base of the study. Multi-disciplinary and collaborative research contributions are necessary for making cities in Malaysia more livable due to the rapid progress in making Malaysia a developed nation by the year 2020. This paper also presents some preliminary results of the livable city project focusing on the physical and social infrastructures such as water consumption, land properties, crime and health to reflect on the livability of the city or otherwise.

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Title: Environmental Sustainability Metrics for Nickel Sulphide Versus Nickel Laterite

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Abstract

The application of sustainability principles to mining is often conceptually challenging – after all, mineral resources are widely perceived to be ‘finite’. In reality, mineral production is higher today than ever. A crucial metal linked to development and society is nickel, used in stainless steel and a variety of engineered infrastructure or technology. The world has two major reserves of nickel ore types – sulphides (~40%) or laterites (~60%). Most historical production has come from sulphide ores, with lesser production from laterite ores. Nickel laterite ores are metallurgically complex and not readily amenable to concentration, pyrometallurgical smelting and refining to metal. As such, alternative technology is required, like intensive ammonia leach technology or more complex high pressure acid leach (HPAL) processing combined with solvent extraction and electrowinning. Given the fact that more nickel resources are known in laterite than sulphide ores, the future of global nickel production will progressively include more laterite-derived nickel – major new laterite projects are being developed in Australia, New Caledonia and elsewhere. Laterite deposits tend to be lower in grade but bigger in total size compared to sulphides. There is, however, exceedingly little information available on the actual environmental sustainability metrics of sulphide versus laterite ores. Aspects such as energy, chemicals and water inputs and pollution outputs such as greenhouse emissions and sulphur dioxide are critical to understanding the relative sustainability of the ore types. This paper compiles and analyses the available data for nickel sulphide and laterite production. Overall, the data shows that the effort to produce nickel metal from laterites requires higher energy and greenhouse emissions per tonne of nickel metal. With respect to future production, this suggests that the contribution of nickel mining to greenhouse emissions will grow at a faster rate than just its production rate alone. The data raises major issues in terms of the ultimate environmental sustainability of nickel mining.

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Title: Sustainable Use of a Bauxite Residue (red sand) as Highway Embankment Materials

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Abstract

Disposal of bauxite residues by stockpiling is an economic burden for the alumina industry. In this study a by-product from bauxite residue Red Sand was stabilised by the addition of red lime (another by-product alumina refineries) and fly ash (a by-product from coal fired power generation). Investigations were then conducted to evaluate the potential use of the stabilised red sand mixture as a highway embankment material.

Our findings show that

1. the optimum stabilisation mixture was 75% Red Sand, 10% red lime and 15% fly ash (dry mass).
2. the improvement in strength was due to both mechanical and lime stabilisation.
3. for embankment heights less than 15m a slope of 2H:1V or flatter is acceptable for Red Sand alone, while a slope of 1H:4V or flatter meet the stability requirements for stabilised Red Sand.

This stabilisation of those industrial by-products for an embankment material can provide a sustainable reuse option in alternative to current stockpiling practices.

AUTHOR: Dr Anna L. Johnson (BSc (Oregon), PhD (Otago))

Presenter: Anna Johnson

Title: New Zealand Approaches to Growth Management

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Abstract

In the last 5 years, New Zealand has experienced a renaissance in strategic urban planning, with growth management strategies having been produced for most of New Zealand's fastest growing regions and districts. This paper summarises the results of research on recent approaches to growth management planning in New Zealand, in light of international trends.

The research sets out a framework for the evaluation of growth management strategies and critically examines several of the strategies produced to date in New Zealand. The evaluation framework examines governance arrangements, and the structure and scope of growth management planning, including the key growth management policies and implementation tools. The paper traces the influence of international growth management trends in New Zealand practice and highlights the similarities and differences in approaches. It includes a discussion on the strengths and weaknesses of different strategies, and provides recommendations for future practice.

Overall, the results clearly demonstrate the influence of international urban planning trends (both theoretical and practice) on growth management planning in New Zealand. However, the ability of some of these strategies to be successfully implemented in New Zealand given the effects-based approach of the Resource Management Act (RMA) and lack of clear national guidance and supporting legislation (outside of Auckland) is questioned. There is also evidence of how some of the best practice criteria for growth management planning are not being met in several strategies. For example, in some cases there is lack of clear integration and/or coordination between land use planning and transportation and other infrastructure planning and funding.

AUTHOR: Dr Patricia Kelly

Presenter: Patricia Kelly

Title: **McGraduates or Globo sapiens? Engineering as a civilising influence.**

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Abstract

We are well into the UN Decade of Education in Sustainable Development (2005-2015). In 2001 Stephen Sterling cautioned against curricula that treat sustainability as something that can be contained, codified and transmitted.

The recent Carrick report on Australian engineering education (and other studies) found that most curricula still over-emphasise technical content, at the expense of process and the kind of “fuzzy” graduate attributes called for in 1992 by Agenda21. Such curricula and the attitudes that underpin them, keep engineering “stuck” in a paradigm which is not just out-dated but also antithetical to personal growth, the best interests of the Engineering profession and ultimately the planet upon which engineers continue to have such enormous impact.

Putting sustainability values at the heart of education needs more than content changes. Professionals who have been educated to exploit rather than to sustain will be no use to societies with ecologies and economies in crisis. This paper uses Causal Layered Analysis (CLA) as a tool to explore the Carrick Report and other suggested approaches to engineering education. The resulting insights help to explain why business-as-usual curricula only produce McGraduates, engineers who are ‘globally portable’ (do any job) or at best, ‘globally competent’ (do any job smarter). Sustainable futures will be created and maintained by Globo sapiens, wise global citizens, engineers who can be a “civilising influence”, doing better things and doing them differently.

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Co-Authors: Mrs. Anna Jonasson (MSc)
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Title: A Principle-Based Decision Making Framework for Sustainable Electricity Infrastructures

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Abstract

Electricity generation is both a major contributor to the root causes of environmental unsustainability, and an energy source that will likely play an important role in the transition to a sustainable society. Because renewable sources of electricity generation are seen as environmentally friendly as a group, there is a danger that investments will be made in technologies that do not effectively consider all environmental impacts and thus drive society towards additional unsustainable challenges.

The purpose of this study is to present a decision making tool that serves as a total systems perspective of environmental impacts for electricity infrastructure options. The tool compares energy technologies on the basis of their contribution to our current, unsustainable society using a set of principles commonly referred to as The Natural Step framework. These principles are integrated into a qualitative life cycle analysis that gives a broad, strategic overview of each technology's strengths and weaknesses. For each life cycle stage, the tool is used to analyze the chosen technology's contribution to the systematic increases of materials from the Earth's crust and man made substances in the Earth's biosphere. In addition, physical degradation of the ecosystem and the effect on human well-being will also be analyzed. The results are then used to create strategic bench-marking metrics that are presented to collaborating electrical utilities and governments. A concerted research effort could create a general guide for sustainable energy planning, which would compare all possible sources of electricity generation based on their total sustainability potential.¹

¹ Zaricksson, M., M. Enroth, and A. Widing. 1999. "Environmental Management Systems: Paper Tiger or Powerful Tool. Stockholm: Industrial Research Institutes in Sweden.

AUTHOR: Mr Brian Kouvelis (BEng, DipMgt, FIPENZ)
Presenter: Brian Kouvelis
Title: Engineering Best Practice Where are we at? Climate Change in Context

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Abstract

The paper considers the context of the current legislative setting and drivers that require Local Government Engineers to incorporate climate change predictions into their asset management practices, their engineering design Codes of Practice and their planning for long term sustainability of basic infrastructure. The position of key agencies who have been tracking Central Government intervention strategies, in relation to climate change impacts on New Zealand society and sustainable infrastructure planning is discussed.

A review of some typical Territorial Local Authority Code of Practices has been undertaken to establish the extent to which climate change factors are built into activity management plans and current Codes of Practices with some suggestions on how impacts of climate change predictions can be incorporated into "Engineering Best Practice" for basic infrastructure services.

Case study examples of where and how climate change is likely to impact on engineering design and the context of these impacts in relation to other factors and variables such as population growth, levels of services, planning horizons, current design practices and other sustainability issues are discussed.

The importance of a sound supporting framework and organization strategy to ensure consistency of approach to incorporating aspects of climate change predictions into any overall organizational risk strategy is stressed. Adaptation methods and options for innovative actions to integrate climate change impacts into overall asset management planning and engineering design practices are put forward.

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Title: **The Visioning Project: Part of the Transition Engineering Process**

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Abstract

The current transport infrastructure and vehicle technology in developed countries has emerged during conditions of low-cost and abundant fossil fuel. It is not possible to simply substitute renewable fuels from any combination of resources in a way that reduces fossil fuel consumption but requires no changes in land use, infrastructure and vehicle technology. However, many scenarios and research programs focus on substitution of technology and resources rather than transitional change of urban form and expectations. The paper presents a conceptual framework for the coherent integration of development projects involved in the new field of transition engineering. The research results focus on one of these projects, the visioning project. The research objective for the visioning project was to gain an understanding of the nature and magnitude of the systemic infrastructure changes that would be required to provide a modern quality of life using only renewable energy resources. A method was developed to generate feasible-sustainability concepts. The method first quantified the renewable energy resources available for transport in a New Zealand town, including biofuel, human power, and renewable electricity. Then transport system design concepts were generated using basic energy flow balance modelling for each major transport activity, e.g. personal mobility, access to markets and services, goods movements. The availability of transport options and energy sources is a strong determinant in the development of land use patterns. The feasible-sustainability concept involved adaptive changes to the pre-transition urban form and infrastructure. However, the resulting concept infrastructure and urban form was not radically different from the pre-transition neighbourhood. This feasible-sustainability transport system concept, based on a realistic use of renewable energy could fill a gap in the shared cultural vision that people in developed countries have about the long-range future and should inform strategic investments in the near term.

AUTHOR: Dr Maggie Lawton (PhD, BSc(Hons), GSNZAP)
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Title: Developing the blueprint for urban water use efficiency

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Abstract

How do you change the urban habits of a lifetime, using water profligately as if it is a free good, an unlimited resource? Whose responsibility is it to challenge existing systems and lead the change? Is our water supply policy aligned to using water efficiently and reducing demand and if not what amendments are required?

The results of a structured survey and literature review on urban water efficiency initiatives carried out in New Zealand and overseas, are presented in this paper. The research concludes that having a legislative and policy framework to support urban water efficiency is a key component of a broader interaction between the councils/water supply authorities (WSAs), policy makers, industry and consumers. The information has been used to inform workshops with councils/WSAs who indicated an interest in reducing water demand. Guidelines for decision making have been developed which can be used by any council/WSA embarking on or strengthening their water use efficiency strategy. Water use efficiency needs to be approached from many angles. While consumer education is essential in understanding the need for policy and regulation it is unlikely, of itself to provide the degree of incentive required to significantly use water more efficiently. Local government is best placed to lead a demand management strategy which should ideally consider three sets of variables; the current and future context from the global to local scale; available water efficiency or demand management initiatives and the policy and legislative approaches required to implement those initiatives within the relevant council context. National government could provide more assistance through clarifying existing or developing new legislation promoting water use efficiency policy. This in turn would send a clear signal to the water supply industry to provide sustainable solutions to water consumers; setting the scene for a new blueprint for urban water use efficiency.

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Title: A Needs Based Approach to the Urban Design and Planning Process

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Abstract

Sustainability within the built environment is both a function of design and how its community responds to that design. We have numerous tools explaining 'how' to design 'green' communities, however we struggle to 'green' the residents that eventually inhabit them. If a community is to help move society towards sustainability, it must not only be sustainable by design but must promote sustainable mental models and nurture sustainable behaviour. Working with the design process is one of the most upstream confluences in tackling issues of systems thinking, strategy towards sustainability and ensuring there is both collaboration within the project team and participation with broader stakeholders. 'Needs Based Design' (NBD) is a new approach to urban design, based on an understanding of fundamental human needs and creating spaces that eliminate or minimise barriers to people satisfying their needs. Based on a five-level model for decision making in complex systems, NBD takes a whole-systems approach to urban design and development. Adapted from a systems-thinking framework for sustainability, also referred to as The Natural Step Framework, the NBD framework and method have been created as a simple generic model that can be understood, adopted and carried out by designers, developers, planners, government and community groups. NBD can be used to explain and understand complex systems. It uses scientifically-based principles for a definition of sustainability and basic human needs, as a basis for a shared vision and language for making decisions. With a common understanding of complex issues project teams and community stakeholders have the potential to use this framework to work collaboratively to apply systems understanding, visioning and backcasting from principles. NBD outlines a theoretical process and a set of tools for collaborative decision making in complex systems to reach a vision of a community that behaves sustainably to help move society towards sustainability.

AUTHOR: Scott Losee

Presenter: Scott Losee

Title: **Accounting for Climate Change and Peak Oil in Planning and Infrastructure Development in South East Queensland**

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Abstract

This paper examines the consideration of climate change and peak oil in planning and infrastructure development in South East Queensland (SEQ). It does so from the perspective of a consultant and former public servant who has worked on many intersecting plans and strategies, as well as many of the projects that have emerged from the planning processes. It discusses how the public policy treatment of climate change and peak oil has been evolutionary and followed an apparent sequential pattern: climate change mitigation, then adaptation, then peak oil. It also notes the intensifying pace at which climate change and peak oil are influencing planning and development in the region.

The examination goes into depth on several of the key policies and projects in which the author has been involved including the Brisbane City Council's (BCC) Climate Change and Energy Taskforce (CCETF), BCC's CitySmart initiative and the SEQ Regional Plan and the associated SEQ Infrastructure Plan and Program (SEQIPP). It also addresses project-level consideration of climate change and peak oil as it can be applied to projects such as those flowing from SEQIPP. It begins by describing some local context for planning, infrastructure and climate change in SEQ. The paper will then address planning and infrastructure development initiatives in relation to climate change mitigation, adaptation and peak oil.

AUTHOR: Mr Roger Loveless
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Presenter: Roger Loveless

Title: Street Lighting: A Visible Sign of Commitment to Sustainable Electricity Use

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Abstract

Do we need every street light on, all night every night?

Earth Hour 2008 prompted people to question why there is no will to innovate, and still use decades old "business as usual" practices.

This is an international problem as evidenced by responses to the "expert inquiry" in a Study for the European Commission DG TREN unit D3 Preparatory Studies for Eco-design Requirements of Energy using Products.

Street lighting cannot stay outside the normal energy efficient service delivery cycle that requires:

- Assessment of service need.
- Determination of how to supply that service as efficiently as possible.
- Implementation of energy efficient systems.
- Monitoring of performance.
- Implementation of corrective actions.
- Re-assessment of the service need.

AUTHOR: Dr Lionel D. Lyles, PhD
Presenter: Lionel Lyles
Title: Human Carbon Life Footprint and CO₂ Emission placed in the Earth Atmosphere

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Abstract

In 2004 total world carbon emissions released into the Earth atmosphere totaled 26.08 billion metric tons. By 2005, the United States alone placed 6 million metric tons of CO₂ in the Earth atmosphere. The worldwide total emissions have not abated since 2005, but continued a worldwide trend of increase to the present. Several ArcGIS Map Visualizations are presented to substantiate the increase of CO₂ emissions from 1980 to 2005.

Of the 26.08 billion metric tons of CO₂ emissions released into the atmosphere in 2004, power generation plants and industry accounted for 60 percent; industry, 18.2 percent, and residential 12.6 percent. By 2005, the U.S. residential sector alone placed 21.1 percent of the 6 million metric tons of CO₂ placed in the atmosphere that year. And since the residential sector largely drives worldwide power generation of energy using fossil fuels, this research provides a mathematical formula-kilowatt-hours times 1.36 equals CO₂ emitted to generate human electricity consumption-that can be used to demonstrate how much CO₂ is placed in the Earth's atmosphere based on the square footage of living space inside a home.

Using Kilowatt-hour data for selected square footage of living space in homes in the United States, it will be demonstrated that in order to reverse the human carbon life footprint, a reversal in home construction is necessary to significantly reduce CO₂ emissions placed in the atmosphere. One fact makes clear the urgency of this research; namely, "the average size of a new American home[s] grew 45 percent in 30 years," [increasing from 1,700 square feet in 1976 to 2,469 by 2006].

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Presenter: Ian Mason

Title: An analysis of the role of the carbon neutral public sector in reducing greenhouse gas emissions in New Zealand

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Abstract

In 2007 the New Zealand government announced systematic plans for a carbon-neutral public sector, with a commitment for six Government Departments to become carbon neutral by 2012, and for the remaining 28 core public service departments to develop plans during that period. A key reason given for adopting this strategy was that the Government wished to “lead by example”.

In this paper we review of the scheme put forward for New Zealand's government departments, examine leading by example, and look at the role of offsetting in achieving carbon neutrality targets. Inventories from the six lead agencies showed that transport accounted for the majority of departmental emissions; electricity also contributed significantly; whilst waste to landfill accounted for < 2%. Plans showed wide variability in terms of quantitative and qualitative reduction goals, and relied heavily on offsets in order to achieve carbon neutral status.

Notable instances of example setting were found, but further research is required in order to assess their impact on the wider community. It is proposed that political rather than managerial leadership is required in order to achieve future deep contractions in electricity and transport emissions.

AUTHOR: Christine McCormack

Co-authors: John Porter

Presenter: Emily Botje

Title: From Zero to “Hero” – Queenstown Lakes District Council Faces up to the Challenge of Water Demand Management

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Abstract

The recent summer drought has highlighted the need for wise water use to ensure the sustainability of resources and water for the future. But how does this apply to a council like the Queenstown Lakes District Council (QLDC) where over 80% of the population are supplied water from large pristine lakes which are difficult to see as a limited resource? The Queenstown Lakes District is the fastest growing area in the country with huge developer demands often swamping small communities. The QLDC is approaching a crossroads where uncontrolled demands have the potential to outpace the capacity of existing supply infrastructure. In addition, the new Drinking Water Standards will require construction of water treatment plants which will significantly increase the cost of water to the QLDC and the residents. How much water do QLDC residents use? The total consumption including residential, industry, commercial, visitors, irrigation and leakage is estimated on an annual average as between 500 and 1,300 litres/person/day in the existing schemes. All existing QLDC reticulated schemes are on-demand, and the combination of the dry climate, lack of universal metering and a commonly held view that the water source is limitless has led to these very high demands.

MWH were commissioned to prepare a Water Demand Management Strategy and individual Plans for each scheme incorporating New Zealand and international best practices. Flow data indicated the potential for high leakage and a programme of night flow monitoring was initiated to determine the level of leakage and prioritise areas for repair. This paper will describe the journey that QLDC have started on towards sustainable water demands. It will discuss the findings of the Strategy and Plans including Queenstown's demand analysis and night flow monitoring results and the action plan for implementing the recommended measures.

AUTHOR: Paul McGimpsey

Co-author: Michael McMullan

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Title: Strategic Environmental Assessment and Regional Transport Planning: Opportunities in New Zealand

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Abstract

Recent changes to transport legislation in New Zealand have meant that a much greater consideration of the environmental consequences of transport decisions is now required. The concept of considering the environmental effects of individual transport projects is well established under the assessment of effects on the environment (AEE) provisions of the Resource Management Act 1991 (RMA). More recently, amendments to land transport legislation have indicated that the environmental effects of transport policies and plans should also be undertaken. The application of strategic environmental assessment (SEA) to policies, plans or programmes helps to inform the decision-making and implementation process at a strategic level. SEA is widely used internationally, particularly in the European Union where it is mandated, to assess the environmental and sustainability implications of policies, plans or programmes. SEA is not formally practiced in New Zealand. This paper reports on research that investigated the possible application of SEA to regional transport planning in New Zealand. It presents the results of a case study conducted in the Bay of Plenty (BOP) region. The paper begins with a brief introduction to the principles and elements of best-practice SEA, including an example of its application in the United Kingdom (UK). The BOP case study is then presented critically evaluating the consideration of sustainability in current regional transport planning practice before considering whether the more direct use of SEA would aid current decision-making processes.. The paper concludes by outlining where changes to the current decision-making process could be made to improve the consideration of environmental sustainability and ultimately lead to more sustainable transport solutions.

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Title: Infrastructure for Sustainable Industrial Wastes Recovery in Malaysia

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Abstract

Currently specific infrastructures for industrial wastes recovery are not well establish in Malaysia as stakeholders often focus on the physical infrastructure for treatment and disposals of industrial wastes. For the past four decades this approach resulted in illegal dumping, and the illegal export and import of waste. However, with new technology development and increasing commitment, many types of industrial waste have been recovered through recycling. Solid and hazardous waste recovery contributed significantly to economic benefits and environmental protection. The amount of industrial hazardous waste recovery shows an increasing trend. 120,570 metric ton was recovered in 2000; this increased to 272,419 metric ton in 2004; but in 2005 decreased to 149,569 metric ton. Between years 2000 to 2005, 1.12 million metric ton of industrial hazardous waste has been recovered, with estimated value of RM 4.48 billion. To ensure sustainability of industrial waste recovery, good infrastructure support is needed. Physical, governance and economic infrastructure is required for sustainable industrial waste recovery in Malaysia. The physical infrastructure includes support for recovery activities by the generator, the transporter and the recycler; technology development and application, as well as efforts for human resource development. The governance infrastructure also plays an important role, as it provides the infrastructure for good management to minimize environmental and human impacts. The economic infrastructure includes financial mechanisms and economic tools to ensure efficient wastes recovery activities. These infrastructures should be in place to achieve sustainable industrial wastes recovery in Malaysia.

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Title: Will Sustainability Constraints Cause 'Peak Minerals' ?

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Abstract

The mining of apparently finite mineral resources is almost unanimously considered as 'unsustainable' – yet the scale of modern mineral production is vast and continues to grow exponentially, especially in the face of the biggest global mining boom in history. In recent years there has been increasingly public debate about the concept of 'Peak Oil' – that is, oil is a 'finite' resource and there are those advocating that production will soon peak and enter an inevitable but permanent decline (quickly becoming an uneconomic commodity shortly after this point). Despite much discussion of 'Peak Oil', there is little analysis of the same fundamental issues for minerals and metals. Recent research has begun to compile major data sets on mineral production trends, such as economic resources, ore grades, waste rock (overburden), as well as water, energy, greenhouse and chemical costs of mineral production.

At present, there are major global efforts underway to improve energy and water efficiency as well as significantly reduce greenhouse emissions and thereby combat climate change. The compiled data on the environmental costs of mineral production is then used to consider the "sustainable" future of mining, i.e. in a future of declining greenhouse emissions and increasing energy and water efficiency. Ultimately, the world may not physically 'run out' of copper, coal, gold or other minerals, but aggregate production must peak and decline as new mining operations become increasingly constrained by low grade mineral deposits, greenhouse emissions and water. Thus, the concept of 'Peak Minerals' does appear to be significant, with the timing and severity of the peak fundamentally related to other sustainability constraints.

AUTHOR: Dr Kerry Mulligan
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Title: Reforesting the Built Environment –
A Practical Feasibility Case Study in Christchurch

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Abstract

As the demand for infill housing increases in suburban areas, more land becomes sealed and impervious to water. The demand on the storm water systems increases, along with an increase in the detrimental effects of erosion and water pollution. Green roofs can assist in managing the demand on storm water systems as well as provide increased thermal insulation, improving air quality, habitat for insects and birds, and enhancing the aesthetic appearance of increasingly dense urban areas.

This paper describes a small scale modular retrofit green roof system that is suitable for installation over existing roof systems. Initial observations indicate the green roof system is able to retain a high percentage of the rain fall and therefore reduce the demand on the storm water system

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Presenter: Doug Matson
Title: Use of an insulation-dispersion adobe composite in green building construction

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Abstract

The Nga Whare Oranga Trust in New Zealand is studying the use of indigenous clay embedded with a dispersed particulate material to fabricate insulation for small-scale structures. The insulation is to serve as a sustainable and inexpensive substitute for commercial fiber products since homeowners may obtain all raw materials onsite and use local labor for processing and installation. The wet clay mixture is molded and dried into adobe bricks, which are then stacked inside wall sections and subsequently covered with wall board cladding. The primary purpose of this adobe is to minimize heat loss to the surroundings although some structural bracing may be realized.

The adobe fabrication process is evaluated with emphasis on the mixing, packing, and drying methods. Two formulations were studied – a local Ohaaki clay with hard indigenous pumice and a commercial Kaolin clay with soft waste polystyrene bead. Experimental verification of the influence of dispersant volume fraction on compressive strength shows that the parallel model of elastic properties of granular composites is the best predictor of adobe performance, with strength decreasing linearly to 0.4 MPa at 50% by volume of the soft dispersant. Thermal conductivity measurements show that the parallel conduction model is not the best predictor of adobe insulation performance as clay properties dominate such that a thermal conductivity of 1.2 W/mK is realized.

AUTHOR: Caroline Nguyen

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Presenter: Marc Edwards

Title: Resolving Water Quality Issues in Premise Plumbing Systems with Advanced Water Conservation Features

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Abstract

New buildings increasingly incorporate advanced water conservation features (e.g., metered and sensor faucets, low-flow showerheads and toilets, waterless urinals) and use of grey water and recycled water for non-potable purposes. Recent experiences at the University of North Carolina at Chapel Hill (UNC) highlight the negative impact of these sustainable practices on water quality at the tap. By greatly diminishing use of potable water, the water residence time in building plumbing can markedly increase, and problems with microbial growth, taste and odor problems, and elevated lead have occurred. A systematic evaluation was conducted to identify and resolve the problems through chloramine disinfectant decay studies, microbial testing, and measurements of other chemical parameters. Chloramine residuals in many parts of the buildings were non-existent without extensive flushing to draw fresh water from the mains. Several factors explain the lack of residual. In new buildings at UNC, water detention times in the plumbing could exceed several days during full occupancy without the usual flushing from toilets and other high demand water features. During this extra time the disinfectant is more likely to dissipate. Residual loss was also exacerbated by relatively high temperature in drinking water fountain lines due to remote positioning of cooling units. Finally, new copper piping has been shown previously to accelerate chloramine decay. At some locations as much as 40 minutes of continuous flushing were necessary before chloramines levels in the water main were observed at building taps. Testing revealed very high levels of heterotrophic plate counts (HPC) in first draw water (>308,000 cfu/mL), which is not unexpected given the warm conditions, lack of chloramine residuals, and long detention times. Remedial actions, including supplemental flushing, were developed and implemented.

AUTHOR: Michael Nolan

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Title: Adapting Infrastructure for Climate Change Impacts

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Abstract

Infrastructure that is being designed and built now is being designed on past climate, rather than the climate that infrastructure will experience during its expected life. Planning on the basis of a false assumption in this way presents a significant risk to governments, institutional investors, infrastructure sectors and individual organisations.

Climate change impacts on infrastructure will have a direct financial and reputational impact to corporations and government especially where public/private partnerships hand back a degraded asset to the state due to unexpected degradation and reduced life of an asset from changed climatic conditions.

Essentially each form of infrastructure (water, power, transport, buildings and communications) has key sensitivities to a change in particular climate variables such as extreme wind, solar radiation, extreme rainfall, heat waves, soil moisture. The direct exposure to climate change will of course depend on where they are located, the integrity/age of existing assets, the location of assets, the expected service life of assets and the dependence of assets on other supply services that may also be vulnerable such as water, power and access.

New investment for infrastructure will need to be 'climate ready' to meet future climate change design compliance. Organisations that are infrastructure intensive need to understand their existing direct exposure.

A range of climate change adaptation responses will be discussed using several Maunsell projects completed in recent years.

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Presenter: Peter Ollivier

Title: Nelson Regional Sewerage Scheme –
A Sustainable Solution?

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Abstract

In the mid 1970's two New Zealand territorial local authorities, Nelson City and Tasman District Council jointly set up a regional sewerage authority to provide a centralised wastewater collection, treatment and disposal scheme. The new, at the time award-winning scheme, was opened in 1982 and achieved the community's aims of reducing point discharges to the local estuary, and improving water quality. However since then a new Nelson Regional Sewerage Business Unit (NRSBU) has been formed with a more formal governance structure and a new mandate from its two local authority owners. New initiatives have included addressing economic, environmental and cultural issues, putting in place demand and growth management strategies, and implementing a range of nutrient management and recycling, water re-use, and energy management solutions. Eight years on the NRSBU has achieved a remarkable turnaround in all aspects of its governance, management, service delivery and environmental outcomes of the regional scheme it administers. But how sustainable has this turnaround been? This question is considered by using a standardised eight-point decision support tool as an assessment guide. We conclude that the question is complex with no simple answer and demonstrate that the qualitative process of carrying out the self-assessment is in fact more important than the quantitative answer. It is the process itself which provides invaluable insight into the robustness of the decision making on the project, and provides guidance into avenues that should be addressed in future strategic planning and decision making. The paper also examines the decision making process undertaken, and how a standardised framework of sustainability questions might influence or improve the process, and hence the final decisions.

AUTHOR: Dr Shannon Page

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Presenter: Shannon Page

Title: Carbon Capture and Storage: An appropriate technology
for New Zealand?

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Abstract

Carbon capture and storage (CCS) has been widely touted as a practical way to reduce carbon dioxide emissions from fossil fuel combustion, and if successfully implemented, could permit the continued use of coal and gas for many decades, whilst at the same time meeting greenhouse gas targets. In this paper we discuss the applicability of CCS technology to existing coal-fired electricity generation in New Zealand, and to new thermal generation using Integrated Gasification Combined Cycle (IGCC) technology, with specific reference to the time frames signalled for deep cuts in New Zealand's greenhouse gas (GHG) emissions and those required for major works of this nature. Energy penalty estimates show that adoption of CCS with IGCC would involve the consumption of at least 22% additional coal for the capture and compression stages only. The current global absence of full-scale coal fired power plants with operational CCS systems, and the planning and construction times likely for adoption and construction of new plant, indicate that CCS technology will not assist New Zealand to meet interim GHG reductions of 20-40% by 2020. If applied to a 900 MWe (IGCC) thermal power plant, the technology could contribute 7% of annual GHG reductions starting from 2024-2030. However, considerable technical, commercial and legal uncertainties remain to be resolved.. On balance we consider CCS technology to be inappropriate for New Zealand conditions and recommend alternative investment of research funds into the use of woody biomass, a permanent and sustainable resource, for future thermal heat and power generation.

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Title: Environmental Sustainability based Budget Allocation System

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Abstract

In the past, environmental sustainability indicators (ESIs) and budget allocation were two independent systems. As a result, the budget allocated by a local government might not be adequate for effectively improving regional environmental sustainability (RES). A special budget allocation system was therefore developed to assist the local authority with making appropriate budget allocations for improving RES. This system includes the establishment of visions and goals, managing ESI and key indicators, classifying ESIs, analyzing the linkages between indicators and budget items, and evaluating the budget allocated.

Each region has its own specific characteristics and may differ significantly from other regions. The Strength-Weakness-Opportunity-Threat (SWOT) framework is thus adopted for promoting environmental sustainability based on regional characteristics that are hard to evaluate with the Driving force-State-Response framework. The previous system was applicable for the water sector only and was not adequate to cover all aspects of environmental sustainability. Therefore, the proposed system includes other main sectors such as air pollution control, waste management, and toxic substances management. To demonstrate the applicability of the proposed system, a case study for a local environmental protection bureau was implemented and discussed.

AUTHOR: Dr Annie R. Pearce (Ph.D., LEED AP)

Presenter: Annie Pearce

Title: Sustainability at the Installation Scale: A Comparison of LEED-ND and Systems-Based Sustainability Assessment

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Abstract

The United States Department of Defense (DoD) will invest billions of dollars over the next few years in facility and infrastructure systems as part of implementing priorities for Base Realignment and Closure (BRAC) and force transformation at its installations. These investments are anticipated to save significant resources that would otherwise be devoted to the long term operations and maintenance of unnecessary facilities. As part of its planning for BRAC execution, DoD wishes to consider how investment in sustainable facilities and infrastructure Best Available Technologies and Strategies (BATS) may maintain or increase its ability to deliver mission requirements and readiness while further reducing costs, resource use, and environmental impacts. Specifically, DoD is interested in understanding how current approaches to sustainability assessment can be applied at the scale of military installations to identify and prioritize BATS for investment of limited resources. Military installations in the U.S. range from small outposts to military cities that may house up to 100,000 people and provide work facilities, training ranges, housing, and infrastructure systems to support all activities associated with base operations.

Existing techniques such as Leadership in Energy and Environmental Design (LEED)-based planning and design and Life Cycle Costing (LCC) analysis have contributed to the development of more sustainable facility and infrastructure systems on DoD installations. Systems-Based Sustainability Assessment Techniques (SBSAT) have also been applied at the scale of individual facilities to identify/prioritize candidate actions to improve sustainability. This paper describes a recent effort to scale the SBSAT approach to apply to installation-level analysis, including individual facilities and operations, site, and infrastructure systems. The paper compares the SBSAT approach to LEED-Neighborhood Development in the context of a case study of the U.S. Army's Fort Belvoir and draws conclusions about the applicability and utility of each approach in the context of installation sustainability planning.

AUTHOR: Dr Annie R. Pearce (Ph.D., LEED AP)

Presenter: Annie Pearce

Title: Measuring the Sustainability of Infrastructure Systems:
Information Requirements and Desiderata

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Abstract

Civil infrastructure systems (CIS) are complex technological systems that meet critical human needs, persist over significant lengths of time, and involve multiple diverse stakeholders. Their interrelations with the technological and ecological systems that surround them have significant impacts on those systems. These impacts have not always been noticeable on the scale of individual facilities, but their cumulative effects on the planet over time have been increasingly well documented. In response to these impacts, interest in evaluating the sustainability of CIS is increasing among the owners responsible for their design, delivery, and operation to facilitate better decision making with regard to the limited resources available to deliver the services these systems provide.

This paper presents an overview of three distinct approaches to evaluating the sustainability of CIS – prescriptive, performance-based, and systems-based. Based on experiences with and lessons learned from these three measurement approaches in vertical construction, the paper compares and contrasts the information requirements of each approach and the types of outcomes and guidance each approach would yield for the organizations that are responsible for CIS. The underlying theoretical framework for the paper is based on diffusion of innovation theory in organizational contexts, which provides a basis for evaluating which of the three approaches is most likely to succeed in the context of public sector decision making. The paper concludes with recommendations for the development of metrics of sustainability for CIS that take into account the organizational context of use to achieve both system sustainability and sustainability of implementation within the organization.

AUTHOR: Dr John Peet

Presenter: John Peet

Title: Resource Scarcity - a Physical, not an Economic Issue

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Abstract

It is common for geological and technological information on the quantity and quality of resources (e.g. of high-quality energy or fuel) to be translated into economic terms (eg \$/tonne, ¢/kWh) in order to be incorporated into decision-making processes. The reason for this is bound up with mainstream (neoclassical) economic theories relating to the nature of production as an economic process, where value is added to inputs of capital and labour, all measured in monetary units.

The underlying reality of economic production is always physical, however, involving transformation of one form of physical resource into a more ordered form, using high quality energy and matter via an appropriate process. That the process involved is in fact entirely physical does not deny the existence of social or economic “drivers” or consequences, but must nevertheless be central to any policy of resource use; economic assessments alone cannot incorporate all of the physical or biophysical information. In this paper, the importance of examining resources in physical and biophysical terms and taking the results all the way to the decision-making stage is exemplified using the net energy criterion Energy Return on Investment (EROI).

The paper concludes by describing how such measures can be incorporated into long-term decisionmaking frameworks via the concept of the Steady State Economy (SSE) as a model for sustainability of the social-economic-environmental system in which we all live. To make the transition towards a SSE, a fundamentally-modified (biophysical) economics is essential.

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Presenter: Jane Puddephatt and Viv Heslop

Title: **Shifting With the Times: The Emergence of Low Impact Approaches To Building Sustainable Communities**

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Abstract

The challenges facing society from climate change and other global pressures require us to make fundamental shifts in the way that we manage urban development. While the drivers for change often come from a global perspective, how we decide to manage that change is something that needs to be done locally. One of the tools available to manage the effects of change and the shift to more sustainable practice is low impact urban design and development (LIUDD). It is increasingly being promoted as an alternative and more sustainable approach to conventional urban development practice. While many of the ideas for LIUDD come from overseas experience, it is being increasingly implemented in New Zealand as a means to manage the negative impacts of urban development. However the practice of LIUDD is often ahead of policy. A common barrier to changing practice is seen as the clash between the policies, plans and codes of practice, and the reluctance of some professions to embrace LIUDD as a tool to deliver more sustainable communities.

The LIUDD research programme, run by Landcare Research and the University of Auckland, and funded by the Foundation of Research Science and Technology, has been exploring the processes of change as they relate to shifting policy and practice to more sustainable approaches to urban development. This work has looked at how to develop a more supportive policy framework and how to build the capacity of practitioners and organisations to take on board new approaches. This paper will discuss the findings of a recent review of international best practice in terms of policy mechanisms to promote the uptake of low impact approaches, how this knowledge can inform the development and strengthening of policy in New Zealand, and the processes that can be used to challenge the status quo and shift practice.

AUTHOR: Dr Chris Riedy (BE, PhD)
Presenter: Chris Riedy
Title: Urban infrastructure for long-term climate change response

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Abstract

In the context of climate change response, sustainable urban infrastructure needs to deliver deep cuts in greenhouse gas (GHG) emissions, of the order of 80-90% by 2050.

This paper examines how various GHG reduction strategies applied to urban infrastructure open up or foreclose the potential for deeper cuts in the long-term. It uses case studies of a major precinct-scale urban redevelopment site and a city-wide planning process in Sydney to illustrate how developers and planners are balancing short to medium-term GHG reduction actions with the need to achieve much deeper cuts in the long-term.

There is a particular focus on the implications of strategies that prioritise gas-fired cogeneration. The paper argues that too little attention is being given to the long-term implications of short-term GHG reduction strategies and proposes infrastructure design principles for long-term GHG reduction.

AUTHOR: Ms Anna Robak

Co-authors: Dr Henning Bjornlund

Presenter: Anna Robak

Title: Charting relationships between water supply and community livelihood and national economic welfare

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Abstract

Water is recognised as an economic good and government and private enterprises invest money in an attempt to gain the greatest returns from this economic good. However, existing methods of assessing 'the greatest return' do not place a monetary value on the benefits of water supply to communities or to the country's economy (GWP 2003; Pond et al. 2008). In this paper we discuss our first ideas towards developing a method to estimate the community and national benefits of upgrading small water supply systems. This paper provides a starting point to defining those benefits by identifying conceptual relationships between a water supply system and quality of life indicators. These relationships are presented in terms of a flow chart, in which the water supply system is defined in terms of its inputs and attributes. Community welfare is defined in terms of generally accepted quality of life parameters; and national welfare is defined in terms of Gross Domestic Product (GDP). The chart highlights which relationships are well understood and which relationships require greater analysis to significantly improve the understanding of the benefits of water supply systems. The chart will be useful in helping local and national decision makers to consider the impacts of their decisions on the water supply system itself, community-level quality of life indicators, and GDP.

This paper summarises the relationships identified during the literature review phase of the first author's PhD candidature. The next phase involves development of models to analyse and quantify those relationships.

AUTHOR: Dr John Russell (BE, PhD, Dip.Ed, FIEA)

Presenter: John Russell

Title: Engineering the Global Thermostat!
PART A – Humanity's Dilemma

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Abstract

"Engineering the Global Thermostat!" is presented in two Parts: Part A and Part B. The complete paper involves itself in the emerging debate concerning engineering the global climate to counter global warming. Can we do it? Is it wise? What has happened in the past? Under what circumstances would we do it and what could go wrong?

Part A, this paper, will review our knowledge of a changing climate over the ages and comment on the uniqueness of the last 10,000 years. Using the Milankovitch mechanism an attempt is made to forecast the future "predestined" climate change and then to predict a more complicated state by superimposing the anthropogenic effects on such global changes using the findings of the Intergovernmental Panel on Climate Change Assessment Report.

Part B, "Creating a Permaclimate" deals with what temperature to set the 'Thermostat', considers the 'Double Threat' and what existing and proposed 'Geo-Engineering' are economically feasible and ethically possible

AUTHOR: Dr John Russell (BE, PhD, Dip.Ed, FIEA)

Presenter: John Russell

Title: Engineering the Global Thermostat!
PART B – Creating the Permaclimate

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Abstract

"Engineering the Global Thermostat!" is presented in two Parts: Part A and Part B. The complete paper involves itself in the emerging debate concerning engineering the global climate to counter global warming. Can we do it? Is it wise? What has happened in the past? Under what circumstances would we do it and what could go wrong?

Part A reviewed our knowledge of a changing climate over the ages and commented on the uniqueness of the last 10,000 years. Using the Milankovitch mechanism an attempt was made to forecast the future "predestined" climate change (next 50,000 years) and then to predict a more complicated state, by superimposing the anthropogenic effects on such global changes using the findings of the Intergovernmental Panel on Climate Change Assessment Report.

Part B, this paper, "Creating a Permaclimate" deals with deciding to what temperature to set the 'Thermostat', considers the 'Double Threat' and what existing and proposed 'Geo-Engineering' are economically feasible and ethically possible.

AUTHOR: Dr Osamu Saito

Presenter: Osamu Saito

Title: Restructuring existing rural resorts as a sustainable infrastructure for basin socio-ecological systems in Japan: A case of redundant golf courses in the Tokyo Metropolitan Area

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Abstract

Commercial leisure resort infrastructures such as golf and ski resorts have been developed extensively in many rural areas of Japan. During Japan's economic bubble from the late 1980s to the early 1990s, memberships and real estate of resorts were considered a measure of popular speculative deals. As a result, there are over 2,400 golf courses and 700 skiing sites in Japan. Following the burst of the bubble economy, many existing resorts faced tough management situations. Due to the recent diversification of leisure activities, low birthrate and ageing population, a significant number of resorts are expected to become redundant or even be abandoned in the near future. This paper, therefore, aims to (1) estimate the number of rural golf courses that will face redundancy or abandonment by 2035 in Japan and the Tokyo Metropolitan Area (Tokyo MA), (2) identify which golf courses will be potentially redundant in the Tokyo MA and (3) propose alternative management options for restructuring the existing golf courses into a sustainable infrastructure for basin socio-ecological systems.

On the basis of the government's population prospect by 2035, and white papers and statistics on leisure and sports, this study estimated that 152 (23%) golf courses will be redundant by 2035 in the Tokyo MA. Based on a spatial distribution analysis of the existing golf courses, the study identified 302 golf courses that are or will be under pressure to become redundant. Finally, the paper discusses alternative management options for restructuring the existing golf courses into a sustainable infrastructure. Alternative options include converting to multi-purpose parks, biofuel feedstock plantations, cemetery, pasture and reforestation. This redundancy is not a problem unique to Japan. Other Asian countries like China and India will face a similar problem, as they turn into a mature and ageing society in future.

AUTHOR: Ron Shaw MBA,
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Presenter: Ron Shaw

Title: Delivering sustainability through the SME business sector

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Abstract

The small to medium size enterprise [SME] sector consists of 99% of all New Zealand businesses and employ 60% of New Zealanders. The pervasiveness of SMEs means that the day to day delivery of the changes required to deliver lasting sustainability improvements in New Zealand will happen in the sector.

For SMEs to move towards sustainability they need to learn to Measure, Mitigate, and Manage their resource intensity. SMEs are generally short of time and the level of skills required to do this. Measurement tools are widely available. The main hurdles blocking measurement are the time required and understanding what to do with this information. The mitigation and management of SMEs resource intensity is more problematical than the measurement aspect. Mitigation and management requires a level of skill that may not easily be found within an SME.

It is here that professional bodies have to consider what action to take to offer SMEs access to reasonably priced solutions packaged in routine, standardised systems and processes.

AUTHOR: Sarah Sinclair (BEng (Hons), MBA, CEng MICE)
Co-author: Ana Krpo (MApplSci (Hons), PgDipSci, BCom)
Presenters: Sarah Sinclair and Ana Krpo
Title: Developing a Climate Change Toolkit – Lessons Learned, and the Importance of a Spatial Approach

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Abstract

Sustainability represents an issue that is central to the success of organizations. Many organizations are embracing sustainability in terms of reducing their impact on the planet's resources. However, as procurers, designers, owners and operators of infrastructure, we do not always consider whether we are asking the right questions to incorporate sustainability into our new infrastructure. This paper addresses part of SKM's sustainability into design initiative, in terms of taking account of climate change in designing sustainable infrastructure.

Climate Change is at the centre of media and political attention at the moment. The Intergovernmental Panel on Climate Change (IPCC) has confirmed that neither mitigation or adaptation can work by themselves – any approach to managing climate change must have both. Even if emissions are reduced now, we will continue to see climate change effects for some time. Adaptation to climate change is therefore a critical part of any future planning. SKM identified the opportunity to facilitate early adaptation by undertaking a broad-scale assessment of potential vulnerabilities or opportunities arising from climate change effects, to ensure that informed choices can be made at project start-up. The paper discusses how a toolkit was developed and tested using a risk based approach.

Early feedback on the toolkit identified issues with the practicalities of implementing a broad scale assessment of climate risk for each project. Data availability was a critical issue, and we had to resolve how to access data and how to deal with ownership, level of detail, and uncertainty in climate change effects. A spatial approach to gathering and presenting data was found to be the best way to facilitate the understanding of climate impacts within the toolkit, and this paper discusses approaches used, and general issues with climate change vulnerability mapping.

AUTHOR: Greg Slaughter (BSc(Hons), ME, MIPENZ, CPEng)

Presenter Greg Slaughter

Title: Sustainable Concrete: Fact or Fiction?

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Abstract

Although concrete is an essential component of sustainable building, it also contains high embodied CO₂. The cement and concrete industries in New Zealand are undertaking measures to manage the carbon footprint of their products. This paper outlines the three examples of projects that Holcim (New Zealand) Ltd is involved with, aimed at understanding and reducing the embodied energy contained within its products.

- An active programme of alternative fuel and raw material (AFR) use for cement production has been in place at the company's Westport cement plant for the last 12 years. Over this time, the use of AFR (predominantly used oil) has helped reduce specific CO₂ emissions from cement by more than 20%.

- Research by the company indicates that up to 50% of the CO₂ emissions during cement manufacturing can be reabsorbed (particularly when aged concrete is crushed for recycling). It appears that recarbonation of crushed concrete in New Zealand is occurring at a similar rate of CO₂ uptake in demolition concrete as found by previous Nordic research. Further work is continuing to determine optimal conditions for uptake, and the timeframes over which this can be expected to occur for typical New Zealand concrete.

- An engineering feasibility study is currently being carried out on the use of algae to capture CO₂ and use as a fuel for cement manufacturing in New Zealand. This project has the potential to close the loop on CO₂ production from cement manufacturing and significantly reduce the embodied CO₂ of concrete products.

The cement and concrete manufacturing industries are confident in their ability to continue to supply sustainable products for New Zealand infrastructure.

AUTHOR: Jonathan Stanger (MSc)

Co-authors: Dr Nick Tucker
Dr Stuart Coles

Presenter: Jon Stanger

Title: Green Industrialization for Developing Nations

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Abstract

Industrialization is a desirable state to achieve for undeveloped countries as it improves the general standard of living for the local population through increased wealth. However traditional routes to industrialization typically involve the burning of fossil fuels adding CO₂ to the atmosphere. Resource consumption in industrial processes is also currently unsustainable as the raw material is not recovered at the end of a products life.

With these points in mind a project is proposed to use new sustainable and environmentally friendly technologies to develop a route to industrialization for undeveloped nations.

AUTHOR: Hanna Taylor

Presenter: Rebecca Sanders

Title: Acknowledging the White Elephant in the Room, and Making Aid Work

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Abstract

The failure of the aid dollar to effect lasting, tangible change is well known. While the failure to meet sustainability targets in New Zealand translates most often to negative environmental impacts, interventions or infrastructure that are unsustainable in an aid and development setting can result in loss of health, livelihood, and in extreme cases, lives. In the face of such consequences, the global momentum for sustainable development must be turned most strongly towards the developing world where the application of engineering and sustainability science has the most potential to engender positive change, now and into the future.

The challenge to achieve long lasting, sustainable change is one of the greatest hurdles facing the aid and development sector and is the topic of this presentation. Partnering with the world's largest aid and development NGO and funded by NZAID, Synergine Group Ltd was recently engaged in Cambodia to improve their national capacity to implement high quality, sustainable water and sanitation interventions. The engagement consisted of a pilot project in four villages, resource development, and capacity building through training and skills transfer to locally based World Vision Cambodia staff. The Project focused primarily on potable water supply and treatment, sanitation, and hygiene promotion interventions in the rural sector at a household, community and school level. Secondary elements comprised solid waste management and increased household productivity through composting and gardening.

Key findings, challenges and successes of the project will be discussed to aid the development of a blueprint for the design and implementation of sustainable infrastructure in the rural Southeast Asian setting. The presentation will feature an extensive slide show and provide figures and review of the tangible health and livelihood goals achieved and critique of project methodology.

AUTHOR: Hanna Taylor

Presenter: Nathaniel Miller

Title: **At the Coal Face of Sustainability Implementation:
Balancing the Environmental, Social and Economic Bottom
Line in Urban Developments**

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Abstract

Over this decade, New Zealand's urban growth planners will face increasing pressure to accommodate burgeoning populations within constrained urban boundaries without sacrificing the environmental and social values that New Zealanders hold dear. The challenges faced in balancing such economic, environmental, and social constraints in urban development is the focus of this paper.

To allow for a detailed discussion within a 'real life' context, this presentation focuses on a practical pilot study developed in partnership with Synergine, the Ministry for the Environment (MfE), Waitakere City Council (WCC) and the New Zealand Housing Foundation (NZHF) on a 77 lot NZHF subdivision at West Coast Road in West Auckland. The Sustainable Community Development Project, as the pilot study is known, is a case study designed to test the holistic triple bottom line definition of sustainability at a neighbourhood scale, at an actual site, so that long-term environmental, social and economic benefits (housing access and affordability) are maximised at the site, and the lessons learnt applied within the wider regulatory, and development community.

The ultimate goal of the Sustainable Community Development Project, and presentation of this paper, is the enabling and accelerating of the adoption of sustainable neighbourhood and household level design and practices in the life of average New Zealanders. To this end, the presentation will outline regulatory and budgetary challenges to the design and development of sustainable homes and neighbourhoods, capital and ongoing cost analysis of the sustainability features implemented at the West Coast Road site, social impacts and benefits of holistic triple bottom line design applied at the site, and a critique of the Project methodology and outcomes.

AUTHOR: Richard Taylor BE (Civil) – First Class Hons

Presenter: Richard Taylor

Title: What is the Infrastructure Leakage Index (ILI) and how did Waitakere City Council manage to achieve an ILI of 1.0.

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Abstract

This paper explains the relatively new performance indicator for real water losses (from water supply distribution systems) called the 'Infrastructure Leakage Index (ILI)' and how Waitakere City Council, through a number of initiatives and management practices over a 18 year period, has achieved and maintained an Infrastructure Leakage Index of close to 1.0, which is a world class ranking.

The traditional water loss performance indicator 'percentage water loss' is a very poor indicator of real water losses. In this paper an explanation is given of meaningful performance indicators for real water losses such as 'litres/connection/day' and the ILI. A comparison of international data is provided. Waitakere City Council, over the past 18 years, has implemented operational and management practices which have been very successful in reducing water loss to the point where it has achieved what is accepted as a world class ranking. These practices include setting up water supply distribution zones, an effective 'real time' monitoring system (using telemetry), setting leakage thresholds for each water supply zone, targeted leak detection work, pressure management to both reduce and stabilise water supply pressures, ongoing commitment to pressure control, monitoring and leakage reduction, and use of new leak detection technologies.

The practices above cannot be considered in isolation to the management structure, systems, processes and scale of operations at Waitakere City, and the paper also discusses the relevance of these matters to the successful management of a water supply distribution system.

AUTHOR: Dr Gabrielle Torkington

Co-author: Ms Veronica Ulfves

Presenter: Veronica Ulfves

Title: Using Greenhouse Inventories and Life Cycle Analysis to Deliver Meaningful Environmental Profiling For Infrastructure: Case Studies For Learning.

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Abstract

There is much debate around the best way to provide accurate and meaningful environmental footprinting for infrastructure-based businesses; difficulties in scoping and lack of data for assets are just some of the “roadblocks” to a successful outcome. In this paper we will use two case studies (Transit (NZ) and Orion New Zealand Ltd) to illustrate frameworks for environmental profiling for infrastructure projects. Transit (NZ) plan to determine the environmental footprint of its activities over which it has direct control using a greenhouse gas inventory. Transit wish to respond to government emissions reduction targets in a proactive way. The main confounding factor remains that the environmental impact of the design, construction, operation and maintenance of roading networks is only a small part of the total impact of the roading network over its full life cycle.

We will present options considered to respond to Transits requirements, the difficulties in scoping and how scaleability of solutions is important when dealing with large, multi-site, subcontractor dominated businesses. Orion New Zealand Ltd has recognised that its corporate responsibility around GHG emissions extends beyond a narrow footprinting exercise. Orion set an ambitious target to measure the footprint of its primary equipment, impact of all its activities and the impact of the subsidiary Connetics. We will elaborate on the challenges of the project including how the GHG footprint was calculated and the processes involved in setting a meaningful scope. Orions’ award winning Asset Management Plan provided detailed data which was converted from the language of an electricity distributor into data compatible with the chosen calculation method – Life Cycle Analysis (LCA). We will discuss why LCA was chosen as the assessment method. The result was an objective, quantified assessment of the GHG footprint of the network and a document enabling Orion to communicate the findings of the project.

AUTHOR: Dr Maya A. Trotz

Presenter: Maya Trotz

Title: **Diaspora Communities and Sustainable Urban Development: Lessons from floods in Guyana**

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Abstract

Guyana loses approximately 83% of its highly skilled labor force to Canada, the US and the UK, leading the world in this practice. It ranks 97th on the Human Development Index and migrant remittances account for approximately 24% of the country's GDP. While most research on these migrant connections focus on monetary or in kind remittances, far less attention has been paid to diaspora knowledge networks as an intervention that can possibly convert "brain drain" into a "brain gain". In what ways might these networks play an integral role in the design and development of sustainable infrastructure needed in home countries? This paper uses Guyana as an example and builds upon the diaspora involvement in disaster relief efforts to explore opportunities for continuous, long term engagement that can contribute to home country sustainable development, especially in terms of infrastructural systems (e.g. water).

About 75% of Guyana's population resides on the low lying coastal zone, including ~30% in urban areas. Floods in January 2005 affected 85% of the total population and Guyanese in the diaspora mobilized to provide disaster relief. Through the internet and other means, this event engaged Guyanese in discussions on water infrastructure and the sustainability of living on a low lying coast in the face of global climate change.

Drawing on the researcher's involvement in a website intervention in relation to the floods, this paper discusses how the response of the Guyanese diaspora to disaster relief efforts highlighted the potential to contribute on multiple fronts to improve Guyana's infrastructure: design; management; and infrastructure recovery from disaster. It also highlights the limitations to engagement and offers some possible solutions to overcoming those limitations so that the diaspora can truly contribute to the sustainability and resiliency of Guyana's coastal communities – something that is slowly being recognized as essential in the face of globalization.

AUTHOR: Mr Jeffrey J.Vickers (BE (Hons))
Co-author: Dr Carol A. Boyle
Presenter: Jeff Vickers
Title: A New Approach for Sustainable Product Development
Using Scenario Network Mapping and Eco-design

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Abstract

The two most widely recognised ethics of sustainable development are equity between present and future people (intergenerational equity) and equity between currently living people (intra-generational equity); however, it is not always clear how to translate these principles into practice. This paper argues that at least two questions must first be addressed in order to bound sustainable development in space and time: (1) 'what is to be sustained?' and (2) 'sustained for how long?' In this paper, the system to be sustained is a business and the time horizon considered is 20 years. As a crucial role of any business is to meet needs within society, this paper presents a new framework for sustainable product and service development which combines both forward-looking strategy and measures that can be implemented in day-to-day product/service development. Once the framework is introduced, its application in the context of industrial electronics company Actronic Technologies is presented. The strategic component of the framework uses a new scenario-building technique, scenario network mapping, to map trends within a business' core markets. By extending the business' planning horizon to several decades, it is possible to develop roadmaps for radically new technologies, products and/or services. However, as most products and services will undergo several major redesigns over this period, there is also room for both incremental change and flexibility at an operational level. Even though the duration of a business' impacts upon society and the natural environment may well extend beyond 20 years, the long-term future is overwhelmingly uncertain and in most cases it will not be feasible to study a time horizon of much more than this. In order to account for longer-term impacts, this framework requires that long-term risks be assessed by collaborative groups (e.g., universities and industry groups) and translated into implications that affect businesses in the short-term.

AUTHOR: Gabriel Weber

Co-authors: Prof. DrDr Edeltraud Guenther,
Martin Nowack

Presenter: Martin Nowack

Title: Application of real options thinking for the management of
climate change risks

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Abstract

This paper examines real option thinking as a corporate adaptation strategy to dealing with climate change uncertainties. We propose that the core sustainability issue of climate change can be dealt with through the application of real options thinking as an adaptation strategy.

This contribution is a conceptual approach which assesses the benefits of real options thinking in risk management at the case of climate change. Thus it offers a tool for decision makers to deal with climate change uncertainties. By applying real options thinking to the assessment of corporate adaptation strategies, this innovative approach brings a financial market discipline to the evaluation of a company's adaptation opportunities. We find that real options thinking is an appropriate heuristic for assessment and treatment of climate change risks.

This paper adds to the growing body of literature which advocates the benefits of real options thinking. Furthermore, this paper contributes to the current literature on climate change adaptation and climate change risk.

AUTHOR: Dr Kevin Winter (PhD, University of Cape Town)

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Professor Neil Armitage	Ms Lizzie Kruger,
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Presenter: Kevin Winter

Title: Let's fix it:
Managing greywater in shanty settlements, South Africa

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Abstract

The character of greywater in South Africa's informal, shanty settlements varies considerably, often dark grey in appearance and generated from all forms of household activities and only formally excluding water from the toilet. Since options for disposal are limited in non-sewered settlements, residents resort to the most convenient method of disposing it on the ground alongside their shack dwellings. While some municipalities have provided simple technologies to assist in disposal, all too often these well-intentioned initiatives fail: officials are convinced that failures are caused by the users; while local residents claim that the government does too little to address their basic need for a clean, healthy environment.

This paper identifies some of the reasons why existing drainage structures have failed and identifies the social and institutional challenges for greywater management in non-sewered settlements. The cause of poor services in shanty settlements is complex since it is woven into a history of socio-economic injustice and of the state's present capacity and policies. While not ignoring the complexity, this paper argues that effective solutions to managing drainage lie largely in the development of co-operative partnerships between users, elected local councilors and municipal officials.

The paper describes a study that applies ideas about Adaptive Decision Making Processes to implement various low-cost technologies as interim solutions that seek to reduce the impact of waste water on human health and the environment. The approach begins with stakeholder consultation followed by participant surveys, observations, workshops, opportunities for collaborative decision-making, and finally intervention and adaptive learning. Thus far the study has achieved mixed results, the greatest challenge being to strengthen partnerships and trust between stakeholders. The prospects for sustainable service delivery lie in developing human capacity and effective governance rather than the technology.

AUTHOR: Zebadiah Worth (BE (Hons))

Co-authors: Dr Carol Boyle
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Presenter: Zeb Worth

Title: Combined Life Cycle Cost Assessment of Roof Construction.

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Abstract

This paper develops a methodology for incorporating the in-direct 'costs' of life cycle CO₂ emissions and embodied energy with the life cycle economic costs of four different types of roof construction common in New Zealand. A desktop study was undertaken comparing four alternative cladding/framing options for constructing the roof of a hypothetical design building. The two cladding options chosen are steel sheeting and concrete tiles, with the two framing options being softwood timber trusses and lightweight structural steel framing. The material quantities, embodied energy and CO₂ emissions of each roof configuration have been assessed using simplified life cycle models. The combined life cycle cost of each roofing system has been determined by adding the material costs with the estimated 'costs' of the embodied energy and CO₂ emissions. Material costs have been determined based on current installed prices and the maintenance costs discounted to net present values. The embodied energy and CO₂ emissions have been calculated using previous input-output models developed for New Zealand building materials. It was generally found that concrete tiled roof structures had lower overall combined life cycle costs when compared to the steel sheeting options, mainly due to the greater durability and lower embodied energy content of the concrete tile cladding. It is hoped that including the environmental 'costs' as a monetary value will help housing developers and stakeholders to quickly assess which alternatives are the most sustainable.

AUTHOR: Dr Kayoko Yamamoto

Presenter: Dr Kayoko Yamamoto

Title: City Planning based on Green Space Development in Major Asian Cities

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Abstract

The purpose of this study is to review representative cases of green space development and to view its direction in major Asian cities. For this purpose, I describe the characteristics of green space distribution and outline the genealogy of city planning based on green space development. The findings of this study can be summarized in the following three points.

- (1) The Green Belt concept was promoted in Japan in the latter half of the 1930's, South Korea in the early 1970's, and Beijing in China in the latter half of the 1950's. However, the Green Belt was converged into an urbanization control area in Japan in 1968 when the New City Planning Law was enacted, and the lifting of Green Belt control has been performed step-by-step in South Korea in recent years. In Beijing, although the maintenance of the Green Belt ran into difficulties, the detailed plan for the Green Belt was revised from the middle of the 1990's, and the Beijing municipal government has promoted it.
- (2) Singapore launched the Garden City Movement to promote green space development to cope with rapid urbanization and development after independence in the latter half of the 1960's. Beijing developed a Garden City based on the Singapore model, and Shanghai is also aiming at the development of a green city. Kuala Lumpur has developed the Lake Gardens, a man-made lake and large green spaces, and it now aims to construct a new administrative center as a Garden City in a man-made lake.
- (3) The results of previous studies and this study show that there are two major directions in such green-oriented city planning. One direction is the establishment of the concept of multi-regional development, while the other has resulted in the concept of an environmentally symbiotic city based on the Garden City concept.

AUTHOR: Dr Jay Yang (Associate Professor)

Co-author: Soon Kam Lim (PhD Scholar)

Presenter: Soon Kam Lim

Title: Reality Check – The Identification of Sustainability Perception and Deliverables for Australian Road Infrastructure Projects

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Abstract

The recent resource boom and economic development is putting extreme pressure on Australia's infrastructure, particularly on roads and railways. Developing these infrastructure typically demand a high level of resources and long term financial commitments. Governments and other stakeholders will also need to pay particular attention to sustainability outcomes, given the current public awareness and global challenges on sustainability. This will require the adoption of sustainability principles during project conception, design and planning. But equally important are the evaluation of results of doing so and the consideration of accountability in project delivery. However, literature study and consultation with the infrastructure industry found that in the absence of common understanding and priorities among stakeholders on what constitutes sustainability, tangible outcomes is often neglected, with little efforts on evaluation and feedback for future work. As a result, policies and strategies on sustainability remain largely ideological and cannot be sufficiently reflected in the actual project delivery.

This paper discusses results of the initial findings of a two-round interview with a group of senior practitioners in Australian infrastructure industry, which was aimed at identifying existing perceptions on sustainability and the agreeable priority issues between stakeholders. Base on these findings, a generic integrated perception-reality framework on sustainability in roads infrastructure has been established. It paves the way for further identification of critical issues that impact upon sustainability deliverables through another component of the on-going research. These research efforts will help promote more integrated thinking and consistent approach to enhance deliverables of the sustainability agenda in road and highway infrastructure projects in Australia.

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Title: Stormwater Ponds More Than Meets the Eye

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Abstract

Stormwater ponds are now common features of our urban landscape. They have been constructed to mitigate the adverse effects of development, to control flooding and to improve water quality. This evolution has now reached an epoch where hundreds of ponds are now dotted throughout Auckland and increasingly in other parts of New Zealand.

Ponds are designed to reduce flooding and accumulate tones of sediment, which often contains harmful contaminants that would otherwise negatively impact waterways and marine environments. In many ways they succeed in their design objectives; however it is becoming increasingly clear that there are unforeseen impacts of ponds.

This paper investigated the challenges that are faced with ongoing pond maintenance and summarises possible solutions for a more sustainable future.

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Title: The Sustainability of Permeable Road Pavements –
The North Shore Experience

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Abstract

Road Infrastructure is the backbone of a country's socio-economic sustainability. Often though, roads would also be one of the major hurdles of the environmental and cultural sustainability. During road construction and maintenance, finite geological resources are being consumed and borrow pits could be seriously detrimental to the aesthetic values of some areas. In addition to that, the road corridor significantly influences the natural flow and treatment of runoff water. In an attempt to address some of these environmental sustainability issues engineers have developed permeable pavements. A major design consideration of classical road pavements is to keep it water-tight and dry at all times. Unlike this, the permeable pavement captures water into the pavement layers, thus not only reducing the runoff but also treating the water through the natural filtration process. Fassman et al (2007) reported that the North Shore permeable pavement experiment was successful in delaying the runoff by 2.4 hours and reduce the peak flow by 83%. In addition to that there was a significant improvement on the water quality when compared to the adjacent asphalt pavement. The question remains though, how well does the permeable pavements perform both physically and according to life-cycle considerations.

This paper reports on the results obtained from the North Shore permeable pavement experiment. It details the finding of the structural integrity and long-term performance of these pavements. It also discusses the pavement design principles and evaluates the economic sustainability of these pavements. Ultimately the paper recommends viable application areas for these pavements in order to assist in the establishment of a long-term socio-economical and environmental sustainable solution.

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Title: Sustainability and Alliancing: a case study of new governance practices that emerged from the Roe 7 Highway in Perth

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Abstract

This paper examines the governance contribution that project Alliancing has made to the design and construction details of the Roe 7 Highway in Perth, Western Australia. In particular, it focuses on changes to the design initiated by the community which was made possible by the Alliance framework because of the unique relationship that developed between the engineers and community representatives. Interviews of professionals and community representatives were carried out to record the story and their accounts are retold. The changes initiated by the community reduced environmental impacts from the highway and improved the sustainability credentials of the project.

This paper articulates the governance issues at play in the Roe 7 example, and uses them as a basis for ideas on how project management frameworks like Alliancing might also be used to foster greater collaboration between government agencies and the community during the planning and pre-construction phases of difficult projects where fostering more sustainable outcomes is desirable.