CONFERENCE HANDBOOK

2007

PROGRAMME

AND

BOOK OF ABSTRACTS

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SPONSORS

Sponsors 2

GENERAL INFORMATION

VENUE

Faculty of Engineering, The University of Auckland
20 Symonds Street, Auckland

Please note that members of the organising committee are wearing blue names labels in their neck wallets.

Should you require any assistance during the conference, please contact someone with a blue name label, someone at the Secretariat Office, Room 403.405 or contact Vicky by phone: 027 2305 365.

Don't forget to complete the Conference Feedback form in your compendiums

The Conference Proceedings are on the CD included with this Handbook. Printed proceedings will be not be provided.

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

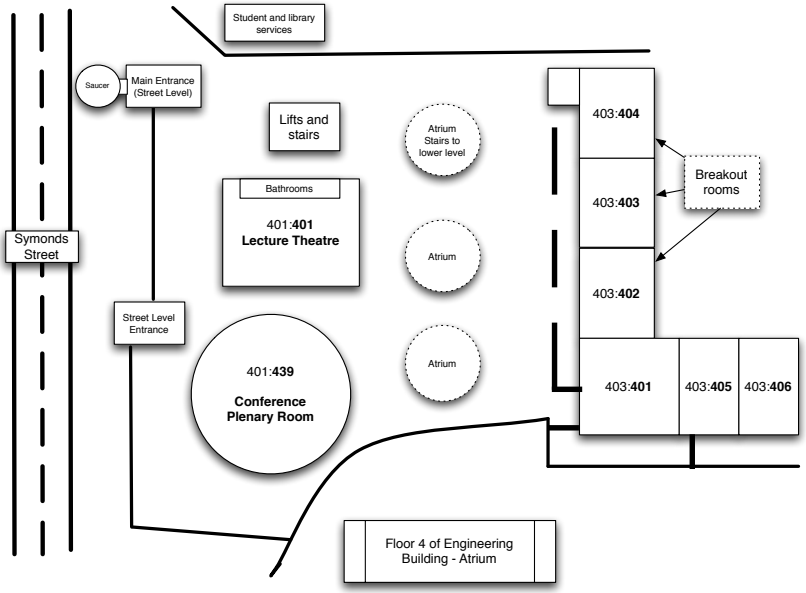
Parallel Paper Presentations will be available from the website post the conference for downloading.

We have a secure lock up area should anyone wish to use it. Contact Vicky

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, or contact Vicky or a staff member If you are not on the list you may be refused entry at the venue.

CONFERENCE ROOM LOCATIONS

FACULTY OF ENGINEERING
4TH FLOOR LAYOUT



The **New Zealand Society for Sustainability Engineering and Science (NZSSES),** are the hosts to the 2nd International Conference on Sustainability Engineering and Science - Talking and Walking Sustainability.

NZSSES is a Technical Interest Group that operates under the auspices of IPENZ, The Institution of Professional Engineers of New Zealand.

The 2007 committee of the New Zealand Society for Sustainable Engineering and Science are:

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

Zoe Burkitt
MWH NZ Ltd. Email: Zoe.L.Burkitt@nz.mwhglobal.com

Dr David Kettle
Consultant, D & B Kettle Consulting Ltd. Email: dbkettlelimited@slingshot.co.nz

Yasenko Krpo
TSE Group, Email: yasenko.krpo@tse.co.nz

Dr Ir Ron McDowall
The University of Auckland. Email: r.mcdowall@auckland.ac.nz

Vineet Rajasekhar
The University of Auckland - NEXUS. Email: vineet.rajasekhar@gmail.com

Misty Skinner
Ministry of Agriculture and Forestry. Email: Misty.Skinner@maf.govt.nz

Ex-officio:
Dr John Peet
Canterbury University, Email: john.peet@canterbury.ac.nz

General enquiries should be sent to the Secretariat:
Vicky Adin MA (Hons)
Email: vickya@kiwilink.co.nz
Phone: +64 9 444 8881, Mobile: + 64 27 2305 365

PROGRAMME

TUESDAY 20 February 2007	ATRIUM
4.30 pm	REGISTRATIONS OPEN
6.00 pm 6.30 pm 6.40 pm 6.45 pm	THE IPENZ AUCKLAND BRANCH WELCOME RECEPTION Powhiri: Haka the Legend Refreshments will be served Welcome: **Dr Ron McDowall,** Co-Director, ICSER, NZ Guest Speaker: **Dr Morgan Williams,** Parliamentary Commissioner for the Environment ***Hardwiring sustainability: some key ingredients?*** Meet and greet guests and delegates Music by: **Scott**

WEDNESDAY 21 February 2007 KEYNOTE PRESENTATIONS	Morning Session PLENARY ROOM 401.439
8.00 am	REGISTRATION DESK OPENS
8.45 am	**Welcome** — **Dr Carol Boyle**, Chair NZSSES
9.00 am	Official Opening **Hon David Parker** Minister for Energy, Minister Responsible for Climate Change Issues, Minister for Land Information
9.30 am	**Keynote Address: Professor Peter Guthrie** Cambridge University, England ***The Engineer's Role in Sustainable Development - New Approaches*** *Sponsored by The IPENZ Foundation*
10.00 am	**Keynote Address: Professor Tim O'Riordan** University of East Anglia, Sustainable Development Commission, UK. ***Charting Sustainability*** *Sponsored by the NZ Parliamentary Commissioner for the Environment*
10.30 am - 11.00 am Morning Tea Break	

WEDNESDAY 21 February 2007 SESSION 1: 11.00 am - 12.30 pm

PARALLEL PAPER SESSION 1

Room 403.404 - Liveable Communities 1 – Transport
Chair: **Zoe Burkitt,** NZSSES

Papers **presented** by:

Vince Dravitzki, Opus International Consultants, NZ,
Economics drove our first sustainable urban transport system and the unsustainable one that followed

Kirsten Finnis (presented by **Dr Darren Walton)** Opus International Consultants, NZ
Field observations of factors influencing pedestrian walking speeds

Chris Harris, North Shore City Council, NZ
Governing Spaces: Urban Transit, Land Development and the Local State

Rae-Anne Kurucz, Auckland Regional Transport Authority, NZ
The TravelWise - Workplaces Process: a Programme for Implementing Workplace Travel Plans in the Auckland Region.

Room 403.403 - Sustainable Tools 1
Chair: **Paul Jowitt,** Vice-President ICE *Sponsored by Morphum Environmental Ltd*

Papers **presented** by:

Dr Jo-Anne Cavanagh, Landcare Research, NZ
The Experiences of Applying a Sustainability Assessment Tool

Gayathri Babarenda Gamage, Formway Furniture Limited, Wellington, NZ
Sustainability through Risk assessment: A Case Study of resource risk

Kerry Griffiths, URS New Zealand Limited,
Project Sustainability Management in Infrastructure Projects

Carrie Guthrie, Victoria University, Wellington, NZ
What are 'Structural Insulated Panels' and are they the sustainable solution to standard light framing load-bearing wall construction?

WEDNESDAY 21 February 2007 SESSION 1: 11.00 am - 12.30 pm

PARALLEL PAPER SESSION 1 - continued

Room 403.402 - Education 1
Chair: **John Peet,** NZSSES

Papers **presented** by:

Nicola Bould, University of Otago, NZ
Sustainable Design Education: Students Take Charge of Creating a Clean, Green University

Dr Heather Cruickshank, Cambridge University, England.
Engineering Education: Embedding Sustainable Development Concepts into an Established Curriculum

Dr Cliff Davidson, Carnegie Mellon University, Pennsylvania, USA
Graduate Courses in Sustainable Engineering: The Carnegie Mellon Experience

Rhys Taylor, Landcare Research, NZ
Behaviour Change for Sustainability: Exploring a role for Community Education

Room 403.401 - Business and Governance 1
Chair: **Misty Skinner,** NZSSES

Papers **presented** by:

Lois Easton, Beacon Pathway Limited, NZ
Beacon's High Standard of Sustainability – implications for the sustainable development of the residential built environment

Stewart Hamilton, NZ Aluminium Smelters Ltd, NZ
New Zealand Aluminium Smelters Limited Climate Change Approach

James Hassell, DLA Phillips Fox Ltd, NZ
Green Wash or Green to the Core? Pushing the Business World to Take Sustainability Seriously

Emma McConachy, Landcare Research, NZ
Greening the Screen: a Model for Sector Engagement in Sustainable Development

WEDNESDAY 21 February 2007	SESSION 1: 11.00 am - 12.30 pm

PARALLEL PAPER SESSION 1 - continued

Room 401.401- Sustainable Technology 1
Chair: **Yasenko Krpo,** NZSSES *Sponsored by Holcim (New Zealand) Limited*

Papers **presented** by:

Dr Anthony Bellvé, Crest Energy Kaipara Ltd. NZ
Pathway to Energy Generation from Marine Tidal Currents in New Zealand's Kaipara Harbour

Dr David Kettle, D&B Kettle Consulting Ltd, NZ
Principles At The Fundamental Level of a Systems-Based Sustainability Framework

Dr Donald Liou University of North Carolina, Charlotte USA
Building the Framework for Hurricane Chaser, a Conceptual Wind-Energy Harvesting Vessel

Dr Helen Lou, Lamar University, Beaumont, TX, USA
Application of Pareto Optimization under Uncertainty in Chemical Process Design for Sustainability

12.30 pm - 1.30 pm Lunch

WEDNESDAY 21 February 2007 KEYNOTE PRESENTATIONS	Afternoon Session PLENARY ROOM 401.439
1.30 pm	**Keynote Address: Professor Jorge Vanegas,** Centre for Housing and Urban Development, University of Texas, USA ***Enhancing the Quality of Life of People and Place in the Colonias of Texas through Sustainable Urbanism***
2.00 pm	**Keynote Address: Dr Carol Boyle,** International Centre for Sustainability Engineering and Research (ICSER)
2.30 pm	**Keynote Address: Chris Hendrickson,** Carnegie Mellon University, Pittsburgh, USA ***Use of the Economic Input-Output Life-Cycle Assessment Website***
3.00 pm -3.30 pm	Afternoon Tea Break

WEDNESDAY 21 February 2007 SESSION 2: 3.30 pm - 5.00 pm

PARALLEL PAPER SESSION 2

Room 403.404 - Liveable Communities 2
Chair: **Jorge Vanegas,** Texas A&M, USA

Papers **presented** by:

Liz Ampt, Sinclair Knight Mertz, Australia
The Role of Behaviour Change in Reducing CO_2 Emissions

Lauren Christie (co-presented by **Roman Jaques**) BRANZ
The Eco-Design Advisor: an Independent Resource for the Building Industry

John Duder, Devonport Board, NZ
Devonport: A Sustainable Community?

Dr Sumita Ghosh, Landcare Research, NZ
Is Policy Leading to Improved Sustainability at the Local Urban Scale?

Room 403.403 - Sustainable Tools 2 *Sponsored by Morphum Environmental Ltd*
Chair: **John Peet,** NZSES

Papers **presented** by:

Catherine DiBlasi, University of Maryland, Baltimore County (UMBC) USA
Implementing a Sustainable Storm Water Management Program in an Urban Center - Baltimore City, Maryland

Caleb Clarke, Morphum Environmental Ltd, NZ
GIS and Ecosystem Management Tools – a Process for Sustainable Development on Great Barrier Island.

Dr David Kettle, Anew NZ
Measuring Real Wealth in New Zealand

Cristina Piluso, Wayne State University, Detroit, MI, USA
Decision Analysis Framework for the Industrial Sustainability Analysis of the Surface Finishing Industry

WEDNESDAY 21 February 2007 SESSION 2: 3.30 pm - 5.00 pm

PARALLEL PAPER SESSION 2 - continued

Room 403.402 - Education 2
Chair: **Chris Hendrickson,** Carnegie Mellon University, USA

Papers **presented** by:

Pat Kelly, CELTS University of Canberra, Australia
Accepters, Converts and "Resisters" on the road to Globo sapiens

James Mihelcic, Michigan Technological University, USA
Educating Engineers in the Sustainable Futures Model with a Global Perspective

Kendra Wasiluk, RMIT Centre for Design, Victoria, Australia
Deepening Shades of green: Fostering Adult Environmental Education through Experienced-based Professional Development Curriculum

Room 403.401 - Business and Governance 2
Chair: **Tim O'Riordan,** Sustainable Development Commission, UK

Papers **presented** by:

Dr Colin Meurk, Landcare Research, NZ
Biodiversity in Crisis: A Crucial Role for Business

Cerasela Stancu, Landcare Research, NZ
Making sustainable links: the well-being of NZ exports in a changing climate

Rainer Seidel, University of Auckland, NZ
Establishing Sustainable Manufacturing Practices in SMEs

Misty Skinner, Ministry of Agriculture and Forestry, NZ
Applying International Policy Lessons for Sustainable Agriculture to New Zealand

WEDNESDAY 21 February 2007	SESSION 2: 3.30 pm - 5.00 pm

PARALLEL PAPER SESSION 2 - continued

Room 401.401- Sustainable Technology 2 *Sponsored by Holcim (New Zealand) Limited*
Chair: P**eter Guthrie**, Cambridge University, UK

Papers **presented** by:

Peerapong Jitsangiam, Curtin University of Technology, Western Australia,
Sustainable use of a bauxite residue (red sand) in terms of roadway materials

Dr Gavin Mudd, Monash University, Australia,
Sustainability Aspects of Uranium Mining: Towards Accurate Accounting ?

Neil Purdie, Connell Wagner Limited, NZ
Passive Design in the Pacific Environment

Omid Titidezh, Shomal University, Iran
Sustainable Development Challenges in Planning and Operation of Multipurpose Hydro System in Iran (Dez and Karoon Basins)

PLENARY SESSION 401.439

5.00 pm	**Wrap up of Day's Sessions** – Question and Answer session time

WEDNESDAY 21 February 2007 – Optional Evening Session
Plenary Room 401.439

5.30 pm	The **TSE Group** Cocktail Hour
6.30 pm	**Institution of Civil Engineers UK** (ICE) **BRUNEL Lecture Series** Presented by **Professor Paul Jowitt**, Vice-President, ICE. Supported by ICE NZ.
8.00 pm	Supper by ICE New Zealand.

THURSDAY 22 February 2007 SESSION 3: 9.00 am - 10.30 am

PARALLEL PAPER SESSION 3

Room 403.404 - Liveable Communities 3
Chair: **Misty Skinner,** NZSSES

Papers **presented** by:

Dr Anna Johnson, Opus International Consultants, NZ
What do New Zealander's Want From Their Cities? Results from Dunedin

Sasha Maher, Victoria University of Wellington, NZ
A Shared Sense of Belonging: the Politics of Defining in Sustainable Community Housing Typologies

Dr Nalanie Mithraratne, Landcare Research, NZ
Sustainable Choices for Residential Water Supply in Auckland

Mary Rose, Citizen, NZ
Liveable Communities: Shared Houses for Older Women

Room 403.403 - Sustainable Tools 3 *Sponsored by Morphum Environmental Ltd*
Chair: **David Kettle**, NZSSES

Papers **presented** by:

Andreas Hamm, University of Canterbury, NZ
Strategic Analysis of Continuity for Complex Energy and Environment Systems

Dr Michael Overcash, North Carolina State University, USA
Life cycle and approaches to sustainability research

Dr Robert Staib, Macquarie University, NSW, Australia
Water Sustainability In Sydney's Rouse Hill Development Area: Past Practices And Future Plans

Dr Marcel Weil, Forschungszentrum Karlsruhe, Department of Technology-Induced Material Flow (ITC-ZTS), Germany
Sustainable Design of Geopolymers - Integration of Economic and Environmental Aspects in the Early Phases of Material Development

THURSDAY 22 February 2007 SESSION 3: 9.00 am - 10.30 am

PARALLEL PAPER SESSION 3 - continued

Room 403.402 - Philosophy and Science
Chair: **Paul Jowitt**, ICE, UK

Papers **presented** by:

Dr Ian Boothroyd, Golder Kingett Mitchell, NZ
Sustainable resource management: A Pressure-State-Response framework for sustainability in the urban environment

Alec Couchman, Warren & Mahoney, NZ
A new ERA in architecture: Environmentally Restorative Architecture in the 21st Century

Dr Heather Cruickshank, Cambridge University UK
Application of Sustainable Development Concepts in Backbone Infrastructure Provision

Professor Ian Lowe, Griffith University, Queensland, Australia.
Shaping Sustainable Futures – an Outline of the Transition

Room 403.401- Mixed Session 1:
Liveable Communities/Transport/Business & Governance
Chair: **Yasenko Krpo,** NZSSES

Papers **presented** by:

Chris Harris, North Shore City Council, NZ
Lost City: Forgotten Plans for an Alternative Auckland

David Willmott, Centre for Urban and Transport Studies, NZ
Sustainable Progress

Jocelyn Watkin, Sustainable Cities, Manukau City Council, NZ
Success in Sustainability – a case study on the Auckland Sustainable Cities Programme

Jeff Vickers, University of Auckland, NZ
The Changing Face of Environmental Legislation: New Policy Directions in the European Union

THURSDAY 22 February 2007	SESSION 3: 9.00 am - 10.30 am

PARALLEL PAPER SESSION 3 - continued

Room 401.401 - Sustainable Technology 3
Chair: **Zoe Burkitt**, NZSSES *Sponsored by Holcim (New Zealand) Limited*

Papers **presented** by:

Manuel Seidel, University of Auckland, NZ
Sustainability in practice: A case of environmental packaging for ready to assemble furniture

Kel Dummett, Sustainability Victoria Australia
Designing for a Sustainable Future: Partnerships to Sustainability

Josh Gluckman (presented by **Alice Wilson)**, Ministry for the Environment, NZ
Encouraging Sustainable Product Design - an Update on Practical New Zealand Activity

Dr Gavin Mudd, Monash University, Australia.
Resource Consumption Intensity and the Sustainability of Gold Mining

10.30 am – 11.00 am Morning Tea

KEYNOTE PRESENTATIONS	PLENARY ROOM 401.439
11.00 am	**Keynote Address: Dr Steve Thompson,** Royal Society of New Zealand ***Matching Understanding with Action***
11.30 am	**Keynote Address: Kathryn Maxwell,** Ministry for the Environment. ***Govt3 Programme Presentation***
12.00 noon	**Keynote Address: Jim Bradley,** General Manager, MWH ***Practical Progress in our New Zealand Journey towards more Sustainable Water and Waste/Wastewater Management***

12.30 pm – 1.30 pm Lunch

THURSDAY 22 February 2007 SESSION 4: 1.30 pm - 3.30 pm

WORKSHOPS, PRESENTATIONS and PARALLEL PAPERS

Room 401.401 - WORKSHOP

Policy & Legislation for Sustainable Management
Theme: **Can Policy Tackle Climate Change?**
The workshop will include a presentation on existing policy and legislation; followed by breakout into focus groups on required changes and roles for discussion and feedback.
Sponsored by MWH NZ Ltd

Room 403.404 - WORKSHOP

Education for Sustainability
Sponsored by Genesis Energy

Room 401.439 - PRESENTATION

National Science Foundation, USA
NSF Programmes
Cindy Lee
NSF sponsored Center for Sustainable Engineering activities
David Allen, Cliff Davidson and Cindy Murphy

Room 403.403 - PARALLEL PAPER SESSION

Sustainable Tools 4: *Sponsored by Morphum Environmental Ltd*
Chair: **Vineet Rajasekhar,** NZSSES

Papers **presented** by:

Dr Sarah McLaren, Landcare Research, NZ.
Defining a Role for Sustainable Consumption Initiatives in New Zealand

Dr Barbara Nebel, Scion, NZ
The Exemplar House - a Generic LCA Model for Houses in New Zealand

Dr Annie Pearce, Virginia Polytechnic Institute and State University, USA
Sustainable Capital Projects: Leapfrogging the First Cost Barrier

Damian Young, Morphum Environmental Ltd, NZ
LIDAR Survey, Modelling and GIS as tools used in the sustainable management of the urban drainage systems

3.00 pm – 3.30 pm Afternoon tea

THURSDAY 22 February 2007 SESSION 5: 3.30 pm – 5.00 pm

PARALLEL PAPER SESSION 5

Room 403.404 - Liveable Communities 4
Chair: **Tim O'Riordan**, UK

Papers **presented** by:

Matthew Paetz, Babbage Consultants Ltd.
From Red Lights to Green Lights: Town Planning Incentives for Green Building

Dr John Russell, LaTrobe University, Victoria Australia
What is Sustainability when on the Climate Roller Coaster?

Patricia Vasconcelos, URS NZ
A Greenway Network for a more Sustainable Auckland

Dr Darren Walton, Opus International Consultants Ltd, NZ
Impediments to Walking as a Mode Choice

Room 403.403 - Sustainable Tools 5 *Sponsored by Morphum Environmental Ltd.*
Chair: **David Kettle**, NZSSES

Papers **presented** by:

Dan Ducker, University of Auckland, NZ
A framework for integrated assessment of POPs destruction technology

Andrew Duncan, Massey University. NZ
Solar design tools for sustainable residential land development

Darren Utting, Synergine Group Ltd, NZ
A Web-Based Sustainability Assessment Tool Streamlining Local Government Practice: TUSC

Dr Lin Roberts, The Natural Step, NZ
A Systems Framework for Sustainability and its Application to a Construction Project

THURSDAY 22 February 2007 SESSION 5: 3.30 pm – 5.00 pm

PARALLEL PAPER SESSION 5 - continued

Room 403.402 - Liveable Communities 5 – Transport
Chair: **Chris Hendrickson.** Carnegie Mellon University, USA

Papers **presented** by:

Chris Harris, North Shore City Council, NZ
Sprucing up the Shop Window: Improving the Bus Stop Environment for Passengers, Pedestrians and Property Owners

Marta Karlik-Neale, URS NZ
One-Planet Living & Sustainable Transport in London

Dr Katsuhito Nakazawa, Fujitsu Ltd, Japan
Analysis of Sustainable Transport Using by Information Services

Lisa Rossiter, Transit NZ
How Urban Design is Improving State Highways in our Communities

Room 403.401- Mixed Session 2 -Liveable Communities / Tools Energy based
Chair: **Jorge Vanegas,** Texas A&M University, USA

Papers **presented** by:

Grant Curtin, Energy Pro Ltd, NZ
Tools for Sustainable Best-Practice Energy Management

Stephen Drew, Strata Energy/ Demand Response NZ
Less Talking and More Walking down the Energy Efficiency Road - the Journey has begun

Dr Richard Love, Massey University, NZ
Tools for Energy Efficiency in Industrial Processes

Pamela Storey, *Huntly Energy Efficiency Trust, NZ*
Changing Communities through Practical Energy Efficiency - the HEET Experience

THURSDAY 22 February 2007	SESSION 5: 3.30 pm – 5.00 pm

PARALLEL PAPER SESSION 5 - continued

Room 401.401- Sustainable Technology 4 *Sponsored by Holcim(New Zealand) Ltd*
Chair: **Peter Guthrie,** Cambridge University, UK

Papers **presente**d by:

Idil Gaziulusoy, University of Auckland, NZ
A Conceptual Systemic Framework Proposal for Sustainable Technology Development: Incorporating Future Studies within a Co-Evolutionary Approach

Dr Dennis List, University of Adelaide, Australia
Scenarios: methods and uses

Dr Susan Krumdieck, University of Canterbury, NZ
Strategic Analysis Adaptation Assessment: An Alternative to the Storyline Scenario

Dr Ron McDowall, ISCER, NZ
Foresighting Frontier Product Innovation for Sustainability: Does Scenario Building Really Work?

PLENARY SESSION 401.439

5.00 pm	**Wrap up of Day's Sessions** – Question and Answer session time

CONFERENCE DINNER - **The Floating Pavilion, Halsey St, Viaduct Harbour**

Please confirm your attendance for transport and catering purposes

Buses will depart Hyatt Regency Hotel at 6.45 pm and 7.15 pm.

Returning to Hyatt Regency at 11.00 pm and 12 midnight.

If your name is not on the list you may be refused entry.

7.00 pm	Pre-dinner drinks
7.30 pm	Seated for dinner
8.00 pm	Buffet served (no pre-designated seating – make up your own tables)
	Dinner speaker *sponsored by Connell Wagner Limited*
	Coffee and Dessert
	Mix and Mingle and Dancing

FRIDAY 23 February 2007 SESSION 6: 9.00 am 10.30 am

WORKSHOPS and PRESENTATIONS

ROOM 401.401- WORKSHOP

Sustainable Urban Design

The workshop will include initial presentations from three different development projects underway in the Auckland Region, followed by a facilitated discussion. The three projects have differing sustainability drivers from an economic, environmental and social perspective.

Chairs: **Yasenko Krpo** and **Dr David Kettle**

Case Studies::

Flat Bush Development: Manukau City Council

Long Bay Development: **John Duguid**, North Shore City

A 250 hectare greenfield urban development in an environmentally sensitive receiving environment.

Tamaki Edge: **David Clelland** Auckland City Council

Providing for 30,000 additional people and 10,000 new jobs through urban renewal and brownfields development.

ROOM 403.404 - WORKSHOP

Topic: Delegate Nominated

During the conference delegates can nominate a subject for discussion.
The topic with the largest requests will be accommodated.

ROOM 401.439 - WORKSHOP

Frontier Design for Sustainability

Chair: **Dr Ron McDowall,** ICSER *Sponsored by ICSER*

10.30 am – 11.00 am Morning tea

KEYNOTE PRESENTATIONS PLENARY SESSION 401-1439

11.00 am	**Keynote Address: Simon Upton,** Chair OECD Roundtable on Sustainable Development.
11.30 am	**Keynote Address: Dr Jim Salinger,** NIWA ***Climate Change Facts and Impacts***
12.00 noon	**Keynote Address: Professor Tord Kjellstrom** Health and Environment International Trust, NZ ***Human health: the ultimate bottom line of the triple bottom line of sustainability***

12.30 pm – 1.30 pm Lunch

FRIDAY 23 February 2007 PANEL DISCUSSION	PLENARY SESSION 401-1439
1.30 pm	PANEL DISCUSSION– Talking and Walking Sustainability Chair: **Dr Carol Boyle,** NZSSES Panellists: Jorge Vanegas Tim O'Riordan Peter Guthrie Paul Jowitt Chris Hendrickson Steve Thompson Tord Kjellstrom Jim Bradley Jim Salinger
3.00 pm – 3.30 pm	Afternoon tea

BREAKOUT SESSIONS 3.30pm - 4.00pm	
ROOM	PARALLEL PAPER RECOMMENDATIONS: **Breakout sessions. One per parallel paper theme.** Delegates to formulate one recommendation from each parallel paper theme for ongoing discussion, collaboration, and research, and report back to closing session. Rapporteurs to be appointed during breakout session.
403.404	Liveable Communities Chair: **Zoe Burkitt,** NZSSES
403.403	Sustainable Tools Chair: **David Kettle,** NZSSES
403.402	Education Chair: **John Peet,** NZSSES
403.401	Business & Governance Chair: **Misty Skinner,** NZSSES
401.439	Philosophy & Science Chair: **Vineet Rajasekhar,** NZSSES
401.401	Sustainable Technology Chair: **Yasenko Krpo,** NZSSES

CLOSING SESSION	PLENARY ROOM 401.439
4.00pm	Rapporteurs report to Plenary session with their recommendations
4.30 pm	Dr Carol Boyle, Chair NZSSES Closing Remarks

KEYNOTE SPEAKERS

SPEECH ABSTRACTS and PROFILES

In order of programme

Dr Morgan Williams, Parliamentary Commission for the Environment

Title: Hardwiring sustainability: some key ingredients?

Dr Williams speech will cover a few of the institutional, knowledge, education and leadership 'ingredients' that seem essential to empower NZ's quest to be a more sustainable nation - in all dimensions of the word put particularly in terms of our natural capital.

Profile:
Dr Morgan Williams is a Cantabrian, who grew up milking cows, building things and mucking about in rivers. He has a background in ecological sciences, 20 years experience with the Ministry of Agriculture & Forestry (MAF) and an ever-widening range of research interests, particularly in the areas of pests and sustainable land use.

Dr Williams has been widely involved in Australian research and environmental matters and has acted as the New Zealand representative on trans-Tasman committees. Following a short spell in the private sector with Wrightsons Group, he was appointed Parliamentary Commissioner for the Environment, a position which he has held for the past six years. His family is also focused on environmental matters and his partner, Pam, is currently President of the NZ Association of Environment Education and a Victoria University Research Fellow in this field.

Professor Peter Guthrie

Professor in Engineering for Sustainable Development

Title: The Engineer's Role in Sustainable Development - New Approaches

Professor Guthrie's keynote will address the issue of how to embed sustainable development into large scale infrastructure projects.

Contact information:
Peter Guthrie
RAE/DEFRA/AEA T plc
Professor of Engineering for Sustainable Development
Engineering Department, University of Cambridge, Trumpington St, Cambridge, CB2 1PZ
01223 765627 tel, 01223 765625: fax 07770 834580 mob pmg31@cam.ac.uk email

Abstract:

The paper seeks to reflect on the journey towards the current perceptions of sustainable development, addressing environmental consciousness, industrial maturity in developed economies, globalisation, rising social consciousness, including corporate social responsibility, global warming and climate change, and resource depletion. This sets the backdrop for the response required of engineers in their professional duties.

There is a need to define sustainable development. The Brundtland definition can be used as the overarching definition - it is understandable and contains the four principles (futurity etc) which can be used as the markers for more detailed definitions within sectors or disciplines. In each endeavour such as say house building, urban development, mining, there is now a need to develop a more detailed and specific definition. Because of the very nature of sustainable development this needs to be developed collaboratively, and may need to be by country and even by region within country, although the diversity should not be used as a means of avoidance. By its nature, the definition must have a long term future embedded. This inevitably induces all the concerns about the inability to predict the succeeding generations' needs and demands, but this cannot deflect the process from defining future consequences and future aspirations now. From the definition, all further work flows – how to design, where to design, how to implement, how to maintain and use, how to decommission and prepare for onward use. The impact of climate change has taken many years to be recognised. The response time of the atmospheric system is likely to be as slow in arresting global warming and consequent climate change. Policies now for CO_2 reduction are likely to benefit generations in the 22nd Century and beyond. For the next 100 and possibly

200 years we have to react to effects that will inevitably occur. Mitigation is crucial for long-term survival and the strategic nature of the political response has been encouraging, but to cut carbon emissions is not enough. We have to deal with the changes that have already started to show themselves. Adaptation – the major threats are rising sea levels, increased severity of weather events such as storms (with extreme windspeeds), rainfall, drought, and extremes of temperature; shifts in rainfall patterns – some areas much wetter overall some vast areas desertified; increased acidity of the oceans threatening coral reefs and plankton; and loss of species threatening biodiversity In engineering and specifically civil and mining engineering what does this mean for our action?

The paper will describe recent research at Cambridge to determine behaviour relating to decision making around the measurement and assessment of sustainable development including a three dimensions conceptual model, a framework for decision making, and the inclusion of social aspects in a rigorous and novel way.

The paper will draw on case studies where these approaches have been applied including

- social and structural vulnerability in an island community in Greece
- a mining case study
- the development of 10,000 new homes in the Thames Gateway in England
- the design and construction of educational buildings in UK
- the drive for sustainable development in Afghanistan as an example of a fragile state

In developing new civil engineering projects, in masterplanning for urban living, in mining projects for extraction of the resources we will continue to need, the paper makes the case that we must now define a new order, a vision of what life will have to be like in a world of

- lower resource use,
- higher quality of life for more of the world's people, and
- more limited access to energy

This will mean defining and designing radically different systems. Without a vision for this sustainable world we are only incrementally getting less bad, at a rate that is too slow to meet the rapid changes we may be facing. The market is being left to determine the way ahead and the market forces are driven by more immediate goals than sustainability. Legislation and government action are increasingly imposing more and more actions that contribute to less unsustainable development but this will not be enough.

What civil engineers build in the next two decades will be part of the built environment for the next two hundred years.

We need to determine a vision and then do what is feasible and achievable to open the way to getting there; the structure is crucial, and it is essential not to compromise this for short term expediency. What is needed now is a new breed of engineer with vision, breadth, rigour, determination and the ability to carry opinion on difficult and contentious decisions. Such a change will require a whole new approach to the formation of the new generation of engineers

Profile:
Professor Peter Guthrie is with 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. He was involved in the founding of RedR, a charity that provides engineers and other personnel to relief agencies in disasters. In recognition of this initiative he was awarded the prestigious Beacon Prize for charitable giving in 2005.

As a former Director of consultants Scott Wilson he was responsible for the establishment of their Training Division, the management of the firm's design of the Channel Tunnel Rail Link, the setting up of the Environmental Division, and its growth over ten years to some 150 professional staff.

He is an active Trustee of the charity, ITDG (Intermediate Technology Development Group) and Chair of the subsidiary company ITC, and Trustee/ Director of Engineers Without Borders (EWB) which is a student inspired organisation which seeks to help students make a contribution to the relief of poverty through improved awareness and field projects linked to research. He was awarded the OBE in 1994. He was Vice-President of the Institution of Civil Engineers in the late 1990s.

Professor Tim O'Riordan

Professor of Environmental Sciences at the University of East Anglia
Commissioner on the Sustainable Development Commission UK

Title: Charting Sustainability

Contact information:
Professor of Environmental Sciences
Centre for Social and Economic Research on the Global Environment (CSERGE), United Kingdom
School of Environmental Sciences, University of East Anglia, Norwich, NR4 7TT, United Kingdom
Tel: +44 1603-592840, Fax: +44 1603-280558: Email: t.oriordan@uea.ac.uk

Abstract:

In his keynote address **Professor O'Riordan** will look at the challenges to defining and implementing sustainability.

- He will discuss the big issues for bringing electoral and short term democracy towards an ecological democracy for sharing the planet with future generations.
- He will survey sustainability science and show how the schools and higher education sectors can adapt to all of this.
- He will provide examples to show how all this can be done.

Profile:

Professor Tim O'Riordan is Professor of Environmental Sciences at the University of East Anglia and Commissioner on the Sustainable Development Commission UK, described as the government's watchdog on sustainable development. He has edited a number of books on the institutional aspects of global environmental change policy and practice, and led two international research projects on the transition to sustainability in the European Union (1995-1999). His current research interests are focused on global-local relations and their implications for the transition to sustainability in Europe. He is also involved with user groups, in the practical application of deliberative and inclusionary processes for the reallocation of scarce water resources in Broadland, and in the management of the public private partnership for flood alleviation again in the Broads.

He has served as Chairman of the Environment Committee for the Broads Authority, was a member of Norfolk and Suffolk Local Flood Defence Committee, of advisory panels to Dow Chemical and Eastern Group PLC, and is a core member of the Prince of Wales' seminar on Business and the Environment. Elected Fellow of the Royal Academy in 1999, Tim is also Executive Editor of Environment Magazine, and of Risk Assessment: An Institutional Journal.

Professor Jorge Vanegas

Director of The Center for Housing and Urban Development (CHUD)

Title: Enhancing the Quality of Life of People and Place in the Colonias of Texas through Sustainable Urbanism

Contact information:
Jorge A. Vanegas, Director
Center for Housing and Urban Development, College of Architecture, Texas A & M University
Direct Tel.: (979) 845-7070: General Tels.: (979) 862-2370: (979) 862-2374
Email: CHUD-Director@tamu.edu

Abstract:
Sustainable Urbanism is a new framework for interdisciplinary expertise in the environmental design and engineering professions, as well as the earth and social sciences, about the processes that shape contemporary urban environments. It explores sustainability and cities in a rapidly urbanizing world by focusing on the form of the built environment – the infrastructure, land developments, built landscapes, and facilities that collectively make up metropolitan regions.

The practice of sustainable urbanism integrates all the factors critical to the processes of planning, designing, developing, building, and managing the urban built environment – energy, water, materials, and the wastes, byproducts, impacts, and pollutants resulting from these processes – in such a way that all rates of production, consumption, and waste can be maintained over time without exceeding the innate ability of their surroundings to support these processes, including the ability of the surroundings to absorb their impacts.

This presentation will focus on how Sustainable Urbanism is providing a framework for accomplishing the mission of the Center for Housing and Urban Development in the College of Architecture at Texas A & M University, which is to develop and deliver integrated, sustainable, scalable, flexible, evidence-based, outcome-driven, and technology-enabled solutions to enhance the quality of life (People) and the quality of the built environment (Place), particularly for the disadvantaged and impoverished Hispanic communities in Texas along the Texas/Mexico Rio Grande border, also known as the colonias.

Profile:

Professor Jorge Vanegas has recently taken on the role of Director of The Center for Housing and Urban Development (CHUD). CHUD has implemented a Colonias Program, which works to reduce the residents' relative isolation from programs and services that could improve their lives. Colonias are unincorporated, rural communities that dot the U.S. border with Mexico. Most lack water and sewers, contain self-built housing, and are challenged by low literacy rates, low incomes, high unemployment, and a high incidence of illness among their residents. The communities typically have no programs for young people or the elderly.

CHUD has worked in 12 colonias to establish Community Resource Centers (CRC) where residents can access health, human services, education, workforce, youth, elderly, and community development programs. It plans to establish a Field Research and Learning Centers to help residents identify, address, and solve community issues through research and outreach and to encourage residents to start and maintain small businesses. CHUD also is studying the use alternative building materials to make homes more affordable.

PRIOR to this appointment Dr Vanegas was Associate Professor and Group Leader in the Construction Engineering and Management (CEM) Program of the School of Civil and Environmental Engineering (CEE) at the Georgia Institute of Technology (Georgia Tech). In recognition of his research and teaching accomplishments, Dr Vanegas has received:

2001 - Society of Hispanic Professional Engineers Educator of the Year Award
1999 - The CoE Fred and Teresa Estrada Young Professorship
1998 - Georgia Tech Outstanding Interdisciplinary Activity Award
1995 - The first Construction Industry Institute (CII) Outstanding Instructor Award
1992 - A National Science Foundation National Young Investigator Award (NSF/NYI)

Dr Carol Boyle BSc(Hon.), MEnvDes., PhD (Engineering), MIPENZ
Director, International Centre for Sustainability Engineering and Research,

Contact information:
Director
International Centre for Sustainability Engineering and Research
Civil and Environmental Engineering
University of Auckland, Private Bag 92019, Auckland, New Zealand 1142
Email: c.boyle@auckland.ac.nz
Phone: 64 9 373 7599 x88210
Fax: 64 9 373 7462

Profile:

Dr Boyle has been working in the field of sustainability engineering for the past nine 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. She and her postgraduate students are currently working with a number of companies including Formway Furniture Ltd., Actronic Ltd. and Fisher&Paykel Ltd. to move their products towards sustainability.

In addition, she is undertaking research with Meridian Energy to develop a sustainable energy strategy for both the company and energy production in New Zealand. Currently she is the Chair of the New Zealand Society for Sustainability Engineering and Science, an IPENZ technical interest group, and is a Board member of Sustainable Aotearoa New Zealand.

Dr Chris Hendrickson, Carnegie Mellon University , Pittsburgh USA

Title: Use of the Economic Input-Output Life-Cycle Assessment Website (www.eiolca.net)

By Chris Hendrickson*, H. Scott Matthews* and Mike Griffin*
*Green Design Institute, Carnegie Mellon University, Pittsburgh, PA 15208, USA

Contact information:
Chris Hendrickson, Duquesne Light Professor of Engineering
Carnegie Mellon University Pittsburgh, PA
Phone: 412-268-1066
Webpage: www.ce.cmu.edu/~cth

Abstract:

The Economic Input-Output Life-Cycle Assessment (EIO-LCA) model developed at Carnegie Mellon provides the capability to evaluate economic and environmental effects across the supply chain for any of 491 industry sectors in the U.S. economy [1, 2]. The EIO-LCA model is in active use at the website www.eiolca.net [3]. Since the website became available in 2000, we have had over one million uses of the model (or over 15,000 per month).

The EIO-LCA model is useful since it can estimate the supply chain use of inputs and resulting environmental outputs across the economy using publicly available data sources from the U.S. government. By integrating economic data on the existing flow of commerce between commodity sectors with environmental data on releases and material flows generated by each sector, it is possible to estimate the additional environmental emissions caused by an increase in production within a particular sector, accounting for the supply chain emissions. In the current model, conventional air emissions, greenhouse gas emissions, net energy (by source) and toxic releases are estimated in addition to economic impacts for any particular purchase. The EIO-LCA approach can be used to avoid some of the system boundary limitations of process LCA by drawing upon data for the entire economy. By combining EIO-LCA analysis with process-based models, the advantages of both approaches can be achieved [2].

The EIO-LCA model has been used in a variety of life cycle analysis studies [2], including appliances, buildings, energy generation and transmission, logistics, motor vehicles, and services. This talk will discuss our approach to combining the input-output results with process models and impact models to obtain hybrid assessments. Some general themes can be identified from our experience in such applications:

- Environmental impacts can occur in any phase of a product or process, so focusing on a single phase such as manufacturing can be misleading.
- New technology can have positive or negative environmental impacts, but a life cycle assessment can help pinpoint opportunities.
- Drawing appropriate analysis boundaries and properly accounting for resources requires considerable care.

Profile:

Dr. Chris Hendrickson is the Duquesne Light Company Professor of Engineering, Co-Director of the Green Design Institute and Director of the Steinbrenner Institute for Environmental Education and Research at Carnegie Mellon University. His research, teaching and consulting are in the general area of engineering planning and management, including design for the environment, system performance, project management, finance and computer applications.

References

1. Lave, L., E. Cobas-Flores, C. Hendrickson, and F. McMichael. 1995. Generalizing Life Cycle Analysis: Using Input–Output Analysis to Estimate Economy-Wide Discharges. Environmental Science & Technology 29(9): 420A–426A.

2. Hendrickson, Chris T., Lester B. Lave, H. Scott Matthews, Arpad Horvath, Satish Joshi, Francis C. McMichael, Heather MacLean, Gyorgyi Cicas, Deanna Matthews and Joule Bergerson, 'Environmental Life Cycle Assessment of Goods and Services: An Input-Output Approach,' Resources for the Future, 2006.

3. Carnegie Mellon University Green Design Institute. (2006) Economic Input-Output Life Cycle Assessment (EIO-LCA) model [Internet], Available from: <http://www.eiolca.net/> [Accessed 11 Sep, 2006]

4. BEA (Bureau of Economic Analysis). 2004. Input–Output Accounts Data. http://www.bea.gov/bea/dn2/i-o_benchmark.htm (accessed June 29, 2004)

Kathryn Maxwell, Ministry for the Environment

Title: Central Government walking the talk on sustainability

Contact information:
Environment House
23 Kate Sheppard Place
Wellington New Zealand
Phone: 0064 4 439 7464
Fax: 0064 4 439 7702
Email address: kathryn.maxwell@mfe.govt.nz

Abstract:
Sustainability seems to be a new mantra popping up everywhere - but what is it? A generally accepted definition says it is "development which meets the needs of the present without compromising the ability of future generations to meet their own needs."

The New Zealand Government has agreed that sustainable development principles should underpin its economic, social and environmental policies - at home, and abroad. It has set up work programmes which contribute to sustainable development. It expects the government agencies that have signed up to the Govt³ programme to set an example and undertake sustainable practices in their own organisations.

The New Zealand Government spends approximately $5 billion on purchasing goods and services, and has extensive impact on the environment, for example its large workforce, its owned and leased buildings, IT, paper usage and vehicle fleet to name a few.

Under the motto 'practice what you preach', the Ministry for the Environment runs the Govt³ programme that helps government agencies become more sustainable.

There are four key topic areas of Govt³, namely buildings, transport (including vehicles), office consumables and equipment, and recycling and waste minimisation. There are also two major cross-cutting themes, sustainable procurement (also known as sustainable purchasing) and energy efficiency.

The Govt³ programme is now moving from the awareness phase into the exciting engagement and action phase. Examples will be provided.

Jim Bradley, Senior Principal with MWH New Zealand Limited

Title: Practical Progress in our New Zealand Journey towards more Sustainable Water and Waste/Wastewater Management

Contact information
Jim Bradley, MWH New Zealand Ltd
Level 2, Building C Millennium Centre, 600 Great South Road, Greenlane
PO Box 12-941, Penrose, AUCKLAND
DDI: (+64 9) 580 4504
Fax: (+64 9) 580 4514
Cell: 027 436 1195
Email: jim.w.bradley@mwhglobal.com
Web: www.mwhglobal.co.nz

Abstract:
New Zealand is progressing with increased enthusiasm and momentum down a sustainable development path in which sustainable water and waste/wastewater management is a key part. Legislation and programmes relating to the management of resources and the environment both at Central and Local Government levels have clearly enshrined in their purpose, that of sustainable development. Many business organisations and individual businesses are similarly adopting and implementing sustainable development principles.

There are many tools for furthering the nation's progress in sustainable development. Fundamental to applying these tools is the further need for "silo linking" and integration of organisations and approaches. There is an increasing number of notable projects that provide sound examples of such linking and integration.

The principles and practices of identifying natural capital and using ecosystem services along with approaches based on resource efficiency are being progressively adopted and integrated into sustainable water and waste/wastewater management. After setting the scene and Identifying a number of the tools, principles and practises, the presentation will feature a selection of water management and water supply projects and waste/wastewater management projects that demonstrate on the ground progress in New Zealand's sustainability journey.

The presentation will also develop links with global progress in some selected water and waste/wastewater management fields and draws some conclusions of how New Zealand measures up at the present time.

Profile:
James (Jim) Bradley is Senior Principal with MWH New Zealand Limited

Jim has a long distinguished professional career in the fields of civil, environmental and public health engineering in New Zealand, particularly active in serving local authority clients. Passionate about sustainable development, Jim has given over 60 national and international papers and presentations, and has participated in a number of national and international advisory groups, technical committees, and industry associations boards.

Jim is a fellow of the Institute of Professional Engineers in New Zealand, a Diplomat of the American Academy of Environmental Engineers, a Life Member of the New Zealand Water and Waste Association and an Honorary Member of the Waste Management Institute of New Zealand. Jim was the inaugural winner of the IPENZ Supreme Technical Award for Engineering Achievers 2004 in the Sustainability and Clean Technology category, and in 2005 was the inaugural winner of the William Pickering Award for Engineering Leadership at the New Zealand Engineering Excellence Awards.

Dr Steve Thompson, Chief Executive, Royal Society of New Zealand

Title: Matching Understanding with Action

Contact information:
Dr. Steve Thompson, Chief Executive,
The Royal Society of New Zealand, PO Box 598, Wellington, NZ
e-mail: steve.thompson@rsnz.org Ph: +64 4 472 7421 DDI: 470-5757
Cell: 021-512-055 Fax: 473 1841
The gateway to New Zealand science: http://www.rsnz.org

Abstract

In the years since the 1972 UN Environment Conference, and the 1987 Brundtland report, billions of words have been written about sustainable development. Here in New Zealand, our own Parliamentary Commissioner for the Environment has written over 70 reports since 1997, and the government has espoused its own action plan for sustainable development.

Yet we remain behind the world in our actions. While "reduce, re-use and re-cycle" are ingrained in several societies (along with the most important "r" – rethink), we have yet to adopt, on any widespread basis, the one tool that is essential for sustainable development: a mechanism for arriving at consensus on what action to take.

This paper proposes a mechanism which brings stakeholder organisations together to build a common understanding on sustainable development, including a common vision and principles. It can lead on to codes of practice or action plans for stakeholders, and policy options for government and for governing bodies of business, education and public interest groups.

Profile:

Dr Steve Thompson is the Chief Executive of the Royal Society for New Zealand with skills in leadership in strategic management, policy formulation, economic, environmental and science analysis, and experience in international work. He has an academic background in agriculture, economics and business and extensive experience in science management. He has an Honours degree in Agricultural Science from the UK, a Masters degree in Economics from Canada and a PhD in Agriculture from the UK. He is also a graduate of Canada's National Defence College and the Queen's University Programme for Public Executives. He is recognized as a team builder with inter-personal skills in facilitation, conflict resolution, research management and motivation.

Prior to his appointment with RSNZ, Steve was Chief Executive Officer with New Zealand's Foundation for Research, Science and Technology New Zealand's main research and technology investment agency, He also held the Chair in Sustainable Development at the University of New Brunswick, Canada, researching sustainable forestry and primary resources, teaching policy and outreach in sustainable development and conflict resolution at the regional, national and international levels.

Steve has held many other roles in Canada including Senior Fellow National Round Table on the Environment and the Economy, Director General of Inspection, with Agriculture Canada, Director General of Research, Agriculture Canada and a Policy Adviser, Agriculture.

Simon Upton, Chair OECD Roundtable for Sustainable Development

Profile:
Simon Upton is a New Zealander who has, since January 2001, been living in Paris from where he chairs the OECD Round Table on Sustainable Development.

In addition to his work at the Round Table, Mr Upton is a board member of the International Research Institute for Climate Prediction at Columbia University, New York, and Chairman of the Independent Assurance Group advising the World Business Council on Sustainable Development's Mobility 2030 project. He was primarily responsible for setting up a ministerial Task Force on Illegal, Unreported and Unregulated Fishing on the High Seas. He has recently joined an Eminent Persons Group on subsidies sponsored by the International Institute for Sustainable Development.

Mr Upton brings an extensive political background to his current role. He was first elected to Parliament in New Zealand in 1981 at the age of 23 representing the National Party, New Zealand's principal party of the centre-right. He became one of New Zealand's youngest Cabinet Ministers in 1990. Between then and 1999 he held a wide variety of portfolios including Environment, Biosecurity, Science & Technology, Health and State Services. Mr Upton was appointed a member of the Privy Council in 2000 and retired from politics at the age of 42 early in 2001.

In his time as New Zealand's Environment Minister, Mr. Upton was responsible for passing two groundbreaking statutory codes, the Resource Management Act 1991 and the Hazardous Substances & New Organisms Act 1996. He became a prominent figure in international environmental negotiations chairing the 1998 meeting of OECD environment ministers and the 7th Session of the Commission of Sustainable Development in 1998-1999. In addition, he played an important role in climate change negotiations between 1994 and 1999. In 1999 the World Economic Forum in Davos named him as the Environment Minister in its annual 'Dream Cabinet'.

Mr. Upton is a Rhodes Scholar who has degrees in English literature, music and law from the University of Auckland and a MLitt in political philosophy from Oxford University. He has been a prolific contributor of papers and articles on a wide variety of science and environment topics and was the first non-scientist to be elected a Fellow of the Royal New Zealand Society in recognition of his contribution to research and science policy in New Zealand.

Dr Jim Salinger, Principal Scientist - Climate, NIWA

Title: Climate Change Facts and Impacts

Contact information:
Dr Jim Salinger, Principal Scientist - Climate
NIWA,, P. O. Box 109 695, Newmarket
Physical: 269 Khyber Pass Road
AUCKLAND, New Zealand
Tel: + 64 9 375 2053, Fax: + 64 9 375 2051, Mob: + 64 27 521 9468
e-mail: j.salinger@niwa.co.nz

Abstract:

There is overwhelming evidence that global climate is warming in the climate system is widespread , that in the second part of the 20th century increasing atmospheric greenhouse gas concentrations are the principal cause, and warming is already causing effects on the planet. The latest evidence shows that temperatures in the second half of the 20th centruy now are the highest they have been in the Northern Hemisphere for at least the last 1000 years. There is abundant evidence of widespread melting of ice in glaciers, ice caps on the sea. As well in the Northern Hemisphere plants and animals are moving towards the poles, with an earlier timing of spring events. Earlier spring planting has occurred of crops, and an increase in high temperature extremes has led to more deaths in Europe and Asia.

Temperatures are expected to continue to increase during the 21st century. Global climate change projections are in the range 2 to 4.5°C by the end of the 21st century, with mid-range projections giving a rise of mean temperatures for New Zealand of about 2°C and fewer frosts. Any warming in the upper range is very likely without precedent during the last 20,000 years. Very heavy rainfall recurrence intervals will decrease, with drought frequency and fire risk increases in eastern New Zealand. Sea level is likely to rise between 9 – 88 cm.

The largest hazard impacts are likely to come from extreme events. Drought affected areas are likely to increase with heavy rainfall, which will increase flood events. Projected climate change is likely to cause mortality of coral reefs, and increase human mortality from heatwaves, floods and droughts. Temperature increases in the upper range are likely to cause dangerous anthropogenic interference with slow down of the thermohaline circulation, melting of ice sheets and broadscale impacts on ecosystems.

Profile:

Jim Salinger's interest in climate matters started early, whilst in the Deep South. It developed further when he built his own climate station in Dunedin, observing the warm nor'westers followed by the cold sou'westers that can blitz the southern provinces. It was put into practice when he expanded into tramping and gardening activities.

A leading climate change expert, he has been involved in researching and monitoring past and current climate trends, as a university climate researcher, and later in the former New Zealand Meteorological Service.

Jim now works as a senior climate scientist preparing climate updates, as well as leading various research projects on New Zealand climate change.

Professor Tord Kjellstrom

Department of Public Health Science, National Institute of Public Health, Ostersund, Sweden,
Health and Environment International Trust,, NZ

Title: Human health: the ultimate bottom line of the triple bottom line of sustainability

Contact information:
Department of Public Health Science, National Institute of Public Health, Ostersund, Sweden, and Health and Environment International Trust, Mapua, New Zealand,
Telephone: +64-3-5403347, Email: kjellstromt@yahoo.com

Abstract:

Sustainability is a truly global concept where the main driving force is the limited natural resources of this planet, which are essential for human life and health. This includes drinking water, clean air, soil for growing food, energy supply, and accessible raw materials for manufacturing of the products humanity is dependent upon. An increasing global population and the dramatic continuing urbanization create new challenges for sustainability of human health. The need to create shelter for billions of people, transport water and food to their dwellings, transport and manage waste, and transport people during their daily chores create additional strains on the environment and energy supply. In addition the modern consumer society has created a plethora of more or less useful products that advertising encourages us to desire and acquire. The use of certain natural and synthetic materials creates serious health hazards which threaten global sustainability. The largest threat so far may well be the looming effects of global warming.

This conference has highlighted a number of threats to sustainability and the solutions that can be provided by appropriate policies, technologies and engineering applications. The three bottom lines of sustainability, environmental, economic and social, have been analysed from a perspective of what engineering and science can contribute to a sustainable world, for us humans and for other species. Our own survival is likely to be the priority of most people, as pointed out in the first principle of the Rio Declaration of 1992: "Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature." Thus, human health is the ultimate bottom line of the triple bottom line. Policies and programs for sustainability need to take this into account and foster technology, engineering and science that protect and improve human health in an equitable manner.

Profile:
Tord Kjellstrom is part-time Professor at the National Institute of Public Health, Stockholm, Sweden. This institute is the agency monitoring the implementation of the 11 broad Swedish national public health goals. It serves as a knowledge centre on public health interventions for the local and regional government agencies in Sweden that have primary responsibility for achieving the public health goals.

In addition, Professor Kjellstrom works as an independent environmental and occupational health consultant for New Zealand government agencies and WHO. He also has affiliations as visiting fellow at the National Centre for Epidemiology and Population Health, Australian National University, Canberra, Australia, Honorary Fellow at the Department of Public Health, Wellington School of Medicine and Health Sciences, New Zealand, and Member of the Board of Directors of the Accident Compensation Corporation, New Zealand.

He has a medical undergraduate degree and Med Dr degree from the Karolinska Institute, Stockholm, Sweden, and a Master of Engineering degree from the Royal Institute of Technology, Stockholm, Sweden. He has worked since 1970 as a teacher and researcher in Epidemiology, Environmental Health and Occupational Health primarily in Sweden, New Zealand and Australia. He has published more than 300 reports on different topics in his fields, most recently focussing on health aspects of air pollution, climate change, transport and urbanization. From 1985 to 1997 he worked at the World Health Organization, Geneva, first as environmental epidemiologist and later as Director of Global and Integrated Environmental Health.

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AUTHOR: Elizabeth Ampt

Presenter: Liz Ampt

Title: The Role of Behaviour Change in Reducing CO_2 Emissions

Contact Information:
Liz Ampt Director, Behavioural Change
Sinclair Knight Mertz, 33 King William Street, Adelaide, SA 5000 Australia
Tel: +61 8 8424 3875; Fax: +61 8 8424 3810; Mobile: +61 438 554 197
Email: lampt@skm.com.au

Abstract:
This paper describes approaches to reducing energy use in transport, energy, water and waste. The differences between supply and demand management are clearly articulated and it is argued that the increasingly widely used method called 'behaviour change' is a separate approach. Furthermore the two different ways of implementing behaviour change projects are described – one top down (social marketing), and the other bottom up (an individual community development approach).

The community development approach is then described in detail showing how (particularly in transport, it focuses on the individual and household helping themselves to bring about changes that they want (ranging from saving time and money, through to keeping their children safe, getting to know people in the community, and even losing weight)! In achieving these goals, people and communities often also reduce kilometres and greenhouse gases.

Some of the most valuable outcomes of bottom-up approaches are the unexpected benefits. These range from building a community building a playground, to the creation of artworks, to the opening of a medical centre. The paper then puts these into perspective and describes why, although the exact outcome cannot be predicted, it is not unusual that a community of people that are able to shape their own lives are also likely to create a new environment for themselves and others.

Finally it is shown how one component of the community development approach (teaching people to deal with similar issues in the future) will become increasingly relevant in the areas of emissions reduction in water, energy and waste – as well as in transport.

* Written while at Steer Davies Gleave, Adelaide

AUTHOR: Dr Anthony Bellvé[1]

Co-authors: Geoffrey Austin[1,3] Bill Woods[1,4]

Presenter: Dr Anthony Bellvé

Title: Pathway to Energy Generation from Marine Tidal Currents in New Zealand's Kaipara Harbour

Contact Information:
Dr. Anthony R. Bellvé, Crest Energy Limited, P.O. Box 38889, Howick, Auckland.
Tel: 021 671-681, Email a.bellve@crest-energy.com 1. Crest Energy Kaipara Limited,
3. Department of Physics, University of Auckland, 4. Team Power. Auckland, New Zealand

Abstract:

Crest Energy Limited plans to generate, subject to acquisition of Resource Consents, ~200 MW of electricity from flood and ebb tidal currents in the Kaipara Harbour, Auckland, New Zealand, by submerging some 200 marine turbines into an 18-km^2 area of the harbour's entrance channel. Tides generated by the sun, earth and the moon's gravity are predictable for centuries and therefore effectively ensure an infinite supply of sustainable energy. The Kaipara Harbour's tidal currents flow four times daily, exchanging at each spring flood or ebb movement a tidal prism of ~1,990 million cubic meters at velocities of <2.4 meters per second. It is anticipated, given the available currents, that each turbine will generate ~1.2 MW [peak]. Energy produced is to provide substantial generation north of Auckland's isthmus, and thereby improve diversity and security of supply to the Auckland and Northland regions.

Turbines mounted on gravity-based foundations are to be located strategically throughout the harbour's channel. The size and position of individual turbines will be optimized for power output, based on the harbour's bathymetry and currents. The turbines, linked in arrays of around 30 units, will generate direct current (DC) for transmission via two buried, sub sea cables to a substation located adjacent to the Hoteo River in the harbour's eastern catchments. The high voltage DC power is to be converted at the substation to high voltage alternating current (HVAC). The latter is to be transformed commensurately to match the existing 33-, 110- or 220-kV transmission systems for distribution through the networks. The design of the marine turbine arrays and the transmission cables engage ecological principles, to mitigate effects on environmentally-sensitive areas of the harbour's channels and estuaries. The "Assessment of Environmental Effects and Resource Consent Applications" were lodged in July, and supplemental information in November, 2006, with the Northland Regional Council, Auckland Regional Council and Rodney District Council, for purposes of the Resource Management Act and consultation with Tangata Whenua and other interested parties.

AUTHOR: **Ian K. G. Boothroyd, Director,** BSc(Hons), MSc, DPhil, MBA, MIBIOL, CBIOL, MRSNZ

Co-authors: **Ms Maree Drury** BSc(Hons), MSc

Presenter: **Dr Ian Boothroyd**

Title: **Sustainable Resource Management: A Pressure-State-Response Framework for Sustainability in the Urban Environment**

Contact information:
Kingett Mitchell Ltd, P. O. Box 33-849, Takapuna, Auckland; and School of Geography, Geology and Environmental Science, University of Auckland, P. O. Box 92019, Auckland, New Zealand.
Telephone: ++64 9 486 8068 Fax: ++64 9 486 8072

Abstract:
The majority of New Zealanders live in urban environments, and national and regional community surveys have shown that improving the state of our urban waterways and environment are high priorities.

An understanding of the real and perceived driving forces and pressures contributing to the sustainability of the natural resources of urban (including peri-urban) environments and the real and perceived human, social (including cultural) and economic contexts are critical to achieving sustainability. The effectiveness of achieving a balanced human-ecosystem relationship can be explored through frameworks such as the Pressure-State-Response (PSR) framework and the application of management tools such as integrated catchment management.

The Ministry for the Environment have adopted the OECD's stress-response (PSR) framework approach to measuring sustainability. The PSR model is based on the concept of causality; human activities exert pressures on the environment, altering the quality and quantity of environmental resources that lead to responses in human behaviour. Using case studies from Auckland we will present a model of sustainability applied to urban stream environments that aims to identify what attributes are likely to contribute to the advancement of sustainability in urban environments. We will present the results of a study using the PSR framework and indicate how the results can be applied. Limitations of the PSR framework will also be highlighted along with progress towards a greater socio-ecological integration.

AUTHOR: **Ms Nicola Bould** BA(Hons) (UK),

Presenter: Nicola Bould

Title: **Sustainable Design Education: Students Take Charge of Creating a Clean, Green University**

Contact Information:
A:Design Studies | University of Otago | PO Box 56 | Dunedin | NZ
p: 64 3 472 8947 | f: 64 3 479 3066 | e: nicola@design.otago.ac.nz

Abstract:
The word 'sustainable' in product design is frequently misused or tagged onto products as an afterthought. Yet there is strong research to support the argument that with today's expanding landfills, depleting oil reserves and massive changes to our environment it is necessary to design responsibly to ensure the future of our planet.

Since March 2006 these sustainable beliefs have been used to provoke design students at the University of Otago in New Zealand to question their surroundings. The students were given the task to investigate environmental problems, analyse the results and take charge of designing their own clean, green university.

This paper considers the design process these students experienced, the success of their designed outcomes and whether this project has had a positive affect on their awareness of environmental issues. The student project is part of a deeper research to understand and improve sustainable product design education. It has been encouraged by the work of Charter, Tischner, Datschefski, McDonough and Braungart (to name a few), who have proved that creative solutions to sustainable product design are viable. The goal of this research is to develop a methodology for facilitating social responsibility for future product designers. Getting it right in tertiary education may help to accelerate societal change and educate our future leaders, building a culture of people who are responsible for their actions, who care about their neighbours and their environment. Ultimately this will help build inclusive and sustainable communities.

AUTHOR: **Dr Jo-Anne E Cavanagh[1],** Researcher, BSc, BSc(Hons), PhD

Co-Authors: **Dr Bob Frame[1],** Science Leader, BSc, PhD
Mr Michael Fraser[2], Senior Lecturer, BSc BCA(Hons)
Mr Jeremy Gabe[1], Researcher, BScE(Civil, Env), MAS

Presenter: Jo Cavanagh

Title: **Experiences of Applying a Sustainability Assessment Model**

Contact information:
[1]Landcare Research, Private Bag 40, Lincoln 7640, NZ. Ph: +64 3 321 9999
[2]Victoria University, PO Box 600 Wellington 6140, NZ. Ph: +64 4 472 1000
Emails: cavanaghj@landcareresearch.co.nz, frameb@landcareresearch.co.nz, Michael.fraser@vuw.ac.nz, gabej@landcareresearch.co.nz

Abstract:
A key challenge in moving towards a more sustainable future is adequately embedding sustainability principles into organisational decision-making. The Sustainability Assessment Model (SAM) is put forward as one option to highlight and assess sustainability principles within various project decisions. Developed originally in the UK, SAM is a Full Cost Accounting tool designed to graphically display the monetised costs and benefits of externalities arising from the social, environmental, resource and economic implications of a project – where a "project" consists of any economic activity for which a scope can be defined and acceptable boundaries laid (e.g. development of an oil and gas field or waste disposal). The primary intention of SAM is to engage a broader range of stakeholders, to generate dialogue around indirect impacts of a given project, in turn facilitating broader consideration of options and in doing so achieve greater sustainability for that project.

This paper discusses the experiences gained through the application of SAM in urban case studies in New Zealand, including assessment of different waste management options, housing and transport projects. In particular, a number of challenges were faced in undertaking the assessments, these include; establishing appropriate boundaries for assessment, data limitations, differing levels of engagement achieved with different stakeholders, and the relationship of SAM to more conventional assessments (including cost-benefit analysis and triple bottom line reporting). Some of these challenges are likely to be applicable to any approach that aims to embed sustainability into organisational decision-making.

AUTHOR: Lauren Christie

Co-authors: Albrecht Stoecklein
Roman Jaques

Presenter: Roman Jaques

Title: The Eco-Design Advisor: an Independent Resource for the Building Industry

Contact Information:
BRANZ Ltd, Private Bag 50 908, Moonshine Road, Judgeford, Porirua City, NZ
Phone: +64 4 237 1170, Fax: +64 4 237 1171.
Emails:LaurenChristie@branz.co.nz,AlbrechtStoecklein@branz.co.nz, RomanJaques@branz.co.nz.

Abstract:
The Eco Design Advisor (EDA) is a project currently being trialled by BRANZ Ltd with funding and support from Building Research, the Foundation for Research, Science and Technology (FRST), local government (Waitakere City, Hamilton City and Kapiti Coast District Councils), and the Ministry for the Environment (MfE). The EDA operates from council, providing free, easily accessible, personalised and independent information on any environmental design issue to both homeowners and designers/tradespeople. The three primary functions the EDA fulfils are:

1. A free supply of information
2. Facilitation between client, designer and tradespeople
3. Networking between stakeholders and sustainability resources.

The EDA program was designed to address the three main obstacles of sustainable design which previous research identified. These were: that there is no stage at which the home owner is directly prompted to make decisions regarding sustainability; that there is a lack of specific technical information and advice; and finally, there is a lack of industry expertise combined with a general reluctance to implement sustainability features.

An important part of this project is to assess through surveys the attitudinal and behavioural impact on designers and tradespeople, and hence any on-rolling benefits of the EDA project. Evaluation surveys will be conducted with homeowners, designers, tradespeople and council members in order to assess the success of this project and how it could be improved for future use past the 10-month pilot initiative. The results will assess the success and viability of this programme in terms of its value and effectiveness as a tool for the building industry. This paper outlines the research leading to the development of the scheme, the implementation of it and the methodology of analysing its effectiveness.

AUTHOR: Caleb Clarke

Presenter: Caleb Clark

Title: GIS and Ecosystem Management Tools – a Process for Sustainable Development on Great Barrier Island.

Contact information:
Morphum Environmental Ltd
P.O. Box 99641 Newmarket, Auckland NZ
Em: caleb@morphum.com Ph: 021 423371

Abstract:
Great Barrier Island has a rich set of natural resources. Human activities have modified the land; however the life supporting capacity of the islands ecosystems, and the abundance and biodiversity of the native fauna and flora remains great. A majority of the Island remains in conservation estate. Conservation imperatives, a rigorous planning context and significant technical issues for development provide a complex set of constraints to consider for the planning of sustainable land use. In order to proceed, development needs to work within these constraints to fit the land.

This paper describes a case study where geographic information systems and an ecosystem management approach are used to record, manage and present information regarding natural values and constraints for large scale private development on Great Barrier Island.

Modelling and matrix analysis tools are then used to establish the most suitable locations and best options for land use. This allows the production of land management plans that optimise the trade-offs between the capacity of the land to support plants and wildlife, and human development objectives. These plans transparently display a robust decision-making process, and ultimately offer a pattern to work towards more sustainable development on a local scale.

AUTHOR: **Alec Couchman,** B.Arch,ARCUK,ANZIA,GBCA, Green Star AP

Presenter: **Alec Couchman**

Title: **A new ERA in Architecture. Environmentally Restorative Architecture in the 21st Century."**

Contact information:
Warren and Mahoney Limited
201 Victoria Street West, PO Box 91517, Auckland 1010
T: +64 (9) 916 5040, F: +64 (9) 309 2671
M: +64 (27) 529 9698, Email: alec.couchman@wam.co.nz
www.warrenandmahoney.com

Abstract:

Climate change is a reality. However you analyse the numbers or debate the reasons, global warming is happening and is happening faster than previously thought, and the impact of humans is part, if not wholly responsible. Allied to this is the universal human need for shelter. This means the production of the built environment will continue to be a factor in global warming. Accordingly, we at WAM no longer believe buildings should be, or can afford to be, sustainable. They should be restorative *and* architecture. That is, buildings should generate more energy than they produce or that was required to produce the elements that made up the building itself. That over the lifetime of the building (say 50 years) the building will have a nett positive energy production and will have processed all air, water and waste on site prior to discharging it beyond its boundary.

Maintaining the status quo or even reducing our impact in the face of third world population growth and first world economic imperatives will not suffice. Environmentally Restorative Architecture (ERA) will allow all countries to reduce their carbon output, improve the health of our people and ultimately our cities, reduce the need for oil based fuels and give the next generation a clear sense of hope. We would also argue that there are strong economic arguments in favour of this approach that will generate wealth and employment for all people employed in the construction industry.

As Peter Cox of Exeter University said, "We are like alcoholics who have got as far as admitting there is a problem. It is a start. Now we have got to start drying out. Or, put another way, the worlds' liver needs a break."

AUTHOR: **Dr Heather Cruickshank,** PhD (CANTAB) BEng BSc CEng MICE MCIWEM

Presenter: Dr Heather Cruickshank

Title: **Engineering Education: Embedding Sustainable Development Concepts into an Established Curriculum**

Contact Information:
Department of Engineering, Centre for Sustainable Development,
University of Cambridge, Trumpington Street, Cambridge, CB2 1PZ, UK.
tel: +44(0)1223 766685 fax: +44(0)1223 765625 hjc34@cam.ac.uk

Abstract:

Cambridge University Engineering Department began a concerted effort to introduce sustainable development concepts into undergraduate teaching in 1999. Importantly, it has been recognised that the most effective way of incorporating sustainable development concepts is by embedding the material into existing technical courses. To achieve this requires commitment of teaching staff in response to a range of internal and external drivers for change. During this time, to facilitate the spread of sustainable development concepts into engineering CUED has founded a Centre for Sustainable Development that contributes to teaching and research and has built on experience in undergraduate courses to establish a post-graduate course where practising engineers with experience can further specialise in the application of sustainable development concepts. It has been found that to deliver meaningful content regarding sustainable development to these two groups has necessitated the use of a range of delivery methods.

Applying the concepts of sustainable development to engineering subjects requires the external and societal context of engineering to be addressed and it provides the opportunity to develop professional skills and attitudes through systems thinking, which is so central to projects that contribute to sustainable development. In particular, the external focus that requires a wide spatial perspective when it addresses issues of global concern, and the longer temporal perspective necessitated by considering issues of inter-generational equity and the needs of future generations can be explored and provide a context when teaching the principles of engineering science. This paper explores the process by which previous teaching of engineering science has been developed to increase both the effectiveness and the scope of integration of sustainable development and associated transferable skills into the wider engineering curriculum at the University of Cambridge. This includes the engagement of teaching staff and methods to facilitate sharing of teaching material.

AUTHOR: **Dr Heather Cruickshank** PhD (CANTAB) BEng BSc CEng MICE MCIWEM

Presenter: **Dr Heather Cruickshank**

Title: **Application of Sustainable Development Concepts in Backbone Infrastructure Provision**

Contact Information:
Dr Heather J Cruickshank PhD (CANTAB) BEng BSc CEng MICE MCIWEM
Department of Engineering, Centre for Sustainable Development,
University of Cambridge, Trumpington Street, Cambridge, CB2 1PZ, UK.
tel: +44(0)1223 766685 fax: +44(0)1223 765625 hjc34@cam.ac.uk

Abstract:

This paper explores the necessity to include sustainable development concepts into the fundamental decisions associated with provision of 'backbone infrastructure' in fragile states, post-conflict nations, and poor countries, particularly during the limited period of trans-national interest when international aid is available. It addresses the opportunities that can result from this aid intervention in terms of future development of the host country. Building human capacity, and improving environmental protection can be direct effects of aid intervention that is manifest through engineering projects, but can only be achieved if the initial projects are executed in an appropriate manner, with an emphasis on application of sustainable development concepts.

Sustainable development requires consideration of systems that interact in a complex way. Consideration of these systems, with regard to the provision of infrastructure for the built environment requires engineers to embrace a range of additional skills beyond the engineering science they have traditionally relied upon to solve engineering problems. Regarding sustainable development as a route towards the ultimate goal of global sustainability, this paper explores some of the perceptions of what development means and the context in which we now operate.

This paper examines how decisions are made, by whom, and in what context. It draws on field research and recommends expanding the solution space open to engineers. To facilitate this broader decision-making requirement, it provides a framework to assist engineers in arriving at a suitable solution. Using eight key criteria of sustainable development to analyse developments, conclusions are drawn regarding the enabling mechanisms required to allow the concepts of sustainable development to be incorporated into practical engineering.

AUTHOR: Grant Curtin

Co-Author: Hitesh Patel

Presenter: Grant Curtin

Title: Tools for Sustainable Best-Practice Energy Management

Contact information:
EnergyPro Solutions Limited
PO Box 26 693, Epsom, Auckland 1003, New Zealand
Ph: +64 9 623 0547 Fax: +64 9 623 0527
Email:grantc@energypro.co.nz (presenter)
Email:hitesh@energypro.co.nz

Abstract:
Sustainable development requires long-term resource management coupled with the efficient use of existing assets. To achieve energy sustainability, organisations need to efficiently track energy consumption and be able to audit and analyse the information to identify and implement opportunities for efficiency improvements.

Accurate models and tools to implement best practice processes and systems to facilitate energy management have been developed over the past 16 years in collaboration with corporate and local government organisations, This paper discusses the models and tools, outlining their applicability and discussing the success of implementing enterprise-wide sustainable energy management.

AUTHOR: Professor Cliff Davidson

Co-authors: Chris T. Hendrickson, H. Scott Matthews

Title: Graduate Courses in Sustainable Engineering: The Carnegie Mellon Experience

Contact Information:
[1]Department of Civil and Environmental Engineering
[2]Department of Engineering and Public Policy,
Carnegie Mellon University, Pittsburgh, PA, USA 15213

Abstract:
The Center for Sustainable Engineering (CSE) is a three-institution consortium consisting of Carnegie Mellon University, the University of Texas at Austin, and Arizona State University. The CSE is supported by the U.S. National Science Foundation and the U.S. Environmental Protection Agency. The goal of the Center is to develop and implement activities to enhance education in Sustainable Engineering (SE) at colleges and universities around the world. One of these activities is to conduct workshops to assist faculty members in incorporating SE concepts, examples, and case studies into their courses. The workshops also serve to develop a community of engineering educators who can share their ideas and educational materials on SE.

The first two workshops of the CSE were held in July 2006 at Carnegie Mellon. Attending the workshops were over 60 faculty members from institutions throughout the U.S. and Canada, plus several additional faculty members and graduate students from the CSE member institutions. The workshops consisted of plenary sessions on key concepts in SE, plenary sessions on pedagogy related to SE, and breakout groups in the following topical areas: Energy, Industrial Ecology, Green Buildings, Materials and Manufacturing, and Water Resources. These topics were selected based on the indicated interests of faculty attending the workshops.

Discussions at the workshops indicate that there are a number of challenges to widespread implementation of SE education as part of engineering curricula. The challenges will be considered at upcoming CSE workshops in 2007 to be held at the University of Texas at Austin.

AUTHOR: Ms. Catherine J. DiBlasi[1],

Co-authors: Dr. Neely Law[2]
Dr. Upal Ghosh, Assistant Professor[1],

Presenter: Catherine J. DiBlasi

Title: Implementing a Sustainable Storm Water Management Program in an Urban Center - Baltimore, Maryland

Contact Information:
*[1]University of Maryland, Baltimore County, Civil & Environmental Engineering, 1000 Hilltop Circle, Baltimore, Maryland 21250. *cath3@umbc.edu, 443-802-7966.*
[2]Center for Watershed Protection, 8390 Main Street, Ellicott City, Maryland 21043. Ph: 1-410-461-8323 Fax: 1-410-461-8324

Abstract:
In the Chesapeake Bay, eutrophication resulting from excess nutrient loading is the main cause of poor water quality and aquatic habitat loss. Major sources of nutrients to the Chesapeake Bay include agricultural runoff, wastewater treatment plants and stormwater, specifically urban stormwater, which is the focus of this research. Although reducing nutrient loads is a priority, stormwater management practices in an urban center also have the potential to improve public health and quality of life in local communities. To achieve these goals, municipalities must adopt a holistic approach to stormwater management, which includes extensive public education and outreach. Municipalities also need the knowledge to select sustainable management practices with consideration for environmental, social and economic concerns. Two specific practices, which have the potential to positively impact both urban stormwater quality and public health and attitude are street sweeping and storm drain cleanouts. These practices are already implemented over a large footprint of Baltimore, Maryland and this research aims to determine how to maximize their effectiveness. Performance of these two practices is being examined through a collaborative research effort involving a literature review, a multi-state municipal survey, and an intensive field monitoring program in southwest Baltimore City.

The field monitoring component focuses on nutrient and sediment loads in stormwater, and will result in improved estimates of the potential pollutant reductions possible through street sweeping and storm drain cleanout. In addition to examining water quality changes, public health effects of these practices will be investigated through a risk assessment for contaminants found in particulate matter collected from street surfaces. Results of this research will enable municipalities within the Chesapeake Bay watershed to make stormwater management decisions, which reduce nutrient inputs and simultaneously improve quality of life in urban communities.

AUTHOR: Vince Dravitzki

Co-Authors: Tiffany Lester

Presenter: Vince Dravitzki

Title: Economics Drove Our First Sustainable Urban Transport System and the Unsustainable One That Followed

Contact information:
Opus International Consultants, Central Laboratories
PO Box 30-845, Lower Hutt
Email: vince.dravitzki@opus.co.nz

Abstract:
Typically New Zealanders look to learn from experience in other countries but then need to assess whether those situations are applicable to New Zealand. This Paper instead looks to New Zealand's own past experiences for circumstances that have influenced the success and sustainability of public or private transport systems. While the Paper draws on historical data the Paper is not intended as a comprehensive history of transport in New Zealand. Rather the Paper reviews the eras in which different forms of transport were dominant, highlights a number of the economic issues influencing transport behaviour, illustrates that people's transport behaviour in New Zealand has been economic rather than emotive, and concludes that if we want behaviours in transport that are sustainable then we need the economic settings to direct this type of behaviour.

This Paper divides the period 1900-2005 into four key phases of urban transport in New Zealand cities, showing the key role of economics in first supporting sustainable forms of urban transport, then the role of economics in driving and reinforcing the shift to unsustainable forms.

AUTHOR: **Stephen Drew**, BSc (Hons), MIChemE

Presenter: **Stephen Drew**

Title: **Less Talking and More Walking down the Energy Efficiency Road - the Journey has Begun.**

Contact Information:
Strata Energy Consulting, P O Box 12332 Thorndon Wellington
Ph: +64 4-471 0312, Mobile: +64 21 634 880, Em: stephen.drew@strataenergy.co.nz

Abstract:
A recent journey down Energy Efficiency Road started for one large New Zealand industrial corporate in 2002 driven by the need to build-up their international competitiveness. Now in 2006, the Fonterra Energy Reduction Project has moved on to all 23 dairy manufacturing sites in New Zealand. This ambitious energy efficiency journey has seen some solutions being implemented, which are among the best examples of sustainability engineering in New Zealand. A number of lessons have been learnt along the way that should make the start of similar journeys easier for other industries. However, taking the next steps from walking to running will see the urgent up-skilling of engineers along with the recognition of the value of engineering energy management specialists in their respective technical areas. Underpinning new tools will be the approach to "Best Practice" and bringing all industrial sites up to world standards to set a platform for investment in energy saving projects.

New tools in Monitoring and Targeting will be needed - monitoring is relatively easy, it is the targeting that needs innovation and work going forward. New thinking is also needed to make the capital investment projects happen as part of Business-as-Usual. Plants should be designed to minimise life-cycle costs and they will be far more energy efficient, easier to operate and more sustainable to the environment. Continuous investment will be needed to keep up with the rest of the world. It is anticipated that sustainability engineering will take the journey on to the larger proportion of medium-sized industrial sites in New Zealand. It is a journey that will never be completed as technology continuously improves. New Zealand is now at cross-roads in terms of how fast it can make progress.

AUTHOR: **Dan Ducker,** BSc, Dip Eng (University of Auckland)

Co-authors: Dr Carol Boyle

Presenter: Dan Ducker

Title: A Framework for Integrated Assessment of POPs Destruction Technology

Contact information:
International Centre for Sustainability Engineering & Research
Department of Civil & Environmental Engineering
Faculty of Engineering. University of Auckland
Email: d.ducker@auckland.ac.nz

Abstract:
Managing Persistent Organic Pollutant (POP) waste is a dirty business. In countries presently lacking sufficient treatment capacity, the decision to commission new hazardous waste destruction facilities is fraught with difficulty. Such decisions require the consideration of environmental, socio-technical, and economic components, most of which carry significant uncertainty. Vastly differing perspectives from a multitude of stakeholders often mean consensus forming on any single technology/strategy is unlikely. Institutional decision makers require a robust, transparent process, however, to date the literature has been lacking in this area.

This paper seeks to partially fill the gap by providing a framework for an integrated assessment of POPs destruction technologies. Initially the problem is structured through identification of problem dimensions, social circumstances and cognitive factors. Next, a systematic examination of prerequisites is undertaken and appropriate tools are determined to meet these requirements. Finally, the necessary tools are amalgamated into a unified framework which may be developed further to encapsulate other hazardous waste streams

AUTHOR: **John Duder**[1] BE, FIPENZ

Co-authors: **Lesley Jenkins**[2] BSc, MRRP, DipGrad (Mgmt) MNZPI

Presenter: John Duder

Title: Devonport: A Sustainable Community?

Contact information:
[1]Deputy Chair, Devonport Community Board
[2]Strategic Development Manager, North Shore City Council
Em: jduder@tonkin.co.nz

Abstract:
North Shore City is developing a strong environmental and sustainability ethic and is progressing a number of initiatives to minimise waste, reduce pollution of coastal waters, encourage greener transport, and generally raise public awareness and participation in sustainability.

Examples are given as implemented, and in some cases initiated, in Devonport, including resource recycling; arterial and green cycle routes; upgrading stormwater and sewerage systems and introducing holding facilities for the benefit of downstream communities; walking school buses; encouraging ferry transport; community initiative in ensuring ex-Navy land was returned to open public space, and a strong focus on heritage preservation with its implicit emphasis on conservation of resources.

These initiatives reflect the four well-beings, namely environment, economic, social and cultural, as espoused in the Local Government Act 2002.

AUTHOR: **Kel Dummett,** DipT; BSc; MEnvEd; PhD (pending)

Presenter: Kel Dummett

Title: **Designing for a Sustainable Future: Partnerships to Sustainability**

Contact information:
Project Manager, Sustainable Design, Sustainability Victoria
T: 03 8626 8729| F: 03 9663 1007 | Level 28, the Urban Workshop, 50 Lonsdale Street, Melbourne 3000.
Website: www.sustainability.vic.gov.au
Em Kel.Dummett@sustainability.vic.gov.au

Abstract:

Many environmental economists have written of the environmental harm caused by products. Most of the world's environmental problems can be traced back to the impacts from one or more stages of a product's life cycle, and importantly, most of a product's environmental impacts are locked in at the design stage. For this reason, minimising or eliminating environmental impacts must be a core consideration for all product designers and manufacturers.

This paper gives an overview of Sustainability Victoria's Design for Sustainability program and focuses on the core component of the program, the Design for Sustainability Partnership, which is a unique collaboration between government, the design community, private enterprise and academia, and which has developed initiatives to progress the mainstreaming of Design for Sustainability.

AUTHOR: **Andrew Duncan,** B.Eng(Hons) M.Eng MIPENZ CPEng IntPE

Presenter: Andrew Duncan

Title: **Solar design tools for sustainable residential land development**

Contact information:
Tel: +64 6 3708175

Abstract:
As New Zealand's natural gas reserves decline and electricity demand growth exceeds the building of new generation plants, greater focus needs to be applied to energy efficient design in domestic buildings and land developments. As society evolves, so too should our understanding of what helps form safe, healthy communities: this should be reflected in the way we design the places that we live in.

A case study of residential land development was analysed in terms of its potential for energy efficiency gains and optimisation of solar resources. A design tool was developed to assess the solar energy loss of a specific building site due to existing land features. 'Solar obstruction contours' were produced that define the maximum permissible height of obstructions before solar shading occurs. These contours were produced based on a minimum percentage solar energy capture. Thermal energy demand for the development case study was calculated by specification of a Building Performance Index (BPI) relative to floor area. The demand was then balanced against on-site thermal energy production from biomass to give a percentage of thermal energy self-sufficiency.

The tools developed can be used to optimise the design of a residential land development resulting in an increase in renewable energy use above that of standard residential developments. The study concluded that incorporation of the tools as standard practice by municipalities is viable, and if implemented would increase the energy efficiency and renewable energy use of the New Zealand housing stock.

AUTHOR: **Lois Easton**[1], MSc (Hons)

Co-author: **Nick Collins**[2], MA, MBA

Presenter: **Lois Easton**

Title: **Beacon's High Standard of Sustainability – implications for the sustainable development of the residential built environment**

Contact information:
[1] Policy and Regulatory Research Team Leader.
[2]General Manager Beacon Pathway Limited, PO Box 11 338, Ellerslie, Auckland
Telephone: +64 9 846 9446
Email: loise@beaconpathway.co.nz

Abstract:
The sustainability of the residential built environment is an important issue for New Zealand, as much of the energy and water consumed and waste produced in the country occurs in people's homes. Similarly the health of the indoor environment within homes has a significant impact on the overall health of the community, particularly as relates to respiratory conditions. Beacon, a FRST funded research consortium, aims to see the majority of New Zealand homes achieve a high standard of sustainability by 2012. Beacon has developed benchmarks for energy and water consumption and checklists for waste, indoor environment quality and materials used in house construction, which define Beacon's high standard of sustainability.

These benchmarks and measures represent a "line in the sand" against which the sustainability of New Zealand's homes can be measured and for which retrofit packages for existing homes, and standard methodologies for design of new homes can be developed. In the case of the energy and water measures they also create the opportunity for individual households to consider their own sustainability against and for the ongoing measurement of the sustainability of the residential built environment.

AUTHOR: Kirsten K. Finnis[1]

Co-author: D. Walton[1,2]

Presenter: Darren Walton

Title: Field Observations of Factors Influencing Walking Speeds

Contact information:
1. Opus International Consultants, PO Box 30845, Lower Hutt, New Zealand
2. University of Canterbury, Private Bag 4800, Christchurch, New Zealand

Abstract:

This study measures pedestrian walking speeds in New Zealand to estimate the influences of mean walking speeds as these concern urban planning and pedestrian facility design. Research was conducted using field observations of walking speeds under different conditions: gradient and urban/rural townships.

The data show complex interrelationships between environment, personal characteristics of pedestrian and physical factors. Mean walking speeds between 70-95 m/min are observed. These results do not support the ideal that walking speeds are indicative of pace of life. Rather, walking speeds are proposed to be an indicator of the environment's "walkability" as walking speeds that closely reflect that of the mean population are key to the successful design of pedestrian facilities.

AUTHOR: Gayathri Babarenda Gamage[1], PhD Candidate

Co-author: Dr Carol Boyle[2]

Presenter: Gaya Gamage

Title: Sustainability through Risk Assessment: A Case Study of Resource Risk

Contact information:
[1]Formway Furniture Ltd. 176 Gracefield Road, Lower Hutt, Wellington, NZ
Email: gayag@formway.com, Ph: 04 568 1835 or 021 167 6618 Fax: 04 568 1195
[2]International Centre for Sustainability Engineering and Research,
University of Auckland, Department of Civil and Environmental Engineering,
20 Symonds Street, Auckland, NZ., Ph: 09 373 7599 ext. 88210, Fax: 09 373 7462
Em: c.boyle@auckland.ac.nz

Abstract:

In the past, and indeed the present, it has been difficult to operationalise sustainability since it is reasonably difficult to determine if in fact a system is functioning 'sustainably'. Literature shows that preventing unsustainability through focussing on sustainability as a concept is difficult because the only indication that the system is not sustainable is through failure. One way to overcome this is to determine when and how the system in question would become unsustainable thereby ultimately leading to failure. Assuming that any action that prevents the continued function of the system is unsustainable, appropriate actions can be taken to prevent failure. Hence we are essentially dealing with risk to the system and the management of this risk.

This paper looks at some of the significant material resources in the manufacture of Formway Furniture's office furniture and evaluates the risk posed through them to continued manufacture and hence survival of the particular product. Life Cycle Assessment (LCA) previously carried out on Formway Furniture products; MCC and Grid 2 screens, helped determine significant material resources of each product. The resources include aluminium and steel sourced within New Zealand and internationally. The study evaluates the risk to the system through these resources as a first step in managing the short, medium and long term adverse consequences for the product manufacture and hence to the company itself. The development of a risk matrix for aluminium and steel will help prioritise the risks, which can then assist in their management. Thus the research attempts to show that risk and the management of risk is an integral, if not inherent, part of sustainable development.

AUTHOR: A. Idil Gaziulusoy[1] Ph.D. Candidate

Co-author: Dr Carol Boyle[2]

Presenter Idil Gaziulusoy

Title: A Conceptual Systemic Framework Proposal for Sustainable Technology Development: Incorporating Future Studies within a Co-Evolutionary Approach

Contact information:
1.Fisher & Paykel Appliances, Ph: +64 9 2730600 (ext. 7967) Em: a.idil.gaziulusoy@fp.co.nz
[2]International Centre for Sustainability Engineering and Research,
University of Auckland, Department of Civil and Environmental Engineering,

Abstract:

This article explores the role of future studies in developing sustainable technologies within a co-evolutionary context. In the first section it clarifies briefly the definition of sustainable development, complexity and co-evolution, in order to establish the frame within which the theoretical exploration will be carried out. The second section provides information about characteristics of sustainable technology development, which requires a radical shift from the current technological paradigm. Other types of innovations in institutional, social and organisational domains, which co-exist with or precede technological innovations, and influence of these on sustainable technology development, are clarified also in this section. The third section reveals the relationship between technology development and future studies. This relationship is projected onto sustainable technology development and the need for radical innovations. Foresighting-backcasting approach is presented as a meta-tool to facilitate the co-evolutionary innovation by allowing a non-reductionist systems approach possible towards development of sustainable technologies. It is concluded that, within the co-evolutionary innovation framework, planning for governance and policy development should have the longest time span and largest operational context in order to link all types of innovations to each other and render radical technological change possible.

AUTHOR: Dr Sumita Ghosh[1]

Co-Authors: Dr Robert Vale[2]

Presenter: Dr Sumita Ghosh

Title: Is Policy Leading to Improved Sustainability at the Local Urban Scale?

Contact information:
[1]Landcare Research, 231 Morrin Road, Tamaki
Auckland, New Zealand. DDI: 64 9 574 4126
Email: GhoshS@landcareresearch.co.nz
[2]DDI: + 64 9 574 4167 or + 64- 9- 373 7599 ext 88583, Fax: 64 9 574 4101
Email: valer@landcareresearch.co.nz or r.vale@auckland.ac.nz

Abstract:

In New Zealand, urban growth strategies and environmental policies at national and regional levels are influencing urban transformations at the local scale. Intensified residential and mixed use developments are emerging at growth nodes as outcomes of the Auckland Regional Growth Strategy 2050. The New Zealand Urban Design Protocol identified significant influences from government legislation, strategies and policies on urban design and the built forms at local level. The national walking and cycling strategy indicates that supportive local-scale layout and design in both existing and new developments could significantly influence travel behaviour. One of the six goals of the National Energy Efficiency and Conservation Strategy is to reduce local environmental effects of energy production and use.

The Urban Form Design and Development (UFDD) work, part of the "Auckland Sustainable Cities Programme" under the NZ Sustainable Development Programme of Action (NZSDPOA), focussed on policy mechanisms to drive sustainable urban form at the local scale in the Auckland Region. Using a case study-based approach, this paper investigates how national and regional policies influence the environmental sustainability of emerging local residential forms at this scale, especially in the Auckland Region. Three selected case studies are examined in terms of: applied urban design principles; design characteristics including street patterns, subdivision layouts and open space provisions; density of development; potential and actual renewable energy use and available transport options. A comparison of the New Zealand approach to sustainable urban forms with an international zero energy residential development is made. Results indicate the policies could influence emerging local-scale urban forms in varied manners generating significantly different contributions to environmental sustainability.

AUTHOR: Josh Gluckman

Presenter: Alice Wilson

Title: Encouraging Sustainable Product Design – an Update on Practical New Zealand Activity

Contact information:
Sustainable Industry Group
Ministry for the Environment - Manatu Mo Te Taiao
P O Box 10362, Wellington, New Zealand
Ph: 04 439 7400
EMAIL: alice.wilson@mfe.govt.nz

Abstract:
Design and innovation processes are key 'front-of-pipe' drivers towards sustainable industry practice. Sustainable product design (as 'design for the environment') is identified in the New Zealand Waste Strategy as a key element of waste reduction and materials efficiency.

Building on existing partnerships with industry, product stewardship initiatives and sustainable procurement, the Ministry for the Environment is working to make sustainability part of the product design and innovation process. Key aspects of encouraging sustainable product design that have been identified, and are being progressed, include:

- Networks and workshops to increase awareness among designers, educators and industry leaders;
- Tools and resources to support sustainable product design and innovation for industry, design professionals, and design school graduates;
- Showcasing and rewarding good practice (through awards and case studies);
- Building capacity to deliver sustainable product design and innovation;
- Introducing environmental aspects to existing and emerging design and innovation initiatives; and
- Exploring opportunities to encourage path-breaking innovation through research and development futures thinking.

Examples are used to illustrate emerging activity in these key areas. A focus is provided on the positive interest building in industry and the design sector.

AUTHOR: Kerry Griffiths

Presenter: Kerry Griffiths

Title: Project Sustainability Management in Infrastructure Projects

Contact information:
Kerry Griffiths is a Principal with URS New Zealand and has worked in the Corporate Social Responsibility and Sustainability Management field in New Zealand for the last ten years.
URS New Zealand, Engineering and Environmental Management
Level 4, Lambton House, 160 Lambton Quay.
P.O. Box 3367, Wellington, New Zealand
Direct: 64 4 496 3861, Mob: 029 496 3861, Fax: 64 4 496 3755
Em: Kerry_Griffiths@urscorp.com, website: http://www.urscorp.co.nz

Abstract:
This paper explores how by integrating environmental and social considerations into project management you can deliver projects that are environmentally sound and contribute to sustainable development.

This paper covers:

- An overview of sustainability management as it relates to infrastructure projects
- A case study which illustrates sustainability management in action
- Relevant tools and frameworks

AUTHOR: Carrie Guthrie, BSc

Co-authors: Jacqueline McIntosh

Presenter: Carrie Guthrie

Title: What are 'Structural Insulated Panels' and Are They The Sustainable Solution to Standard Light Framing Load-bearing Wall Construction?

Contact information:
Jacqueline McIntosh
School of Architecture and Design Victoria University of Wellington
P.O. Box 600 Wellington, NZ. Ph: 04 463 6296
Em: jacqueline.mcintosh@vuw.ac.nz or guthricarr@student.vuw.ac.nz

Abstract:
A relatively recent innovation in building component systems, Structural Insulated Panels systems (SIPs) are fast gaining popularity in North America and Europe. Hailed as 'green building product' and promoted as environmentally sustainable, the Structural Insulation Panel Association claims in it's website that SIPs create a 'green building' through:

- Energy efficiency and renewable energy
- Waste reduction during the construction process
- Creation of healthy indoor environments

But is this claim true, and what are the measures of sustainability? This paper serves first to define a structural insulated panel, then to consider appropriate measures with which to test its 'sustainability' claims and finally to compare its performance as a wall component relative to standard NZ wall construction methods.

AUTHOR: **Stewart Hamilton,** BE (Hons)

Presenter: **Stewart Hamilton**

Title: **New Zealand Aluminium Smelters Limited Climate Change Approach**

Contact information:
New Zealand Aluminium Smelters Limited, Private Bag 90110, Invercargill
Ph: +64 3 218 5999, Em: Stewart.Hamilton@riotinto.com

Abstract:
The reality of Climate Change is becoming increasingly accepted, and concerns about the implications of it are becoming widespread. Businesses are no different to any other citizens, in that the past few years have been a journey from denial to general acceptance of the science, and willingness to be part of the solution. Climate Change is a serious global issue and New Zealand Aluminium Smelters Limited (NZAS) is keen to show leadership in responding to the issue. This has been demonstrated with significant Greenhouse Gas (GHG) emissions reductions since 1990. Since 1990 direct site CO_2-e emissions have been reduced by 41%, while production has increased 26% (a greater than 50% reduction in GHG emissions on an intensity basis). NZAS is committed to reducing GHG emissions by a further five per cent over the next five years, despite the reductions becoming increasingly more difficult.

In 2005 NZAS signed a Framework for Agreement for a Negotiated Greenhouse Agreement (NGA) with the New Zealand Government. The agreement committed NZAS to a pathway to World's Best Practice and recognised NZAS' competitive at risk status as a major energy user in an export market. It makes good business sense for NZAS to continue to contribute to emissions reduction targets. As a major energy user, greater energy efficiency enhances our international competitiveness, meaning that there is natural synergy between energy efficiency and profitability. Improved process control reduces GHG emissions and is a vital component of NZAS' production of the highest purity aluminium in the world. Reducing onsite GHG emissions and improving energy efficiency are important parts of the Sustainable Development approach that NZAS is taking to address Climate Change. Other initiatives include contributing to aluminium recycling, energy efficiency in the community and light-weighting of vehicles. The perception of the value of Sustainable Development initiatives has continued to evolve over the past few years and is increasingly taking on an important role in NZAS' business decisions. NZAS is measured not just by internal efficiency improvements but also by the perception of customers, investors and other stakeholders.

AUTHOR: **Andreas Hamm,** B.Sc., M.Sc.,

Co-authors: **Dr. Susan Krumdieck**
BS, MS(Ariz. State), PhD(Colorado), MRSNZ
Dr. Mark Jermy

Presenter: **Andy Hamm**

Title: **Strategic Analysis of Continuity for Complex Energy and Environment Systems for Developing Regions**

Contact information:
Advanced Materials and Energy Systems Laboratory,
Department of Mechanical Engineering,
University of Canterbury, Private Bag 4800, Christchurch, NZ.
Tel: +64 3 364.2987 ext 7243 -
E-Mails; ahh35@student.canterbury.ac.nz, susan.krumdieck@canterbury.ac.nz

Abstract:
It is possible that in the near future, energy engineering will be called upon to help society adapt to permanently constrained fuel supplies, constrained green house gas emissions, and electricity supply systems running with minimal capacity margins. The goal of this research is to develop an analytical method for adaptive energy systems engineering within the context of resource constraints. The method involves assessing available energy resources, environmental and social issues, and economic activities.

A spectrum of development options is identified for a given region and a Reference Energy Demand is calculated for each representative level. A spectrum of conceptual Reference Energy System Models is generated for each development level with a range of renewable energy penetration. The outcome is a matrix of energy system investment and resource utilization for the range of energy service level defined by the development level. These models are then used for comparative risk assessment.

The result is an easily understood visual based investment and risk assessment for both development and adaptation to constrained resource availability. The above approach is being applied to a relatively simple case study on Rotuma, an isolated Pacific Island society. The case study results will show a clear development space for Rotuma where needs and services are in balance with investment, local resource availability and environmental constraints.

AUTHOR: Chris Harris

Presenter: Chris Harris

Title: Lost City: Forgotten Plans for an Alternative Auckland

Contact information:
Passenger Transport Services Coordinator, North Shore City Council
Private Bag 93-500 , Takapuna , North Shore City
Ph (09) 486-8400 Fax (09) 486-8510
Em: Chris.Harris@northshorecity.govt.nz

Abstract:
Sixty years ago an innovative state plan was produced for Auckland. Dated 1946, this plan featured nested circular railway loops in the central isthmus and a system of traffic calming based on greenways linking culs-de-sac to pedestrianised town centres. Closely similar ideas were to briefly recur in the 1970s. These ideas represent a permanent, somewhat underground, vision of an alternative Auckland. This vision has been overshadowed by a more familiar orthodoxy of a city too sprawling to plan. It is suggested that the latter has developed by way of a reaction to past planning activism by the New Zealand state. Exemplified by the 1946 plan, this state planning was based on a paradigm of public capture of land value gains in defined railway corridors.

This alternative vision is profoundly relevant to Auckland's physical setting, more so than the continuing over-accommodation of the automobile. As population increases this may tip the balance in favour of Auckland's alternative vision.

Disclaimer:
This paper is based on my personal experiences, research and opinions, and does not purport to represent the views of any organisations that I am affiliated with

AUTHOR: Chris Harris

Presenter: Chris Harris

Title: **Governing Spaces: Urban Transit, Land Development and the Local State**

Contact information:
Passenger Transport Services Coordinator, North Shore City Council
Private Bag 93-500 , Takapuna , North Shore City
Ph (09) 486-8400 Fax (09) 486-8510
Em: Chris.Harris@northshorecity.govt.nz

Abstract:

In New Zealand and in the United Kingdom, policymakers have assumed that public transport operators are in a similar position to the operators of trucks, taxis, airlines and shipping. As such, a philosophy of commercialisation has been applied to bus operations. In practice, transit commercialisation has been disastrous. A large part of the problem is that transit operations do not compete with each other so much as with the automobile. As such, the agency which has the most incentive and ability to attract new customers to transit is not the operator but rather the city or to be more precise, the 'local state'. It is up to the local state to organise 'loss leader' transit services on priority routes, which will facilitate more intensive land development and eventually pay for themselves through higher rates.

Transit commercialisation permits the local state to evade its development responsibilities and forces operators themselves into a defensive mode, reliant on inelastic, 'captive' customers and employing market strategies such as non-transferable tickets to retain their share of a small and perhaps shrinking pie.

Disclaimer:
This paper is based on my personal experiences, research and opinions, and does not purport to represent the views of any organisations that I am affiliated with

AUTHOR: Chris Harris

Presenter: Chris Harris

Title: Sprucing up the Shop Window: Improving the Bus Stop Environment for Passengers, Pedestrians and Property Owners

Contact information:
Passenger Transport Services Coordinator, North Shore City Council
Private Bag 93-500 , Takapuna , North Shore City
Ph (09) 486-8400 Fax (09) 486-8510
Em: Chris.Harris@northshorecity.govt.nz

Abstract:

Most public transport journeys begin at the local bus stop, yet this "shop window" of the passenger transport system has long been an unattractive, neglected and dirty one. Even the most detailed public transport textbooks contain little positive advice on the design of bus stops and shelters, other than their spacing. The obvious threat to the health of old people imposed by requiring them to wait at poorly sheltered bus stops, for sporadic off peak services, attracts little attention. Nor is the possibility of integrating bus stops with traffic calming and pedestrian crossings often considered. The inappropriateness of internal-combustion engines for buses, given that heavy acceleration must occur near the bus stop, attracts little attention. Much time is also wasted in dealing with property owner objections, which largely derive from the substandard character of real world bus stops, and in finding safe locations for bus stops on roads without traffic calming. In this presentation, I will discuss North Shore City's experience with its bus shelter improvement programme and will also enlarge upon recent developments in electric bus transit and in the possibility of integrating bus stops with local pedestrian crossings and traffic calming, even on arterial roads.

AUTHOR: James Hassall

Co-Author: Lucie Drummond

Presenter: James Hassall

Title: Green wash or green to the core?
Pushing the business world to take sustainability seriously

Contact information:
Phillips Fox | 209 Queen Street,Auckland
Phone +64 9 300 3862 | Fax + 64 9 303 2311
Em:James.Hassall@dlaphillipsfox.com
Lucie.Drummond@dlaphillipsfox.com
Website: http://www.phillipsfox.com |

Abstract:
Should Government be regulating business to encourage it to focus on issues of sustainability? Or, should the decision whether or not a business will focus on sustainability be left to market forces? Issues relating to sustainability appear almost daily in the media. Some businesses are addressing such issues, others are choosing to ignore them and still others are simply confused as to what it means for them. Despite what might sometimes be the impression in the business world, Government in New Zealand has, so far, taken a relatively light-handed approach to regulating sustainability. 'Sustainability' appears as a concept in expected statutes, notably the Resource Management, Conservation, Biosecurity and Fisheries Acts. It is increasingly appearing in other statutes where sustainability has not played a major role, such as the Building, Civil Aviation, Maritime Transport and Gambling Acts.

What sustainability means in these various statutes is able to be debated and interpreted in various ways. Whether, or by how much, the use of the word 'sustainability' is leading to sustainable outcomes is poorly, if at all, measured. Perhaps more pressing for business is the change taking place in the market place. This change is being signaled perhaps most loudly by the so-called Carbon Disclosure Project 4, a questionnaire being sent to companies worldwide by multi-trillion dollar funds seeking information about businesses' carbon emissions footprint. The impact of CDP4 has not been felt strongly in New Zealand, but already there are home grown 'ethical' investment funds which will be directing their investment to those businesses which behave in sustainable ways. This paper will explore these and other issues related to the pressures on business to behave sustainably. It will consider the impact of such pressures and consider whether anything more can or should be done to push businesses to behave sustainably.

AUTHOR: **Peerapong Jitsangiam**[1], PhD Candidate, BEng(Civil Engineering), MEng(Geotechnical Engineering)

Co-authors: **Dr. Hamid Nikraz**[2], Associate Professor, PhD, FIEAust, CPEng
Dr. Evan Jamieson[3]

Presenter: **Peerapong Jitsangiam**

Title: **Sustainable Use of a Bauxite Residue (red sand) in terms of Roadway Materials**

Contact information:
1.Centre for Sustainable Resource Processing (CSRP), Department of Civil Engineering, Curtin University of Technology, Bentley Campus, Perth, Western Australia, Australia, 6102: Telephone: +61 8 4 9200 3207 Fax: +61 8 9266 2681: 2. Department of Civil Engineering, Curtin University of Technology, Telephone: +61 8 9200 3207 Fax: +61 8 9266 2681

3. Senior Research Scientist TDG STEP coordinator, Technology Delivery Group Alcoa World Alumina, Telephone:+61 08 9410 3852, Em: evan.jamieson@alcoa.com.au

Abstract:
Australia produces approximately 40% of the world's bauxite and over 30% of the world's alumina. The management and containment of large impoundment areas are costly. The sustainable use of coarse bauxite residues for road construction is an attractive option with a high potential for large volume reuse. During the extraction of alumina from bauxite ore using the Bayer process, a fine residue is produced called red mud. In Western Australia, Darling Range bauxite deposits contain high levels of quartz, which results in a coarse residue fraction also being produced. This fraction has been termed red sand with a typical particle size in excess of 90 micron. Typically, red mud and red sand are produced in almost equal quantity. Processing of red sand can neutralise the residual caustic and lower the salt content as required. This study focuses on whether red sand is a viable option for use as a road base material in Western Australia. The soil stabilisation technique, a pozzolanic- stabilised mixture, was used to improve the properties of red sand to satisfy minimum requirements of road bases. The intent of this stabilisation technique is to use potential by-products from industry in Western Australia as stabilising materials. Once the appropriate mixture of red sand, fly ash, and activators was established, a set of laboratory tests were performed. These included an unconfined compressive strength test, a resilient modulus test, and a permanent deformation test. Comparisons were made between the stabilised red sand and the conventional road base material in West Australia (crushed rock with the addition of 2% General Purpose (GP) Portland Cement.). The results of this study show that the performance of the stabilised red sand is superior to that of the standard use material. Our findings indicate that stabilised red sand can provide improved performance when used as road base material in Western Australia.

AUTHOR: Dr Anna Johnson[1]

Co-author: Sarah Weller[2]

Presenter: Anna Johnson

Title: What Do New Zealanders Want From Their Cities? Results from Dunedin

Contact information:
1. Opus International Consultants, PO Box 1913, Dunedin
Ph: (03)474 8899 Anna.Johnson@opus.co.nz
2. Dunedin City Council Transportation Planning

Abstract:
This paper presents the findings of research which identifies different perspectives on city liveability within New Zealand. For the purposes of this research liveability is defined as what people feel are the most important things that contribute to making a place a good or bad place to live (at the neighbourhood/ suburb and wider city scale), with a particular focus on elements of city form and design. Based on previous theory, the authors hypothesised that while 'liveability' is ultimately a subjective concept, distinct perspectives on liveability can be identified. In order to understand these perspectives the authors used Q-methodology, a statistically-based method which allows different perspectives to be revealed, supplemented by a qualitative interview approach.

The Q-methodology phase involved presenting participants in Dunedin with opinion and preference statements on different aspects of city liveability relating to form and design, such as modes of transportation, provision of local services, dwelling density, and shopping preferences. These statements were sorted into a standard distribution which allowed patterns in preferences to be calculated. The Q methodology exercise was successful in identifying several different perspectives on what makes a city more or less liveable in terms of form and design. This paper presents the results from the Dunedin study. It also interprets these findings in light of the prevailing theories and movements within the urban planning field, particularly in terms of the New Urbanism and contrasting free-market approaches. The findings provide important insight into the debate that exists around New Urbanism as an appropriate approach for New Zealand. This is significant for urban planners tasked with managing growth in New Zealand and providing liveable communities for current and future residents of New Zealand's urban areas.

AUTHOR: Marta Karlik-Neale

Presenter: Marta Karlik-Neale

Title: One-Planet Living and Sustainable Transport in London

Contact information:
URS New Zealand
Level 4, Lambton Quay, Wellington
PO Box 33 67
Tel. 04 496 3750 Fax. 04 495 1486
E-mail marta_karlik-neale@urscorp.com

Abstract:
London's ecological footprint has been recently estimated to be 5.8 global hectares (gha) per person, while the Earth capacity is only 1.9gha per person. If everybody on Earth consumed the same amount of resources as Londoners, we would need 3 planets. A big part of this consumption is related to resources used in transportation—93% of environmental resources used in London transport come from personal mobility.

This paper considers issues of personal mobility from the perspective of individual choice and sustainable lifestyle —a lifestyle that can be maintained with only one planet. The author investigates ideas developed by London's public bodies and businesses in a task force "Towards a Sustainable London: Reducing the Capital's Ecological Footprint". A number of behavioural models are used to consider how effective different strategies could be in inducing change in travel behaviour. The role of infrastructure is highlighted, while indicating opportunities for synergies in co-ordinated actions between road development, public transport, educational campaigns and changes to working and living urban environment.

AUTHOR: Dr Patricia Kelly

Presenter: Pat Kelly

Paper title: Accepters, Converts and "Resisters" on the road to Globo sapiens

Contact information:
CELTS, Centre for the Enhancement of Learning, Teaching and Scholarship
University of Canberra, ACT, Australia
Address: 3 Camille Court, Mt Coolum, Queensland, Australia, 4573
Tel/Fax: 61 + 7 54462712
Mobile: 0409 353678
Email: Patricia.Kelly@canberra.edu.au

Abstract:
I want my teaching to contribute to a society that chooses to "survive" rather than "fail". I have described elsewhere how a reflective process and on-line support contributed to a learning "oasis" - that encouraged many first year engineering students to leave their cultural and intellectual comfort zones to on the way to becoming sustainability professionals for an increasingly complex century. This led me to consider several common models of graduate attributes, Globally portable, Globally competent, and my preferred model, Globo sapiens (wise global citizens). This paper uses further research findings to counter common criticisms of "soft skills" units by students and staff, using interviewees' comments to show that the teaching environment and strategies provided precisely the personal, academic and professional benefits about which students and staff were most dubious.

More significantly, it shows how particular students resisted or reconstructed their worlds when challenged at fundamental levels, but within a supportive atmosphere. 60% were willing to engage with change, 30% changed their minds from regarding it as "crap" and a "waste of time" to seeing it as beneficial and useful, and 10% resisted all the way. Learnings included my own journey from seeing these students as Resisters, to seeing their "resistings" and responding more effectively in my teaching.

The study has international relevance because it was based in large, socially and culturally diverse cohorts of first year engineering students, many of whom did not choose or want to study such a course. Such cohorts are the most likely norm as Higher Education responds to increasing pressures for global "education as sustainability".

AUTHOR: **David Kettle**[1,2] BE (Hons), ME, PhD, MIPENZ, CPEng,

Co-authors: **Dave Breuer**[2] M Eng.
Chris Ferkins[2] Dip Hort FRIH.,
Gary Russell[2] JP, M Phil, M Sc.,
John Shaw[2] B Eng, DPA.,
Ray Skinner[2] CA.,
Antony Vallyon[2] BMS, MMS(Distinction).

Presenter: David Kettle

Title: Measuring Real Wealth in New Zealand

Contact Information:
[1]D&B Kettle Consulting Ltd.
[2]Members of the ANEW NZ Progress Indicator Group.
Anew NZ Progress Indicator Action Group
Antony Vallyon at 021 720 056, antony@visionpacific.com
John Shaw (09) 378-2188, g.jshaw@xnet.co.nz.

Abstract:
The paper presents a goal of developing an integrating and comparable system of accounts based on Genuine Progress Indicators. Genuine Progress Indicators (GPIs) are an alternative to the practice of equating progress with economic growth alone. The GPI links the economy with social and environmental variables to create a more comprehensive and accurate measurement tool. The GPI assigns monetary value to the value of human, social, and natural capital, in addition to standard measures of produced capital, and assigns value to assets like population health, educational attainment, community safety, voluntary work, and environmental quality. The benefits to New Zealand can be immense, giving us a measurement tool that challenges the misuse of present indicators and enabling us to have a policy tool that will benefit our social, cultural, economic and environmental performance as a nation. This policy tool could in turn be communicated to the general public.

AUTHOR: **David Kettle,** BE (Hons), ME, MIPENZ, CPEng, PhD,

Presenter: **David Kettle**

Title: **Principles At The Fundamental Level Of A Systems-Based Sustainability Framework**

Contact information:
D&B Kettle Consulting Ltd, Auckland, NZ
Email dbkettlelimited@slingshot.co.nz
Mailing address 295 Wainui Rd, Silverdale RD2, Auckland 1462

Abstract:
There are numerous sustainability frameworks and associated indicators cited in the literature for measuring sustainability. There is no shortage of possible indicators. The question is; how to choose the most appropriate number and types of indicators. Too many and it is overly complicated and time consuming, too few and not all the relevant issues are adequately covered.

This paper proposes a sustainability framework based on a row-column structure linking principles to indicators. In order to use the framework, agreement on the fundamental principles, based on systems thinking, is a vital step prior to the choice of indicators. This provides a structured, logical approach to choosing the most appropriate sustainability indicators.

The more fundamental level of principles is also shown to represent a possible commonality between the different 'worldviews' of 'western' and 'eastern' cultures, thus proposing another advantage for using principles at the fundamental level of sustainability.

AUTHOR: Susan Krumdieck,
BS, MS(Ariz. State), PhD(Colorado), MRSNZ

Co-Author: Mohammed Imroz Sohel,
B.Sc.Eng (BUET), M.Sc. (Aachen), MIEB

Presenter: Susan Krumdieck

Title: Strategic Analysis Adaptation Assessment: An Alternative to the Storyline Scenario

Contact information:
Dr Susan Krumdieck,, Senior Lecturer,
Advanced Energy and Material Systems Laboratory, Department of Mechanical Engineering
University of Canterbury, Private Bag 4800, Christchurch, New Zealand 8004
Telephone: +64 3364 2987 Ext:7249, Fax: +64 3364 2078
Email: susan.krumdieck@canterbury.ac.nz

Abstract:

Scenarios of future trends are widely used by government and international agencies to inform decision-making. While story line scenarios may be useful for business or government thinking, they are not effective at informing engineering research, innovation and design, and add very little to the understanding of sustainability. This paper presents a strategic analysis approach to complex systems, which relies on identification of risks to important activities and wellbeing. This method mimics the actual processes of anthropogenic continuity, where people explore, experiment, learn from success and mistakes, and adapt and evolve. The method is applied to the case study of transportation fuel supply in New Zealand. Directions for immediate strategic engineering research and innovation are clear outcomes of the analysis.

AUTHOR: Rae-Anne Kurucz[1]

Co Author: Brent Bielby[2]

Presenters: Rae-Anne Kurucz and Brent Bielby

Title: The TravelWise - Workplaces Process: a Programme for Implementing Workplace Travel Plans in the Auckland Region.

Contact information:
1. Sustainable Transport Leader Auckland Regional Transport Authority
Auckland Regional Transport Authority, 21 Pitt Street, Private Bag 92 236, Auckland, NZ
Telephone: +64 9 379 4422 extn 9038 Fax: +64 9 379 4423
E-Mails: Rae-Anne.Kurucz@arta.co.nz;
2 Waitakere Central Travel Plan Champion, Waitakere City Council
Brent.Bielby@waitakere.govt.nz

Abstract:

Auckland Regional Transport Authority (ARTA) sets up partnerships with Auckland-based workplaces to implement travel plans. ARTA offers workplaces a standard, quality assured "how to" guide'' (the TravelWise-workplaces process) and in return for following this process, organisations gain access to a suite of high-value travel plan tools eg travel surveys, rideshare software, personal journey planning services etc. ARTA is capturing transport data through the process and ensuring that travel plans in the Region meet their quality expectations and deliver results ie reduce solo car driving.

The high value tools make travel plans more affordable to workplaces, and the process (and associated training) is closing the skills gap, making travel plans more accessible. The Auckland region Sustainable Transport Plan sets the scene for a co-ordinated, controlled roll out of travel plans across the Auckland region.

Waitakere City Council is a TravelWise organisation. The council joined the ARTA TravelWise programme in November 2005. The Waitakere Central Travel Plan (located in Henderson) is the first workplace travel plan in Waitakere and aims to be an example for other workplaces in the Henderson area. Through the travel plan the council is now implementing high value initiatives such as Public Transport subsidies for staff, car pooling, car park management, cycle facilities and ongoing staff communications. This paper is about ARTA's TravelWise-workplaces programme and a case study of its implementation with Waitakere City Council.

AUTHOR: **Donald D. Liou**[1], PhD, PE, Member ASCE

Co-author: **Bruce Gehrig**[2], PhD, Member ASCE

Presenter: **Donald D. Liou**

Title: **Building the Framework for Hurricane Chaser, a Conceptual Wind-Energy Harvesting Vessel**

Contact information:
1. Associate Professor, College of Engineering
University of North Carolina at Charlotte
9201 University City Blvd. Charlotte, NC 28223-0001, U.S.A.
Phone: (704) 687-4179, Fax: (704) 687-6499
E-mail: dnliou@uncc.edu

2. Assistant Professor, College of Engineering
University of North Carolina at Charlotte
9201 University City Blvd. Charlotte, NC 28223-0001, U.S.A.
Phone: (704) 687-6165, Fax: (704) 687-6499
E-mail: gbgehrig@uncc.edu

Abstract:
Hurricanes are viewed differently by different people. For environmentally-minded people, they are a manifestation of global warming; for potential victims living in their pathways they are a matter of evacuation and property damages; for municipality administrators, they represent a disaster planning and emergency response challenge. For most people hurricanes are viewed in these negative ways. However, for alternative-energy enthusiasts hurricanes have a silver lining resulting from their long-duration air turbulence and extreme energy in the atmosphere. A review of recent hurricanes, such as Hurricane Katrina of 2005, indicates that, although they caused casualty in the thousands and property damages in the billions of US dollars, not even a fraction of the energy contained in them were successfully extracted. This is simply because there were few means available to systematically and effectively extract the enormous energy contained in a hurricane. This leads us to develop the "hurricane chaser," which is a conceptual wind-energy harvesting vessel. With an aim to prove that most of the existing technology, including hurricane forecasting and tracking and wind-power turbines, are now mature enough, in this paper we attempt to lay down some first-level foundation works for the conceptual wind-energy harvesting vessel.

AUTHOR: **Dr Dennis Hardy List,** PhD, MBA, MA(Psych), BA

Presenter Dennis List

Title: Scenarios: methods and uses

Contact information
Education Centre for Innovation and Commercialisation, University of Adelaide,
Adelaide SA 5005, Australia
Email: dennis.list@adelaide.edu.au
Telephone +61 8 8303 7422 / mobile +61 405 983 891
Fax +61 8 8303 7512

Abstract:
This paper introduces two of the standard methods of scenario development, and contrasts them with scenario network mapping (SNM)., a new method developed by the author. Standard methods produce a small number of large-scale comprehensive scenarios, while SNM produces a large number of partial scenarios, which may be combined.

The focus will be on how scenarios can be applied, and the conflict between the normative solutions often desired and the paths to reaching those solutions. The paper will be illustrated by a case study of the development of a new type of electric motor.

AUTHOR: Dr Helen H. Lou

Co-authors: Dr Li Sun,
Aditi Singh,

Presenter: Helen Lou

Title: Application of Pareto Optimization under Uncertainty in Chemical Process Design for Sustainability

Contact information:
Department of Chemical Engineering, Lamar University,
P.O.Box 10053, Beaumont, TX 77710, United States
Tel: 409-880-8207 - Fax: 409-880-2197
Email:helen.lou@lamar.edu

Abstract:
The development of a sustainable chemical processes aims at optimizing its economic, environmental and societal sustainability simultaneously. This can be solved as a multi-objective optimization (MOO) problem. However, in real systems, there are many uncertainties that affect the performance of a process. These include market fluctuation, changes in material properties, manufacturing variations, errors in model prediction etc. In order to generate a more robust solution, it is essential to develop a multi-objective optimization methodology including uncertainty. This would facilitate the design for sustainability.

In this paper, the authors use the Pareto optimization methodology to identify the optimal design specifications and operating conditions of chemical processes under uncertainties. The objective of this MOO problem is to maximize the overall sustainability of the process. The utility of this methodology is demonstrated by a case study based on the design of a condensate treatment unit in an ammonia plant.

AUTHOR: Dr Richard Love[1]

Co-author: Professor Don Cleland[2]

Presenter: Richard Love

Title: Tools for Energy Efficiency in Industrial Processes

Contact information:
1. Institute of Food, Nutrition, and Human Health
2. Institute of Technology and Engineering
Massey University
Private Bag 11 222, Palmerston North
r.j.love@massey.ac.nz
(06) 350 5986

Abstract:
An important facet of sustainability is energy consumption. Simple thermodynamics states that all processes conserve energy — that is, the total amount of energy present in the world is unchanged by any particular process. What is significant, however, for sustainability is the form in which energy is embodied. A sustainable process is one that transforms the least amount of energy from high quality forms, like fuel, to low quality forms, like heat.

A sustainable process is therefore an efficient one, and the evaluation of energy efficiency is ultimately a comparative exercise; to make meaningful decisions about energy efficiency the measured efficiency of a process must be compared to a benchmark. Then, once the energy efficiency of a process has been measured and benchmarked, control or design actions may be taken to improve the process. This requires that energy efficiency data is presented in a timely and apt manner to personnel, whether they are plant operators, technical management, design engineers, or financial controllers. To this end, it is important that energy efficiency data is presented from a critical perspective, that not only identifies what energy use was achieved, but also indicates why energy use occurred and how it could be used more efficiently.

The final step is to ensure, via on-going monitoring, that energy efficiency gains have in fact been realised and to identify new opportunities. Using a case study in industrial refrigeration plants, this paper examines some of the technical and managerial issues that arise in measuring, benchmarking, and monitoring energy efficiency and in consequent decision making.

AUTHOR: Emeritus Professor Ian Lowe

Presenter: Ian Lowe

Title: Shaping a Sustainable Future – an Outline of the Transition

Contact information:
School of Science, Griffith University
Nathan Campus, 170 Kessels Road
Nathan, QLD 4111
Ph: +61 0 7 3735 7656 - Fax: +61 0 7 3735 7656
Email address: I.lowe@griffith.edu.au

Abstract:
The warnings from scientists are urgent and unequivocal: our civilisation is unwittingly stepping in front of an ecological lorry that is about to flatten us. We are using resources future generations will need, damaging environmental systems, and compromising social stability by increasing the gap between rich and poor. In short, we are consuming the future. Without a radical re-thinking of the way we currently live, our society is doomed.

We need to tackle this problem head-on and develop far-reaching solutions to our environmental and social crisis. This does not just require technical innovation. It also demands fundamental changes to our values and our social institutions. This paper develops a vision of a healthier society – one that is humane, takes an eco-centric approach, adopts long-term thinking, uses our natural resources responsibly, is informed about the fragility of our natural systems, is efficient in turning resources into the services we need, and is resourced from natural flows of energy. The paper goes on to suggest the first concrete steps toward achieving this sort of desirable future.

History has shown that human systems can change very quickly. Once we realise the need for a new direction – and act on it – an equitable and sustainable world is within reach. If civilisation is to survive, this century will have to be a time of dramatic transformation, not just in technical capacity but also in our approach to the natural world – and each other. The road we are travelling now can only end in disaster.

AUTHOR: Sasha Maher, MA

Co-authors: Jacqueline McIntosh

Presenter: Sasha Maher

Title: A Shared Sense of Belonging: the Politics of Defining in Dustainable Community Housing Typologies

Contact information:
Jacqueline McIntosh
School of Architecture and Design
Victoria University of Wellington
P.O. Box 600, Wellington, NZ
Ph: 04 463 6296 - Em: jacqueline.mcintosh@vuw.ac.nz

Abstract:
A central principle of sustainability and the foundation for liveable community design and development is the recognition of the interdependence of economic, environmental, and equity issues. These principles are clearly evidenced in the resurgence of non-traditional housing involving forms of shared accommodation, which seek to reduce total housing cost (and total construction), provide opportunities for collective use of space, and increase overall quality of life by enhancing opportunities for social interaction. Literature on these forms of non-traditional housing is dominated by research carried out in Scandinavia, the UK, and the US, with houses being classified as either examples of collective or co-housing, or, of affordable housing. Yet there are other emerging forms of non-traditional sustainable housing which are almost unreported in the literature.

This paper discusses some of the issues at work in using non-traditional housing design typologies. It begins by exploring the current definitions of communal housing and asks whether the definitions are adequate descriptions of emerging housing designs such as conjoined housing, which are not easily classified under the sustainable housing literature. Through an exploration of typology, it illustrates the need to recalibrate the methods in which non-traditional sustainable houses are defined in order to both include those new forms that are currently being designed and built, and to address the ideological constructions of sharing in housing research and literature.

AUTHOR: **Emma McConachy**

Co-author: **Dr Ann Smith,** BSc(Hons) (Adelaide), PhD (London)

Presenter: **Emma McConachy**

Title: **Greening the Screen: A Model for Sector Engagement in Sustainable Development**

Contact information:
Landcare Research,
Private Bag 92170, Auckland 1142, New Zealand
Telephone: + 64 9 574 4100 - Fax: + 64 9 574 4101
Email: mcconachye@landcareresearch.co.nz

Abstract:
There is a growing recognition by the business community that long-term sustainable development requires good environmental and social performance. The business benefits are well documented. Screen production is a high impact industry and faces similar business challenges. For film and television programmes about environmental issues, we might expect the production to be made in an environmentally responsible manner. Greening behind the scenes is not exclusive to environmental programmes; all types of production benefit from good environmental practices no matter what the storyline. Screen industry professionals are talented, innovative and receptive to environmental and social messages. They show great concern for the environment but admit that there is a lot more that needs to be done to understand the impacts of the industry. The sector is growing rapidly and good environmental management practices will ensure that growth is sustainable for the environment and for the wider community. New Zealand's spectacular scenery and "clean green" brand is showcased through screen production.

Through film and television, all sorts of information is synthesized to educate, inspire, challenge and effect behaviour change. The film industry is unique in its ability to influence audiences drawn from a wide cross-section of society. Some claim that film and television companies have an unwritten responsibility to use their influence for a greater good such as sustainable development. In consultation with a wide range of screen production organisations, an environmental toolkit has been developed for the New Zealand film and television industry. This is believed to be the first of its kind in the world and the process for its development provides a model for engaging with other sectors. Because of the nature of the industry where many individuals and small companies come together for a production and then disperse to other productions, these practices will spread virally.

AUTHOR: Dr Ir. Ron McDowall,
BBS/BSc, MPhil, PhD, FIPENZ,CPEng, IntPE

Presenter: Ron McDowall

Title: Foresighting Frontier Product Innovation for Sustainability; Does scenario building really work?

Contact information:
Research Fellow: Faculty of Engineering
The University of Auckland, New Zealand.
mx +64 21677 620
Em: r.mcdowall@auckland.ac.nz

Abstract:
For I dipped into the future, far as human eye could see,
saw the vision of the world, and all the wonder that would be…..

Tennyson could do it so why do we find it so difficult to perform the scenario building and foresighting for innovation for sustainability. Can scenario building really work for product design predictions fifty years out or is foresighting doomed to failure. The logic of sustainable technology development is easily understood (pathbreaking and not incremental) and its backcasting loops are obvious, but can developers, designers and manufacturers justify and put in place thirty-year design research programs that rely on scenarios. Will future design be relegated to the realm of supercomputers that can predicate the future in terms of needs and thus generate future system state scenarios that designers can apply to developmental pathways?

Thirty years ago a Swedish engineering company developed the "Black Room Model" using the 'Tennyson' approach to predict the future system state of large scale transmission systems and thus the design of protection systems without the use of a single computer or scenario building and they got it right. Today when you talk to large manufacturers about having to redesign their dinosaur product line up their eyes glaze over at the thought of scenario builders taking over the design function and setting thirty year product development planning. Scenario building has a poor reputation at best and is entirely wrong at its worst. Given that there are no sustainable technologies in existence today, will manufacturers and designers put their money on scenario building to formulate long-range development plans? This paper examines the veracity and performance of foresighting using scenario building and suggests a new approach.

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AUTHOR: Dr Sarah McLaren

Presenter: Dr Sarah McLaren

Title: Defining a Role for Sustainable Consumption Initiatives in New Zealand

Contact information:
Senior Adviser,Sustainability and Society,
Landcare Research, PO Box 40, Lincoln 7640. Telephone: +64 27 449 1165. Fax: +64 3 321 9998.
Email: mclarens@landcareresearch.co.nz

Abstract:
In Europe, environmental policymaking has evolved from an end-of-pipe focus in the 1970s, through cleaner production in the 1980s, to a product-oriented approach in the 1990s. However, in general the focus has been largely on sustainable production rather than on sustainable consumption; therefore the aggregated impacts of consumption and their implications for sustainable development have been largely overlooked in policymaking.

This situation is now changing worldwide with initiatives such as the United Nations 10-year Framework of Programs on Sustainable Consumption and Production (SCP) and the EU's commitment to producing a SCP Action Plan by 2007. It is therefore timely to consider the implications of the sustainable consumption agenda for New Zealand. This paper focuses on a) the role of product-oriented policy (such as Europe's Integrated Product Policy); b) the role of information provision (such as ecolabelling) in evolution of consumption patterns; and c) possible impacts on New Zealand's export-dominated economy.

AUTHOR: **Dr Colin D Meurk,** BSc (Hons) (Canterbury), PhD (Otago)

Co-authors **Cerasela Stancu,**
Dr Ann Smith, BSc(Hons) (Adelaide), PhD (London)

Presenter: **Colin Meurk**

Title: **Biodiversity in Crisis: A Crucial Role for Business**

Contact information:
Landcare Research, PO Box 69, Lincoln 8152, New Zealand
Telephone: +64 3 321 9740: Fax: +64 3 321 9998; E-mail; meurkc@landcareresearch.co.nz

Abstract:
New Zealand's unique biodiversity is collapsing. It is ill-adapted to the tidal wave of introduced species that accompanied human colonisation. Contemporary New Zealanders have grown up surrounded by exotic nature, and therefore have historically identified with that, so resistance to native vegetation recovery adds to an already high ecological hurdle faced by our biota. Biodiversity, landscape and indigenous culture are special attributes of the country that create an enduring identity and authentic branding opportunity. It is vital that New Zealand's clean green image is underpinned by our biodiversity if we are to maintain a genuine point of difference culturally and in the market place. The Convention on Biological Diversity identifies the role of business and industry as crucial in protecting and restoring biodiversity, but the New Zealand Biodiversity Strategy fails to acknowledge this. The Resource Management Act implies that responsibility for sustainable development and biodiversity recovery belongs to everyone. Corporates have an influential role in society and role models have an obligation to act responsibly. To be effective, this must go beyond sponsorship - by instilling among staff a conservation ethic and conveying this to the wider community. Whereas business overseas is strongly linked with biodiversity, this has not been widely the case with corporate New Zealand. Our research has nevertheless found examples of business involvement in high profile biodiversity projects. For some, this involvement is largely patronage where the benefits accrue more to company image than to biodiversity needs. Others such as quarrying, courier, and ecotourism businesses, property developers and accountants have demonstrated more tangible commitments to conservation. The wine industry's environmental commitment stands out, as in Marlborough and Waipara, and the Australian Murray Valley. These model companies are often inspired by champions, are developing environmental plans, minimising waste and energy use, integrating native habitat into their lands, and seeking similar commitments from suppliers.

AUTHOR: Dr James R. Mihelcic

Co-authors: Kurtis G. Paterson, Linda D. Phillips, Qiong Zhang, David W. Watkins, Brian Barkdoll, Valerie J. Fuchs, David R. Hokanson

Presenter: James R. Mihelcic

Title: Educating Engineers in the Sustainable Futures Model with a Global Perspective

Contact information:
James Mihelcic, Professor of Civil & Environmental Engineering,
Co-Director, Sustainable Futures Institute, Michigan Technological University, Houghton, Michigan 49931
Telephone: 906-487-2324, Fax: 906-487-2943: Email: jm41@mtu.edu
More information: www.cee.mtu.edu/sustainable_engineering & www.sfi.mtu.edu

Abstract:
The solutions to the world's current and future problems require that engineers and scientists design and construct ecologically and socially just systems within the carrying capacity of nature without compromising future generations. In addition, as governments move toward policies that promote an international marketplace, educators need to prepare students to succeed in the global economy. Young people entering the workforce in the upcoming decades will also have the opportunity to play a critical role in the eradication of poverty and hunger and facilitation of sustainable development, appropriate technology, beneficial infrastructure, and promotion of change that is environmentally and socially just.

Many universities espouse the idea that discipline integration is a prerequisite for successful implementation of sustainability in education. However, few engineering curriculum have taken the step to integrate concepts of sustainable development with an international experience. This paper discusses the educational and global drivers for curricular change in this important area and demonstrates how several undergraduate and graduate programs initiated at Michigan

Technological University can provide a more interdisciplinary basis for educating engineers on global concepts of sustainability. To date these programs have taken place in 21 countries and reached approximately 300 students (49% women) that represent 11 engineering disciplines and 9 non-eng disciplines.

AUTHOR: Dr Nalanie Mithraratne[1]

Co-author: Dr Robert Vale[2]

Presenter: Nalanie Mithraratne

Tile: Sustainable Choices for Residential Water Supply in Auckland

Contact information:
[1] Research Fellow, Presenter, [2] Senior Researcher)
Centre for Urban Ecosystem Sustainability, Landcare Research, Private Bag 92170, Auckland, NEW ZEALAND
Telephone: 64 9 574 4137 Fax: 64 9 5744101
E-mail: MithraratneN@LandcareResearch.co.nz; ValeR@LandcareResearch.co.nz

Abstract:
The current norm for residential water supply in urban locations is to rely on pipe-borne services. This involves collecting, storing, treating and transporting water over long distances. The extended infrastructure provision, combined with the resultant loss of water due to leaks and pipe bursts, means that the level of investment and intervention required for satisfactory functioning of the system could be more resource intensive than localized measures such as rain tanks. Due to increased development activity in the residential sector during recent times there is a need to expand the existing ageing water supply network in Auckland.

This paper looks at conventional and alternative water supply systems over the useful life of an average New Zealand house to identify those systems with the least life-cycle energy, life-cycle CO_2 emissions and life-cycle cost. Settlement pattern could have implications for efficient use of resources for both rain tanks and mains supply. A series of settlements with various development patterns, building densities (in terms of plot coverage and number of units), and site configurations are analysed to identify which settlement pattern leads to the most efficient water supply system in life-cycle terms. However, the strength of the case for adopting efficient water supply systems depends on the relative importance of water supply in the overall performance of individual houses. Therefore the relative importance of the water supply system as a fraction of the total life-cycle energy, CO_2 and financial cost of the construction, operation and maintenance of average New Zealand houses is considered.

AUTHOR: Dr Gavin M Mudd[1]

Co-author: Mark Diesendorf[2]

Presenter: Gavin Mudd

Title: Sustainability Aspects of Uranium Mining: Towards Accurate Accounting ?

Contact information:
[1] Institute for Sustainable Water Resources, Dept of Civil Engineering, Monash University, CLAYTON, VIC, Australia 3800
[2] Institute of Environmental Studies, University of New South Wales, SYDNEY, NSW, Australia 2052

Abstract:
The mining and milling of uranium ore in Australia has long been a controversial public issue. Over the past year a renewed debate has emerged on the potential for nuclear power to help mitigate against future greenhouse emissions and subsequent climate change. The central thesis of pro-nuclear advocates is the low carbon intensity of nuclear energy compared to fossil fuels. There remains very little detailed analysis of the true carbon costs of nuclear energy, however, despite this being a fundamentally critical aspect of the debate. In this paper, we compile and analyse a range of data on uranium mining and milling, analysing available data on reported uranium resources as well as important sustainability metrics such as energy and water consumption and carbon emissions with respect to unit uranium production.

This is arguably the first time that such analyses have been compiled and presented for modern uranium projects. Overall, the data clearly show the sensitivity of sustainability assessments to the ore grade of the uranium deposit being mined and also that significant gaps remain in the full accounting and assessment of the sustainability (or otherwise) of the nuclear energy path. The paper is a case study of the energy, water and carbon costs of uranium mining within the context of the nuclear energy chain.

AUTHOR: Dr Gavin M Mudd

Presenter: Gavin Mudd

Title: Resource Consumption Intensity and the Sustainability of Gold Mining

Contact information:
Institute for Sustainable Water Resources, Dept of Civil Engineering,
Monash University, CLAYTON, VIC, Australia 3800

Abstract:
Gold mining in Australia and globally has a long and variable history. In recent years, due to ongoing public concern over long-term environmental impacts, the mining industry globally has been moving towards a more sustainable framework. This was presented as the 'Mining, Minerals and Sustainable Development' (MMSD) framework at the Johannesburg Earth Summit in 2002.

There are a number of fundamental issues and concerns with assessing the sustainability of mining. Firstly, long-term trends show that ore grades for almost all metals and minerals will continue to decline (some rapidly so), increasing waste rock is being produced due to the trend towards large scale open cut mining and more complex ores are commonly now being developed. The impact of these trends on the resource intensity, or unit cost, of gold production is of major concern as it could lead to an increase in energy, water and cyanide consumption and greenhouse gas emissions per unit gold produced.

A detailed compilation of these fundamental sustainability indices for gold mining has been undertaken, and is presented with respect to indices over time, ore grade and ore throughput. A clear observation is that the resource intensity of gold mining is extremely sensitive to the ore grade, with energy, water and cyanide consumption and carbon emissions rising rapidly as ore grade decreases. Based on the gold ore resources at operating mines and other known gold deposits, it is most likely that the average gold ore grade will continue to decline in Australia, leading to an increased resource intensity and consequent environmental impacts (assuming no breakthrough new technologies occur). These findings are of major importance to understanding the sustainability of gold mining in Australia, and could be expected to be replicated for other countries given the general similarities of gold mining and milling globally. The final judgement of the sustainability of gold mining therefore must take into account the sensitivity of the ore grade in the resource intensity of gold production.

AUTHOR: Dr Katsuhito Nakazawa*1

Co-authors: Hidefumi Ueda*1, Takafumi Hashitani*1, Hiroyuki Tsurumi*2, Mika Takaoka*2

Presenter: Katsuhito Nakazawa

Title: Analysis of Sustainable Transport Using by Information Services

Contact information:
*Organization: *1 Environmental Engineering Center, Corporate Environmental Affaires Unit, Fujitsu Ltd. and *2 College of Business, Rikkyo University*
10-1 Wakamiya-Morinosato, Atsugi, Kanagawa 243-0197, Japan
Telephone: +81-46-250-8361: Fax: +81-46-248-8812: Email: k.nakazawa@jp.fujitsu.com

Abstract:

CO2 emissions in the transport sector account for about 20% of total CO2 emissions in Japan; the proportion of CO2 emissions from private cars is especially large. To reduce the environmental load in the transport sector, it is necessary to encourage the transport users to shift to sustainable transport. In this study, we developed software for mobile phones to provide environmental information, and analyzed the importance of information services toward helping achieve of sustainable transport.

To provide information services efficiently, we conducted a Web-based questionnaire to examine how people usually use mobile devices to receive information and decide a transport route. The results suggested that providing the environmental information by using the transport route guidance system via mobile phones would be more effectively promote sustainable transport. In addition, we analyzed the importance of environmental information by conjoint analysis, and demonstrated the possibility of improving transport sustainability by providing environmental information to transport users, especially older females.

We also developed software to enable mobile phones to provide environmental information, and conducted a demonstration experiment for actual transport users between a specific terminal station and an event hall in Tokyo. The results showed that transport routes were often selected by using the images of transportations, and that transport users tended to decide the transport route based on fare information. It was shown that the possibility of sustainable transport being selected based on environmental information was about 10%.

AUTHOR: Dr Barbara Nebel

Co-authors: Zsuzsa Szalay

Presenter: Barbara Nebel

Title: The Exemplar House - a generic LCA model for houses in New Zealand

Contact information:
Scion, Rotorua, New Zealand;
Email: barbara.nebel@scionresearch.com
Scion, Rotorua, New Zealand
Budapest University of Technology and Economics, Budapest, Hungary
Email: zsuzsa.szalay@yahoo.com

Abstract:
An improvement of the sustainability of residential buildings is a key issue in New Zealand. Life cycle assessment (LCA) is a useful tool in the environmental assessment of buildings. It can be used to evaluate different alternatives and optimise the design from a life cycle perspective. An LCA model for a typical New Zealand home the 'exemplar house' has therefore been developed in order to demonstrate the use of LCA in decision making processes.

The model compares six different building designs, three climatic regions, three fuel types for heating and two different heating schedules, which are all day heating and intermittent heating. The study has shown that the non renewable consumption for the operational energy accounts for between 30 and 80 % of the overall life cycle energy.

The life cycle impacts of a concrete floor with regard to thermal mass are also taken into account. This demonstrates the importance of using the right building materials in the right context. The tool will be used as a generic research tool which provides a link between building material development and the improvement of the New Zealand building stock.

AUTHOR: Dr Michael Overcash

Presenter: Michael Overcash

Title: Life Cycle and the Approaches to Sustainability Research

Contact information:
Professor Michael Overcash
Department of Chemical and Biomolecular Engineering
North Carolina State University
Raleigh, NC 27695-7905, USA
919-515-2325 (tel.)
919-515-3465 (fax.)
Overcash@ncsu.edu

Abstract:
The challenges of sustainability go beyond normal technological decisions. In fact, sustainability is so complex that a rationale approach is needed to identify subparts that can be more easily analyzed and potentially can clarify what alternatives are important for specific product issues. In this paper an approach toward simplification is described.

Within the broad area of sustainability, there will also be technical decisions since the industrial sectors are major contributors to sustainability. This industrial role derives from society's dependence on industry to meet major aspects of personal and societal needs. What we seek is not just the environmental and economic consequences, but also measures of technology benefits relate to the output of the industrial sectors. A review of some sustainability models will be given. In addition, the utilization of the intrinsic energy value of products through recycle/reuse will be examined in the context of global sustainability.

AUTHOR: **Matthew D. Paetz**[1] BA, BPlan (Hons), MNZPI.

Co-Author: **Knut Pinto-Delas**[2] Masters of Urban Design (EIVP, Paris)

Presenter: **Matthew Paetz**

Title: **From Red Lights to Green Lights: Town Planning Incentives for Green Building**

Contact information:
[1]Planning Manager, Babbage Consultants Limited,
PO Box 2027, Auckland 1140,
Telephone: 09 379 9980 Fax: 09 377 1170
Email: matthew.paetz@babbage.co.nz
[2] Urban Designer, Auckland City Council

Abstract:
Climate Change induced by human activity and associated emissions is commonly recognised as one of the most pressing issues of our age. The buildings we construct, and the energy they use, are highly significant in terms of total energy consumption and emissions. Although debate still rages in the scientific community on the vexed Climate change issue, the consensus appears to be weighing in favour of the camp supporting a theory of human-induced climate change.

Regardless of the reality or otherwise of human-induced climate change, energy efficiency and renewable energy make sense for a variety of reasons, including increased health and wellbeing of occupants, increased productivity, longer term cost savings, reduced demand on an increasingly under-pressure energy infrastructure and market image. However, despite these benefits, there is, by international standards a low uptake of energy efficient building practice in New Zealand.

Internationally, we are witnessing the genesis of an international movement in providing town planning incentives for green building. Innovative local and regional authorities in the USA, Japan and France have had demonstrated success with such schemes. This paper provides preliminary analysis on the ways in which planning incentives can make a significant difference in increasing the uptake of green building developments. It defines further research questions that will be addressed by the author in the Resource Management Law Association Fellowship for 2006 / 2007.

AUTHOR: Dr Annie Pearce

Presenter: Annie Pearce

Title: Sustainable Capital Projects: Leapfrogging the First Cost Barrier

Contact information
Dr. Annie R. Pearce, LEED AP
Department of Building Construction, Myers-Lawson School of Construction
Virginia Polytechnic Institute and State University
250 S. Main Street, Suite 300 (0156), Blacksburg, VA 24061
Phone: 540-818-7732 Fax: 734-293-8538
Email: apearce@vt.edu

Abstract:

Multitudinous strategies, technologies, and best practices exist to improve the sustainability of a capital project, but comparatively few of these tactics have been successfully applied in green building projects without increasing first cost. Given the constrained budgets available for capital projects, the challenge to project managers, designers, and other project stakeholders is to identify and justify the use of cost neutral or cost saving sustainability features that can be included on their projects to meet increasingly stringent sustainability goals set by project owners.

The objective of this paper is to identify and describe a set of techniques for finding cost effective sustainability strategies for capital projects. The paper includes case studies of exemplary capital projects from the United States to illustrate a set of techniques for identifying cost neutral or cost saving project options. These techniques include identification and exploitation of cost discontinuities, review of new technologies, avoidance of infrastructure enhancement costs, dematerialization, use of multifunction technologies, and other cost avoidance approaches. The paper includes an overview of each technique, project case studies to provide real examples of each approach, and lessons learned and recommendations for applying that technique in project planning, design, and implementation.

AUTHOR: Cristina Piluso

Co-Author: Dr Yinlun Huang

Presenter: Cristina Piluso

Title: Decision Analysis Framework for the Industrial Sustainability Analysis of the Surface Finishing Industry

Contact information:
Department of Chemical Engineering and Materials Science,
Wayne State University
5050 Anthony Wayne Drive, Detroit, Michigan 48202
Telephone: (313) 577-3771; Fax: (313) 577-3810
E-mail: yhuang@wayne.edu

Abstract:

Industrial sustainability is a vital issue in pursuing the long-term development of industrial systems. This paper introduces a material efficiency analysis method that extends the existing Ecological Input-Output Analysis (EIOA) method in combination with known and established sustainability metrics. This method can provide a comprehensive analysis of a large-scale industrial system and generate a system view for material efficiency improvement, which is valuable for synergistic regional efforts rather than solely for individual entity sustainability improvements.

AUTHOR: **Neil H Purdie,** BE(Hons) Mech, MIPENZ

Presenter: **Neil Purdie**

Title: **Passive Design in the Pacific Environment**

Contact information:
Associate, Head of Mechanical,, Connell Wagner Limited
Level 4, 139 Carlton Gore Road, P O Box 9762, Newmarket, Auckland
Telephone: +64 9 523 6433 Facsimile: +64 9 524 7815. Email: purdien@conwag.com

Abstract:
Connell Wagner have modelled the performance of a new meeting house design for the Church of Jesus Christ of Latter Day Saints to be built in the Pacific region. The design was required to cater for any orientation and for a number of configurations based on the size of the congregation. Connell Wagner's brief was to optimise the passive design and predict the internal comfort conditions achievable in the tropical climate of the Pacific region. This was followed by capturing the thermal performance data of the prototype building for one full year at Faiaii in Savaii, Samoa. This was compared to an existing standard design of meeting house at Faala in Savaii.

The results dispel a commonly held perception that natural ventilation is the primary mechanism for heat transfer in passive design. This applies to tropical maritime regions throughout the world as well as the Pacific and in subtropical temperate climates. These results are being applied to new meeting houses in New Zealand in conjunction with underfloor heating. The report demonstrates the measured performance of the optimised passive design at Faiaii (P230-17) is performing better than our expectations with respect to internal temperature and humidity and significantly better than the old standard design.

The data collected correlates closely with the predicted temperatures from the ECOTECT model with better than expected humidity levels. The humidity inside is shown to be lower than the humidity level outside. This is a better result than expected. The data demonstrates that performance of the building does not rely on external ventilation to dissipate heat but relies on heat storage in the shaded mass of the building.

The modelling and data analysis clearly demonstrates that the passive design of meeting houses exceeds expectations.

AUTHOR: **Dr Lin Roberts,** BSc Hons, PhD (Auck)

Presenter: **Lin Roberts**

Title: **A Systems Framework for Sustainability and its Application to a Construction Project**

Contact information
The Natural Step NZ, PO Box 69, Lincoln 7608;
Email: linrod@es.co.nz

Abstract:
Developing basic principles for success from an understanding of the system, then systematically planning ahead with those principles in mind (ie. backcasting from sustainability principles), allows strategic step by step progress towards a shared vision of sustainability, without risk of wasting energy addressing symptoms or exacerbating root causes.

The framework for strategic sustainable development developed by the international non-profit organisation, The Natural Step, provides a means to understand, organise and manage impacts, as well as inform routines for what to do to avoid similar mistakes in the future. The paper will describe the framework and its use by a number of departments at the University of Canterbury, in particular by the Facilities Management Department and the School of Biological Sciences, in the context of a construction project. The framework was used in conjunction with an integrated sustainable design process to achieve a common understanding of the extent and urgency of environmental and social impacts across the design team; a common vision for the construction of new Biological Sciences buildings across the buildings' users and designers; sustainability principles to assist in selection of product and design elements; and an enormous shared enthusiasm for the task.

AUTHOR: Mary Rose

Presenter: Mary Rose

Title: Liveable Communities: Shared Houses for Older Women.

Contact information:
graduate diploma of social ecology, resident in a shared house.
Editor: Margaret Bond
PO Box 7097, Hamilton 3247,
Aotearoa/ New Zealand.
Telephone: 64-9-843-6718
E-mail: mary.rose@clear.net.nz

Abstract:
Liveable communities that are sustainable come in many shapes and sizes: like the people who live in them. I am interested in one particular form of liveable community: that of older women living in shared houses.

I will describe it, give some rationale, discuss the advantages of such community, tell you what it needs to be sustainable, list some experiences overseas and in New Zealand, discuss how it can be supported by planning, then offer some thoughts about what this particular form of community has to offer the collective understanding of sustainability. I write about women, for that is where my experience and interest are. It may be that what I write is relevant also to men.

AUTHOR: Lisa Rossiter[1]

Co-author: Jacqueline Bell[2]

Presenter: Lisa Rossiter

Title: How Urban Design is Improving State Highways in our Communities

[1.] National Standards Manager, Transit New Zealand
[2.] Planning Policy Adviser, Transit New Zealand
National Office, Transit New Zealand, PO Box 5084, Wellington
Telephone: +64 4 4966660; Fax: +64 4 4966666: Email: lisa.rossiter@transit.govt.nz

Abstract:

Rapid and intense development of New Zealand's urban and rural landscape places a significant responsibility on Transit New Zealand (Transit) to contribute to the wellbeing of those living in our communities, while continuing to deliver sustainable transport solutions. As the manager of the national state highway network, Transit is in a special position to contribute to vibrant, healthy communities. Incorporating urban design into its activities is one way Transit can assist in achieving this goal. As an early signatory to the New Zealand Urban Design Protocol, Transit is strongly committed to working with others to provide context-sensitive solutions in urban and rural areas. Effective urban design manages each activity within its context and integrates economic, engineering, environmental and social requirements to provide context- sensitive solutions. It also helps Transit meet its statutory requirements under the Land Transport Management Act 2003, which focuses on safety, integration, responsiveness and sustainability.

Urban Design Implementation Principles developed by the Transit New Zealand Board provide a framework to manage urban design issues and implement appropriate responses, on a case-by-case basis. How these principles are incorporated into planning, constructing and maintaining state highways is a key to ensuring transportation makes a positive difference to the places where we all live, work and play. Incorporating urban design in a way that contributes to liveable communities is an exciting challenge for Transit. It offers a unique opportunity to influence the form and function of the communities we live in, and requires long-term vision to successfully achieve this. This paper will explore the options available to Transit, as a national infrastructure provider, in using urban design to help shape prosperous communities. It will also discuss the challenges to making this work successfully including collaboration, funding, historical inadequacies and the importance of getting multi-disciplinary teams involved from the outset.

AUTHOR: Dr John Russell[1]

Co-author: Kevin Long[2]

Presenter: John Russell

Title: What is Sustainability when on the Climate Roller Coaster?

Contact information:
[1]Lecturer in Civil Engineering & Environmental Science
[2]K.E.V. Engineering, Bendigo
Faculty of Science, Technology & Engineering
La Trobe University
PO Box 199, Bendigo Vic 3552
email: j.russell@latrobe.edu.au
Ph: 5444 7347
Fx: 5444 7476

Abstract:

This paper is about the identification of the changing world climate drivers and speculation concerning the future impact such drivers will have on countries in the southern hemisphere, especially Australia and New Zealand. A focus for the above is a case study of climate change which has induced severe hardships in the Bendigo region of Victoria, Australia.

The authors are of the opinion this experience, in this extremely climate sensitive agricultural area, is a forerunner to what could occur to many regions in the southern hemisphere. The case study show the vulnerability of communities to instruments of governance establish during periods of stability and urges the urgent need for modified governance instruments during periods of rapid climatic change. The paper commences the discussion about the meaning, relevance and reality of sustainability for communities during times of climatic uncertainty.

AUTHOR: Dr Rainer Seidel*

Co-authors: Mehdi Shahbazpour
Manuel Seidel

Title: Establishing Sustainable Manufacturing Practices in SMEs

Contact information:
**corresponding author:*
Department of Mechanical Engineering, The University of Auckland
Private Bag 92019, Auckland Mail Centre, Auckland 1142, New Zealand
Phone (Department) +64 (9) 3737 599 Ext. 88146
Phone (Direct) +64 (9) 3737 599 ext. 87578: Fax +64 (9) 3737 479
Email rha.seidel@auckland.ac.nz Website http://www.engineers.auckland.ac.nz/~rsei0011/

Abstract:

During the last few years, drives towards environmentally sound practices have been getting stronger and stronger in most areas of business and society. In particular in Europe sustainability has become a major competitive factor for many manufacturing organisations. In New Zealand and many other countries in the Asia-Pacific region, market forces and social and environmental factors have also started to make manufacturing companies consider sustainability more seriously. However, the change towards environmentally friendly manufacturing poses a significant challenge for Small and Medium sized Enterprises (SMEs), which generally have relatively little experience in this area and few resources available for this task. This is particularly true if they operate in a business environment and within a legislative framework where sustainability is emerging as a relatively new business paradigm.

This paper discusses the issues and challenges that need to be considered in the process of establishing sustainable business practices in manufacturing SMEs. It draws on the experience gained from an ongoing sustainability project at a medium sized furniture manufacturer in New Zealand which started in early 2004. The paper includes the discussion of a range of analysis tools and methods which are useful to gain an understanding of the scope of the sustainability project, to formulate achievable project goals, to develop an effective project programme and work plan, and to optimise the use of project resources. The application of various ecolabelling schemes, environmental standards, and national and international certification programmes to maximise the benefits from the project activities are explored. Conclusions are drawn on the impact of issues such as market developments, government policies, and environmental legislation.

AUTHOR: Manuel Seidel

Co-authors: Mehdi Shahbazpour
Des Tedford

Presenter: Manuel Seidel

Title: Sustainability in practice: A case of environmental packaging for ready to assemble furniture

Contact information:
Department of Mechanical Engineering, University of Auckland
Private bag 92019, Auckland, New Zealand
Phone:- +64 (9) 3737599 ext. 88145
Fax:- +64 (9) 3737479
email:- d.tedford@auckland.ac.nz

Abstract:
While sustainability is gaining momentum as an important social and business objective, many smaller organisations struggle to put it in practice due to the weakness of the external driving forces in their business environment. Given the important role small and medium sized companies play in both developing and OECD economies, finding suitable practical approaches to introduce and integrate sustainability in these companies can, therefore, significantly contribute to the global quest towards sustainable economic development.

This paper provides a practical account of a project aimed at improving environmental impact of product packaging in a New Zealand SME. A number of key factors were identified as main contributors to the success of this project. These include government funding, collaboration with the university, use of simple systematic methods, taking a holistic approach and developing both short-term and long-term solutions.

AUTHOR: Misty Skinner

Presenter: Misty Skinner

Title: Applying International Policy Lessons for Sustainable Agriculture to New Zealand

Contact information:
Ministry of Agriculture and Forestry
PO Box 2526, Wellington
DDI: 04 894 0706, FAX: 04 8940745
Email: misty.skinner@maf.govt.nz

Abstract:
New Zealand's economy is trade-oriented and heavily dependent on its biological and natural resource base. Around 54% of New Zealand's land area is grassland used for pastoral agriculture (as at June 2004) (Statistics New Zealand, 2005). On average, 90% of pastoral production is exported (ABARE and MAF, 2006). This dependence on natural resources for economic development and growth provides a strong incentive to maintain the productive capacity of those resources. The sustainability of New Zealand's agricultural and horticultural sector ("agricultural sector") is therefore important to New Zealand's environment, economy and sense of national identity.

Internationally, there is considerable policy work on the concept of sustainable agriculture. This gives New Zealand the opportunity to interpret that work for the New Zealand context. Specific initiatives such as definitions, strategies and instruments are used to explore the lessons New Zealand can learn from the experience of other countries and which of their initiatives (or elements of these) may be applicable to New Zealand. New Zealand currently favours a voluntary approach to improving environmental performance; however regulation may be used as a backstop where necessary. Central, regional and local government, non-governmental organisations and academic institutions all contribute to sustainable agriculture.

AUTHOR: **Dr Robert Staib,**
BE(Mech), M.Environ Studies, Post Grad. Dip. Admin, PhD, MIEAust., MEIANZ

Presenter: **Dr Robert Staib**

Title: **Water Sustainability in Sydney's Rouse Hill Development Area: Past Practices and Future Plans**

Contact information:
Environmental Manager for RHIC &
Visiting Fellow, Graduate School of the Environment
Macquarie University Sydney Australia

Dr R. Staib
143 Rosedale Road. St Ives NSW 2075, Australia
Telephones: +61 2 9629 3277, 0412 274 777
E-Mail: rstaib@rivernet.com.au

Abstract:
This paper outlines some of the processes (political, legal, planning, design, operational) involved in the progressive delivery of trunk water infrastructure (potable and recycled water, sewage collection and treatment, stormwater quality and quantity controls and revegetation of flood land) to the Rouse Hill Development area (RHDA) in the north-west of Sydney from 1989 to 2006 – in particular the environmental aspects of the these processes.

It discusses some of the policy and management processes of such a long program and identifies some of the good and bad aspects. It discusses this information in light of the continually evolving plans for the delivery of water infrastructure to new urban areas (greenfield sites) in Sydney that are contained in the two recent NSW Government plans: the 2005 Metropolitan Strategy and the 2006 Metropolitan Water Plan. These two plans have been introduced while ongoing debates continue on drought and low water storage dam levels, sustainable water usage, large scale recycled water schemes, desalination and the implementation of water sensitive urban design.

AUTHOR: Cerasela Stancu,

Co-author: Dr Ann Smith,

Presenter: Cerasela Stancu

Title: Making sustainable links: the well-being of NZ exports in a changing climate

Contact information:
Sustainability and Society, Landcare Research, Private Bag 92170, Auckland, New Zealand
Telephone: + 64 9 5744103, Fax: + 64 9 5744101: Email: stancuc@landcareresearch.co.nz

Abstract:
Global trade liberalisation is relentless; trade barriers, quotas and market trends are part of the everyday export-business lexicon – and New Zealand is immersed in it all. Have sustainability requirements also become part of everyday business vocabulary? Consumers world-wide are increasingly aware of the implications of their purchasing decisions and consequently demand products that demonstrate sound environmental and social standards. Repeating events such as the floods and heat-waves in Europe and Hurricane Katrina in the US have increased consumer understanding about the links between production and consumption, greenhouse gas emissions and climate change. In response to these concerns, governments have been supporting the trade in environmental products and services by putting in place national regulations and standards. Similarly, some large companies and retailers have introduced complex environmental and social requirements to their supply chain, including commitments to source more locally – a potential threat to New Zealand exports.

Some New Zealand producers have applied responsible production practices, including energy efficiency and emissions management, which have improved their environmental credentials. To ensure New Zealand products are recognised for their low impact and to maintain their market share, producers and exporters need to be able to demonstrate the low environmental impacts and carbon intensity of their products across their entire life cycle. Such analysis must consider all impacts related to producing and shipping the product to export markets to determine whether energy-efficient production practices can compensate for the distance to the market. Risks from climate change and the high price of fossil fuels not only make a compelling business case for New Zealand producers to improve their practices but also provide them with the opportunity to access faster growing markets for environmentally and socially responsible products at home and abroad.

AUTHOR: Pamela R Storey,
BSEE (Washington), CEM, CLEP, BEP, GIPENZ

Presenter: Pamela Storey

Title: Changing Communities through Practical Energy Efficiency: The HEET Experience

Contact information:
Executive Chairman, Huntly Energy Efficiency Trust, PO Box 188, Huntly, New Zealand,
email pamela.storey@heet.co.nz, 64-7-828-8004 (Phone), 64-27-494-2515 (Mobile),

Abstract:
Determined to see an energy efficiency programme in Huntly, local interested parties worked together to establish the Huntly Energy Efficiency Trust (HEET) in December 2001. HEET has grown substantially over the last five years and is now operating throughout the Waikato and South Auckland regions, providing a range of economic, employment, environmental, social and health benefits to the community through various energy efficiency programmes. Key Benefits of HEET:

- Reduced use and thereby the cost of energy in homes occupied by those on low fixed incomes.
- Improved health and well being of lower income families through warmer drier homes.
- Introduction of broader economic benefits to the community through the retention of energy and health dollars for other uses.
- Training and job creation with its associated social and economic benefits.
- Allows the region to play a significant role in assisting the Government to achieve its targets under the National Energy Efficiency and Conservation Strategy and decreasing New Zealand's reliance on fossil fuels.

The Huntly Energy Efficiency Trust is a solution to many problems from inefficient homes that waste energy to unemployment among young people in the region. It meets the needs of the community for better, more energy efficient homes. It makes the families who live in the homes healthier and it saves them money. Long-term unemployed who have been trained as installers get the benefit of skills and the esteem of having a meaningful job and an income. This programme provides skills, opportunities, lasting improvements in home-owners' well-being and economic as well as environmental benefits.

AUTHOR: **Rhys Taylor,** MSc

Co-author: **Dr Will Allen**

Presenter: **Rhys Taylor**

Title: **Behaviour change for sustainability: Exploring a role for community education.**

Contact information:
Landcare Research Ltd, Gerald Street, PO Box 40 Lincoln, Canterbury, New Zealand.
dd. +64 3 960 2656 and +64 3 321 9600
Emails: taylorr@landcareresearch.co.nz and allenw@landcareresearch.co.nz

Abstract:
An action-research collaboration between 20 city and regional councils has created New Zealand's distinctive Sustainable Living community education programme. Community-based adult education activity was being offered by a range of high schools, environment centres and other non governmental organisations as well as at Council venues. Expansion towards national delivery looks feasible. Learning materials and facilitator guides are published for use by subscribing councils and their education partners on CD, with regular up-dating, and parts appear on the Internet. The content focuses on why and how to act; and the social learning process on group interactions designed to build motivation.

Useful lessons have been learned on who responds to household or lifestyle environmental issues within NZ's prevailing consumer culture, what actions participants can be prompted to take by community education and some key factors affecting behaviour change. Comparison with other NZ and Australian initiatives also targeted on adults and communities has been made recently as part of a FRST-funded Landcare Research project on 'capacity building for sustainable development'. This paper summarizes the comparative research findings and makes recommendations to assist in design and evaluation of the studied and similar educational programmes.

"Behavioural change is fast becoming a kind of 'holy grail' for sustainable development policy – and in particular for sustainable consumption policies. How can we persuade people to behave in more environmentally and socially responsible ways? How can we shift people's transport modes, appliance choices, eating habits, leisure practices, lifestyle expectations (and so on) in such a way as to reduce the damaging impact on the environment and on other people? How can we encourage sustainable consumption and discourage unsustainable consumption?" Sustainable Development Commissioner Prof Tim Jackson, University of Surrey, UK (2005, p 94).

AUTHOR: Omid Titidezh[1]

Co-author: Ebrahim Jabbari[2]

Presenter: Omid Titidezh

Title: Sustainable Development Challenges in Planning and Operation of Multipurpose Hydro System in Iran (Dez and Karoon Basins)

Contact information:
[1.] Vice President in Research, Faculty of Civil Engineering
Shomal University, P.O.Box 731, Amol, Mazandaran, Iran.
URL: http://www.shomal.ac.ir
CV: http://titidezh.shomal.ac.ir
Email: titidezh@shomal.ac.ir
Tel: +98 (121) 220 36 38-9, Fax: +98 (121) 220 37 55, Cell: +98 (912) 133 31 28
[2.] Iran University of Science & Technology
Faculty of Civil Engineering, Tehran, Iran

Abstract:
In recent years Iran has been ranked as fourth in the world in the number of dams under construction. In the Dez and Karoon basins in the southwest of Iran, several dams are under construction forming a cascade system of reservoirs and some sixteen suitable sites are being evaluated for future development. These two rivers with a total basin area of 84000 km2 and 483 m3/s yield merge in the north of the city of Ahvaz to form the great Karoon, which flows into the Persian Gulf. Based on certain investigations carried out by Iran Water and Power Development Company, a subsidiary of the Iranian Ministry of Energy, the two basins have a hydropower energy production potential of 50000 GWh per year and these dams are being constructed or investigated mostly to take advantage of this potential. Based on simulated operation of six constructed or under construction dams in these basins it is possible that the most downstream dam may not be filled to full capacity and as such could not be operated as intended.

However, certain other operation policies with purposes different from energy production and even in conflict with this purpose are under consideration and study such as:

- Diversion of large volumes of water of these two basins to the other basins in the center of the Iranian plateau
- Developing the downstream land of these basins with large national agricultural projects

- Releasing fresh water to maintain an acceptable quality of water at the downstream parts of the rivers and preventing intrusion of salt water of the Persian Gulf into the estuary of the river
- Navigation projects

The conflict between these different objectives causes major complicated challenges, which demand comprehensive investigation. This would result in short and long-term operation policies for these reservoirs.

In this paper, inspecting the existing demands and challenges and reviewing the results of different modelling and simulations, certain approaches for priority allocation or adjustment of each purpose are presented in the order that the conflict between these purposes are considered to be of less priority. Furthermore, some procedures for developing policy-making scenarios and decisions support systems in these basins are presented.

Based on 40-year discharge data of this river and various simulations and optimization processes, it could be concluded that the sixth dam of the cascade, which is the most downstream dam, would not be able to operate properly. Taking into account the presentation of the list of the water diversion and consumption projects from these two basins in the future, in this paper it would be found that following this development policy, the various objectives under consideration will not be fulfilled. Also in regard to the quality and quantity parameters of water discharging into the Persian Gulf the problem of quality change and salinity increment of ground water would result in an end to the environmental interaction due to the non consideration of the integration of the system.

In addition, in the findings of this paper, restrictions and conditions, which should be considered in limiting the development and operation, are highlighted. Among the very important aspects is the discharge of domestic sewage of two great cities and industrial sewage of vast industrial sites. In the banks of the river downstream from the Gotvand regulating dam return water from cane agricultural compounds with $20m^3/s$ discharge and causes high pollution of the river without any self-purification. With a more intense problem during the low discharge period there is a demand for a more extensive study of dependence of quality of river water to its quantity.

Simultaneous investigation of the quality and quantity relationship of this water system, together with its interactions with various purposes and policies of operations, such as hydropower, agriculture, domestic consumption, flood control and so on, results in an integrated operation which is described in this paper as foreseeing the present and future problems more clearly.

AUTHOR: Darren Utting

Presenter: Darren Utting

Title: A Web-Based Sustainability Assessment Tool Streamlining Local Government Practice: TUSC

Contact information:
Darren Utting, Principal Consultant
Synergine Group Limited
Unit 105, 23 Edwin Street, Mt Eden
PO Box 8000 Symonds Street, Auckland, New Zealand
Ph: +64 9 631 1777, DDI: +64 9 631 1762
Cell: +64 21 361 503, Fax: +64 9 631 0070
Email: darren.utting@synergine.com

Abstract:
TUSC is a web-enabled design and analysis tool for assessing the sustainability of residential buildings and neighbourhoods. TUSC was launched at the inaugural NZSSES conference 2 years ago, and the TUSC tool has now been incorporated into Waitakere City Council development remissions policies.

This paper will discuss the need for computer-based tools to assist in integrating local government land development planning and practice, and chart the progression of the TUSC project. It will present new opportunities for this approach, and discuss the potential for TUSC in an expanding marketplace of sustainability rating tools.

The actual web-based prototype will be demonstrated in this session, along with a preview of the next phase of this project, with feedback requested.

AUTHOR: Patrícia Vasconcelos[1]

Co-authors: Michael Pritchard[2]
Dr João Reis Machado[3]

Presenter: Patrícia Vasconcelos.

Title: A Greenway Network for a More Sustainable Auckland

Contact information:
[1.] Environmental Planner, URS
[2.] Associate Professor, University of Auckland,
[3.] Professor, Universidade Nova de Lisboa.
URS Centre, 13-15 College Hill, Auckland.
PO Box 821, Auckland, New Zealand.
Tel: +9 355 1300. Email: patricia_vasconcelos@urscorp.com

Abstract:

Since the early 1970s, there has been a growing understanding that the form and function typical to many urban areas is unsustainable. Significant problems are evident in many urban areas today, such as air, water, and noise pollution, lack of green/open spaces, and inefficient transport systems. Given urban areas are home to around half the world's population, it is vital that efforts are made to improve their sustainability for the well-being of present and future generations.

This paper shows that greenways, especially greenway networks, are an important planning tool to improve urban sustainability. Essentially, greenways are linear green open spaces established along natural or man-made corridors. Their potential to enhance urban sustainability lies in the wide range of environmental, economic and social benefits greenways can provide. To employ this tool, a GIS-based methodology for planning greenway networks is proposed. The generation of these networks is based on a nodal and connectivity analysis and is supported through the GIS environment. Using this methodology, a master plan of a greenway network is developed for the Auckland Isthmus (New Zealand).

AUTHOR: **Jeffrey J. Vickers,** PhD Candidate

Co-author: Dr Carol Boyle

Presenter Jeff Vickers

Title: The Changing Face of Environmental Legislation: New Policy Directions in the European Union

Contact information:
Civil & Environmental Engineering, Faculty of Engineering,
University of Auckland, Auckland, New Zealand
** Email: jeff.vickers@gmail.com; Tel.: +64-9-5257006 ext. 796; Fax: +64-9-5257373.*

Abstract:
Environmental legislation has traditionally been reactive; governments would see a problem and then enact new legislation to target that specific problem. However, over the past few decades governments have started to take an increasingly holistic view by targeting the source of the problem rather than the waste at the end of the pipe. The European Union (EU) has been driving this change in recent years, regulating the automotive and the electronics industries through the enforcement of chemical restrictions, product take-back requirements and reuse/recycling quotas. But the EU has recognised that this will not be enough to achieve sustainability and is now looking forward to 2030 and beyond to help shape future policies. The Eco-design of Energy-Using Products (EuP) Directive, passed in 2005, is one example of how this vision is being translated into action. EuP will require manufacturers of targeted products to consider environmental impacts during product design and represents a fundamental shift in environmental policy.

This paper will consider recent developments in environmental policy and illustrate some likely future developments. It is critical that New Zealand exporters and policy makers be proactive in this area so that New Zealand exports are not closed out of key markets.

AUTHOR: **Dr D. Walton,** B.Sc(hons), Ph.D
Adjunct Senior Fellow, University of Canterbury,

Co Author: Sicily Sunseri

Presenter: Darren Walton

Title: Impediments to Walking as a Mode Choice

Contact information:
Dr Darren Walton
Research Manager, Behavioural Sciences
Opus Central Laboratories
138 Hutt Park Road, Gracefield, Lower Hutt
Ph 04 5870663, Fax 04 587 0604
Email: darren.walton@opus.co.nz

Abstract:
This study evaluates a case-control design of contrasts between 110 drivers of a walkable distance and 238 walkers to address factors influencing the uptake of walking as a mode choice. To overcome the issue of car dependency or the inability to walk, drivers are selected from those whose cars were found parked in a park-n-ride and who live less than 1km of that car park. This unique group of drivers exhibit a break in car dependency by using public transport but still do not walk to the station.

The research uses a 62-item survey to examine twelve factors: Fear of Crime; Trip-Chaining/Car Dependency; Weather; Distance/time; Social Pressure; Fatigue and Fitness; Parking Charges; Enjoyment of Walking; Inconvenience; and Geography. The samples are drawn from two locations: Auckland and Wellington, New Zealand. The results establish that the convenience of a car park at the station induces park-n-ride demand within the 1000m radius despite the ability of people to walk, and that no other factor adequately accounts for the decision-making. Notwithstanding, poor weather has an influence on the decision to drive, and fine weather improves the likelihood of walking.

These results are compared within a literature that suggests walking is impeded by the distance, fear of crime and concern for time. While location effects are observed between the groups the results suggest factors thought to influence the uptake of walking have inconsequential impacts on mode choice decision-making.

AUTHOR: **Kendra Wasiluk,** Dip Int. Des, B.EnvS(Hons)[1]

Co-author: **Jennifer Lynes,** B.Comm., M.E.S., PhD[2]

Presenter: Kendra Wasiluk

Title: **Deepening shades of green: Fostering education for sustainability with an experienced-based professional development course**

Contact information:
[1] Research Officer, RMIT Centre for Design, School of Architecture and Design,GPO Box 2476V, Melbourne Victoria, 3001, Australia. Email:_kendra.wasiluk@rmit.edu.au
[2] Assistant Professor, Department of Environment and Resource Studies, University of Waterloo, 200 University Ave W. | Waterloo, Ontario, N2L 3G1, Canada Email: jklynes@fes.uwaterloo.ca

Abstract:

Environmental education is a lifelong process in which all humans on planet earth should involve themselves. This research critically examines the role of experience-based learning in helping professionals become more aware and interested in sustainability issues. It not only contributes to the discourse on adult environmental education, experience-based learning and professional development, but also takes a unique approach by integrating the ideologies of each to promote education for sustainability. Traditional professional development courses focus on upgrading job related skills, product knowledge, and personal growth. They are an underutilized avenue to foster sustainability education. In the building design field there is an increasing proliferation of environmentally-themed courses, covering topics such as green building rating schemes, energy efficiency and affordability. However, there is a lack of courses which challenge professionals to critically reflect on their core values and beliefs about the environment, their impact upon it and their role in creating a sustainable future. This study was specifically trying to find ways in which to increase sustainable thought in day-to-day professional activities in ways which go beyond simple awareness. A small group of Interior Designers participated in trial course, which included a guided tour of an active landfill and recycling operation located in the Region of Waterloo, approximately one hour west of Toronto. The course was an evocative experience for the participants. Participants all expressed that 'everyone' needs to do a course like this, one even suggesting it somehow needs to be a requirement of being a citizen. Participants felt the experience-based learning style was a key to their learning. "If you don't really see if for yourself you'd miss the point. You can't relate to the scale of it if you are not there," was the feedback from a participant. Highlights of the outcomes of the course along with opportunities for further studies and investigation are presented in this paper.

AUTHOR: Jocelyn Watkin

Presenter: Jocelyn Watkin

Title **Success in Sustainability – a Case Study on the Auckland Sustainable Cities Programme**

Contact information:
Project Manager for the Auckland Sustainable Cities Programme
Strategy Directorate, Manukau City Council, Private Bag 76 917, Manukau City, New Zealand
Telephone: +64 9 262 8900 extn 8622 Fax: +64 9 262 5737: Email: jwatkin@manukau.govt.nz

Abstract:
The Auckland Sustainable Cities Programme (ASCP) was a three-year multi-agency pilot programme conducted between 2003 and June 2006. It achieved a number of sustainable development and partnership outcomes over its duration. The ASCP emerged out of the New Zealand Sustainable Development Programme of Action, the government's response to the 2002 World Summit on Sustainable Development, and was developed in partnership with the Auckland region's seven territorial authorities, the Auckland Regional Council and twelve central government agencies. The ASCP developed 14 sustainable development demonstration projects in six workstrand areas. It was overseen a by a combined steering group of central and local government senior officials, who reported to their respective agencies and councils. An evaluation framework was developed and independent, professional evaluation contractors under took a full evaluation. This framework had a double focus:

a) sustainable development outcomes: sustainable development practice, results and impacts; and
b) partnership: engagement, collaboration and learning

The full evaluation report concluded that the ASCP achieved a number of sustainable development outcomes as well as increased capability of the local and central government sectors to work together in Auckland region. The resulting rise in collaboration and partnership marks an important step forward in the relationship between central government and local government in the Auckland region. The report also concluded that both local and central government benefited from the ASCP and that sustainable development was a key component in the programme. In addition, ASCP provided a springboard for other joint work, including a long-term framework, now known as START. The paper presented will outline the ASCP workstrand and project sustainable development achievements and summarise the partnership achievements, key lessons and benefits to both local and central government.

AUTHOR: Dr Ing. M. Weil[1]

Co-author: K. Dombrowski[2]
A. Buchwald[3]

Presenter Marcel Weil

Title: Sustainable Design of novel Materials Integration of Economic and Environmental Aspects in the Early Stages of Geopolymer Development

Contact information:
[1] Dr.-Ing. Marcel Weil, Department of Technology-Induced Material Flow Institute for Technical Chemistry (ITC-ZTS) Forschungszentrum Karlsruhe, Institute for Technical Chemistry, Germany
Hermann-von-Helmholtz-Platz 1 76344 Eggenstein-Leopoldshafen, Germany
Phone +49 7247 82-6718 Fax +49 7247 82-6715
e-mail: marcel.weil@itc-zts.fzk.de
[2] Freiberg University, Institute for Ceramic, Glass, and Materials, Germany
[3] Bauhaus-University Weimar, Chair of Building Chemistry, Germany

Abstract:

Materials, defined as solids with a function, are basic modules for products in our everyday living and work environment. Developing these products means facing a complex qualification profile, which includes, besides others, technical, economic and ecological aspects. The two latter aspects are not sufficiently included in material development, especially from a Life Cycle point of view.

In this project, Life Cycle Thinking is integrated into the development phase of materials right from the beginning, in order to identify the technical, economic, and ecological benefits and drawbacks of developed geopolymers in comparison to traditional materials. In this contribution, the authors focus on the first of three steps, the screening of raw materials for geopolymer manufacturing.

AUTHOR: D B Willmott
BE(civil) DipTP DipMgt COPs(Econs, Pol.Sci.)

Presenter: David Willmott

Title: Sustainable Progress

Contact information:
Director, Centre for Urban and Transport Studies
22 Orwell Road, Greenhithe, Auckland 0632
Phone: 0064-9-413 7274
Email address: davidbwi@ihug.co.nz

ABSTRACT:

In New Zealand, current bureaucratic and political regimes, under the auspices of the Resource Management Act and associated legislation, including impending carbon gas emission taxes, are implementing a highly regulatory approach to achieving "sustainable development" via top-down single-minded "sustainable management" of developmental effects. But the feedback effects on society and its economy of such sustainable management are almost invariably not or inadequately anticipated, far less defined, considered and evaluated before implementation. Evidence is mounting that those feedback effects can be very substantial and often counter-productive and/or detrimental. Is such an approach to sustainable development itself sustainable?

Sustainability definitions such as the popular Brundtland one are values-laden political constructs, not consistent with a humanly-natural market economy, with human desires as well as human needs, or with individual freedoms and democratic government. Nor are they subject (in the round) to rational scientific analysis, thus clear understanding and acceptance of human implications and the sustained human implementation of sustainable solutions.

Yet the era of environmental free-loading is indeed reaching towards absolute limits in some areas. Some value-based changes to property developmental rights and containment or conversion of effects are thus needed to ensure (natural) progressive development becomes net-positive for the human environment and thus the sustained progress of the human race. Hawken/Lovins' "Natural capitalism" provides some intriguing perspectives on possible solutions to the sustainability conundrum, but relies heavily on governmental intervention while advocating natural markets, freedom and democracy, and the application of science to find nature-based solutions in the containing of detrimental human effects on the environment. But today, science is

threatened with discreditation by activists, regulation by government and self-destruction by practitioners, and the progressive solution to human/environment problems is thus threatened with unsustainability.

This paper holds that, to ensure science's survival and increased contribution to the sustainable progress of humanity, it is essential that science-based professionals maintain strict professional impartiality by excluding personal, societal and even professional institutional values from that part of their persona they would call "scientific".

AUTHOR: **Damian Young**[1] BE Environmental

Co-Author: **John Tait**[2]

Presenter: **Damian Young**

Title: **LIDAR Survey, Modelling and GIS as tools used in the Sustainable Management of Urban Drainage Systems**

Contact information:
[1]Infrastructure and Environmental Engineer. Morphum Environmental
[2] North Shore City Council
Morphum Environmental Ltd, PO Box 99642, Newmarket
Mobile: 021 53 18 18 Email:damian@morphum.com
Websitewww.morphum.com

Abstract:
It is man's ability to hold things in his hand which has enabled him to make use of tools, where other animals have had to rely on their strength and agility, their teeth and their claws. The pathway in the development of humankind is in many ways analogous to our ability to use tools and has correspondingly improved the way we live. Today as we strive to successfully progress into the coming centuries it is once again the tools we use that offer hope for the future.

Overland flow paths (OLFP's) are an important and fundamental component of the stormwater drainage system of all catchments. However, until recently there has been no formal recognition of their location, course or scale in North Shore City (NSC) NSC, making management of this aspect of the stormwater system difficult.

Through the use of mobile data capture technology's (such as Arc Pad with a PDA) multiple data criteria can be collected about OLFP's providing site specific information for further analysis. This paper describes the results from the pilot field assessment and details the way in which these tools can be used to benefit the community, supporting the delivery of sustainable outcomes.