

Green Supply Chain Logistics 'Cradle-to-Grave' Material Flow Frameworks



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Skills Victoria/ISS Institute TAFE Fellowship

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Executive Summary

Climate change is increasingly recognised as the biggest environmental threat we face, and as such it is also becoming a critical business issue. Organisations of all types and sizes need to be aware of their environmental impacts and should be able to demonstrate what they are doing to reduce carbon emissions and mitigate climate change. The ability to deal with all the drivers of performance including the business process, social systems, and enabling technology is essential in an increasingly competitive global marketplace.

Companies must be able to think and act strategically, not just tactically, by treating the supply chain as one integrated system.ⁱ Further, *“organisations with long and complex supply chains, whether they are at the beginning (such as chemicals), in the middle (such as logistics companies), or at the end (retail businesses) of the supply chain, need to understand the sustainability aspects of their supply chains. Supply chain sustainability issues can range from child labour and exploitation of workers on the one hand to ozone depletion, deforestation and global warming on the other. These issues can be broken down according to environmental, social, and economic aspects.”*ⁱⁱ

This approach of Supply Chain Management (SCM) is derived from the fact that there are dependencies between levels in channels from the point of origin to the point of consumption.ⁱⁱⁱ In addition, the concept of sustainability can be used as a primer to drive efficiencies throughout the supply chain by creating competitive advantage and bottom line benefits for business. This is a critical and timely topic that captures increasing concerns over sustainability, whether driven by current legislation, public interest, or competitive opportunity.^{iv}

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Abbreviations and Acronyms

DNA	Deoxyribonucleic Acid
EU	European Union
FSC	Forestry Stewardship Council
GHG	Green House Gases
GSCM	Green Supply Chain Management
ICT	Information and Communications Technology
IPCC	Intergovernmental Panel on Climate Change
IP	Intellectual Property
ISS Institute	International Specialised Skills Institute
LCA	Life Cycle Assessment
MBA	Master Builders Association
MSC	Marine Stewardship Council
NGO	Non governmental organisation
SCM	Supply Chain Management
SDUK	Sustainable Development UK
SSCM	Sustainable Supply Chain Management
SVN	Sustainable Valuable Networks
VRQA	Victorian Registration and Qualifications Authority

Definitions

Agri-food	Describes industries involved in the mass production, processing, and inspection of food products made from agricultural commodities.
Innovation	<p>Creating and meeting new needs with new technical and design styles (new realities of lifestyle).</p> <p><i>Reference: 'Sustainable Policies for a Dynamic Future', Carolynne Bourne AM, ISS Institute 2007.</i></p>
Design	<p>Design is problem setting and problem solving.</p> <p>Design is a fundamental economic and business tool. It is embedded in every aspect of commerce and industry and adds high value to any service or product – in business, government, education and training and the community in general.</p> <p><i>Reference: 'Sustainable Policies for a Dynamic Future', Carolynne Bourne AM, ISS Institute 2007.</i></p>
Skills deficiency	<p>A skill deficiency is where a demand for labour has not been recognised and where accredited courses are not available through Australian higher education institutions. This demand is met where skills and knowledge are acquired on-the-job, gleaned from published material, or from working and/or study overseas.</p> <p>There may be individuals or individual firms that have these capabilities. However, individuals in the main do not share their capabilities, but rather keep the IP to themselves; and over time they retire and pass away. Firms likewise come and go.</p> <p><i>Reference: 'Directory of Opportunities. Specialised Courses with Italy. Part 1: Veneto Region', ISS Institute, 1991.</i></p>
Sustainability	<p>The ISS Institute follows the United Nations NGO on Sustainability, "Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs"</p> <p><i>Reference: http://www.unngosustainability.org/CSD_Definitions%20SD.htm</i></p>

Acknowledgments

Adam Voak would like to thank the following individuals and organisations who gave generously of their time and their expertise to assist, advise and guide him throughout the Fellowship program.

Awarding Body - International Specialised Skills Institute (ISS Institute)

We know that Australia's economic future is reliant upon high level skills and knowledge, underpinned by design and innovation.

The International Specialised Skills Institute Inc (ISS Institute) is an independent, national organisation, which has a record of nearly twenty years of working with Australian industry and commerce to gain best-in-the-world skills and experience in traditional and leading-edge technology, design, innovation and management. The Institute has worked extensively with Government and non-Government organisations, firms, industry bodies, professional associations and education and training institutions.

The Patron in Chief is Sir James Gobbo AC, CVO. The ISS Institute Board of Management is Chaired by Noel Waite AO. The Board comprises Franco Fiorentini, John Iacovangelo, Lady Primrose Potter AC and David Wittner.

Through its CEO, Carolynne Bourne AM, the ISS Institute identifies and researches skill deficiencies and then meets the deficiency needs through its *Overseas Skill Acquisition Plan (Fellowship Program)*, its education and training activities, professional development events and consultancy services.

Under the Overseas Skill Acquisition Plan (Fellowship Program) Australians travel overseas or international experts travel to Australia. Participants then pass on what they have learnt through reports, education and training activities such as workshops, conferences, lectures, forums, seminars and events, therein ensuring that for each Fellowship undertaken many benefit.

As an outcome of its work, ISS Institute has gained a deep understanding of the nature and scope of a number of issues. Four clearly defined economic forces have emerged out of our nearly twenty years of research. The drivers have arisen out of research that has been induced rather than deduced and innovative, practical solutions created - it is about thinking and working differently.

A Global Perspective. 'Skills Deficiencies' + 'Skills Shortages'

Skill deficiencies address future needs. Skill shortages replicate the past and are focused on immediate needs.

Skill deficiency is where a demand for labour has not been recognised and where accredited courses are not available through Australian higher education institutions. This demand is met where skills and knowledge are acquired on-the-job, gleaned from published material, or from working and/or study overseas. This is the focus of the work of ISS Institute.

There may be individuals or firms that have these capabilities. However, individuals in the main do not share their capabilities, but rather keep the IP to themselves; and over time they retire and pass away. Firms likewise come and go. If Australia is to create, build and sustain Industries, knowledge/skills/understandings must be accessible trans-generationally through nationally accredited courses and not be reliant on individuals.

Our international competitors have these capabilities as well as the education and training infrastructure to underpin them.

Addressing skill shortages, however, is merely delivering more of what we already know and can do to meet current market demands. Australia needs to address the **dual** challenge – skill deficiencies and skill shortages.

Acknowledgments

Identifying and closing skills deficiencies is vital to long-term economic prospects in order to sustain sectors that are at risk of disappearing, not being developed or leaving our shores to be taken up by our competitors. The only prudent option is to achieve a high skill, high value-added economy in order to build a significant future in the local and international marketplace.

The Trades

The ISS Institute views the trades as the backbone of our economy. Yet, they are often unseen and, in the main, have no direct voice as to issues which are in their domain of expertise. The trades are equal, but different to professions.

The ISS Institute has the way forward through its 'Master Artisan Framework for Excellence. A New Model for Skilling the Trades', December 2004. The Federal Government, DEEWR commissioned ISS Institute to write an Australian Master Artisan School, Feasibility Plan.

In 2006, the ISS Institute established an advisory body, the **Trades Advisory Council**. The members are Ivan Deveson AO; Martin Ferguson AM, MP, Federal Labor Member for Batman; Geoff Masters, CEO, Australian Council of Educational Research; Simon McKeon, Executive Chairman, Macquarie Bank, Melbourne Office, and Julius Roe, National President Australian Manufacturing Workers' Union. ISS Institute also puts on record its gratitude to the former Chairman of Visy Industries, the late Richard Pratt, for his contribution as a member of the Trades Advisory Council.

Think and Work in an Holistic Approach along the Supply Chain - Collaboration and Communication

Our experience has shown that most perceive that lack of skills is the principal factor related to quality and productivity. We believe that attitudes are often the constraint to turning ideas into product and a successful business; the ability to think laterally, to work and communicate across disciplines and industry sectors, to be able to take risks and think outside the familiar, to share – to turn competitors into partners.

Australia needs to change to thinking and working holistically along the entire Supply Chain; to collaborate and communicate across industries and occupations - designers with master artisans, trades men and women, Government agencies, manufacturers, engineers, farmers, retailers, suppliers to name a few in the Chain.

'Design' has to be seen as more than 'Art' discipline – it is a fundamental economic and business tool for the 21st Century

Design is crucial to the economic future of our nation. Australia needs to understand and learn the value of design, the benefits of good design and for it to become part of everyday language, decision making and choice.

Design is as important to the child exploring the possibilities of the world, as it is to the architect developing new concepts, and as it is to the electrician placing power points or the furniture designer working with a cabinet-maker and manufacturer. As such, design is vested in every member of our community and touches every aspect of our lives.

Our holistic approach takes us to working across occupations and industry sectors and building bridges along the way. The result has been highly effective in the creation of new business, the development of existing business and the return of lost skills and knowledge to our workforce, thus creating jobs - whereby individuals gain; industry and business gain; the Australian community gains economically, educationally and culturally.

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Fellowship Sponsor

Skills Victoria, Victorian Government, is responsible for the administration and coordination of programs for the provision of training and further education, adult community education and employment services in Victoria, and is a valued sponsor of the ISS Institute. Voak would like to thank them for providing funding support for this Fellowship

Specific Acknowledgements

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Supporters

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- Paul Sumner, Skills Victoria Fellowship Coordinator, ISS Institute
- Ken Greenhill, Fellowship Report Co-ordinator, ISS Institute
- Lynda Harvey, Fleetsmart Senior Manager, Canadian Office of Energy Efficiency
- Neil Chambers, Chief Executive Officer, Victorian Transport Association
- Elizabeth Fretheim, Director, Business Strategy and Sustainability, Wal-Mart Stores, Inc
- Duncan Kay, Policy Analyst – Transport, Sustainable Development Commission (UK)
- Rupert Fausset, Principal Sustainability Advisor, Forum for the Future
- Dr Michael Coyle, Director, Imise Ltd
- Mike Varnom, Director and General Manager, Unipart Aftermarket Logistics
- Kevin Maynard, Chief Executive Officer, Canadian Supply Chain Sector Council
- Gary Murray, Senior Manager, Natural Resources Canada
- Bob Smith, Chief – Fleet Vehicles, Natural Resources Canada

About the Fellow

Name: Adam Voak

Qualifications

Voak holds the following qualifications:

- Bachelor of Business, Edith Cowan University, 1997
- Bachelor of Arts, Griffith University, 1999
- Bachelor of Laws, University of New England, 2001
- Graduate Certificate in Legal Studies, Charles Darwin University, 2004
- Master of Arts, University of New England, 2004
- Graduate Diploma of Legal Practice, Australian National University, 2005
- Graduate Certificate in International Customs Law and Administration, Canberra University, 2005
- Master of Laws, University of New England, 2005
- Graduate Certificate in Maritime and Logistics Management, Australian Maritime College, 2007
- Graduate Certificate in Management Communication, Sydney Institute of Technology, 2008
- Master of Training and Development, University of Southern Queensland, 2008
- Graduate Certificate in Ecological Sustainable Development, Western Sydney Institute, 2008
- Graduate Certificate in Management, Victoria University, 2009

Professional Memberships

Voak is a member of the following professional institutes and associations:

- Fellow of the Chartered Institute of Logistics and Transport, 2009 (Chartered Member, 2003)
- Admitted as a Legal Practitioner Northern Territory Supreme Court, 2005
- Admitted as a Solicitor and Barrister High Court of Australia, 2005
- Associate Member Law Institute of Victoria, 2006
- Member of the Institute of Materiel Management, 2007
- Member of Warehouse Education and Research Council, 2007
- Academic Member of the Association for Operations Management (APICS), 2007
- Member of Australian Institute of Export, 2007
- Developer Member of the Institute of Customer Service, 2008

Aims of the Fellowship Program

As resources become increasingly constrained, corporate decision makers will need to embrace new methodology and approaches for economic survival. Remaining confident in this uncertain and globally competitive environment, Australia will need to explore and implement new workplace solutions to minimise the impact of consumption. This study will focus on the knowledge and skill acquisition of theoretical and practical approaches to deploy 'green logistics' including the:

- development of sustainable supply chains which are agile, lean and resilient
- management and leadership techniques initiated to ensure sustainability in global and domestic supply chains
- techniques and approaches used to effectively consider the environmental and social implications of production and consumption
- development of a strategic framework for managing carbon emissions and integrating carbon management into business practice
- integration of supply chain analysis with respect to carbon
- techniques and methodology used to reduce carbon footprints within supply chains
- establishment of learning links with leading overseas teaching establishments and key regulatory authorities
- incorporation of leading edge techniques and approaches into existing national and state based vocational training curricula, particularly in the areas of agri-food, construction, health, fashion and textiles, transport and logistics, tourism and hospitality, and manufacturing.

The Australian Context

A Brief Description of the Industry

The United Kingdom, Canada and the United States have established themselves as creative, innovative and forward thinking when regulating for the impact of logistics and supply chains on the environment. They have acknowledged that uncertainty in supply chains leads to greater environmental impact. The main objective of logistics is to coordinate these activities in a way that meets customer requirements at minimum cost. In the past, this cost has been defined in purely monetary terms. However, as concern for the environment rises, companies must take into account the external costs of logistics associated with climate change, air pollution, noise, vibration and accidents by:

- enhancing econometric freight/commercial vehicle modelling techniques and supply chain decision tools, to better understand the connections and inter-relationships within the distribution cycle
- integrating vehicle routing and scheduling
- introducing innovative and sustainable approaches to packaging, to achieve greater sustainability in urban, regional and global distribution operations
- improving better vehicle utilisation and developing more innovative approaches for the collection, recycling and disposal of waste products to gain economic benefit and reduce the carbon footprint of supply chains
- integrating an evaluative framework to plan for future consumption and population growth.

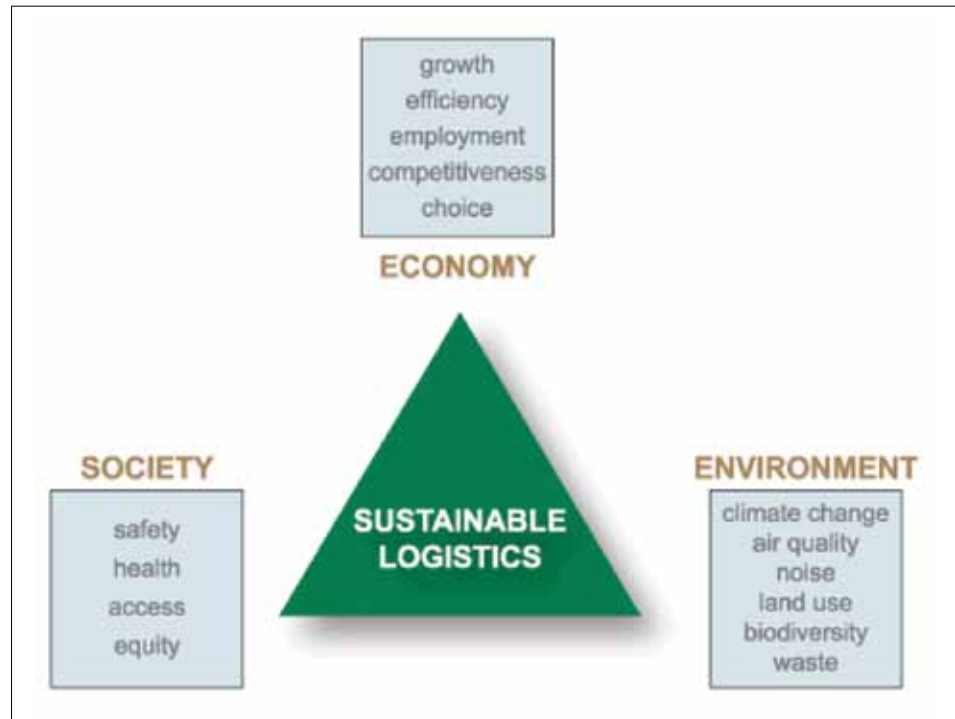
This Fellowship program aimed to identify and learn cutting-edge methodologies and approaches, so as to serve as a catalyst for change by promoting eco-efficiency, innovation and responsible entrepreneurship. Further, these methodologies and approaches will be initiated to reduce the impact of externalities to achieve a more sustainable balance between economic, environmental and social objectives.

However, capacity can be formulated through pro-active training and awareness programs and the formal integration of green logistics methodology into mainstream national vocational education curriculum documents. As part of this acquisition of corporate knowledge, companies need to:

- measure, analyse and set goals to reduce unforeseen situations
- improve first-time fill rates with smarter inventory control
- decrease reliance on emergency air-freight by ensuring the right parts are stocked in the right place
- use proactive and predictive service regimes rather than having a technician go on site, thus cutting down on transport related emissions
- minimise the disposal of excess parts
- employ effective remanufacturing and production practices by incorporating better design into both products and supply chains.

Logistics management activities, due to globalisation, are undergoing fundamental changes. Companies are, among other things, reducing their supplier base, forming partnerships with key suppliers, and implementing leaner methods. A Stevels^v suggests that Green Supply Chain Management (GSCM) can benefit a supply chain in three key areas: society, environment and economy.

The Australian Context



Reference: vi

Further, a GSCM approach can have further impacts that are spiritual, material or emotional. In addition, in 'The Green Imperative: Soap, Perfumery, and Cosmetics' Darrin C. Duber-Smith^{vii} identified numerous reasons to substantiate the adoption of green methodologies. These include:

- target marketing, sustainability of resources
- lowered costs/increased efficiency
- product differentiation and competitive advantage
- competitive and supply chain pressures
- adapting to regulation and reducing risk
- brand reputation, return on investment
- employee morale
- the ethical imperative.

Companies of all sizes are enhancing these fundamental supply chain changes by considering the environmental impact and related bottom-line effects of their decisions and actions. They are increasing their competitiveness by engaging in such environmental performance through enhancing activities such as:

- reducing the obsolescence and waste of maintenance, repair and operating materials through enhanced sourcing and inventory management practices
- substantially decreasing the costs associated with scrap and material losses

The Australian Context

- increasing revenues by converting wastes to by-products
- reducing the use of hazardous materials through more timely and accurate materials tracking and reporting systems
- decreasing the use and waste of solvents, paints, and other chemicals through chemical service partnerships
- recovering valuable materials and assets through efficient product take-back programs.

Creating sustainable supply chains is much more than just a mere reduction in usage and pollution. The GSCM principle can be applied to all departments in the organisation. Yet, despite the potential for significant financial gains, most Australian supply chain managers currently do not focus on environmental concerns. One reason for this is that traditional cost accounting systems typically hide the frequency and magnitude of environmental costs. While raw material and labour costs are directly allocated to the appropriate product or process, other costs are accumulated into overhead accounts, which are allocated proportionally, for example based on the number of units manufactured, to all products, processes, or facilities.

This allocation method might be appropriate for many overhead costs, such as rent, insurance and salaries. However, this approach can lead to inaccurate costing and ineffective decisions when significant costs like waste disposal, training expenses, environmental permitting fees, and other environmental costs are not allocated to the responsible products and processes. For these reasons, supply chain managers often cannot achieve their overall objectives unless they tackle important environmental concerns.

Identifying the Skills Deficiencies

Examine the nature and scale of the environmental impacts on supply chains.

- Attend a 'green supply chain' conference to better understand best practice methodology currently being deployed within supply chains with particular reference to the emerging areas of producer responsibility and reverse logistics.
- To undertake networking pre- and post-course with participants.

Analyse current issues concerning logistics and the environment.

- To conduct interviews with leading academics, regulatory authorities (UK, USA and Canada) and practitioners within the field of sustainable supply chain management and green logistics.
- Attend a conference to understand the drivers and determine methodology deployed for measuring and enhancing supply chain resilience and sustainability.

Identify how firms can environmentally audit their logistics activities, with particular reference to their carbon footprint.

- Attend a course which details and outlines techniques:
 - to internalise environmental costs and calculate an organisation's carbon footprint framed within a logistics context
 - determine strategies for mitigating risk and managing sustainability in supply chains
 - acquire the knowledge to implement tools and techniques to undertake risk and sustainability assessments.
- Conduct interviews and undertake networking opportunities pre- and post-course in attendance with course leaders and regulators within the areas of carbon management within the logistics field.

Present a framework for improved environmental management within supply chains.

- Conduct interviews and record information gained from practitioners and academics relating to sustainable modelling techniques, with particular focus given to:
 - to the approaches deployed to effectively utilise vehicle capacity
 - reduce the demand for freight management
 - transfer freight to less environmentally damaging modes
 - improving fuel efficiency and switching to alternative fuels.

Reduce environmental impact of logistics activities.

- Conduct an analysis and record information sourced – via visitation, observation and the interview process – from organisations that are implementing green logistics strategies and approaches.

Establish links with leading green logistics teaching institutions and regulatory authorities.

- Conduct interviews with leading academics, regulatory authorities (UK, USA and Canada) and practitioners specialising in the implementation of sustainable supply chain management learning programs that endeavour to create awareness of green logistics applications within industry and the broader community.

The International Experience

Green Supply Chain Forum

Florida International University, 19–20 February 2009 (see Attachments)

"We did not inherit this earth from our parents, we have borrowed it from our children."

Worldwide companies face the challenge of implementing environmentally sound operational practices while balancing growth and opportunity in a demanding market place. Further, as companies endeavour to find new ways of becoming leaner, especially in the current economic climate, real emphasis is being placed on reducing energy use and this in turn has made 'going green' both strategically important and economically viable. With this new found urgency, companies are turning to 'green' strategies for answers: therein lies the purpose of the Green Supply Chain.

This Forum, in essence, provided the platform for companies, organisations and government to learn from each others' experiences and share best practice principles, so that their own supply chains and influence on others' supply chains is positive, more efficient, more effective and more agile.

Globally, the trend towards sound environmental practice and corporate sustainability is building in momentum. As multi-nationals protect huge investments in branding, they are becoming acutely aware of the increased scrutiny not only from the general public, but also from better resourced and equipped Non Governmental Organisations (NGOs). Combine this with the slowing of liquidity, due to the global economic downturn, and a perfect storm starts to brew as companies strive to survive, by finding better, faster and cheaper ways of doing business. These goals, however, are not mutually exclusive. By managing better usage of energy resources and embracing design, significant savings can be made. It seems going 'green' is actually good for business.

Further, an increased regulatory focus is leading to new environmental initiatives including the creation of green jobs, enforcement regimes and change management strategies. This time of flux can be turned into a sustained competitive advantage.

In addition to the carbon question, real and future consideration should be given to the new, emerging area of significance 'water footprints'. The future will see a much greater emphasis placed on the inputs and outputs of businesses and the products and services they produce. According to the USA Environment Protection Agency (EPA) 'Lean Program',^{viii} those incumbents that introduced lean approaches without the incorporation of 'green' thinking missed 30% of savings. It is, therefore, necessary to talk about lean and green as one, sending the message of environmentally competitiveness, not just environmentally 'friendly'.

Other points of interest raised at the forum included a discussion in and around supply chain control. What control does a business or organisation have over their supply chain? Once the limits of control are established it is then necessary to ensure that your suppliers do not pass further environmental problems on to your organisation. When sustainability is considered as part of the development process, supplier selection becomes extremely important.

Lean thinking concentrates on the seven wastes (overproduction, excess transportation, excess inventory, excess processing, excess motion, correction, and waiting); the forum introduced an eighth waste - 'green'. This waste takes on particular significance in the reverse supply chain in the context of take-back legislation. It is for this reason organisations are moving away from waste management to resource management. Prudent businesses aim to design out the waste with the assistance of life cycle analysis.

The International Experience

A system's thinking approach not only needs good analytics, together with effective communication and behavioural change, it should also encourage gain sharing agreements that enable the reintroduction of products into the process. In the shades of green, that is, an environmental approach, sustainable dimensions focus on integration. The integration of economic, social and environmental influences, with success being achieved when sustainable thinking is etched into a company's DNA, as well as the staff and consumer.

The organisation's value chain, or the products' supply chain will ultimately form a litmus test for 'green' success; and as the process is a real journey, key stakeholders must do the detective work to remain competitive. Environmental and sustainable thinking must be integrated into the corporate structure and when it is mixed with a little emotional recognition, engagement becomes the catalyst for change.

Canadian Supply Chain Sector Council

Interview with Kevin Maynard, 23 February 2009

The Canadian Supply Chain Sector Council brings together partners in the sector to develop solutions to the human resource challenges faced by its stakeholders. Recognising the vital role of the supply chain to Canada's economy, the Council is committed to enhancing the sector's ability to attract and retain workers at all levels and across the full range of functions, and to advancing the skills of those workers. As part of this focus the Council is in the process of integrating sustainability into job classifications throughout the supply chain.

Fleetsmart – Department of Natural Resources Canada

Meeting with Lynda Harvey, 24 February 2009

The Fleetsmart^{ix} program is an innovative learning model offered by the Canadian Department of Natural Resources. Its main focus is to introduce fleets to energy-efficient practices that can reduce fuel consumption and emissions. Fleetsmart is a program offering free practical advice on how energy-efficient vehicles and business practices can reduce fleet operating costs, improve productivity and increase operational competitiveness. The program is based on a multi-faceted approach to education and training, which outlines through greater operator awareness and accountability the significant economic savings that can be realised by saving fuel. This stratagem also has the co-benefit of reducing green house emissions.

For example, the Fleet Management 101 course outlines and develops the skills for incumbents to measure within context, the resultant impact on managing fuel consumption. The unique program can become a valuable tool to incorporate into traditional driver training models. Through a simple cost/benefit analysis case study approach participants are introduced to the significant savings available through the efficient use of fleets and best practice driving strategies.

"SmartDriver for Highway Trucking is designed to promote energy efficiency as a cost-effective and responsible way to reduce costs and the environmental impact of fleet operations."^x

Combine the Smartdriver^{xi} principles with the introduction of aftermarket technology and significant organisational operational savings can be realised. The Smartdriver Program learning model is not only innovative, but also creative.

The International Experience

The learning principles are expounded through the eyes of Mark Dalton^{xii} a fictional truck owner/operator created by author Edo Van Belkom. In the novel 'Mark Dalton: SmartDriver', Mark "takes his dispatcher's nephew, Jimmy, on the road. Know-it-all Jimmy has just finished a driver-training course, but with Mark he learns about SmartDriver tips, such as coasting to a stop, progressive shifting, proper tire inflation, covering the load and reducing idling."^{xiii} The CD Rom is part of a three part program that aims to introduce smarter driving habits, via regulation, learning resources novel and audio CD, and certification. Other resources are used to spread the fleet efficiency approach including the use of table talkers on place mats and 'show me the money' trivial-pursuit-type games.

Wal-Mart Stores, Inc

Interview with Elizabeth Fretheim, and Distribution Centre Tour, 26 February 2009 (see Attachments)

"At Wal-Mart, we see sustainability as one of the most important opportunities for both the future of our business and the future of our world. Our opportunity is to become a better company by looking at every facet of our business—from the products we offer to the energy we use—through the lens of sustainability."^{xiv}

Wal-Mart has embraced the introduction of sustainable practices. In fact, it is one of the world's leaders in the deployment and development of sustainable initiatives. As an organisation through their 'Responsible Sourcing Group' Wal-Mart has introduced key buying practices that are plat-formed and based on sustainability science. Wal-Mart's buying power and sheer size is being used to effect change in consumer behaviour. To address this Wal-Mart have created Sustainable Value Networks (SVNs), which are used to leverage the implementation sustainability practices into all facets of the business. SVNs, essentially, were created to bring together leaders from Wal-Mart, supplier companies, academia, government, and non-governmental organisations (NGOs) to develop solutions that benefit business and local and global communities.^{xv}



Reference: xvi

The International Experience

The SVNs include:

- Greenhouse Gas^{xvii}
- Sustainable Buildings^{xviii}
- Alternative Fuels^{xix}
- Logistics^{xx}
- Waste^{xxi}
- Packaging^{xxii}
- Wood & Paper^{xxiii}
- Agriculture and Seafood^{xxiv}
- Textiles^{xxv}
- Jewellery^{xxvi}
- Electronics
- Chemical Intensive Products

Wal-Mart is a member of the Initiative for Responsible Mining Assurance and works closely with NGOs like the Marine Stewardship Council, Global Aquaculture Alliance, Organic Certified, Fair Trade Certified, Rainforest Alliance Certified, World Wildlife Fund's Global Forest and Trade Network, and others to ensure a wider view of the definition of sustainability.

Further, as part of their Zero waste initiative, they have introduced a 'Packaging Scorecard'^{xxvii} which encourages Wal-Mart to work with suppliers to develop sustainable solutions regarding packaging, thus allowing consumers to make more informed purchasing decisions. Another area of focus has been fleet efficiency, as opposed to fuel efficiency. This includes thinking about operational efficiencies by reducing the number of kilometres driven, especially empty kilometres. As a part of this process Wal-Mart is currently testing, piloting and deploying a number of green logistics initiatives; not only to save money on diesel fuel, but also to reduce green house gas emissions. Some of the programs currently being undertaken include:

- a partnership with Arvin Meritor^{xxviii}, testing a full-propulsion, dual-mode, diesel-electric hybrid. The truck is powered solely by battery at speeds of less than 48 mph
- some fifteen trucks have been retrofitted to run on reclaimed, brown waste, cooking grease. The grease is being collected from Walmart stores, so as to close the waste product loop^{xxix}

In addition, Wal-Mart has developed a number of video presentations to spread the message of sustainability.^{xxx}

The International Experience

Ecobuild Conference

Conference, 2–4 March 2009 (see Attachments)

Ecobuild is the world's biggest event for sustainable design, construction and the building environment. The supply chain components of the conference focused on zero carbon initiatives and responsible sourcing within the construction sector. The latter discussion centred on the risks associated with degradation and deforestation, in particular the European Union (EU) initiatives on green public procurement. In addition 'chain of custody' issues were promulgated from the backdrop of legally and sustainability sourced forestry products. Major NGOs, most notably the Forest Stewardship Council (FSC), the Tropical Forest Trust and Fair Trade Labelling are focusing on a traceability and transparency model which endeavours to give a product and the resultant supply chain credibility.

Different notions of responsible sourcing were explored particularly an organisation's location within the supply chain or supply network. Presenters also raised a terminology problem when discussing issues such as supply drivers, value systems, be it from the perspective of organic, fair-trade, ethical trading initiatives, responsible jewellery manufacture, Marine Stewardship Council or the Forest Stewardship Council.

The general discussion of the conference was raised via internal and external drivers such as Her Majesty's Government strategy for sustainable construction for the 2012 Olympic Games.

Other speakers highlighted the issue of standardisation in reporting to reduce the overall impact on manufacturers and suppliers in having to continually answer questions and questionnaires when reporting to different government agencies. Standardisation will also play a vital role in ensuring consistent and measurable life cycle analysis information flows as buyers move towards local sourcing directives. Could this ground swell towards procuring locally sourced products become a new form of protectionism? Could a carbon footprint label be used as a tool to control imports?

Embracing a supply chain model that manages carbon also reveals associated cost savings and reliability. It is for this reason that building information modelling is being embraced as it enables the tracking of process change, value stream mapping of construction processes, the monitoring of lean construction initiatives, and the deployment of products and associated services throughout the supply chain. Parametric or collaborative thinking incorporates constraints based thinking to ensure that product supply chains are lean and agile. Couple these initiatives with agile project management, a greater focus on partnerships, increased employee engagement and the integration of key stakeholders into supply chain teams and this can deliver efficiencies and enhance communication flows.

Construction supply chains must not only rely on tracking specific products, but also on the fundamentals of collaborative, creative and innovative thinking frameworks. Greater emphasis should be placed on driving supply chain performance and competence to ensure that 1st and 2nd tier suppliers are included in the open dialogue. From these foundations supply chain deliverables such as: reduced waste, better and more efficient use of raw materials, and resources can be encouraged with a greater predictability in the purchasing cycle.

The International Experience

Omega Dissemination Conference

Conference, 4–5 March 2009 (see Attachments)

Omega is a research cooperative that works closely with those at the frontline of the aviation community to explore solutions that are practical and deliverable.^{xxxi} The cooperative consists of the following universities: Manchester Metropolitan, Cambridge, Cranfield, Leeds, Loughborough, Oxford, Reading, Sheffield and Southampton.

Omega as a publicly funded independent body is uniquely placed to enable greater engagement with representatives and stakeholders from all aspects of the aviation-environment debate. Within this 'neutral forum', divergent views can be discussed to enable best practice methodology to be used to solve aviation sustainability issues. Omega provides knowledge and tools as a catalyst for action within the aviation sector and its associated policy makers. Omega being independent of airlines, airport operators, aircraft and engine manufacturers and government is able to ensure objective discussion and examination of key issues.

The reality of climate change demands action by all contributing sectors. Although aviation is a small contributor at present, the demand projections for air transport mean a growing relative share of total emissions. The Intergovernmental Panel on Climate Change (IPCC) undertook a comprehensive assessment of the effects of aviation on the global climate in 1999 and updating work has been undertaken since, in Europe and elsewhere. Governments have grasped the need for firm action, nowhere more so than the UK which has defined CO₂ control targets, developed wide-ranging strategies and taken a leading role in the international climate debate.

Some things are clear: the CO₂ contribution from aviation to climate change can be identified with confidence, leading to an increasing drive across the aviation sector to improve efficiency. However, the nature and severity of response action will be influenced by the longer-term projections for total climate change. Apart from its CO₂ effects, aviation emissions have climate effects through emissions of oxides of nitrogen (NO_x) and through contrail-induced cirrus clouds. Whilst knowledge is improving quickly in these areas of science, uncertainty remains about the combined effect of all these emissions owing to the complexity of climate physics and chemistry.

Growth in demand for travel and, therefore aviation, has meant greater consideration of aviation management in the context of the environment. Therefore, rationale for this type of research is based on supporting transport-wide knowledge transfer from a core knowledge based on delivering good science. Further, an important part of using the science effectively is to relate it to the potential solutions.

The conference paid particular attention to the metrics and science associated with the interpretation of aviation emissions data through the creation of a fuel climate model. Other points of discussion were based on noise abatement, alternative and sustainable fuels, for example bio diesel, and the trials conducted by Air New Zealand, and air traffic management solutions to ensure the efficient use of airport infrastructure. From an applied research perspective the conference also discussed carbon reduction frameworks for business travel, airline business models and their respective carbon footprints. Within this context, the papers presented looked at: aircraft seat configuration, resultant load factors and their impact, weight reduction approaches, price elasticity, carbon liability of flight activity, offset liabilities, the cost of carrying water, the introduction of new generation aircraft and the promotion of green slots at Heathrow airport.

The International Experience

Dr Michael Coyle

University of Huddersfield, Interview 9 March 2009

Dr Michael Coyle is an international expert in the efficient and effective use of fuels. Dr Coyle discussed numerous methodologies and approaches to effect change within a fleet of vehicles. To ensure correct monitoring and usage of efficient fleet management stratagem, the appointment of a fuel champion dedicated to the fuel efficiency of the fleet is essential. Moreover, to ensure measurement regularity and consistency, baseline data must be established.

From this baseline, fleet managers, owners and drivers are able to consistently measure fuel consumption. In addition to tracking fuel savings and the subsequent reduction in Green House Gases (GHG) emissions, other benefits become visible. These include less maintenance, greater driver productivity and changes in driver attitude resulting in freight best practice.

University of Manchester

Course on Carbon Footprinting, 10–13 March, 2009

Why undertake or analyse a product's carbon footprint? The resurgence of such analysis, particularly Life Cycle Assessment (LCA) was based on the Stern Report^{xxxii} and the resultant UK Climate Change Act 2008^{xxxiii} that sets clear targets that must be achieved by various sectors by 1 June 2009. Other sectors, like those of aviation and shipping, are to be included by 6 April 2012, with compulsory reporting comparing greenhouse gas emissions by 3 April 2012. As a consequence carbon accounting, what can be measured can be managed, is becoming increasingly more prevalent.

LCA techniques are becoming visible both at the organisational level and to include entire and complete supply chains. LCA analysis needs to be considered with not only its boundaries, but also its control limits ie cradle-to-gate versus cradle-to-grave approaches. LCA must be able to understand the assumptions made to ensure transparency, for without transparency the scope for error can be substantial.

LCA is still a relatively new discussion topic, even though its origins are decades old, especially given that only 8% of companies report GHG emissions within their supply chains. It is for these very reasons that the UN Framework Convention on Climate Change focuses on products rather than the companies. It is these LCAs of products that ultimately drive the discussion of the resultant impacts on consumption on climate change. However, carbon dioxide is just part of the story, we must consider all impacts; but unfortunately this leads to confusion and schemes overlapping.

LCAs, in essence, serve many masters and provide valuable information to assist organisations to avoid risk. They enable companies to inform stakeholders, investors and consumers alike on the resultant impacts of particular products. However, data collection and results can vary according to the boundaries established before calculation commences, this will then determine exactly what GHG will be calculated. The tools to undertake such analysis are readily available and the World Research Institute has established a reporting regime to record resultant impacts.

The International Experience

Under mandatory reporting it is best to use the operational approach to report Scope 1 and 2 emissions, normally Scope 3 is voluntary. Scope 3 can be used within the supply chain, that is, within the area of influence. Scope 2 and 3 are outside the boundaries of the facilities.

It should also be remembered that one must not switch approaches in order to ensure consistent performance reporting and accurate data. Materiality also becomes a factor for consideration as the decision to include or exclude would change the results. Therefore, LCA is a tool, not a solution; it is good to be used for comparative purposes once functional units are defined.

Sustainable Development Commission – UK

Interview with Duncan Kay, 16 March 2009

The Sustainable Development Commission was born out of the 'Securing Future Report'. The Commission deploys a wide definition of sustainability. The Commission, at its basis, is the independent government watchdog that monitors sustainable practices within UK Government departments and associated entities.

The Commission also looks closely at cause and effect relationships. Most notably one action in a particular facet or component of a supply chain can drive unsuitable practices elsewhere, that is, bio fuel use and the opposing discussion of food security and availability. The Commission also is charged with considering the effects of transference, those economic arguments without a monetary value attached. The Commission also serves as an adviser to government, by actively engaging departments through the development and deployment of sustainable practices. It also balances the watchdog role with its very important role of capacity building.

Forum for the Future

Interview with Rupert Fausset, 17 March 2009

'Forum for the Future' is a sustainability charity based on a partnership between the public and private sectors. It is funded by subscription fees and fees received for giving ad-hoc advice. The Forum prides itself on developing knowledge and skills in the area of reputation risk management. The Forum serves a number of sectors including the transport, retail and municipal governments by partnering with key organisations to foster sustainable thinking. It ensures ethical approaches by developing longstanding and deep relationships with organisations like BAA, Virgin Atlantic, Euro Star and First Group.

The Forum has been founded on futures thinking, that is, looking closely at the key variables that will effect industry in the future. These variables are then discussed in a wider context to aid in reducing risk to participant organisations and to encourage engagement to escalate involvement in solving the sustainability question.

The International Experience

Envirowise

Industry Briefing, 18 March 2009

Envirowise is a government organisation established to encourage organisations to look closely at managing waste and their carbon footprint. The premise for this educational framework is to reach smaller to medium enterprises in order to foster more efficient and effective usage of organisational resources. The true cost of waste is in the vicinity of 4% of annual turnover. Therefore resource efficiency, that is, doing more with less by eliminating, reducing, recycling or recovering waste, can help the bottom line of a business. In addition, the use of techniques like waste mapping and designing for demand can reduce the subsequent pressure on supply chains. Further, if these techniques are used in conjunction with sustainable purchasing strategies, organisations can develop real competitive advantages.

Sustainable Development UK (SDUK)

Conference Centre, 19 March 2009

The theme of the Sustainable Development U.K. (SDUK) 09 Conference was a 'Time for Change'. The conference focused on issues such as cutting carbon emissions and the UK Government's new sustainable transport policies and initiatives. The conference called for a new language to engage the general public in the quest for reducing carbon emissions. Further, by using techniques like sustainable road maps, organisations can be liberated from the traditional economic models associated with green initiatives. By using real applied tools such as Life Cycle Analysis, behavioural change can begin and the sustainability journey commenced. With the most visible sustainable journey currently being the 2012 Olympics; which has pledged a goal of no waste to landfill.

Other discussions of note included the discussion of high speed trains versus air travel, the EU renewable energy initiative, the global food crisis which could encourage volatility in food prices, food security, shortage of water, migration expectation, ocean acidification, bio-fuels and the emerging concept of fuel poverty.

From this basis the seminars looked closely at the importance of supplier engagement to initiate change especially through public procurement. The need for novel supplier relationship management was expounded via the establishment of supplier forums, supplier workshops, capacity building through ad-hoc workshops, supply chain integrity and a greater focus on managed globalised supply chains.

Unipart

Interview with Mike Varnom, and Facility Tour, 24 March 2009

The Unipart^{xxxiv} way is a lean philosophy based on the elimination of waste and the relentless search for improvements into productivity and customer service. This is combined with the sustained motivation of the workforce to solve these and other problems at their own level. The Unipart experience promulgates five key components that are necessary to consider when embarking on the lean journey:^{xxxv}

1. it must form part of your strategic plan
2. it must be specifically designed to meet the needs of your particular organisation

The International Experience

3. it must be supported with tested tools and techniques
4. it requires a complete commitment by management
5. it also requires a different way of thinking, to ensure a real engagement by all levels of the organisation, if the benefits are to be truly sustained into the future.

In addition, the learning platform/model promulgated by Unipart is founded on providing practical places where learners can see and experience Lean in action. Unipart then uses its own practitioners, drawn from the peer group appropriate to the particular client's workforce, to work alongside the student cohort to coach the participants in all the benefits of implementing Lean.^{xxxvi} Unipart believes that this gives the participant the chance to learn, not just from strategic blueprints and presentations, but also from a mentor working alongside, which can help show how lean thinking can be to their individual advantage as well as benefiting their organisation as a whole.

The Unipart way 'creates engagement with the employee's self interest and self worth and helps embed the fundamental change in culture at all levels that is needed to yield enduring benefits'.^{xxxvii}

Green Manufacturing Conference

Conference, 25–26 March 2009 (see Attachments)

The Green Manufacturing Conference basis was to assist, via information transfer, to fulfil customers and regulators increasing demands for products and operations with smaller-carbon footprints.^{xxxviii} It is the best practice methodology that moves beyond regulations with an environmental and social responsibility flavour, to a drive desire to seek sustained improvement.

The conference introduced the concept of 'Zero Waste', in particular, the benefits of implementing a 'Zero Waste' system into their business. A common thread of the conference proceedings was evoking engagement in environmental programs for financial benefit, for the planet, for their employees, for themselves and for the company as a whole. Further, the dematerialisation of products must take into account efficiencies in the supply chain and plans with the environment in mind. To ensure better use of raw materials and resources, products must be designed for and with the environment.

There are a number of ways to open dialogue with key supply chain stakeholders, one is via the use of focus groups. Once the communication channels are opened, a real invitation to the environmental discussion table can be initiated, allowing the reinforcement of the importance of green principles, the compelling case to assist in risk and cost reduction, and the engagement of key stakeholders, most notably employees.

Knowledge Transfer: Applying the Outcomes

Knowledge transfer in this case is best served in an innovative and unique approach with the lowest carbon footprint, in the spirit of the Fellowship's foundations. It is proposed to establish an online/e-learning course that explains the concept of 'sustainable supply chains'.

By encouraging integrative and creative thinking methodology, members of supply chains can better understand their role and the resultant impact on the flow of products and services. The course will either be developed in the 'Moodle' learning environment, or alternatively as an interactive website that links current learning worldwide.^{xxxix} It is envisaged that the development of such a program would need a projected time-line in the vicinity of five to nine months.

The sustainable supply chain course could also be delivered as a short course, or in combination with the online/interactive e-learning course within a blended learning environment. The course would serve as a primer, a practitioners' guide, to begin the engagement process throughout supply chains.

Recommendations

Government

- Big challenges are to be faced by small to medium enterprises, especially those who have little to no resources, little internal expertise and who are already coping with multiple demands from customers. Governments need to be mindful of these pressures and provide access to best practice methodology, with a view to sharing acquired knowledge. Further, as these organisations are often conservative and risk-averse, new forms of approaching the environment question is needed. Governments and the wider environmental lobby need to expound the benefits of efficient energy management, especially those benefits that are purely economic.

Proposed Action: Both Federal and State Governments need to initiate proactive and engaging 'coal face' programs similar to those deployed by the Canadian Government in its Fleetsmart program.

- Governments and its associated agencies need to sell the business case. How can this be achieved? Currently much effort is being placed in learning organisations, particularly at a Commonwealth level much of this funding benefit could be magnified if lean education programs incorporated the economic value of implementing green initiatives. Thus, treating 'green' as the 8th waste.

Proposed Action: Effective linkage should be made when funding competitive manufacturing training initiatives to include reporting based on the 8th waste, green.

- As a nation we must avoid at all costs the creation of quasi/de facto legislation at a State level driving green initiatives and the environmental legislative framework. We must learn from the United States experience, and avoid the 'California' factor, by providing a national and cooperative response so we avoid the emergence of de facto legislation appearing at the State Government level.

Proposed Action: Environmental laws must be Federal laws to ensure a level playing field for all.

- As a vast nation relying heavily on road transportation, all levels of government through, sustainable purchasing regimes, must encourage the reduction of 'empty miles'. Suppliers must be encouraged and rewarded by providing innovative solutions to sustainability questions. When purchasing goods and services they must consider the full life cycle costs and movement through supply chains/networks when making final cost decisions.

Proposed Action: Governments and their departments at all levels should be leading this initiative. Immediate focus should be placed on giving preference to those organisations who are making concerted efforts to make their supply chains more environmentally, socially and ethically friendly with government procurement regimes.

Proposed Action: To establish a free government 'green supply chain' and 'sustainable development' information source, so that organisations, businesses and companies can use the resource to not only build awareness; but also become better equipped to deal with the future, through requisite knowledge to embrace a more 'environmentally' focused economic climate.^{x1}

Recommendations

Proposed Action: Continued Fellowship sponsorship for organisations such as the ISS Institute to expand and continue learning already gained to build great depth of knowledge in this complex area, particularly within a vocational education context.

Proposed Action: Incorporate design and supply chain innovation methodology into sustainable learning networks such as the National Centre for Sustainability.

Industry

- More focus needs to be placed on supply chains and supply networks within the sustainability context in an effort to establish supplier relationships of mutual benefit not only economically but also for our environment. A rethink in our educational approach must include a greater emphasis on design and a whole life cycle approach. Due consideration should also be made to 'end of use' and 'end of life' considerations at the initial design phase, thus avoiding the multiplier effect down a supply chain.

Proposed Action: Within this life cycle approach we should also give greater thought to reverse supply chains, particularly given the international ground swell for the introduction of take-back legislation.

- Sustainability and the 'greening' of the business school curriculum should occur to expound the sound economic basis behind making our business's more efficient and effective. As a nation who relies heavily on exporting products and services large distances, we must be acutely aware of possible protectionist environments being created through 'green initiatives', in particularly 'carbon footprint' labelling, movement towards responsible sourcing and purchasing and local sourcing initiatives.
- As a nation it is an imperative to re-embrace the science behind many businesses, using the collection of data efficiently and cooperatively, to avoid over reporting and over collection of data and to ensure contractual compliance. In this regard government scanning can play a major role in providing benchmark data to all, rather than just organisations relying on subscribing to specialised expensive carbon and GHG databases.

Education

Proposed Action: Investigation at university level to identify the specific supply chain sustainability concepts into relevant Bachelor and Post Graduate level courses, with the intent of creating a broader and collaborative approach to content specialisations.

Proposed Action: The establishment of research 'centres of excellence' that are funded to undertake independent, pure and applied research including those people from the trades' activities within the value chain. These 'green' knowledge centres could be modelled on similar UK research cooperatives like the Omega^{xii} and Green Logistics^{xiii} forums to ensure Australian and Victorian competitiveness in an increasingly internationalised marketplace.

Proposed Action: TAFE institutions are to incorporate future thinking and creative approaches into existing courses being delivered within the vocational education context to encourage new approaches and methodology.

Recommendations

Proposed Action: Implementation of ‘grass root’ training and education initiatives, particularly for those sectors that consume and rely heavily on fossil fuels. Moreover initiatives like the Canadian Government ‘Fleetsmart’^{xliii} program should be used to assist the multitude of small businesses found within the road transport sector of the Australian economy.

- Currently a range of over 50 units of competency have either the words ‘sustainability’ or ‘sustainable’ built into the unit title and the following courses are currently accredited by the Victorian Registration and Qualifications Authority (VRQA):
 - 21645VIC Diploma of Sustainability
 - 21545VIC Graduate Certificate in Sustainability
 - 21970VIC Graduate Certificate in ICT Sustainability
 - 21854VIC Course in Home Sustainability Assessment

Proposed Action: However, while these units of competency and accredited courses focus broadly on sustainability concepts, effort and resources should be given to the development of supply chain sustainability, sustainable logistics and sustainable procurement methodology.

- Courses of a similar nature to those currently offered by the University of Creative Arts, The Centre for Sustainable Design including the following would be particularly useful to encourage innovative and creative thinking and creative approaches to current and emerging sustainability practices:
 - Sustainable Solutions
 - Eco-design
 - Environmental Communications
 - Innovation of Sustainability
 - Marketing in Sustainability
 - End of Life Management

Proposed Action: Develop a nationally accredited course that delivers innovative and creative thinking and creative approaches to current and emerging sustainability practices.

Proposed Action: The sustainable supply chain courses and/or workshops are to be delivered as a short course or in combination with the online/interactive course within a blended learning environment.

ISS Institute Inc

- The ISS Institute can play an integral role through its collective knowledge base in ensuring the combination of art and science is incorporated into supply and value chains.

Proposed Action: Through its many design Fellows it can encourage the use of design and creative thinking to explore better use of resources particularly through potential communities of practice/learning. Funding needs to be made available post-Fellowship by key government departments to develop these communities lead by Fellows.

Recommendations

- Encourage further and more specific Fellowships that look into specific supply chains, to endeavour to foster the cross pollination of ideas from industry to industry. Often when we look at problems with fresh eyes and from a different perspective we encourage the transference of ideas and knowledge.

Proposed Action: A number of collaborative Fellowships could be funded through a joint supporter initiative between key State/Federal Government departments to encourage cross pollination between the tiers of government.

Proposed Action: Establish best practice collaborative thinking via the introduction and establishment of networking opportunities into varying and specific supply chains. The Australian Logistics Council and the Transport and Logistics Industry Skills Council could play a pivotal role in establishing a Fellowship for this sector.

Further Skills Deficiencies

The following skills deficiencies require further investigation:

- The investigation into the impact of human rights in supply chains and the rising influence of NGOs in internationalised transactions. Organisations such as World Wildlife Fund (WWF), Forestry Stewardship Council (FSC) and Marine Stewardship Council (MSC) are becoming major players in world economic activities.
- Identifying specific skill deficiencies related to ISS Institute's definition of 'sustainability' so that there is an overall uptake and impact on specific and defined supply chains and networks and the way that products are designed, manufactured and dealt with along the whole of the life value chain.
- The use and establishment of sustainable procurement networks and systems to encourage more effective and efficient use of resources and resultant services.
- An integrated thinking approach that incorporates a collaborative model that uses lean and green initiatives throughout supply chains to minimise waste and encourage more efficient use of resources.
- Recognition and investigation into the impact of the erosion of old growth forests to be replaced with either corn or similar products to create bio-fuels, and the flow-on effect of reducing the amount of food available for a growing world population. Follow up Fellowships in the area of human rights in supply chains and food security should be encouraged.

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- xxxvii <http://www.unipartep.co.uk/lean/Introduction/WhatMakesTheUnipartApproachDifferent/tabid/206/Default.aspx>
- xxxviii http://www.devicelink.com/expo/advuk09/green_conference_details.html
- xxxix *"Moodle is a Course Management System (CMS), also known as a Learning Management System (LMS) or a Virtual Learning Environment (VLE). It is a Free web application that educators can use to create effective online learning sites."*
<http://moodle.org/>
- xl New Zealand Business Council for Sustainable Development <http://www.nzbcscd.org.nz/>
- xli <http://www.omega.mmu.ac.uk/>
- xlii <http://www.greenlogistics.org/PageView.aspx?id=97>
- xliii <http://fleetsmart.nrcan.gc.ca/>

Attachments

Index to Attachments (Refer to CD)

Ecobuild Conference Presentations

- Modern Methods of Procurement: Creating an Integrated Project Delivery & Supply Chain, by Bob Owen, Senior Research Fellow, Salford Centre for Research & Innovation in the Built Human Environment
- Innovative Whole Life Costing in Practice, by Ed Bartlett, Whole Life Cost Director, Balfour Beatty Capital
- The Green Guide and BES 6001: Responsible Sourcing for Construction Products, by Jane Anderson, BREEAM Materials, BRE Global
- Life Cycle Costs and Sustainability, by Joe Martin, Executive Director, BCIS
- Outsourcing Supply Chains >>> Creating Environmental and Commercial Benefits, by Karl Hudson, Aggregate Industries Supply Chain Director, and Adrian Fleming, TDG Group Business Development
- Sourcing Concrete Products and Masonry Responsibly, by Martin Clarke, British Precast
- The Role of the Merchant in Delivering Cost Savings, by Naithan Keeping, Jewson
- Flaws in the Green Guide and Possible Solutions, by Neil May, MD NBT, Chair GHA
- Offsite Construction, Supply Chains, by Nick Whitehouse, Terrapin
- Appraising Supply Chain Sustainability Competence & Performance, by Nigel McKay, Head of Supply Chain, Bovis
- Responsible Sourcing: The Timber Trade Story! by Rachel Butler, Head of Sustainability, Timber Trade Federation, Growing the Use of Wood

Green Manufacturing Conference Presentations

- Green Manufacturing Conference Programme
- Opening Address on Environmental Sustainability, by Pamela Gordon, President, TFI Environment
- Case Study: Becoming a Zero Waste Company – the Aims, Processes and Benefits of Size Zero
- Collective ‘Green’ Wisdom: Environmental initiatives evoke unprecedented power of multifunctional collaboration, by Kimberly Allen, PhD, TFI Environment Consultant and Pamela J. Gordon, CMC, President, Technology Forecasters Inc. and TFI Environment
- EU Environment Law and Policy: Selective Overview and Development, by Kris Pollet, Director EU Law and Policy
- REACH Impact on Manufacturing – SVHC Disclosure, by Kris Pollet, Director EU Law and Policy
- The GREEN Machine, Corporate Social Responsibility for manufacturing equipment, by Jan Dijk M.Sc, DConsult, and Jeroen de Groot M.Sc, Philips Assembleon
- Value Orientated Design and Development for the Complete Product Life Cycle – from Alpha to Omega: Fulfilment of Environmental Requirements, by Stefan Schmidt, Quality Environment and Risk-Management, H&S, University of Applied Science & VWI

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- HP Eco Solutions, by Bruno Zago AIEMA, Environmental Manager
- Recycle & Reuse for Manufacturers of Durable Equipment, by Morgan Johnson, Director, Global Service Delivery, Sims Metal Management Limited
- Sustainability and SAP, Greening the Bottom Line, by Adrian Langlouis, Director, High Tech Solution Management
- Product Carbon Foot printing & Carbon Labelling, by Robin Dickinson, Carbon Label Company

Green Supply Chain Forum Presentations

- Sustainability Strategies for the Low Carbon Economy, by Stephen Stokes, VP Sustainability and Green Technology, AMR Research
- Regulating a Low Carbon Economy Source, by Stephen Stokes, VP Sustainability and Green Technology, AMR Research
- Best Practices for Global Supply Chains from Leading Companies, by Chrystina Gastelum, CDP Supply Chain, Carbon Disclosure
- Regulations and Their Impact on Green Supply Chain Management, by Glen Kedzie, ATA Vice President & Environmental Counsel
- 2009 A New Environmental Landscape: Are Your Suppliers Ready? by Kris Pierre, US EPA
- Volvo Logistics, by J Ford
- The Business Case for Green Supply Chain Management, by Bill Haslett, Manager, Enterprise Sourcing and Logistics, Northrop Grumman Corporation
- Making the Business Case for Environmentally Responsible Supply Chain Management, by Diane A. Mollenkopf, Associate Professor of Logistics, University of Tennessee
- Sustainability at Norfolk Southern, by Blair Wimbush, Vice President Real Estate and Corporate Sustainability Officer, Norfolk Southern Corporation
- Burger King Corp. Sustainability Strategy 'The Greening of the King'
- Is a Greener Supply Chain a Leaner Supply Chain? Thoughts on Carbon as the New Muda, by Mondher Ben-Hamida, CPIM, CSCPA Associate Partner/Global Electronics SME/IBM GBS Supply Chain Strategy Practice
- Greening the Supply Chain: From Waste to Resource Management, by Paul Ligon, WM
- Environmental Strategy Development [Including Cost-Effective Green Supply Chain Programs], by Yalmaz Siddiqui, Director of Environmental Strategy, Office Depot
- Workshop I Pre-Read Handouts
- Measuring Your Carbon Footprint, Stonyfield Farm
- Measuring Carbon Footprints In Supply Chains, by Tony Craig and Edgar E Blanco, Massachusetts Institute of Technology
- How to build a sustainable supply chain strategy? AT Kearney Inc
- Building a strategy for Building a strategy for 'Green' Supplier Verification, by Sherry Moomey, Category Manager, Global Procurement, Nike and Angelo Gasparri, JD, PMP, Director, Business Performance Services, KPMG LLP

Attachments

Omega Dissemination Conference Presentations

- Adding Contrails to a Climate Model, by Piers Forster, University of Leeds
- Omega Dissemination Conference flyer
- The Stakeholder View: An Environmental NGO, by Tim Johnson, Director, AEF
- Air Traffic Management Inefficiency: Assessing the Role of ATM in Reducing Environmental Impacts of Aviation, by Dr Tom Reynolds, University of Cambridge
- Responsible Air Travel, by J Counsel, British Airways
- Carbon Offsetting and People Issues: Omega Studies, by Paul Hooper, CATE, MMU
- OMEGA – Stakeholder Viewpoint, Department for Transport
- Economic Benefits of Aviation, by Dr David Gillingwater, Loughborough University
- Latest Market / Economics Knowledge, by Andreas Schäfer, University of Cambridge
- Omega Dissemination Conference program
- Technology Programme, by Professor Ian Poll, Cranfield University
- Project ICARUS & Airline Business Models, by Dr Keith Mason and Dr Chikage Miyoshi, Department of Air Transport, Cranfield University
- Powering a Better World: Rolls-Royce and the Environment: Engine Technology, by Dr Naresh Kumar, Head of Environmental Strategy

Wal-Mart Stores, Inc

- Wal-Mart Sustainable Logistics Fact Sheet
- Wal-Mart Packaging Scorecard PowerPoint Presentation. D-14 Supplier Summit