Low Carbon Emission Supply Network Design and a case in Chinese ICT industry

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Outline

• Background
• Carbon Measurement Methods
• Initial framework
• Case studies
• Future work
• Discussion
Introduction and background

- Climate change is important
- The GHG (Green House Gas) Effect
- GHG will have to be reduced from 48 billion to 24-28 billion tons
- GHG emissions frequently arise from supply
- So the manufacturing industry is trying to tackle the balance issue between profit growth and environment/society sustainability, and low carbon issue become a trend of academic research.

- Carbon emissions and carbon constraints “can financially affect a company even if they occur not in the company itself, but within the value chain of the company.” (Busch et al, 2004)

- This research scope is mainly focused on Consumer Goods, but will also expand to logistic industry.
Pressure for low-carbon shift

Consumers Attitudes (Competition)
Fuel Price Volatility
Regulation & Legislation
Cost and waste saving

European Union
EU ETS
United Kingdom
EU ETS
Climate Change Act
Carbon Reduction Commitment
United States
State and national action
Chicago Climate Exchange
Western Climate Initiative
Californian State Initiatives
Australia
Carbon Pollution Reduction Scheme
New Zealand
Emission Trading

‘I am personally making a significant effort to reduce climate change through how I live my life today’

Carbon Law, 2008

Consumer Survey, HCBC, 2007
Carbon footprint' is a term used to describe the amount of greenhouse gas (GHG) emissions caused by a particular activity or entity, and thus a way for organizations and individuals to assess their contribution to climate change.” (PAS2050, 2008)

Five steps to calculate the carbon footprint

1. Process map
2. Boundaries and prioritisation
3. Data
4. Calculation
5. Uncertainty
GHG (Greenhouse Gas) Protocol Initiative - WRI & WBCSD (at organization level)

- Corporate GHG accounting and reporting.
- Internationally accepted GHG accounting and reporting standards.
ISO 14064

-GREENHOUSE GAS ACCOUNTING AND VERIFICATION (from organization and project perspective)

- International Standards for environmental management.
- an integrated set of tools for programs aimed at reducing GHG, as well as for emissions trading.
- specifications and guidance for the organisational and project levels, and for validation and verification.
Research Question

Industries require practices guidelines

Absence of network level supply chain management for carbon abatement

Industrial Needs

Research Gap

How can supply networks be redesigned in order to reduce carbon emission?
Greening the Supply Chain – Generic Potentials

- Eliminating use of hazardous/toxic and non-functional materials
- Shorter Innovation cycles; managing product transition
- Design for Manufacture to support efficient production
- Distribution channels that minimise storage and transport, and VC impact
- Exploiting regional logistics capabilities and infrastructure, e.g. road, rail, sea, air
- Improving last mile logistics
- Optimum Energy source / impact of location,
- Energy consumption - alternative production processes
- Eliminate use of pollutants, waste, toxic gas emissions
- Production process technology development - integration of processes
- Integration of Product-Process Technologies
- Development of through-life product-service solutions
- Disposal and Landfill
- Managing through-life and end-of-life (reverse logistics)

GSCM Mapping
- Industrial Context
- Capability
- Configuration

(D. Kirkwood, Y. Shi, J.Srai, J. Hu)
Phrase 1
- **Global Supply Network Carbon Footprint Mapping**
- **Deliverables:** Based on different industrial sector observation and analysis, suggest one integrated approach or a scenario scheme to map global supply network carbon footprints.

Phrase 2
- **Improving Global Supply Network Carbon Footprint**
- **Deliverables:** Based on different industrial sectors observation and analysis, preliminary global supply network framework for carbon footprint reduction is generated.

Phrase 3
- **Investigating focused supply network stages for carbon footprint reduction**
- **Deliverable:** Based on industrial sector observation and analysis, case studies report and methods/tools are generated.

Phrase N
- **Network Re-design Method Development**
- **Deliverables:** Focusing on the identified stages (for example: production location decision, network strategic logistics optimisation) in the global supply network, develop a preliminary Network Re-design framework and a preliminary computer simulation model to map/optimise the network (optional).
ICT Industry practice – case of Company L

- One of the biggest PC manufacturers in the world in terms of revenue.
- Starting Low Carbon Supply Chain Initiative from 2006
- Vision--Building a Green, Low Carbon New ICT Industry
Identification the spheres of influence

Sphere 1
operations and the direct emissions from all facilities
– **Scope 1 emissions**

Sphere 2
Energy suppliers and their operational emissions which are attributable to Company L activities – Scope 2 emissions

Sphere 3
Supply chain and emissions associated with the production and delivery of goods and services to Company L (cradle to gate) – Scope 3 emissions

Sphere 4
Customers and the emissions associated with their procurement, use and disposal of products (gate to grave)
– Scope 4 emissions

Sphere 5
Government, NGO, and public actions in support of transition to a low carbon economy
Company L Low Carbon Practice

• Providing IT products which enable efficiency improvements in the generation, delivery and use of energy

• Calculating product life cycle carbon footprint and keep it in a low level

• Improving the energy efficiency of our existing processes and encouraging suppliers to do so in their operations;

• Adopting more environmental friendly transportation methods

• Building Green Supply Chain
Specific practices

• All-In-One machine with high energy efficiency and many other green features.
Specific Practices

- Green Packaging
  - Bulk Package

- Reduced package size
Low Carbon Practice Result

Company L’s carbon efficiency increase 15% in 2009, surpass the 10% target, Scope 1 and Scope 2 carbon emission have been reduced 20% year to year in 2009.
Implication to Low Carbon Economic of ICT industry

• Company should take active action to transfer to a green and energy efficiency, low carbon and sustainability leader, than the others will follow the right direction;

• By the support of the Government, to guide the ICT industry journey in the direction of low-carbon economy;

• The communication between ICT and its related industry should be enhanced to rapid amplification of good practices effect in driving the industry to green and low carbon model.
Contribution and future work

- Overview, and comparison of carbon footprint measurement methods
- Case studies detailing pilot MNC’s strategies, methodologies, and best practices in carbon footprint measurement and reduction;
- A re-design framework and simulation Model of global supply networks for the purpose of cutting carbon emissions
- Preliminary Network-level systematic process and tools on implementing carbon emission reduction practices
- Potential Contribution:  
  - New knowledge to supply chain management in green consideration;
  - Generate supply network design and redesign theory and methodology and process from the perspective of qualitative research;
  - Knowledge in optimization to supply chain operation on multiple objectives and constrains.
THANK YOU