Twenty five people attended the LCA/Biodiversity Roundtable held at the University of NSW on Monday July 23rd 2007.

Biodiversity and LCA practitioners from all industry sectors were encouraged to attend. Representatives from the forestry, water, government, educational and consultancy sectors attended.

The morning was taken up with presentations from the Biodiversity participants. The following presentations were made:

1. 'Measuring responses to disturbance'

Dr. Brad Law, Dr. Trent Penman (State Forests NSW)

An overview of research being conducted by the Forest Biodiversity Group of NSW DPI Science and Research Division was given, and it became obvious that State Forests NSW has accumulated an enormous bank of knowledge over many years.

The presentation focused on:

- The effects of forest management practices (e.g. logging, fuel-reduction burning) on fauna and flora
- Ecology and management of threatened species
- Identifying practical and reliable indicators of biodiversity, and development of methods for monitoring changes in biodiversity
- Development of integrated landscape models of wildlife habitat supply and timber production

- The biodiversity value of eucalypt plantations in rural landscapes

Key points:

- Biodiversity – measures for ecosystems vs. species vs. rare species
- Influences – logging (clear fell v selective) vs. fire vs. grazing
- Attempting to produce "landscape models" timber supply rate relation to biodiversity index, correlations not good enough yet
- Have identified biodiversity relation to forest age and/or forest size
- Created 'toolkits' to rapidly assess naturalness (<1 hr)
- Non-linear state response model based on Eden logging, fire treatments
- All sites decline irrespective of treatment
- Main issue – time since proper wildfire

2. 'Waterways Monitoring in a Major Metropolis - Design Features for Impact Detection in a Complex Environment'

Colin Besley (on behalf of Dr. Marcus Scammel and Dr. Renee Kidson, Sydney Water Corporation)

Colin spoke about why Sydney Water monitors and identified the strategic drivers, how they detect and differentiate impacts in a complex environment, presented a case study 'Riverine Environment: Macroinvertebrates' and identified the key features for success in a complex environment.

Key points:

- Before After Control Impact (BACI) model for freshwater indicators
- Different fluvial habitats
- Genus level species assessment
- Multivariate stats useful but resolution can be an issue
- Univariate stats not troubled by small-scale differences in community structure
- So "Goldilocks principle" - intermediate resolution best
- Problem of extracting hydrology from models
- Need a strong regulatory driver to support adequate monitoring program longevity

3. Assessing impact of human activities on biodiversity and landscapes

Dr. Michael Dunlop (CSIRO)

Michael's talk focused on:

- Issues with measuring biodiversity – poor data,
- dynamics of pressure, many pressures, regional variation
- National water benefits – poor data, poor
- understanding, many impacts (social context) – people
- define impacts, impacts vary between people
- Climate change – 'cascade of impacts' – complicated processes, many interactions, specific impacts, poor data and understanding, dynamics of response – lags, non-linear thresholds, interactions between pressures, regional variation

Lessons about Assessing Impact on Biodiversity

- Poor data and understanding
- Complicated processes, many interactions, specific impacts
- Dynamics of pressures - increasing, decreasing
- Dynamics of response – lags, non-linear, thresholds
- Many pressures – combine and interact
- Many impacts – social context, people define impacts, impacts vary between people, (even more so for biodiversity)
- Regional variation – species and ecosystems, important pressures, ecological responses, social concerns, aggregation difficult

Two particular complications:

Land use – 3 types of pressure – occupation of land (ongoing impacts of land use)- impact each year, off- site impacts, transitions in land use (one-off event with permanent impact)-first change in land use worse than subsequent occupation

Spatial context
- Where the activity occurs (capability, resilience, vulnerability)
- Habitat heterogeneity – spatial arrangement of different land uses in the region, proportion of landscape affected, not area per se
- Non-liner impacts – last hectare worst than first (death by a thousand cuts), delays, thresholds

Suggestions

Land use
- Vegetation extent is a well used surrogate
- Weigh by intensity of use
- VAST (8 state scale – Thackway and Lesslie BRS)

Water extraction
- Pollution, nutrients, sediments
- Invasive species (sources and habitat)
- Human activity

4. 'Biodiversity in Development: complexities and uncertainties in using biodiversity metrics'

Dr. Sarah Bekessy (RMIT)

Sarah spoke about the multi-disciplinary umbrella project at RMIT University, Melbourne which focuses on improving the sustainability of Australian suburban development.

Value of urban fringe biodiversity in Australia

- Over 40% of nationally listed threatened ecological communities and more than 50% of threatened species occur in urban fringe areas
- Urbanisation is now considered one of the greatest threats to biodiversity in Australia

- Biodiversity is neglected in LCA due to uncertainty, global impacts, impact assessment is difficult (habitat quantity, quality and complexity), impacts of fragmentation, risk from catastrophes (disease, fire), risk of inbreeding, spatial/temporal dynamics, links to carbon and water
- Tools for assessing risk and incorporating uncertainty - Bayesian belief networks, population viability analysis, policy modelling
- Challenges for future research - development of appropriate models, complexity of assessment systems, importance of scale of management and robustness of biodiversity assessments to uncertainty

Key points

- Problem of understanding biodiversity when we don't actually know the number of species etc out there
- Recommends using qualitative risk assessment in parallel to LCA
- Tasmania-scale model of Tasmanian Wedge Tail Eagle
- Victorian 'habitat hectares' scores biodiversity offsets
- Dislikes the whole idea of biodiversity offset policies.

The afternoon session involved three presentations from LCA practitioners before the workshop session.

5. 'Life Cycle Impact Assessment'

Tim Grant, RMIT

- Life Cycle Assessment – the assessment of the potential environmental impacts of products and services
- LCI – Life Cycle Inventory – second stage of LCA i.e. collection of environmental and technical flows between processes – also LCI databases – collections of LCI released to public/in software.
- Life Cycle Impact Assessment (LCIA) – the process of indicator development (third stage of LCA)
- Using LCIA results - look at the indicator results, examine the emissions, processes and links to the indicators and data quality, framing of questions, definition of functional units, draw conclusions after this
- The four stages of LCA – goal and scope definition, inventory analysis, impact assessment, interpretation
- Characterization, mid points, end points and indicators
- LCIA categories
- Australian Science into LCA Workshop November

2006. The workshop looked at international models and Australian requirements and over two days looked at a broad range of impact categories.
- Land, water use impacts
- Weighting
- AusLCI - A national project to establish high quality, transparent LCA data and involves industry, research institutes and government. The project has a proposed working group on LCIA

6. 'Challenges of incorporating biodiversity into LCA'

Dr. Paul Koltun (CSIRO)

- LCA and Biodiversity definitions
- Biodiversity is often a measure of the health of biological systems and is usually explored at three levels - *genetic diversity, species diversity and ecosystem diversity*.
- Advantages and limitations
- LCA is dedicated to environmental impact from one functional unit
- World wide impact vs. local impact
- Linear approach adopted in LCA in two directions
- Ecosystems as complex-system organizations can't be totally reduced to chemical and physical principles
- Other problems between LCA & Biodiversity links - other human activity in the local area, time scale paradox, complexity of biodiversity indicators, transparency and ambiguity of LCA results for both types of LCA studies: Attributional LCAs (the accountancy type) and Consequential LCAs (the environmental consequences of possible changes between alternative product systems)
- Is it useful to use results of LCA studies for biodiversity issues - yes
- Is it useful to evaluate biodiversity issues or make decisions using results of LCA studies - No

## 7. Bringing Biodiversity to Life Cycle Assessment - UK approach for rating tools

Dr. Nigel Howard, BRANZ

- LCA of a glass
- Impact assessment: Measurement of issues, Characterisation, Normalisation, Weighting, Ecopoints

- Two aspects of biodiversity
  Direct Land Use
  - Farming
  - Forestry
  - Urbanisation and sprawl: buildings
  Indirect biodiversity impacts from LCA Impact Assessment – Long Range
  - Climate change
  - Acid rain
  - Ozone depletion
  - Pollution
  - Local: plume deposition
  - Global: POP's and PBT's
- Quest for a Mid-Point indicator for Ecological Impacts
- Indicator species
  - Non-migratory bird species diversity
  - Mobile
  - Toward the top of the food chain
  - Easily captured and counted
  - A lot of historic data
  - Reflects the ecological richness of a largish area
- Plant species
  - Immobile
  - Base of the food chain
  - Characterise the habitat
  - Good historic data in different landscapes with different land uses
  - Reflects the ecological richness of a limited area
- Species index
- Use of a construction site

Summary

- Ecological diversity of habitats is complex and interconnected
- This complexity IS similar for many environmental issues
- LCA adopts a mid-point proxy approach
- Accepted metrics for ecological impact have proved elusive
- LCA has failed to embrace ecological diversity
- Ecology has failed to provide LCA with practical metrics
- In the UK, an ecological index – the product of average species number and area has been used as an approximate metric of ecological diversity in BREEAM building rating tools
- This has many practical advantages and seems to promote change that "moves us in the right direction" for reducing ecological decline
- It also has many flaws all of which are accepted
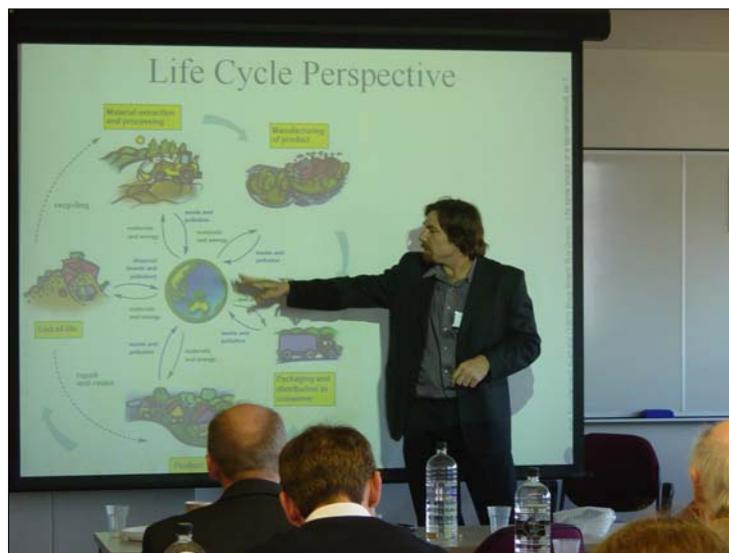
Workshops

Two workshops were held –a land use workshop and a water workshop

Summary of land use workshop

The group comprised about 20 individuals from both the LCA experts and from the Ecology experts. Brief notes from the facilitator are as follows:

- The LCA stakeholders were seeking a practical, measurable, best mid-point indicator to use for biodiversity impacts form land use.
- The ecologists cautioned that all of the available simple metrics are imperfect for this purpose.
- There was good agreement that we did not want to try to reinvent the wheel.
- There was good evidence that existing indices (even the simplest indicators) used by ecologists were similarly effective when "Ground-truthed" against real sites.
- The key attributes that must be included in such an index are:
  - Complexity of habitat
  - Condition of habitat
  - Landscape context
  - Irreplacability
- It was suggested that any indicators used need to work internationally
- It was suggested that GIS might be used to determine site characteristics mapping:
  - Rarity or irreplacability
  - Alpha diversity – numbers of species
  - Beta diversity – number of species in a region

- Conclusion that the LCA/Ecology communities work together to identify key parameters that should be compiled by the Australian Life Cycle Inventory Project.

Summary of water workshop

- Looked at how LCA related to the water cycle
- Discussed how the water sector could examine itself from a LCA perspective
- The group struggled with marginality and discussed the impacts from potable/recycled and desalination
- It was acknowledged that different tools existed that were not perfect.
- The group did not want to reinvent the wheel
- Discussion on the AquaBAMM (aquatic biodiversity metric) report

Roundtable outcomes

- That a sub-committee of the AusLCI Project is convened to identify key parameters for incorporating biodiversity into LCA and that the participants in the Biodiversity Roundtable might be invited.

Post Roundtable

- Joe Lane (Natural Resource Sciences, Queensland) provided a website address for the AquaBAMM (aquatic biodiversity metric) report that was discussed in the water workshop. The address was distributed to all participants.

http://www.epa.qld.gov.au/nature_conservation/habitats/ wetlands/wetland_assessment/ aquatic_conservation_assessments_aquabamm/

Brad and Trent (State Forests NSW) are preparing a discussion paper which they hope to complete sometime in August 2007. In the paper they will identify many of the limitations of the existing toolkits and propose an alternative approach for developing biodiversity measures in LCA.

Thank you

The LCA committee extends their thanks to those people who participated in the Roundtable, the Roundtable organisers and the University of NSW who allowed us to use their room and facilities free of charge.

Jean Wiegard
ALCAS Treasurer