

CRC CI – Clients Driving Innovation
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A Building Sustainability Assessment Framework

LCA Develop

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LCA Design BSA Framework

Framework from LCA Design

- Sustainable building context
- BEA tool reviews
- Building Life Cycle Theory
- The BSA Framework concept
- Persuasive technology

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LCA Design Tool Capabilities

Informed, real time decisions on environmental and cost impacts...

Object orientated CAD architectural system with IFC export capability

IFCs provide common interpretation of real-world objects for IT to be interoperable.

Whole design focus
Transparent performance measures
Identifies alternatives
National database
Integrated CAD IFC LCI assessment:
Reads from 3D CAD
Drill-downs to design "hot spots"
Repeatable calculations
Real-time appraisals
Environmental impacts
Alternative designs

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LCA Design Automated Eco-efficiency Tools for Commercial Building

CRC CI Objectives

- Satisfy needs of sustainable building design
- Develop BEA tool databases/decision-support tools
- Preferred integrated sustainability appraisal tool
- Optimise decisions on buildings sustainability impact
- Uniform info for various concepts, products, designs

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LCA Design Innovation

3D CAD OBJECTS
CAD DRAWINGS OF BUILDING

AUTOMATED TAKE-OFF
COMPONENT MATERIAL QUANTITIES COSTS

AUSTRALIAN LOCAL EMISSION DATA
PROCESS MODELS BOUSTEAD SIMAPRO

KEY ENVIRONMENTAL INDICATORS
ECO-INDICATOR CML

ECO-EFFICIENT DESIGN PROCESS
PERFORMANCE ANALYSIS COST BENCHMARK

Inventory

Impact Category

Damage Assessment

Input: CO₂, CH₄, CFCs

Output: CO₂, SO₂, CFCs, ODP, Fossil fuels

Human Health

Respiratory organics

Climate change

Ecosystem Quality

Resources

Final Single Value

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LCA Design Asses Alternative Facades

Pre-Cast Concrete Panel

Brick Masonry

Glass Curtain Wall

Human Health

Human Toxicity

Climate Layer

Respiratory Organics

Low Glass

Mid Concrete

High Brick

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LCA Develop Intent

The theoretical framework supports decision making through better definition, communication and assessment of sustainable solutions over the building life cycle.



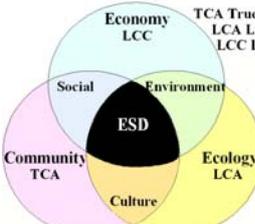
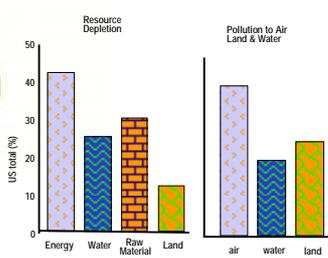
LCA Develop Sustainable Building Context

1. Reviews of theory related to Building Environmental Assessment tool development
2. Reviews of leading international and national tools
3. Consultation with stakeholder groups
4. Experience of the team
5. Others' critiques / theories on environmental decision making



LCA Develop BEA Scope and Methods

**TCA True Cost Assessment
LCA Life Cycle Analysis
LCC Life Cycle Costing**

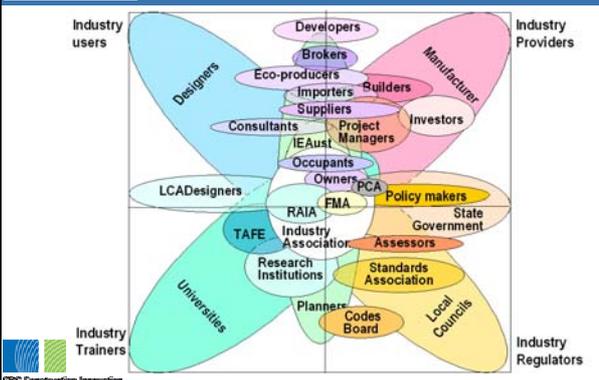



Category	Energy	Water	Raw Material	Land
Resource Depletion	~45	~25	~30	~15
Pollution to Air Land & Water	~40	~20	~25	~25

Buildings Total share 15-42% eco burdens



LCA Develop Stakeholders, Roles & Jobs



Industry users: Designers, Eco-producers, Importers, Suppliers, Project Managers, Consultants, IEAust, Occupants, Owners, LCA Designers, RAIA, TAFE, Industry Association, Research Institutions, Universities, Industry Trainers

Industry Providers: Developers, Brokers, Builders, Manufacturer, Investors, Policy makers, State Government, Assessors, Standards Association, Local Controls, Codes Board, Industry Regulators



LCA Develop Sustainable Aspects

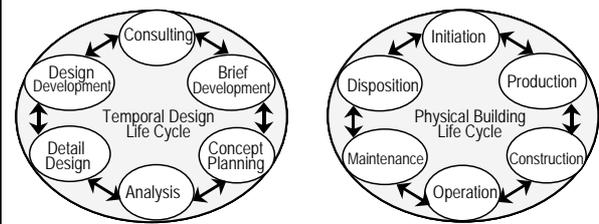
...to reduce environmental, social and economic impacts...

Coordination of stakeholder needs across an array of design criteria:

- Social aspects of welfare, health, safety and comfort;
- Functional and economic aspects of use incorporating flexibility;
- Technical aspects of serviceability, durability, reliability; and.
- Ecological aspects of resource depletion and pollution abatement.

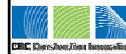


LCA Develop Redefining Life Cycle Thinking



Temporal Design Life Cycle: Consulting, Design Development, Brief Development, Concept Planning, Analysis, Detail Design.

Physical Building Life Cycle: Initiation, Production, Construction, Operation, Maintenance, Disposition.



LCA Develop BEA Life Cycle Considerations

Criteria	Flow	Planning	Design	Procure	Construct	Operate	Disposition
Conserve Sources	Energy	renewable	daylight	daylight	thermal comfort	efficiency	recover
	Water	catchment	efficiency	catchment	avoid run-off	reuse	check quality
	Material	reuse	interoperable	interoperable	disassembly	reparability	recover
	Community	amenity	equity	equity	OH&S	WH&S	heritage
Protect Sinks	Energy	low toxicity	fresh air	fresh air	noise/dust EMP	control, EMS	control, EMS
	Water	Interactive	low impact	low impact	nature corridor	educative	habitat refuge
	Material	safety	disassembly	local	WH&S	WH&S	heritage
	Community	amenity	equity	local	OH&S	WH&S	heritage



LCA Develop Stakeholder Roles & Jobs

*investors... owners... developers... planners...
managers... designers... surveyors...
manufacturers... consultants... builders...
operators...*

*planning... communicating... documenting...
assessing... measuring... procuring... delivering...
building... living*



LCA Develop BSA Framework Assistance

Propose	Estimate	Score
Invest	Design	Label
Plan	Model	Procure
Class	Monitor	Track
Present	Calculate	Supply
Rate	Blueprint	Control
Guide	Report	Check
Benchmark	Regulate	Fitout
Tender	Specify	Certify
Bid	Checklist	Accept
Manual	Bill	Reference



LCA Develop Tool types and theory

Tools:

1. Bridge assessment & actions (tasks) to be undertaken;
2. Bridge professions, ideologies & divergent paradigms;
3. Provide direction and facilitate clear communication; and,
4. Structure and streamline information.



Making a job easier!



- ### LCA Develop BEA Tools Studied
1. Findings of Seo (2002), RMIT et al (2002) and Watson et al (2003);
 2. User applications over the full life cycle from cradle to cradle;
 3. Evaluation of deliverables by temporal and physical life cycles;
 4. Stakeholder applications against potential tool deliverables;
 5. Gaps between user needs and tool attributes/applications; and,
 6. Prospective plug-in tools needed for their work to fill such
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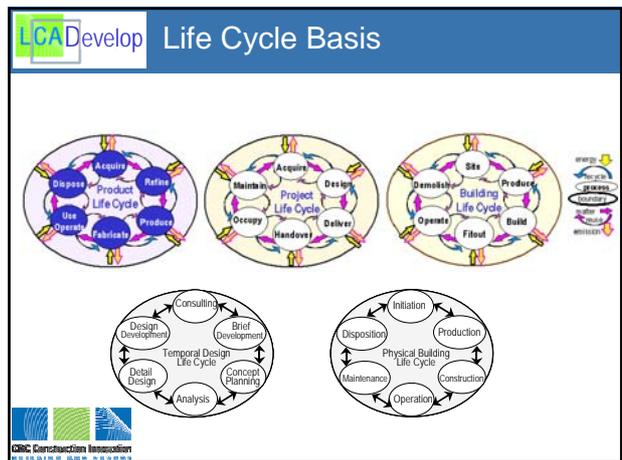
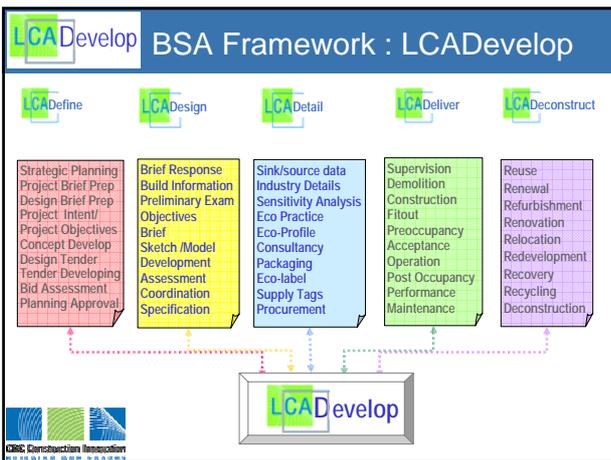
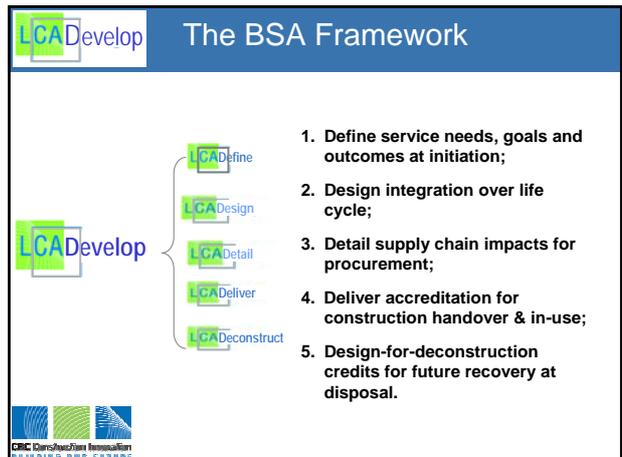
LCA Develop Tools by Application and Phase

Type Vs Phase	Tools Types Used	Project Definition	Concept Design	Detail Design	Supply & Procure	Construct	Fitout	Occupy & Maintain	Renew Disposal
Investor	Benchmark Policy Guide Rating		NABERS	LCA Design				NABERS	
Developer	Goal Strategy Tactics Plan Model								
Council	Estimators Standard Reference								
Provider	Benchmark CoP Tactics Plan								
Designer	Calculator Standard Checklist								
Supplier	Specification EMS Certification								
Manager	Tactics Plan Calculator Standard								
Designer	Checklist Specification EMP								
Builder	Certification								
Owner	CoP Manual Plan Report Standard								
Tenant	Certification Badge								
Operator									



LCA Develop BEA tools desirable attributes

Attribute	Requirement
Coverage	Address whole of life issues
	Cradle to cradle (operational energy)
	Comprehensive interior occupancy focus
LCA Database	Broad industry acceptance
	Manufacturer product assessment
	Real-time selection (real time)
Weighting	'Ecopoints' / rating to define impact
Framework	Design performance simulation ability
	Concept design modelling
	Hierarchical building element structure
Software	Generic shape / building type choice
	Best practice defaults
	Hierarchical building element structure



- ### LCA Develop Interactive Tool Prototypes
- Proposed features:**
- Communication and alignment with ESD principals, policy and planning;
 - Technical and linguistic coordination with other BEA tools
 - Comparative assessment against best building performance benchmarks;
 - Documentation/templates for briefs specification, contract and evaluation;
 - Interactivity with supporting frameworks, guidelines and checklists and
 - Plug in tools to meet user needs for in-use assessment on ESD criteria

