Bharathidasan University

Programme: MSc Environmental Science and Sustainable Management

Course Title: CORPORATE ENVIRONMENTAL STRATEGIES - ISO 14000 , OSHAS and LCA

Course Code: 21PGCC07

Unit- III Life Cycle Approach (LCA)

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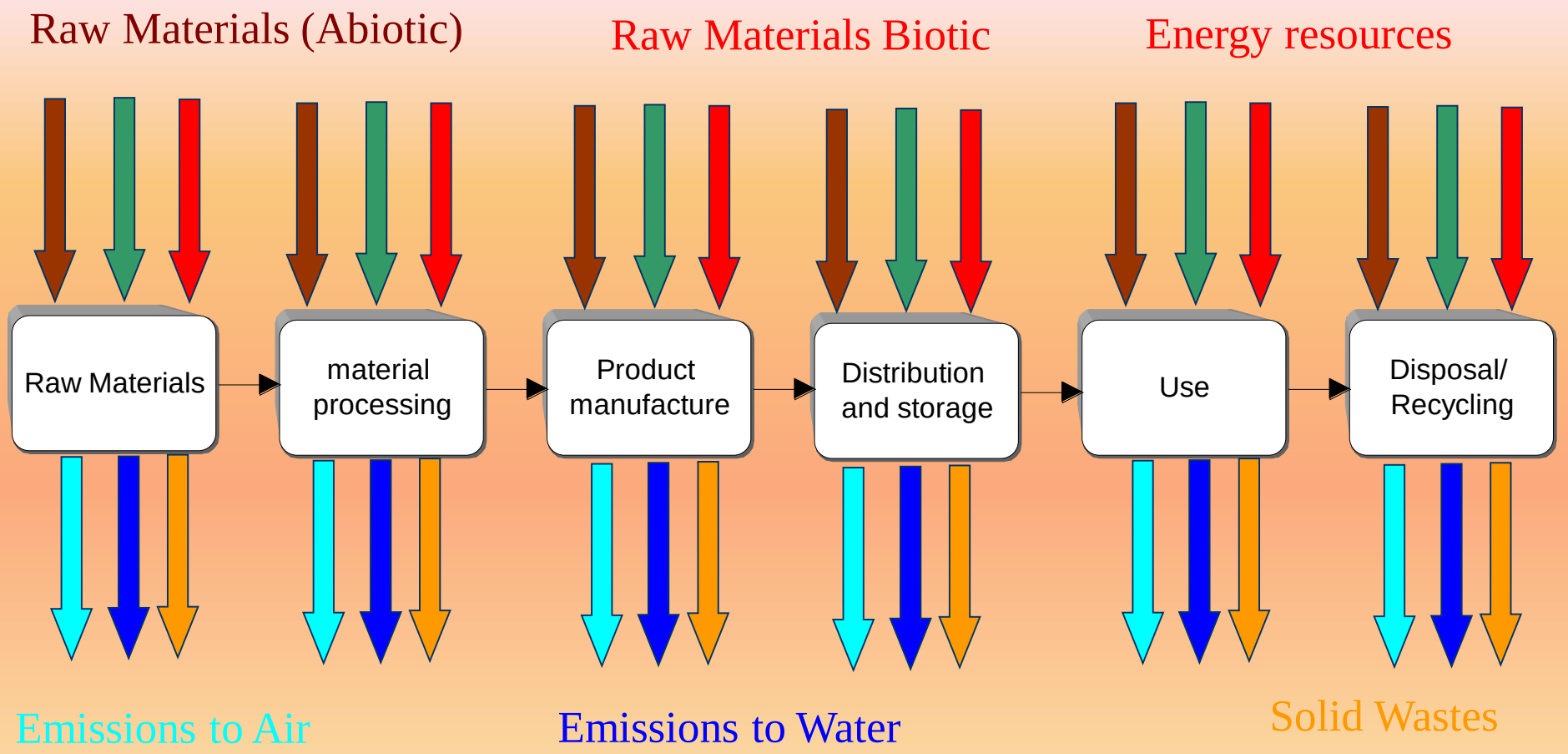
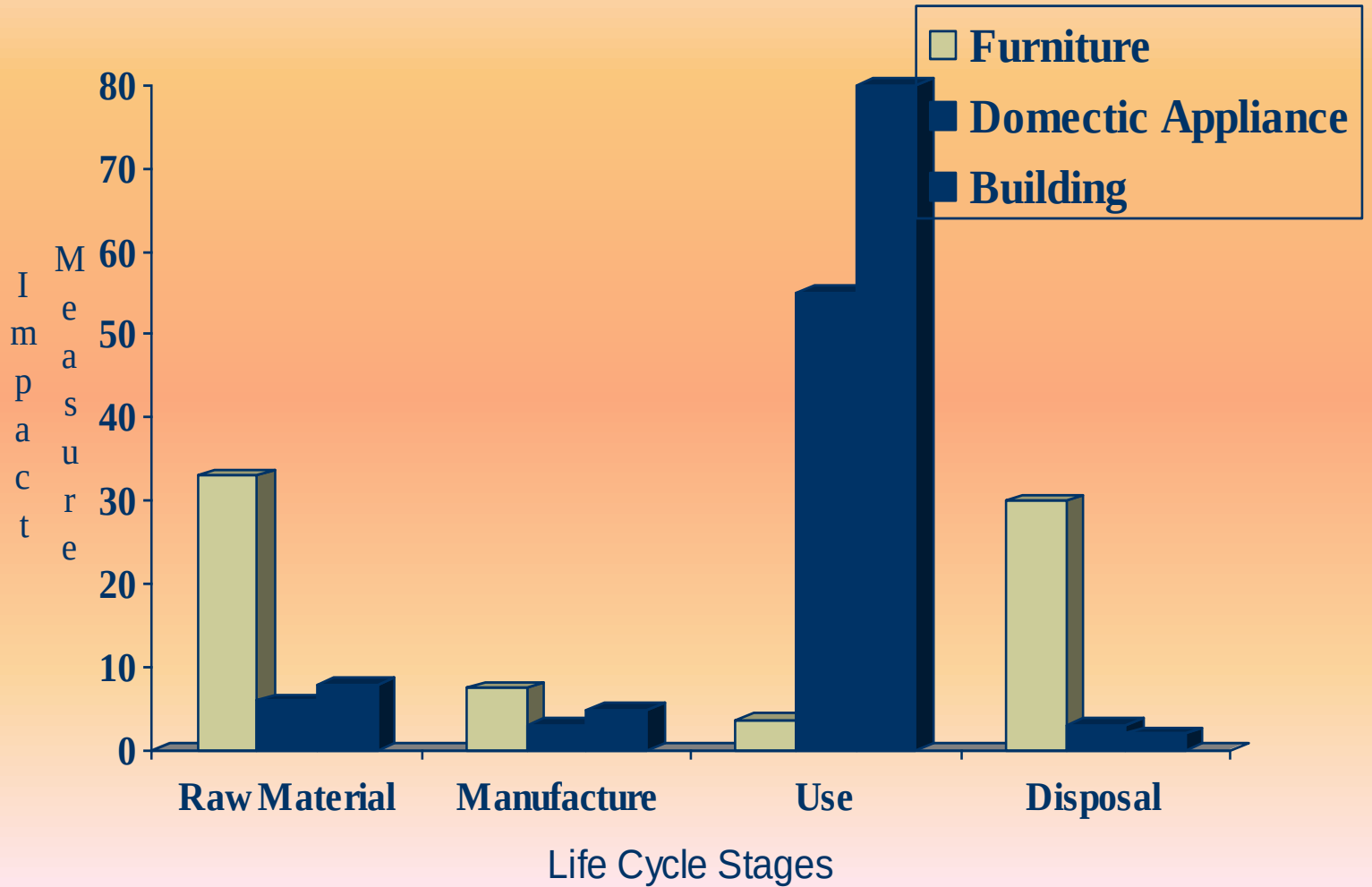
What is LCA


Raw Materials (Abiotic)
Raw Materials Biotic
Energy resources
Raw Materials
material processing
Product manufacture
Distribution and storage
Use
Disposal/ Recycling
Emissions to Air
Emissions to Water
Solid Wastes

The Importance of a Life Cycle Approach

Need to understand what is important, in environmental terms, about you product

The Importance of a Life Cycle Approach

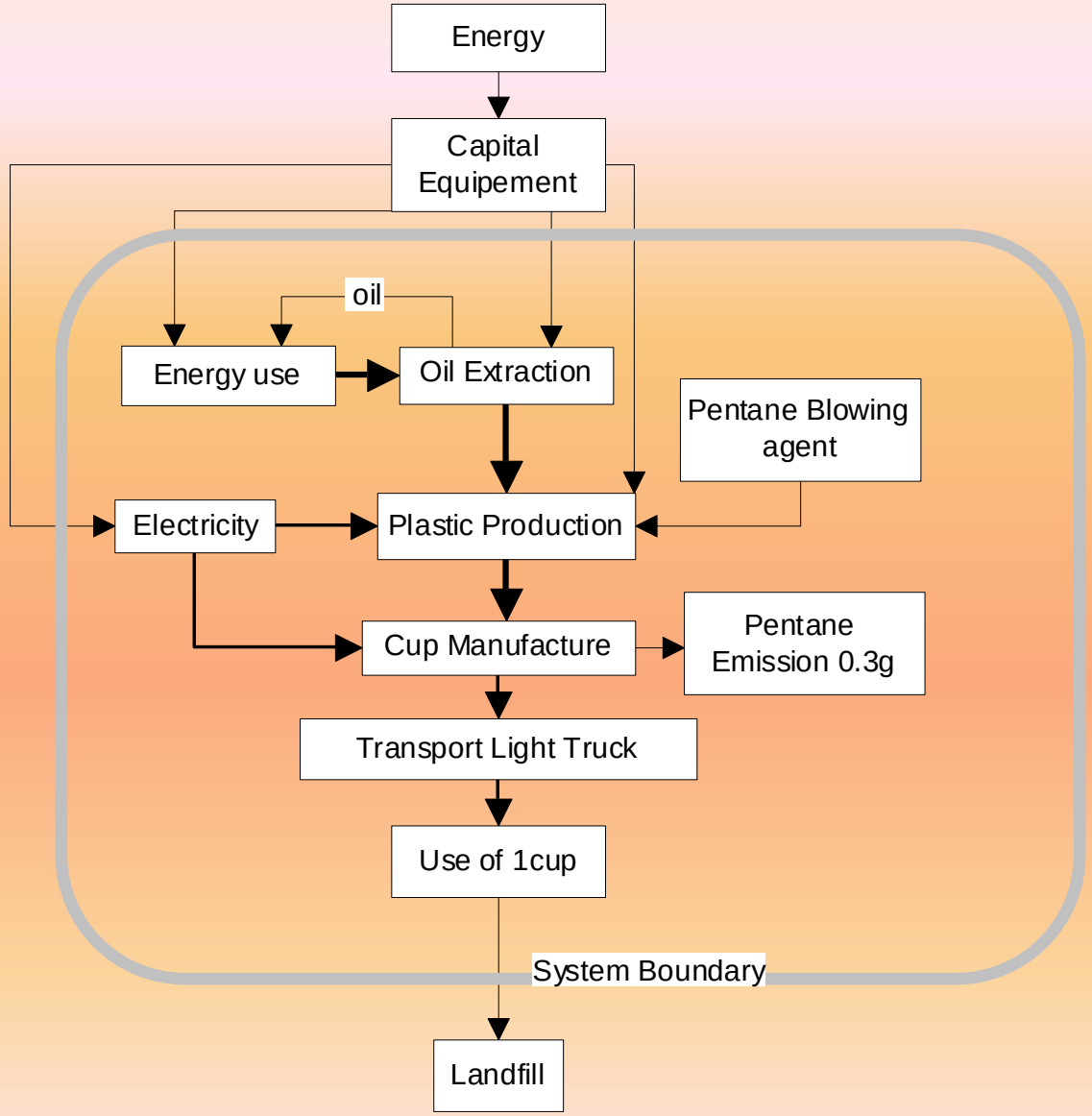


Overview of the LCA process

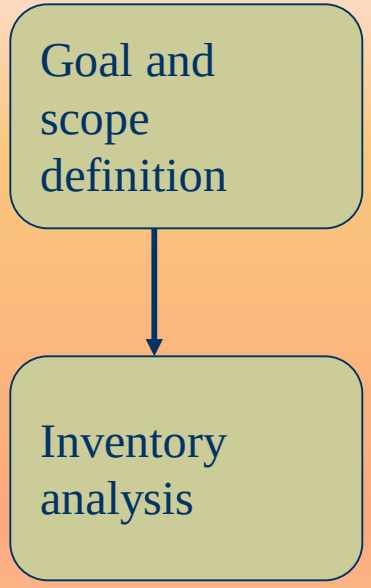
Goal and scope definition

[1] Goal and scope definition:

Description of the product, the scope, the required reliability, the criteria for a judgement



Overview of the LCA process



No	Substance	Category	Unit	Magnesium-	Painted	Steel base Metal rollers PP ec	Titanium Powdercoat Base
1	1,2-dichloroethane	Air	µg	17.1	22.5	6.7	
2	acetaldehyde	Air	µg	383	502	150	
3	acetic acid	Air	mg	1.75	2.3	0.685	
4	acetone	Air	µg	381	500	149	
5	Acid as H+	Water	µg	67.1	87.9	26.2	
6	acrolein	Air	ng	98.2	129	38.4	
7	Ag	Raw	µg	6.3	147	147	
8	Ag	Water	µg	1.51	1.98	0.589	
9	Al	Water	mg	316	416	125	
10	Al	Air	mg	156	21.2	4.79	
11	alcohols	Air	mg	x	21	21	
12	aldehydes	Air	g	0.000971	4.24	4.24	
13	alkanes	Water	µg	319	419	125	
14	alkanes	Air	mg	3.55	4.65	1.39	
15	alkenes	Water	µg	29	38	11.3	
16	alkenes	Air	mg	1.2	1.57	0.468	
17	aluminium scrap	Solid	g	405	x	x	
18	ammonia	Water	mg	0.179	4.23	4.23	
19	ammonia	Air	mg	8.36	3.11	0.94	
20	AOX	Water	µg	8.72	19.8	12.2	
21	As	Water	µg	633	834	252	
22	As	Air	µg	48.6	383	17.6	
23	B	Air	mg	9.22	12.1	3.6	
24	B	Water	µg	540	791	298	
25	Ba	Air	µg	165	217	64.6	
26	Ba	Water	mg	31.1	46.7	18.3	
27	barrage water	Raw	kg	x	4.11	0.687	

[2] Inventory stage: Systematic description of all processes in life cycle phases. Data collection on each process step. Calculation of the inventory table with all raw material depletion's and emissi

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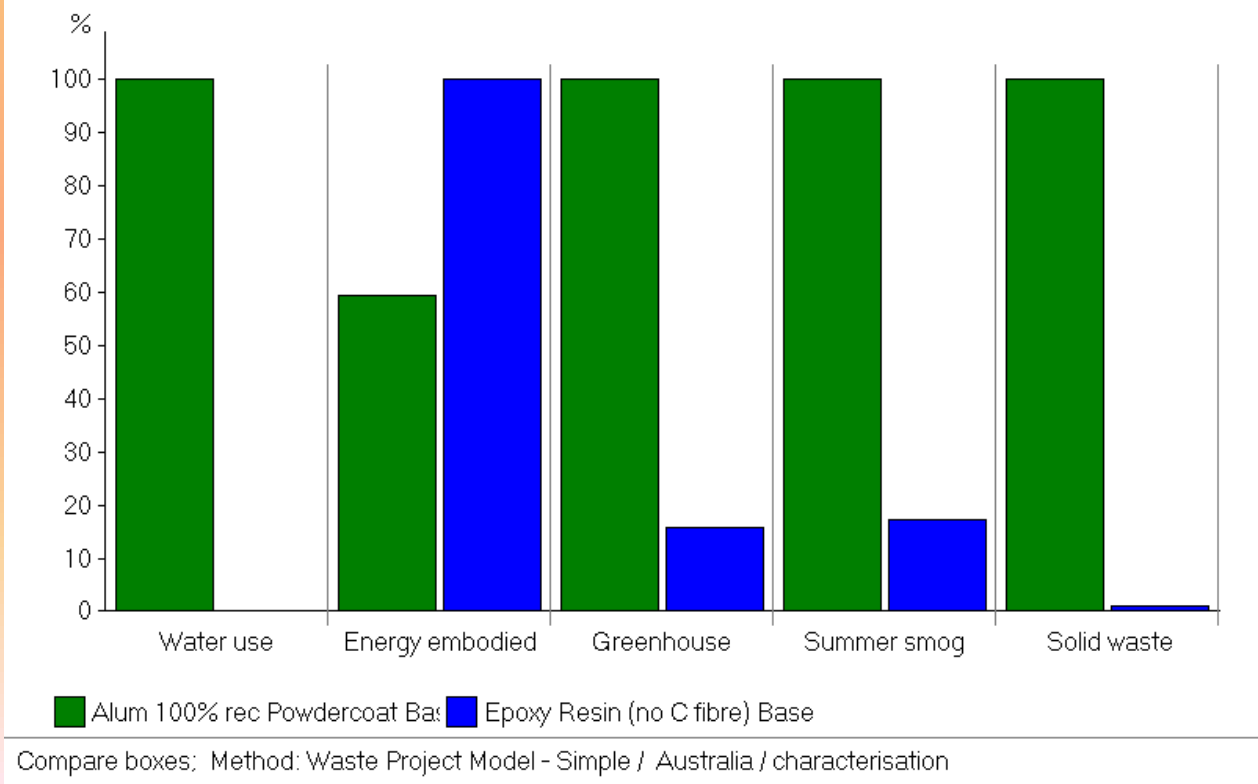
Overview of the LCA process

Goal and scope definition

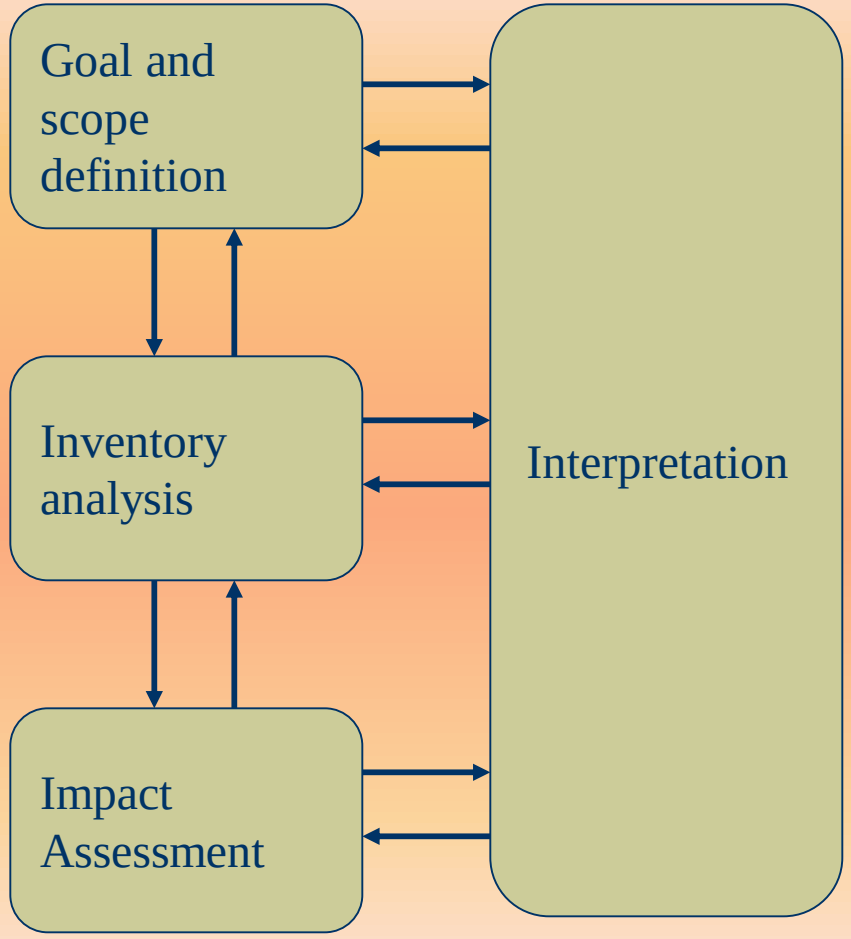
Inventory analysis

Impact Assessment

[3] Impact assessment: Sorting of all emissions and raw material depletion's to their environmental effects. Computation of single scores per effect. 'Normalising' the effect score (relative magnitude), Computation of one 'overall' single score



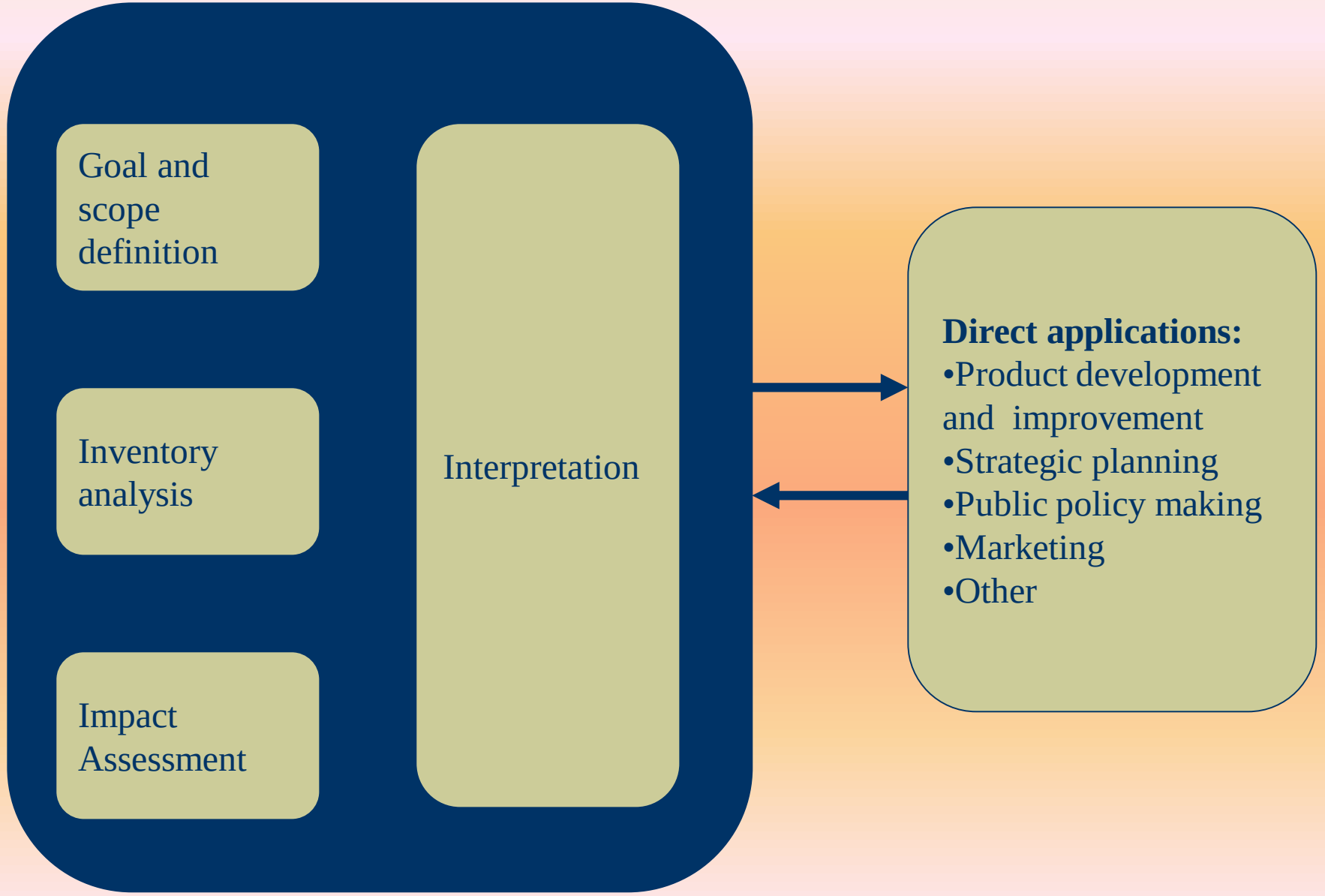
Overview of the LCA process



[[4] Interpretation

- **Identify Significant issues**
- **Evaluation**
  - **Data quality checks**
  - **Sensitivity Analysis**
  - **Consistency checks**
- **Conclusion, recommendations and reporting**

The LCA process



The strengths of LCA

- Can compare across different environmental impacts
- Can compare effects from different stages of the life cycle
- Can compare different ways to deliver the same service

CENTRE FOR DESIGN at RMIT

The strengths of LCA

LCA is focused on the unit of production

- the companies reason for being
- the measure of the accountants and sales staff
- the interface with the customer/public

Env Audit

EPA defines environmental auditing as “a systematic, documented, periodic, and objective review of facility operations and practices related to meeting environmental requirements.”

Audit Planning

- Addresses the specifics of who, what, where, when, and how
- Identifies auditors
- Identifies when the audit(s) will occur
- Identifies what format, checklists, etc will be used
- Establishes specific agendas
- Must align with site procedure for auditing

Audit Approach

- Can do either all at one time, or divided up throughout the year.
- If divided, must decide on whether to do one element of the standard across the plant, or
- All elements in pats of the plant
- Keep in mind consistency issue!

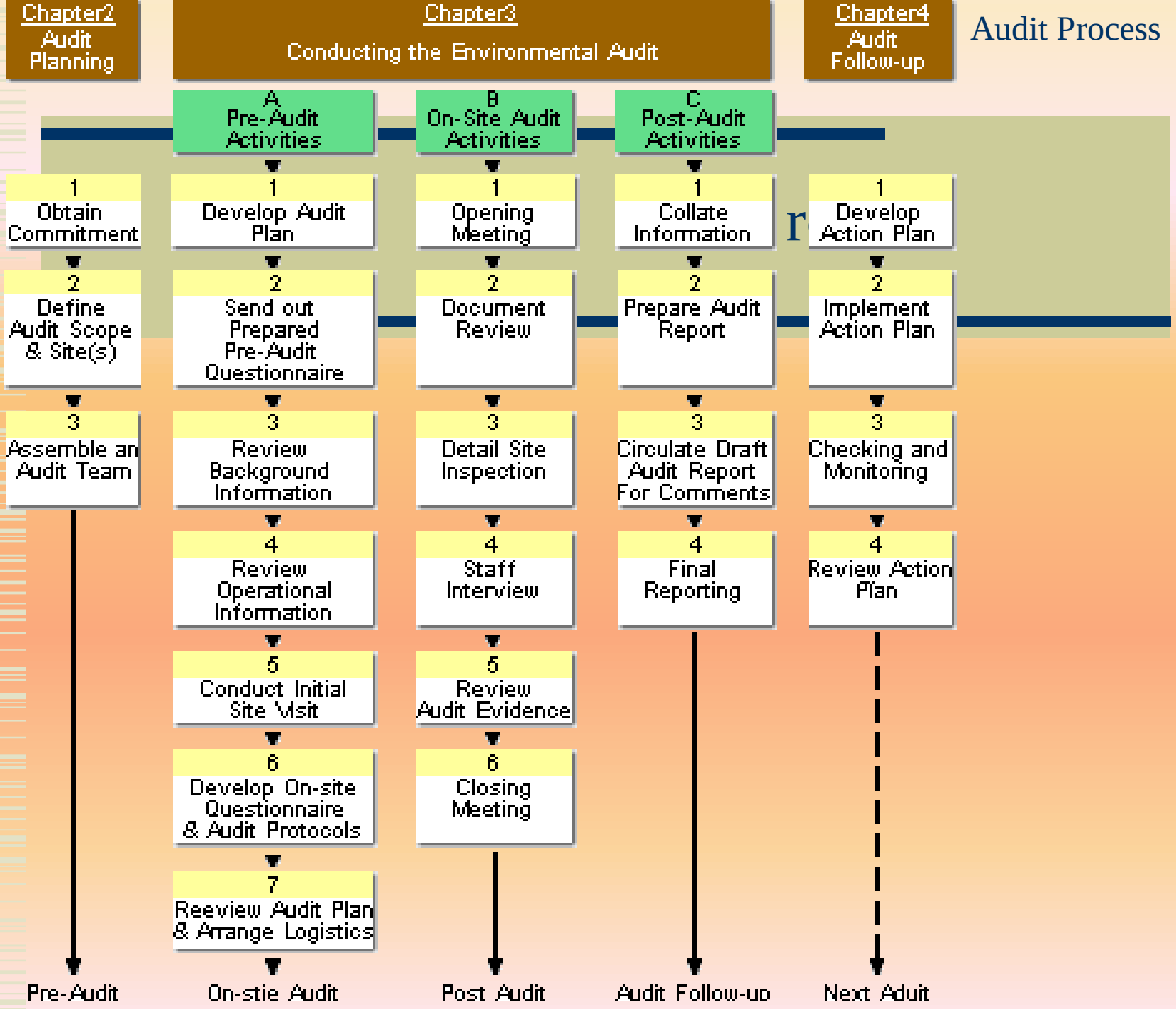
Audit Approach (cont.)

- Audits typically include:
  - Interviews
  - Site Reconnaissance
  - Records review
- In any type of audit, the auditor will compare evidence to criteria, and develop findings

The Audit Team

- Must collectively have knowledge of:
  - EMS
  - Auditing
  - Process or activities
  - Environmental legal and other requirements
  - Environmental Science
  - Any unique, site-specific needs

Audit Process



Topics for Opening Meeting

- The overall duration of the proposed audit
- The starting location and time
- The proposed scope and areas to be covered by the audit
- A timetable for approximate progress of the audit where applicable, e.g., if a number of different departments or geographical areas are to be included in the scope of the audit
- The arrangements for any close out meeting where the findings of the audit can be agreed and corrective action requirements discussed
- The personnel liable to be involved at each stage of the audit

How to Interview

- Attitude of the auditor
- Purpose of the interview
- Types of questions; open, closed, leading, antagonistic, vague

Typical Questions of any Employee:

1. What does the EMS policy say and what does it mean to you?
2. What is your familiarity with the EMS program?
3. What do you do in case of a procedural nonconformance?
4. What do you do in case of a emergency?
5. What kind of training have you received?
6. How do you communicate environmental concerns or ideas?
7. What do you do if you receive environmentally-related communication from external parties?

Typical Questions of Critical Operations (Con't):

1. What are the significant aspects and impacts associated with your function?
2. How do you know what to do?
   (Ask for procedures and operating criteria).
3. What specific training have you received?
4. What are the objectives and targets associated with your function?
5. What is your responsibility for monitoring and measurement activities?
6. What records do you keep?
7. (Any other specific questions prompted by answers 1-6 and/or specific circumstances?)

What Auditors Look for in Terms of Documentation

- **Does your documented system respond to the standard?**
- **Do the procedures describe what's happening?**
- **Is the documentation controlled?**
- **Are all employees informed?**
- **Are the procedures followed, by everyone, all the time?**
- **Is there objective evidence that the procedures are being followed?**

Typical Documents and Records to Review (by Element)

Aspects Procedures

- Aspects list
- Significant determination information
- Significant aspects/impacts list

Legal and Other Requirements

- Listings of applicable legal and other requirements
- Appropriate instructions for compliance
- Permits, manifests, etc.

Objectives and Targets and Environmental Management Programs

- Minutes/notes of objectives and target development
- List of objectives and targets
- Related action plans

Structure and Responsibility

- Job descriptions
- Organizational charts

Training Awareness and Competence

- Training needs listings/matrix
- Manuals, course materials
- Sign-in sheets
- Test records, certificate copies, etc.

Communication

- Specific work instructions
- Records of communication and correspondence

Document Control

* Documents, procedures, and manuals

Operational Control

* Critical operations/aspects listing/matrix
* Specific work instructions
* Environmental issues and instructions within other work instructions
* Contractor policies, work orders, etc.
* Supplier requirements

Emergency Preparedness and Response

- Emergency plans and protocols
- Practice and drill results

Monitoring and Measurement

- Objectives and target action plans
- Specific procedures and work instructions
- Records of monitoring and measurement data collected

Nonconformance, Corrective and Preventive Action

- Corrective actions reports
- Evidence of discussion and follow-up (meeting notes, etc.)

Records

- Records

EMS Audit

- Specific audit procedures, checklists, forms
- EMS audit notes and working documents
- EMS audit reports

Management Review

- Meeting agendas and attendance
- Meeting minutes and action items
- Evidence of follow-up actions, reports, etc.

The Audit Report

The audit findings and/or a summary thereof should be communicated to the client in a written report. Unless specifically excluded by the client, the auditee should receive a copy of the audit report.

Audit-related information that may be in audit reports, includes, but is not limited to:

- The identification of the organization audited and of the client
- The agreed objectives and scope of the audit
- The agreed criteria against which the audit was conducted

- The period covered by the audit and the date(s) the audit was conducted
- The identification of the auditee's representatives participating in the audit
- The identification of the audit team members
- A statement of the confidential nature of the contents
- The distribution list for the audit report
- A summary of the audit process including any obstacles encountered
- Audit conclusions such as:
  - EMS conformance to the EMS audit criteria

  - Whether the system is properly implemented and maintained
  - Whether the internal management review process is able to ensure the continuing suitability and effectiveness of the EMS

- Distribute the report. The audit report should be sent to the client by the lead auditor. Distribution of the audit report should be determined by the client in accordance with the audit plan. The auditee should receive a copy of the audit report unless specifically excluded by the client.

- Document retention.

Topics for Closing Meeting

- Acknowledgment of support
- Recap of audit scope, objectives, and plan
- Overview of findings
- Any special issues or circumstances
- Initial discussion of next visit

The Next Steps
Role of EMS Auditors in Corrective Action

- EMS auditors not required to provide assistance in corrective action unless requested
- Should do so only if qualified; in other words ability to audit does not equate with ability to fix the problems
- EMS auditors must follow up on corrective actions in subsequent audits
- EMS Auditors must look for continual improvement