LIFE CYCLE ASSESSMENT (LCA) CHECKLIST FOR PRODUCT TEAMS

A practical guide for manufacturing, engineering, and product design teams

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1. Define the Goal & Scope

- ☐ Clarify the purpose of the LCA (compliance, internal improvement, customer reporting, eco-labeling, etc.)
- ☐ Identify the primary audience (internal design team, regulators, clients, investors)
- ☐ Decide if the LCA is comparative (e.g., FRP vs steel frame) or single-product impact
- ☐ State whether the LCA will be attributional (average impact per unit) or consequential (impact of change in system)

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2. Establish System Boundaries

- ☐ Cradle-to-gate → raw materials through manufacturing
- ☐ Cradle-to-grave → full life cycle, including end-of-life
- ☐ Cradle-to-cradle → circular systems with recycling/reuse loops
- ☐ Identify cut-off rules (what's excluded and why)
- ☐ Document geographic boundaries (where materials are sourced, produced, used)

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3. Define the Functional Unit

- ☐ Choose a unit that reflects how the product delivers value (e.g., "one transport frame used for 10 years" instead of "1 kg of material")
- ☐ Ensure functional units allow fair comparisons across product designs
- ☐ Record assumptions about service life, durability, and usage conditions

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4. Data Collection Strategy

- ☐ Map the Bill of Materials (BOM) with exact quantities
- ☐ Gather primary data wherever possible:
  - Material sourcing (supplier-specific)
  - Manufacturing energy use (kWh, fuel liters, process hours)
  - Water use, chemical additives, coatings
- ☐ Use secondary data (databases) only where primary data is unavailable
- ☐ Validate supplier-provided data with cross-checks (invoices, utility bills, ERP records)

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5. Emission Factors & Databases

- ☐ Select region-specific emission factors (e.g., Canada's National Inventory Report, US EPA factors)
- ☐ Use vetted LCA databases (ecoinvent, Carbon Minds, U.S. LCI, etc.)
- ☐ Ensure consistency in time period, regional applicability, and methodology
- ☐ Document data sources, versions, and any assumptions

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6. Manufacturing & Operations

- ☐ Capture energy mix used at the plant level (grid average vs renewable PPAs)
- ☐ Include consumables: solvents, cutting fluids, fasteners, packaging
- ☐ Record scrap rates, rework, and yield losses
- ☐ Model transport of intermediate goods (km by truck, rail, air, ship)

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7. Use Phase & Performance

- ☐ Quantify energy consumption during use (if applicable)
- ☐ Estimate maintenance requirements (cleaning, coatings, parts replacement)
- ☐ Include expected lifetime and number of use cycles
- ☐ Assess how user behavior impacts performance (single-use vs reuse, load factors)

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8. End-of-Life & Circularity

- ☐ Model expected waste management pathways: recycling, landfill, incineration, composting
- ☐ Account for recyclability and recovery rates specific to local infrastructure
- ☐ Consider reuse or repurposing opportunities (closed-loop vs open-loop recycling)
- ☐ Apply credits for recycled content or avoided virgin production, if methodology allows

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9. Scenario Analysis & Sensitivity Checks

- ☐ Test different material substitutions (e.g., aluminum vs steel vs FRP)
- ☐ Compare energy mixes (Ontario hydro vs U.S. natural gas grid)
- ☐ Run lifetime extension scenarios (repairable vs disposable design)
- ☐ Evaluate uncertainty by using ranges instead of single values

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10. Interpretation & Reporting

- ☐ Identify hotspots (highest contributors to impact)
- ☐ Present trade-offs transparently (e.g., FRP = lower weight but higher end-of-life challenges)
- ☐ Summarize results in clear visuals (impact breakdowns, Sankey diagrams, heatmaps)
- ☐ Provide recommendations linked to design choices (e.g., reduce material thickness, switch supplier, redesign for disassembly)
- ☐ Document limitations, exclusions, and assumptions

How to Use the LCA Checklist Effectively

1. Treat It as a Living Document

- Update the checklist with every new product iteration or design revision.
- Add notes, data sources, and observations as your project evolves.
- Regular updates ensure continuous improvement and defensible LCA results.

2. Assign Responsibilities

- Assign specific team members to each section (e.g., materials engineer handles data collection, design team defines functional unit).
- Use the checkboxes as accountability tools to track progress.

3. Start Early

- Integrate the checklist at the concept or design stage, not after production.
- Early application allows design decisions to maximize sustainability, cost-efficiency, and material optimization.

4. Focus on High-Impact Areas

- Pay special attention to hotspots identified in your LCA: materials with high emissions, energy-intensive processes, and end-of-life impacts.
- Use the checklist to document potential improvements or alternatives for these areas.

5. Document Everything

- Keep detailed records of all assumptions, data sources, and emission factors.
- Documentation makes results transparent, defensible, and easier to communicate to stakeholders or regulators.

6. Scenario Analysis & Continuous Learning

- Use the checklist to explore "what-if" scenarios (different materials, energy sources, or recycling strategies).
- Incorporate lessons learned into future design cycles.

7. Make it Collaborative

- Encourage cross-functional collaboration: design, engineering, procurement, and sustainability teams should all contribute.
- ECO2 can facilitate workshops to guide teams in applying the checklist effectively.

About ECO2 Solutions

ECO2 Solutions helps manufacturing and product teams **measure, understand, and reduce their environmental impact**. We specialize in Life Cycle Assessments, carbon accounting, and sustainable product design.

How ECO2 can support your team:

- Expert review of LCA studies and emission factors
- Access to credible LCA tools and region-specific datasets
- Customized reports and actionable insights for design decisions
- Training and workshops to embed sustainable practices across teams
- Continuous support for ongoing improvement and compliance

Get in touch:
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Download more resources, templates, and checklists to make sustainability simple and actionable for your team.