



De-risking Early-Stage Energy R&D



Guiding tech scale-up and investment decisions—before design is locked in

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Why early-stage risk assessment?

Increased risk of "locking in" harmful impacts (cost, toxicity, resources, ...)



Design "lock-in" risk



Most life cycle assessment (LCA) is done for **already scaled-up or mature tech**

Changes are easiest to make at early stages

Design freedom in system

Likelihood sustainability analysis is done



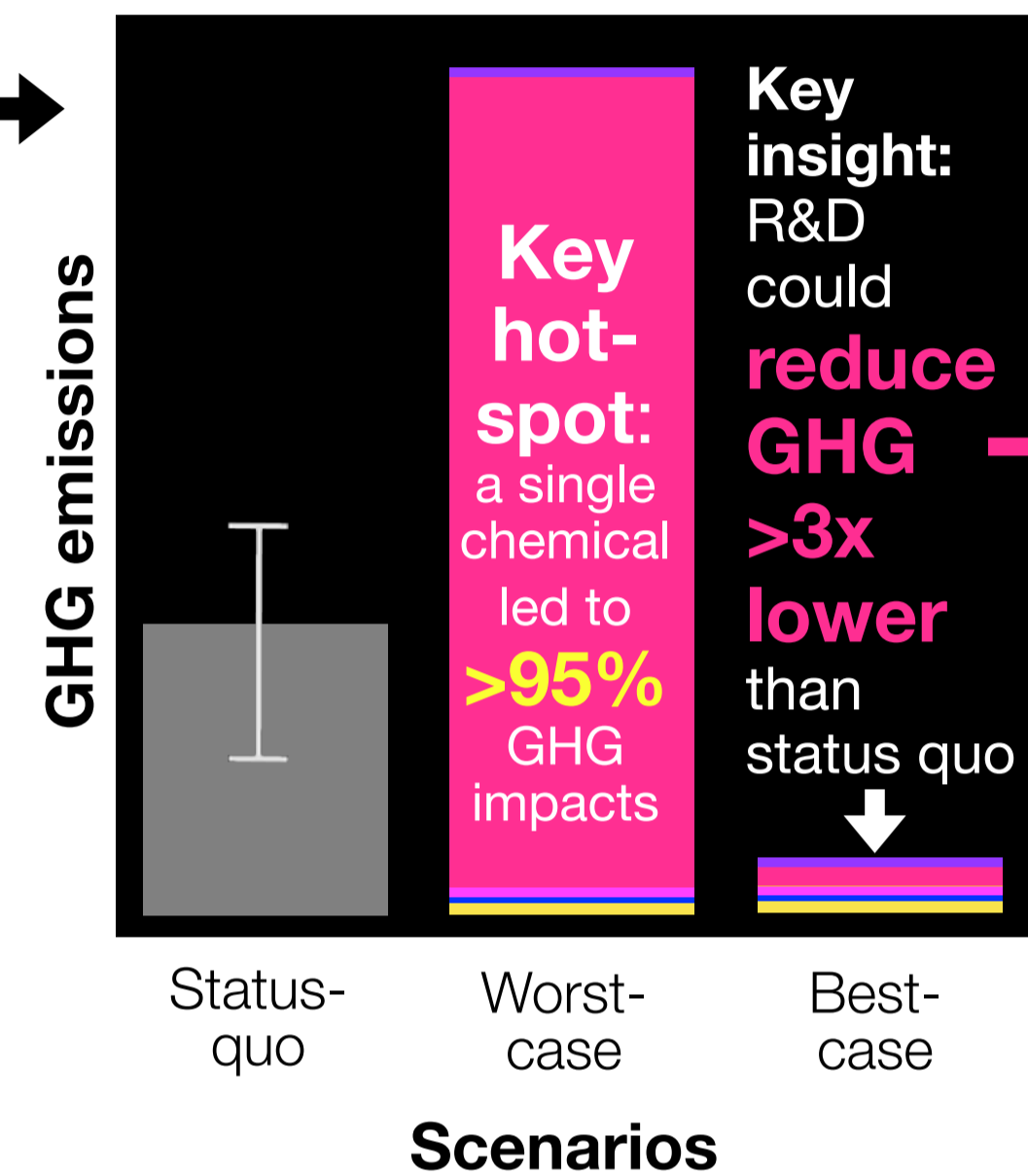
Testbeds LCA assist impact-informed R&D while design is still flexible

80% of impacts are locked in at the design stage
Rule-of-thumb

Case study: from insight to impact

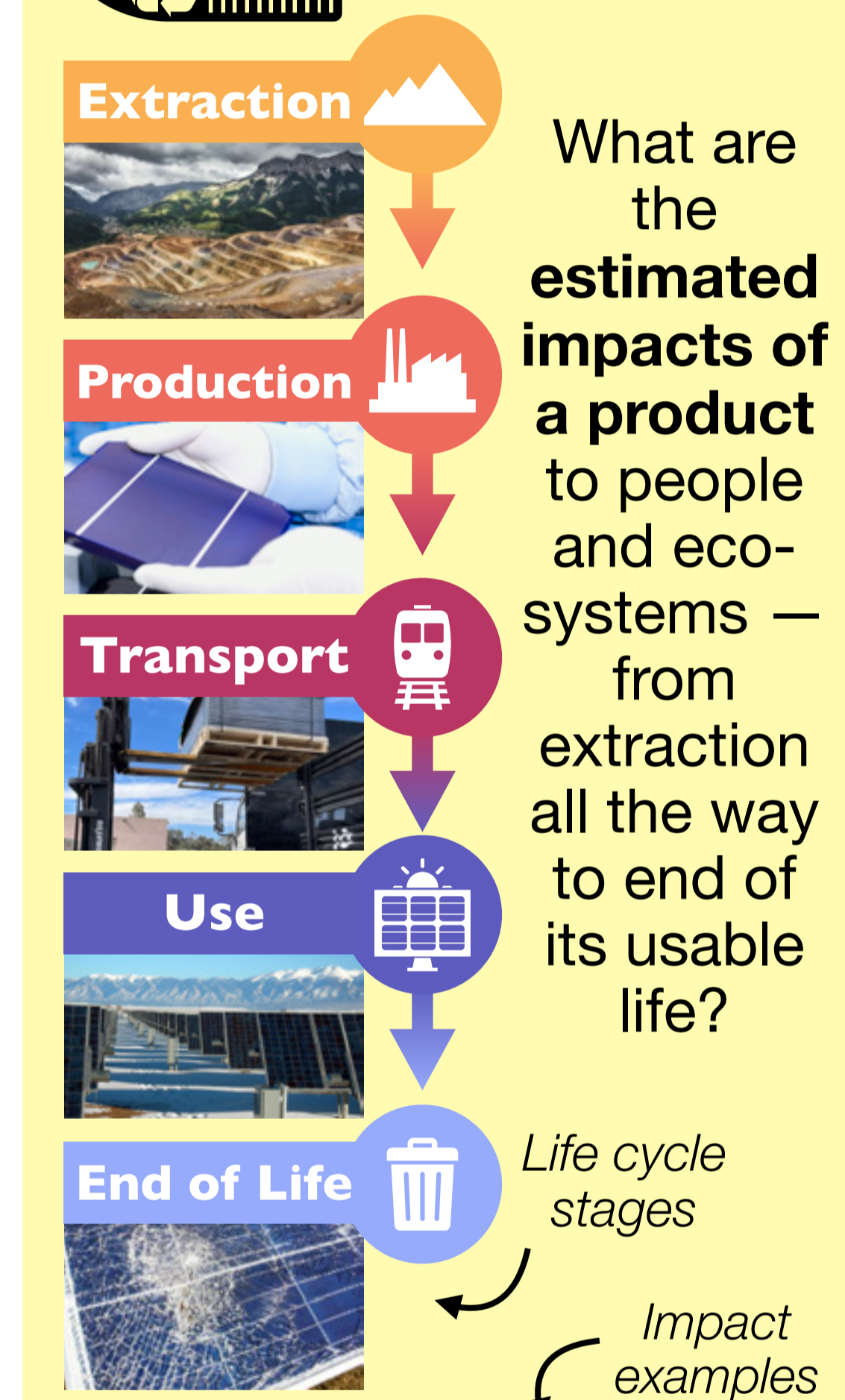
SUNCHEM
Startup extracting critical metals from e-waste

Prototype LCA for process choices
inform precursor & solvent choice, yield, target market

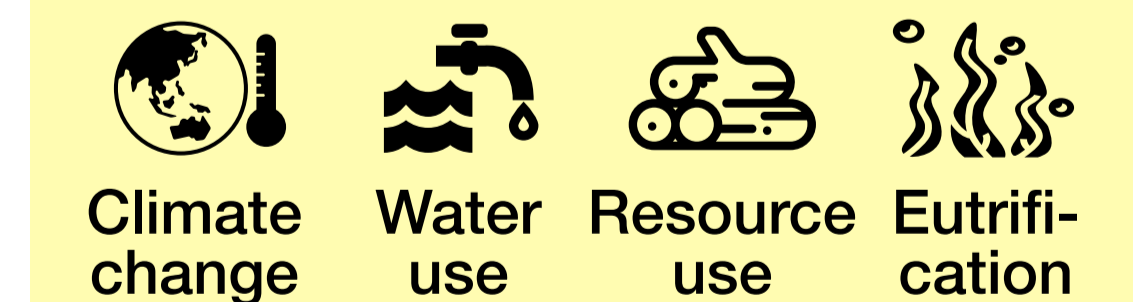


Guided by LCA results, Sunchem began R&D & developed a new process
These insights informed their current pilot-scale design!

Life cycle assessment (LCA) in a nutshell



Environmental impacts



Social impacts



Services across stakeholders

Additional services to support funders & industry

- System supply chain hotspot mapping**
Identify highest-impact intervention points to integrate emerging tech
- Tech due diligence & internal review**
"Fact-check" claims and help guide investment decisions
- Targeted workshops & trainings**
Build life cycle literacy for engineers, researchers, funders

Life cycle modeling of pre-commercial clean tech to guide decisions

- "Screening" LCA for pathway viability**
Materials choice, synthesis route, parameter sensitivity (early-stage indicators)
- Pre-commercial LCA**
Concept to Pilot
- Mid-stage LCA for directional credibility**
Scale-up risk, guide engineering & investment (yield, location, efficiency, ...)
- Standard LCA for reporting/certification is **not our focus!**

Iteration

- Motivated students**
Apply LCA to your work with a mentored project
- Academic researchers**
Add us to grants to co-design LCA-guided R&D
- Climate tech start-ups**
Hire us to de-risk design & scale-up decisions
- Mid-to-large companies**
Prioritize most impactful interventions for new tech
- Tech funders & evaluators**
Add LCA screening to portfolio evals
- Gov't & policy orgs**
Commission LCA to inform program design

Building a new technology?
Or vetting one for investment?

Curious how early-stage analysis can guide design, scale-up, and investment decisions?

Reach out for a free consultation: rwoods@uw.edu



Life Cycle Assessment (LCA) Hub



New service at UW's Washington Clean Energy Testbeds (WCET)



We help innovators and funders of new technologies identify risk hotspots early enough to still change them

Target audience

- **Researchers** designing new materials or processes (TRL ~1–3)
- **Start-ups** scaling up tech (TRL ~2–8; pre-seed through Series B)
- **Funders & evaluators** assessing due-diligence of emerging technologies

Core offering

- **Early-stage screening for pathway viability** → rapid insights for design choices
- **Mid-stage analysis for directional credibility** → guide engineering and scale-up decisions
- **Iterative updates** → explore design scenarios alongside R&D as technologies evolve

What this is not: LCA for certification or product labels, ESG reporting, TEA,* or a “prediction” of the future

**For techno-economic analysis (TEA), reach out to our senior staff scientist Dr. Bosong Li at bli0827@uw.edu*

What makes us unique

- **Embedded in an R&D testbed** → analysis alongside real development
- **Designed for decision-making** → not reporting or box-checking
- **Materials & process expertise** → grounded in materials science & how tech actually scales

How engagements work

- 1 **Scope the question** — Define system & uncertainties
- 2 **Build a model** — Map process flows
- 3 **Identify hotspots** — Quantify high-impact steps & materials
- 4 **Explore alternatives** — Evaluate redesign & scale-up options
- 5 **Guide decisions** — Translate insights into R&D and investment priorities

Additional services

- **Tech due diligence** (*investors*) — validate claims, assess risk
- **Internal LCA review** (*startups*) — guide R&D decisions (non-reporting)
- **Expert LCA review** (*LCA analysts & industry*) — third-party review for reporting
- **Process & inventory modeling** (*LCA analysts*) — for novel materials & synthesis
- **Workshops & trainings** (*across sectors*) — build life-cycle literacy
- **Data tools & workflows** — develop open-source models & datasets

Interested in identifying supply chain risks while changes can still be made?

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