Automated Embodied Carbon Accounting for Residential Builders

Built World Tech — Venture Pilots 2026 | Sponsor: Landmark Homes

1. Challenge Overview

Problem Statement	Whole-building embodied carbon assessments are too slow, expensive, and specialized for most residential builders. The bottleneck is the manual material takeoff. Someone has to read a plan set, measure every assembly, and produce quantities before any tool can return a number.
Solution	Create a software platform that reads a builder's existing PDF design drawings, extracts material quantities automatically, maps those quantities to published embodied carbon data, and returns an estimated whole-building Life Cycle Assessment (wbLCA) plus an interactive interface for testing material substitutions before a spec is locked. This challenge asks teams to calculate the cradle-to-gate (A1-A3) embodied carbon.
Target Customers	Production homebuilders construct 100 to 800 homes per year on standardized plan sets. Their estimators, project managers, and sustainability leads carry this pain directly. A production builder amortizes one assessment across every home built on that plan, so accurate per-plan baselines compound in value in a way they never do for a custom builder.
Why Now	• Canada's federal Standard on Embodied Carbon in Construction, amended March 2025 with requirements effective September 2025, now mandates whole-building Life Cycle Assessment (wbLCA) disclosure on major federally funded projects. • Provincial and municipal standards are expected to mandate embodied carbon assessments over the coming years • AI-assisted quantity takeoff has become practical on residential drawing sets rather than theoretical. • LEED and Zero Carbon Building certifications already reward embodied carbon reductions, creating demand ahead of regulation.
Pain severity	• Traditional embodied carbon assessments can take weeks and costs thousands of dollars in specialized consulting fees. • The output is static. Change a wall assembly or a supplier and the number is stale, so the assessment arrives too late to influence the decisions that would actually reduce carbon. • Builders who cannot produce wbLCA documentation may become ineligible for certain federally funded projects and green procurement opportunities. • Buyers, mortgage lenders, and municipal partners are beginning to ask. Builders without data are disadvantaged on green-labelled products and net-zero communities.

2. Detailed Technical Scope

The prototype target is an automated takeoff-to-carbon pipeline for a single home plan, not a certified LCA engine. Stage 2 is the core, most heavily weighted capability: a wrong takeoff makes a well-presented carbon number worse than useless.

Stage 1 — Drawing Intake

- Accept a residential plan set as vector PDF. PDF is the only supported format for this challenge. Teams will receive plan sets from the sponsor.
- Identify what the set contains: floor plans, elevations, sections, wall assembly details, foundation and roof plans, and window or door schedules.
- Flag what cannot be read. A missing section detail or illegible schedule should produce a reported gap, not a silent assumption.
- Prompt for any project facts not on the drawings: conditioned floor area basis, jurisdiction, and any known product specifications.

Stage 2 — Dimensional Extraction and Quantity Takeoff (core capability)

Determine dimensions and calculate material volumes across the element list attached in the data package. Build the solution to calculate the biggest contributors to embodied carbon using this guide. Start with the largest contributors first. It may not be realistic to include every building element in the prototype during the sprint.

Produce an exportable bill of quantities with every line traceable back to the sheet and detail it came from.

- Label each quantity as directly measured, inferred or assumed. Assumptions must be documented and viewable to the user.
- Allow a human to correct any quantity and have the carbon result update. An estimator who cannot override the machine will not trust it.
- Handle repeat plans, elevation variants, and mirrored layouts without restarting from zero.
- Build in the capacity to add A4-A5 embodied carbon at a future date (details for these calculations will not be provided in the challenge)

Stage 3 — Carbon Factor Lookup and Assessment

- Identify published A1–A3 embodied-carbon factors for the materials contained in the sponsor's building-element and material list. Carbon factors must come from traceable sources such as verified Environmental Product Declarations, recognized EPD databases, or defensible industry-average datasets.
- Match each material quantity to an appropriate carbon record, reconcile the quantity with the record's declared unit, and calculate total A1–A3 emissions. The source, declared unit, validity, geography and data type must remain visible to the user.
- The prototype may initially support the materials used in the supplied plan sets, but its lookup architecture must be capable of scaling to thousands of products and integrating with external databases or APIs. Carbon factors must not be embedded as fixed values throughout the application code.
- Report both a total in kgCO2e and an intensity in kgCO2e/m2. Intensity is what regulators, certifications, and benchmarks compare against.
- Produce a contribution analysis by assembly and material category. For example, concrete contributes X% to the total embodied carbon.

Stage 4 — Interactive Material Configuration

- Let a builder swap a material or assembly and see the carbon result change: cellulose instead of spray foam, fibre cement instead of vinyl, a lower-carbon concrete mix, a different window frame.
- Rank the available substitutions by carbon impact using the Stage 3 contribution analysis rather than listing them arbitrarily.

Primary Reference Data included in the Data Package

- **Carbon factor sources**
- **Methodology and benchmarks:** NRC National Guidelines for Whole-Building Life Cycle Assessment; template whole-building Life Cycle Assessment shown in data package
- **Pilot data package:** vector PDF plan sets from Landmark Homes with material and window schedules.

3. Judging Criteria

Rubric for evaluating team submissions at Semi-Finals and Demo Day. These criteria follow the technical scope in Section 2. Each criterion is scored 1–5 and multiplied by its weight.

#	Criterion	What judges are scoring (1–5)	Weight
1	**Drawing intake**	Does it accept a real plan set in the format provided, identify what the set contains, and report what it cannot read rather than assuming? Does it handle more than one plan set, or was it built around a single demo file?	10%
2	**Quantity extraction**	How close are dimensions and material volumes to the reference takeoff? How much of the element list is covered? Is every quantity traceable to its source sheet and detail? Are measurements, inferences, and defaults clearly distinguished? Can a human correct a quantity and see the carbon result update?	30%
3	**Carbon assessment and Traceability**	Are materials matched to appropriate published factors, with source, declared unit, geography, and module scope visible? Are only like-for-like modules summed? Are results given as both total $kgCO_2e$ and intensity per m^2? Is there a contribution analysis? Where data is missing, does the tool say so rather than substitute silently? Are carbon numbers traceable?	15%
4	**Interactive configuration**	Can a builder swap a material or assembly and see the result change? Are substitutions ranked by actual carbon impact rather than listed arbitrarily? Would a builder open this before locking a spec, or only after?	10%
5	**General Usability and Automation**	Is the output usable for certification, municipal reporting, or a customer conversation without a consultant rewriting it? Does it work across multiple plan sets? How fast does it produce a result on an unseen set? Would an estimator or project manager use this without specialized LCA training? Is the software architecture built to scale?	10%
6	**Implementation plan**	Is there a realistic path to beta, starting with the sponsor?	10%
7	**Business plan**	Is there a credible company here — buyer, willingness to pay, unit economics? And a plan to outcompete in the market.	10%
9	**The X factor**	Hard-to-quantify edge — team, insight, unfair advantage.	5%

#	Criterion	What judges are scoring (1–5)	Weight
	TOTAL		**100%**