People & Planet Impact Studies

This can be done now, affordably.

Trillium-Lakelands
Elementary Teachers' Union

Office Building
Lindsay, Ontario
2,400 sf, $208/sq.ft.
86 tons of net CO2 storage

- Zero toxins
- 105% net energy production on site
- 90% of materials from 250km radius
- 80% less construction waste

Zero House Project

Clarksburg, Ontario
1,100 square feet, $254/sq.ft.
24 tons of CO2 storage

- Zero toxins
- 75% net energy production on site
- 90% of materials from 250km radius
- 95% less construction waste

Unicorn Farm Residence

Middlesex, Vermont 1,650 sf, $303/sq.ft.

Off-grid, fossil fuel and foam-free

600 kg of net CO2e storage

Beyond carbon-by-the-numbers

The bigger picture involves making carbon-storing buildings **AND**:

- Crew working directly with foresters and farmers
- Using all-renewable energy on site
- Taking care of waste
- Crew diversity

How do we think about carbon-storing materials?

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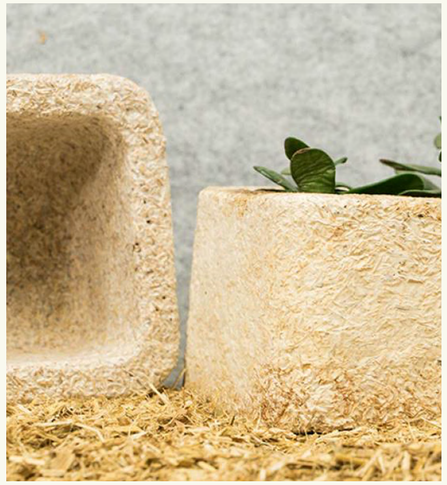
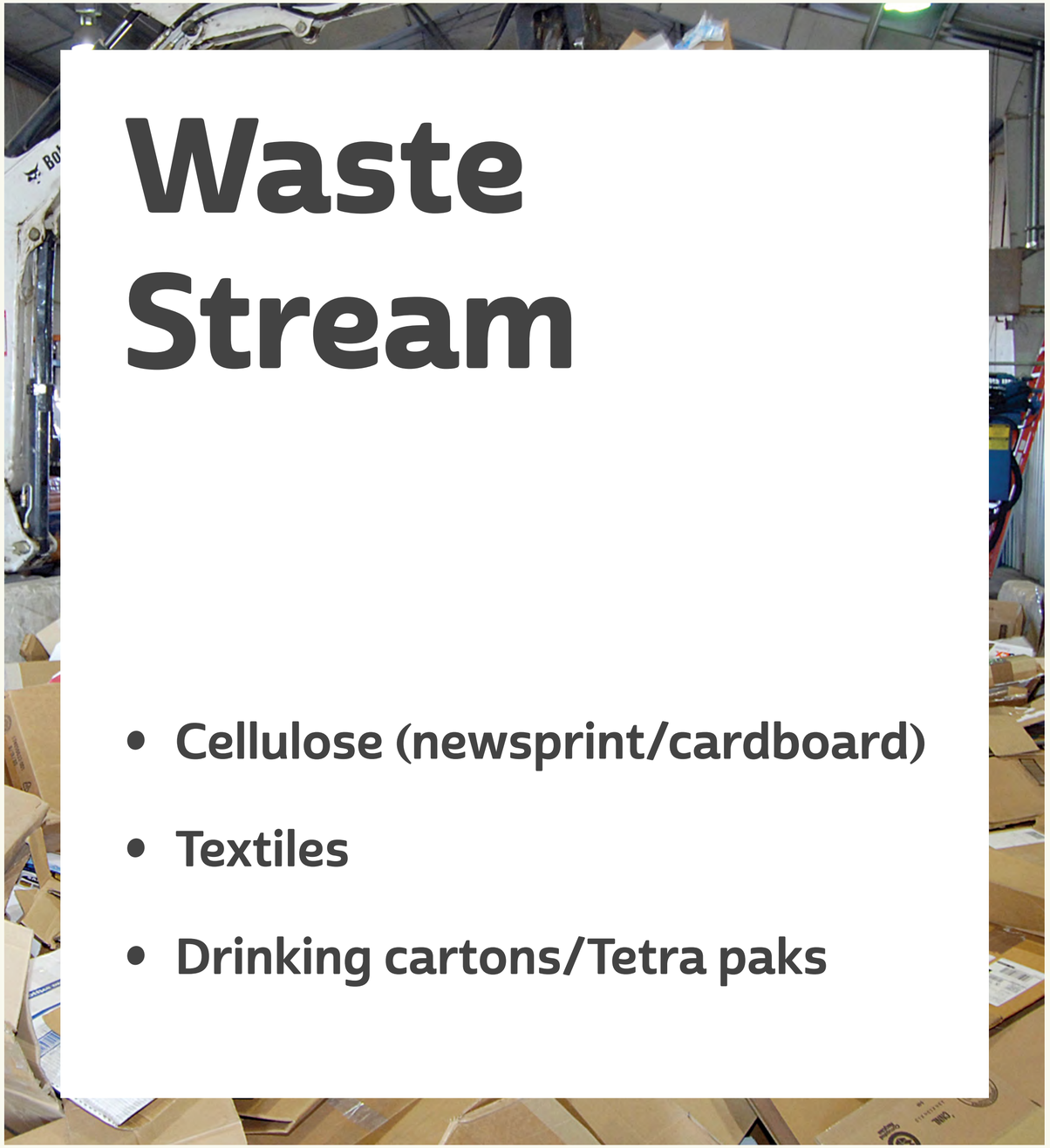


Waste Stream

Agriculture Residue

Factory Grown

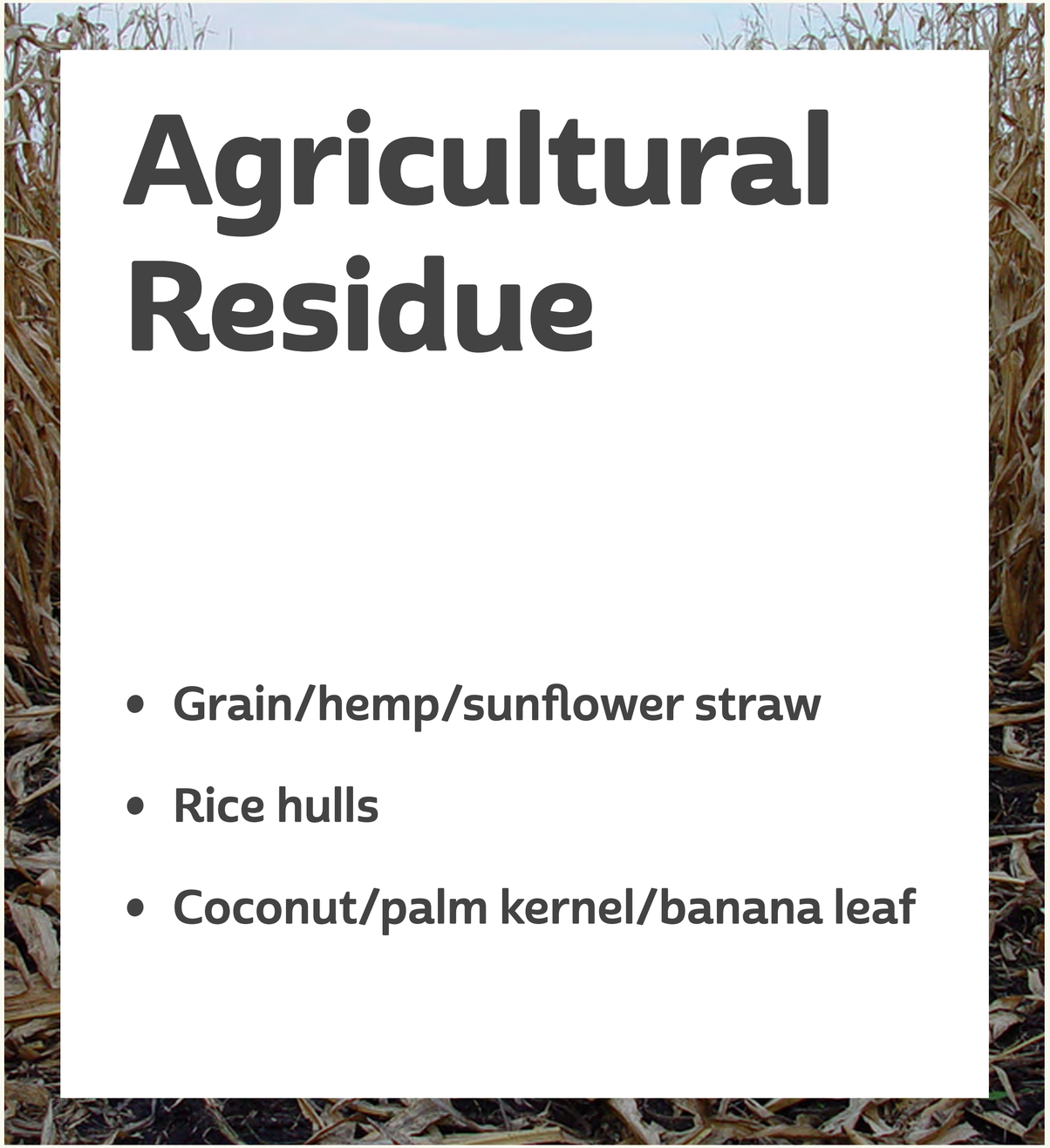
Forestry Products



Waste Stream

- **Cellulose (newsprint/cardboard)**
- **Textiles**
- **Drinking cartons/Tetra paks**

- How large are the stocks? How long will we have them?
- Carbon emissions from collection/transportation?
- What else would happen to that waste?



Agricultural Residue

- **Grain/hemp/sunflower straw**
- **Rice hulls**
- **Coconut/palm kernel/banana leaf**

- How large and where are the stocks?
- Environmental and soil impacts from farming practices?
- Land use changes to match demand?

Factory Grown

- **Mycofoam & Mycoboard**
- **BioMASON Brick**

- What kind of factory inputs?
- GMO organisms?
- Centralized production or distributed regionally?

Forestry Products

- **Timber**
- **Timber by-products**
- **Bamboo**

- Management strategies for long-term viability
- Carbon emissions from soil disruption
- What happens to slash and by-products?

How do we design for carbon-storing materials?

Design strategies

Product data and transparency

Regional industry

End-of-life issues

Design strategies for carbon storage

- **Low carbon foundations**
- **Panelization & disassembly**

- Rammed earth materials
- New cement formulations
- Post/pier foundations

Product data and transparency

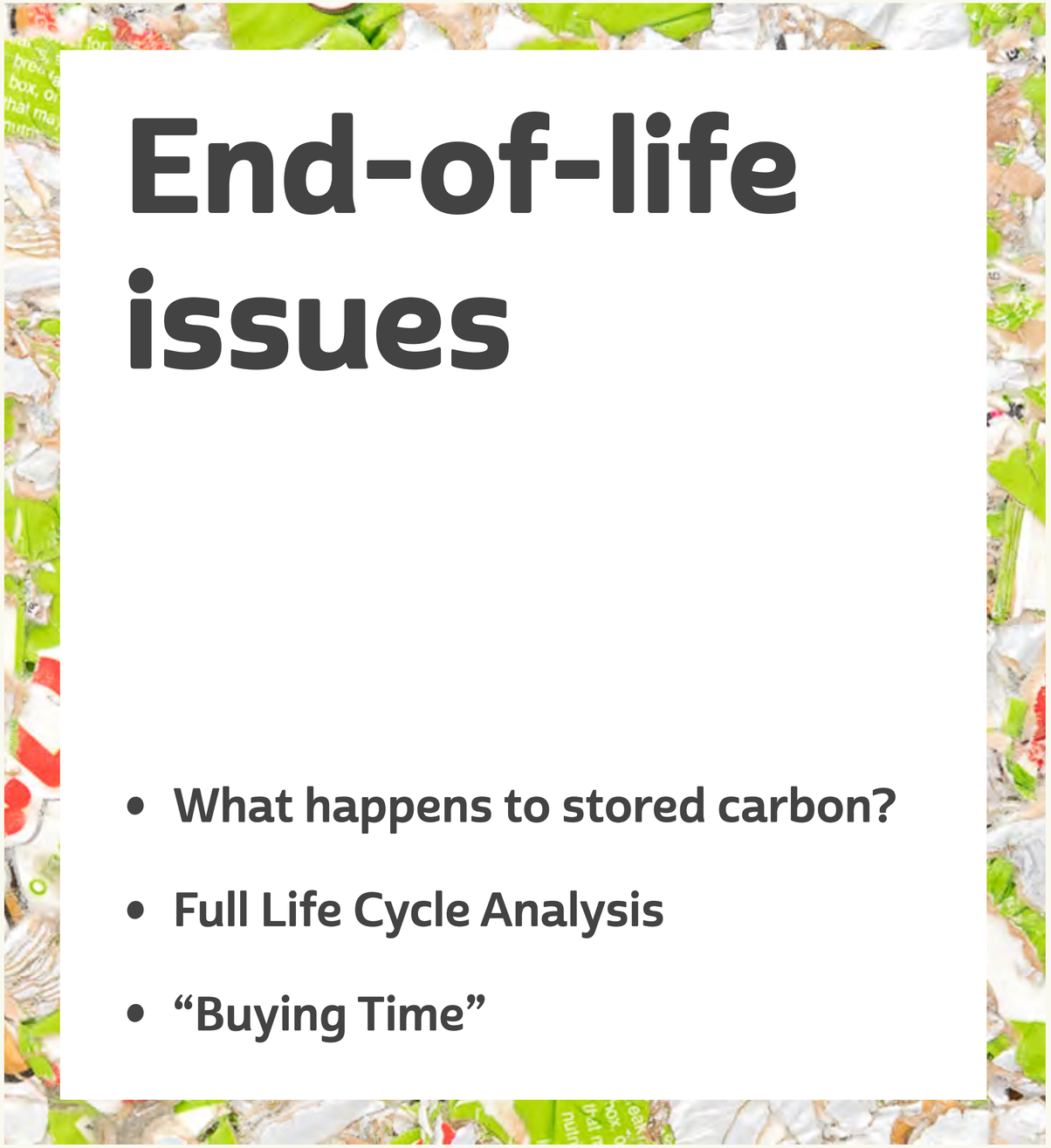
- **Availability of EPD data**
- **Quantifying additional benefits and harms**

- More & better harmonized EPDs featuring biogenic carbon
- Assistance to produce EPDs for small manufacturers
- Better tools for builders and designers

Regional industry

- **Farm/forest to building**
- **Allied industry, many partners**

- Direct partnerships between farmers/ foresters and builders
- Local/regional sourcing
- Co-investment in material production/distribution



End-of-life issues

- **What happens to stored carbon?**
- **Full Life Cycle Analysis**
- **“Buying Time”**

- Biochar, with heat/power generation
- Avoid composite materials that can’t be separated
- Policies and regulation to manage stored carbon

What are the barriers to carbon-storing materials?

Affordability

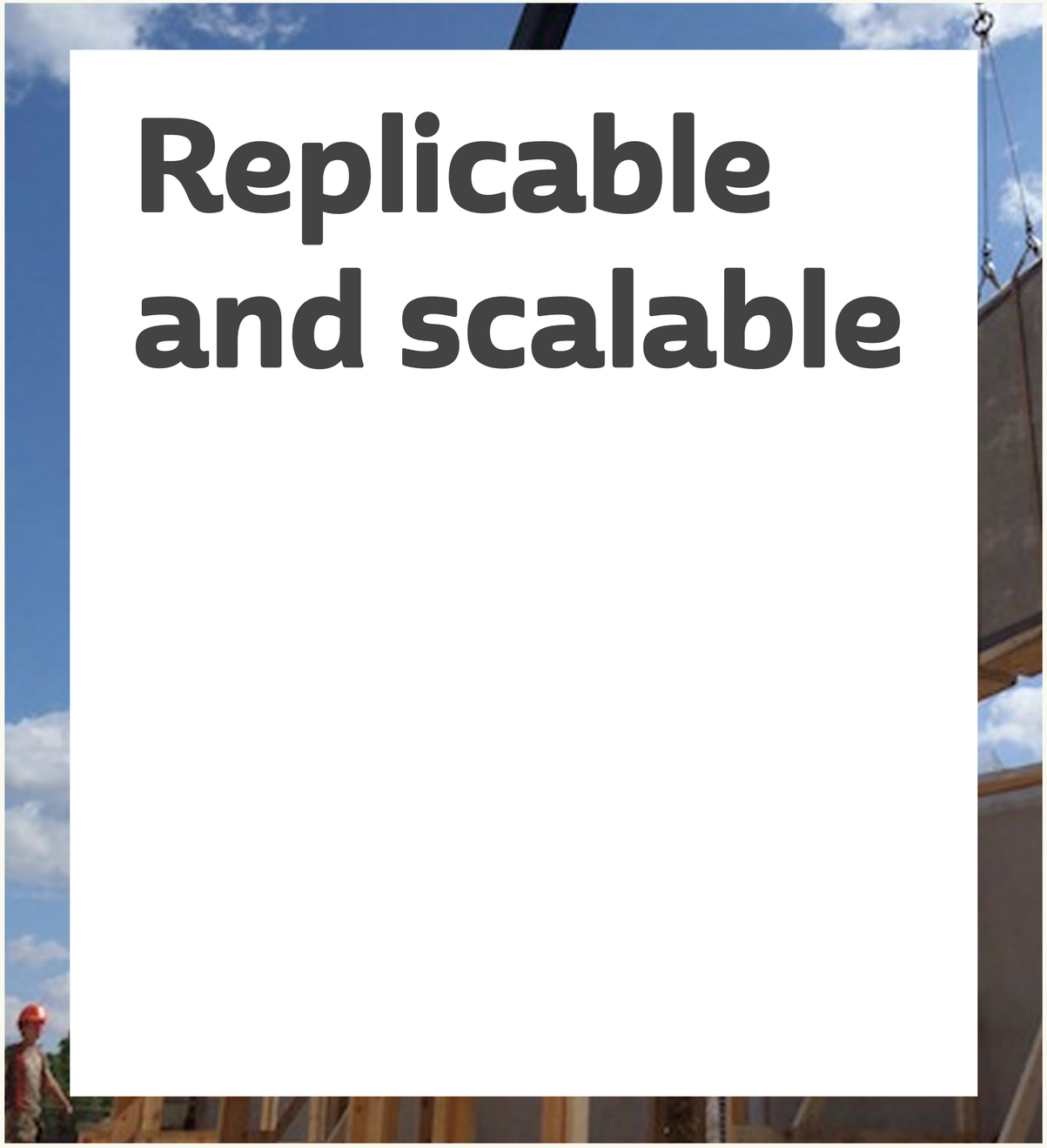
Replicable & scalable

Existing buildings

Codes & permits

Affordability

- **Material & labor costs** – redefine relationship between these costs
- **New models of ownership** – partnerships to offer rent-to-own and other models
- **Housing for climate refugees** – anticipation of human movement and appropriate housing plans



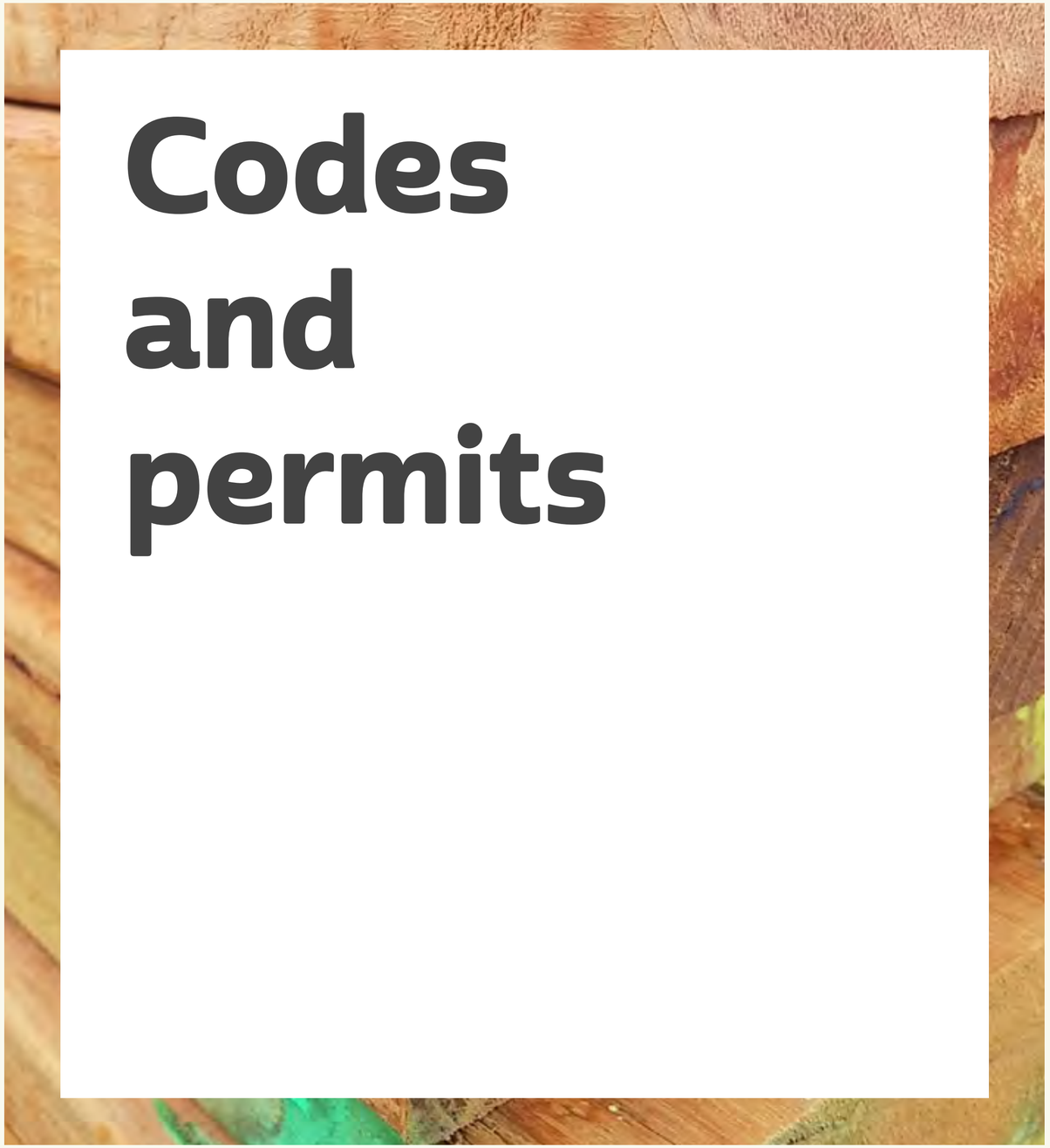
Replicable and scalable

- **Training for existing workers** – widespread programs for use of carbon-storing materials
- **Open-source sharing at design and construction level** – best practices developed rapidly
- **Disruptive manufacturing –** “pop-up” and micro-industry manufacturing

Existing Buildings

- **Retrofits with carbon storing materials** – immediate benefits for carbon-storing insulation and structure

- **Mitigating hazards** – dealing with inherited toxins and performance problems



Codes and permits

- **Carbon pricing** - financial rewards for carbon storage, a level economic playing field
- **Policies to encourage innovation** - simplified alternative compliance pathways
- **“Greening” the codes** - alternative materials and performance-based code

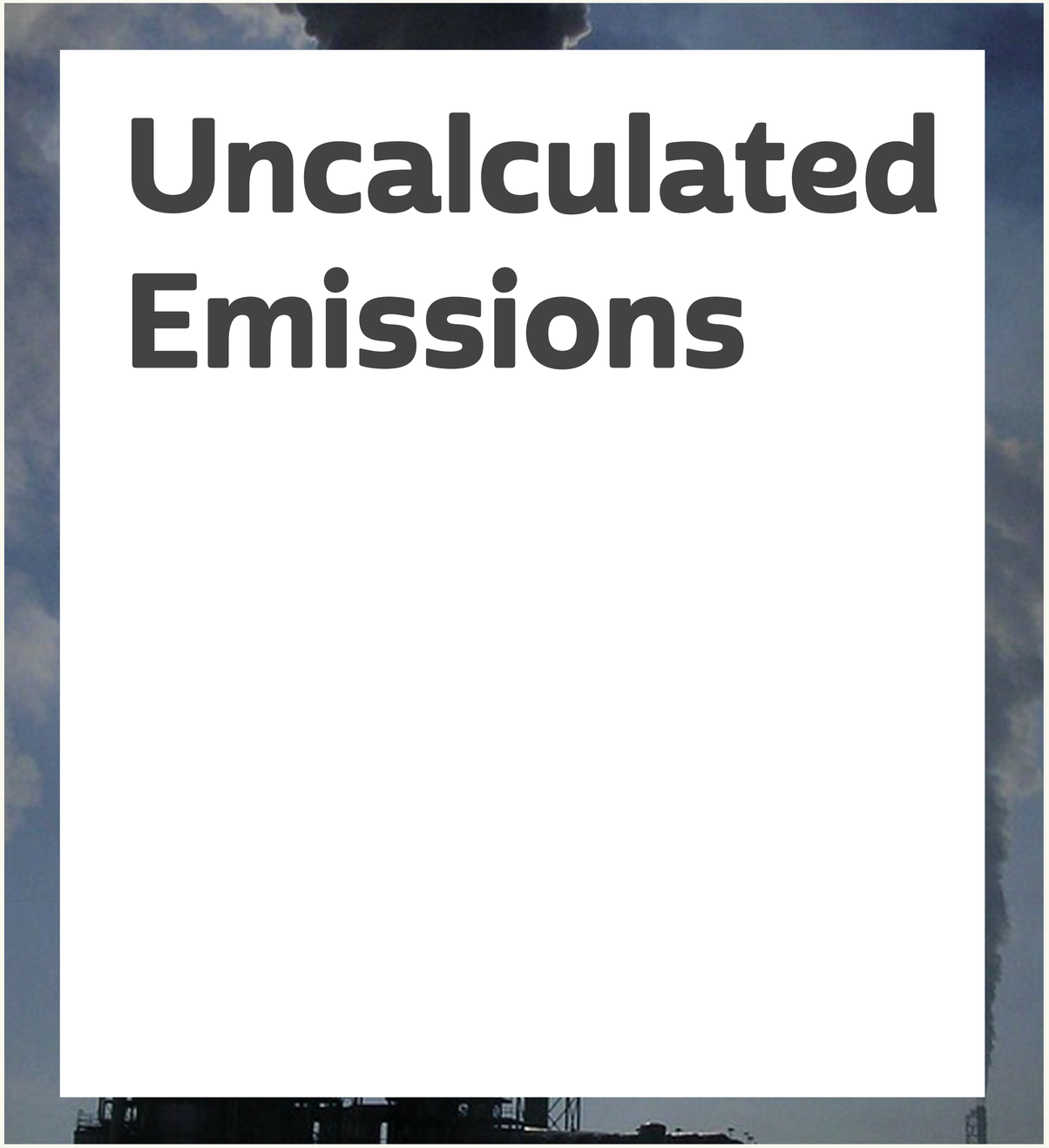
No more “externalities”

Off-site emissions

Heat pumps

“Clean” power

Renewable & storage

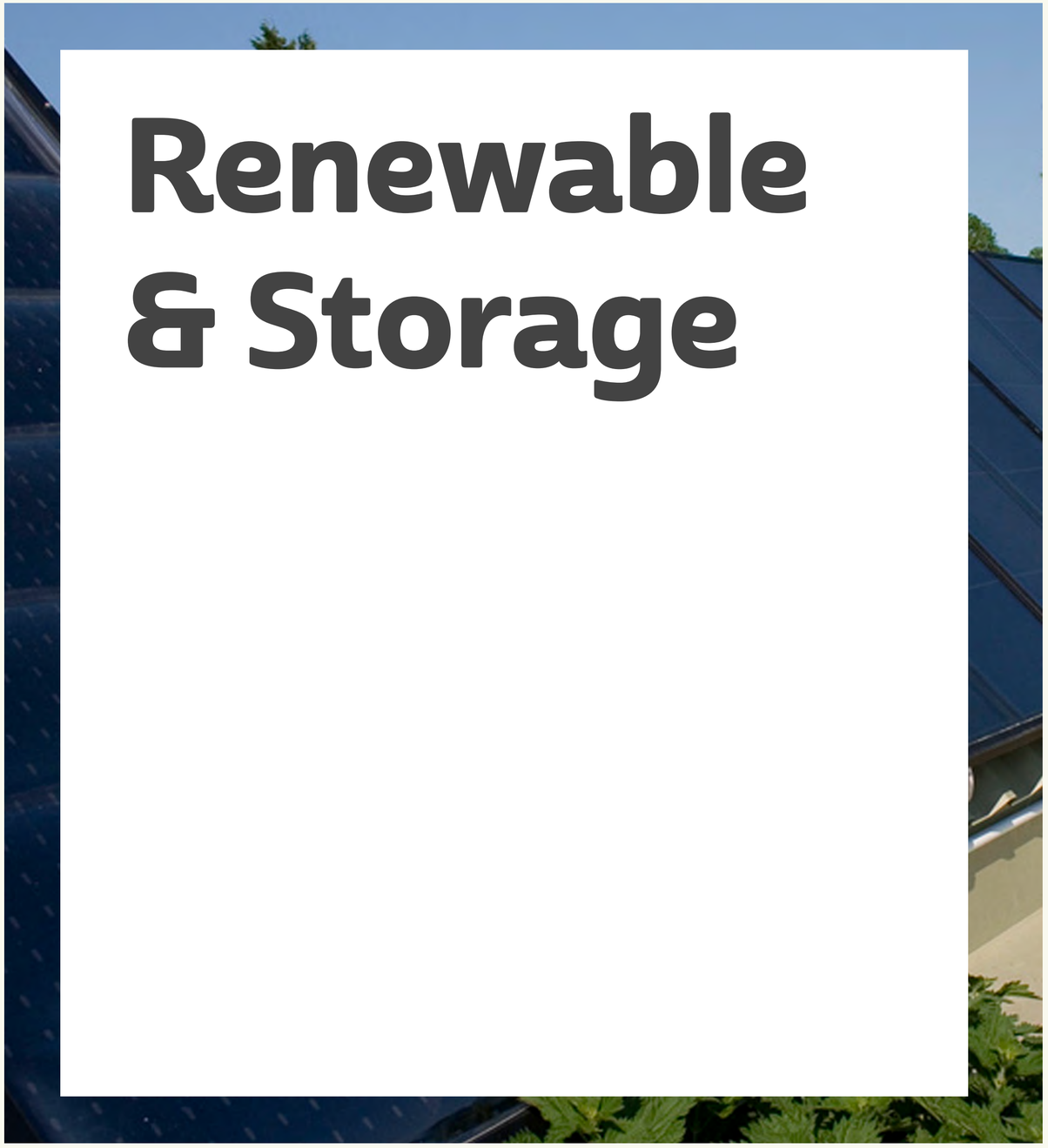


Uncalculated Emissions

- Energy source emissions - often greater than the assigned “carbon factor”
- Methane leakage from natural gas, hydro dam reservoirs
- Nuclear energy is not “zero carbon”

What about heat pumps?

- How much accidental refrigerant leakage during installation?
- How much during decommissioning?
- CO2 and alternate refrigerants
- Best practices and trades support



Renewable & Storage

- Do on-site, grid-tied renewables offset emissions or create more?

- What is the embodied carbon of storage technologies?
  Is it worth it?

Where do we go from here?

We need each other.

- Professional communities of praxis
- Community connections with diverse groups

We need empowerment

- Citizen scientists, public intellectuals
- Democratic control of resources

Greta Thunberg, Climate Activist

Climate crisis is real and upon us - we do not need permission, we need bold action and conviction to make radical changes in our practice.

By taking immediate action, **everyone in this room can become a part of carbon drawdown**, reversing the imbalance to the planetary carbon cycle that has become known as the driver of “Climate Change”.

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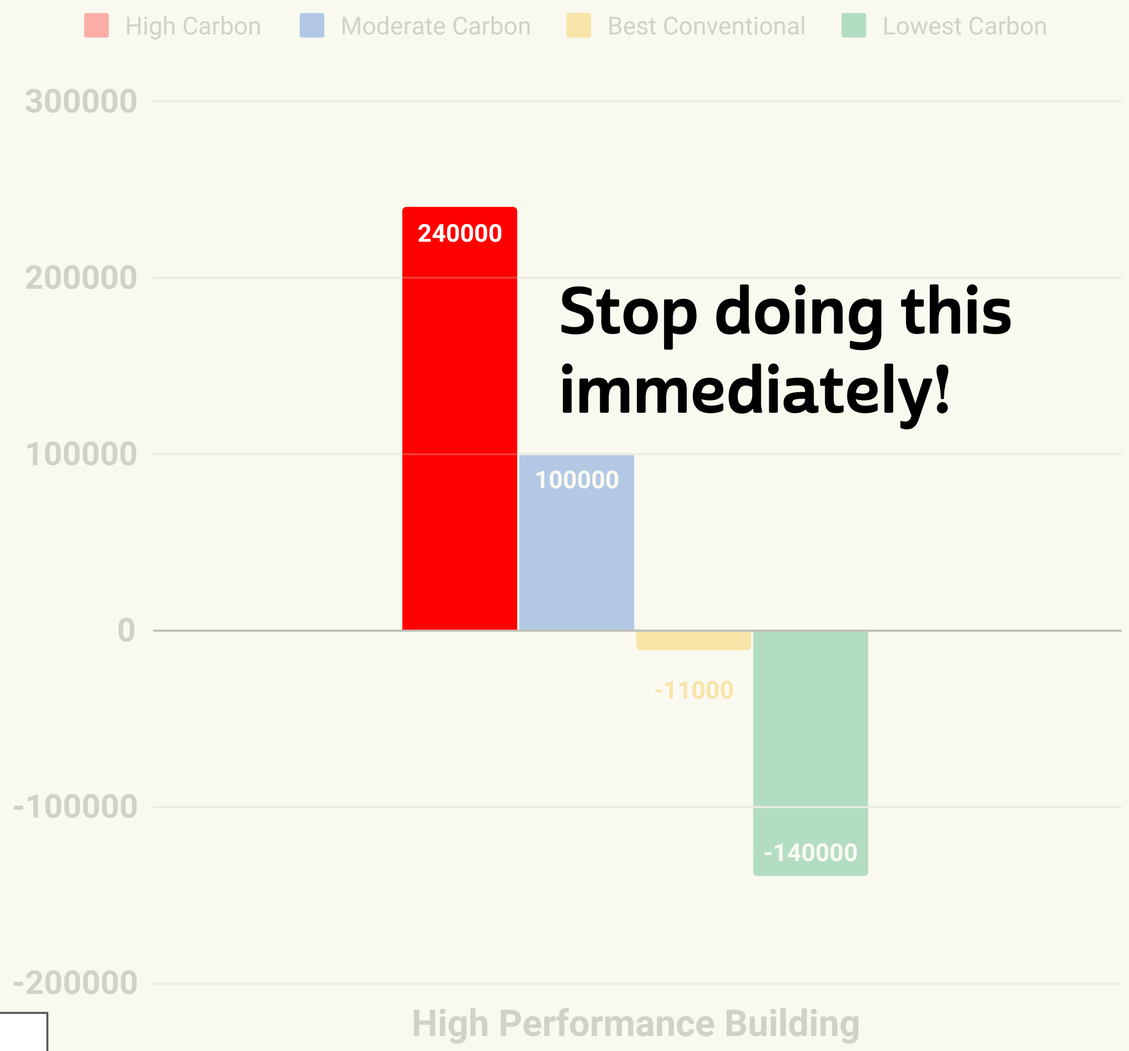
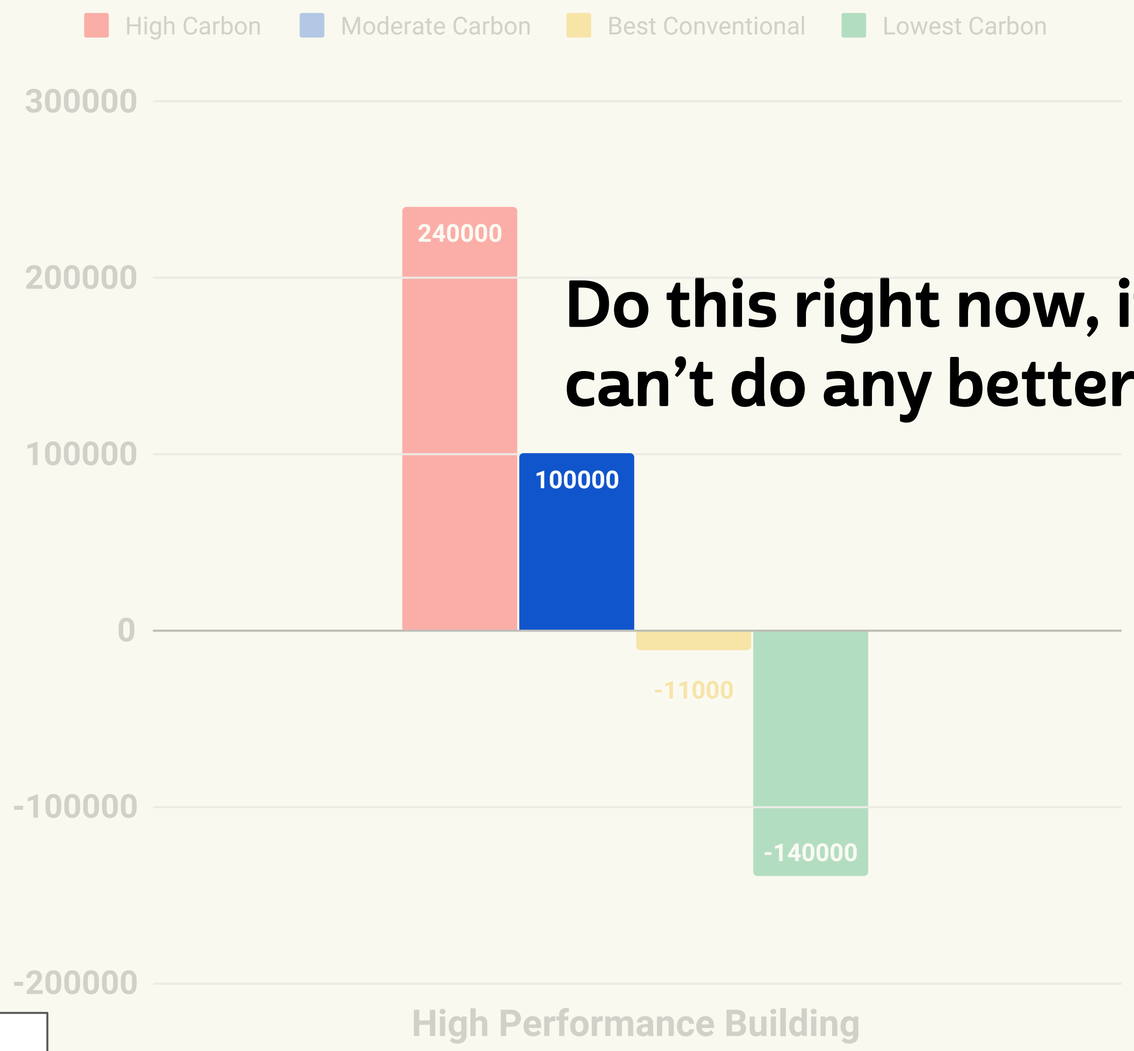
10. Act with great urgency, tremendous passion, and abundant joy.

It’s 2024…



Multi-Unit Building
Embodied CO2e Emissions



Do this right now, if you can’t do any better

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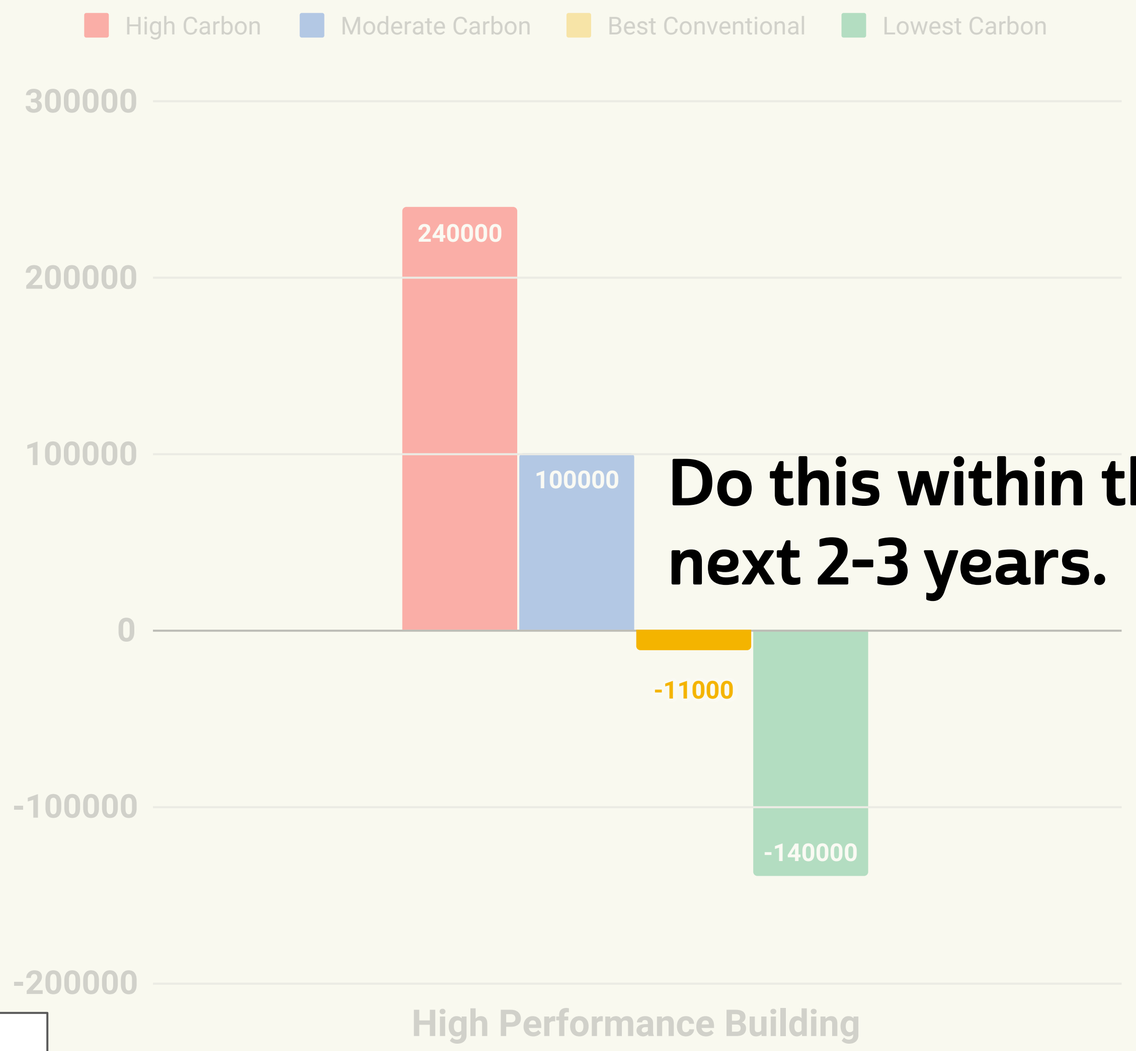
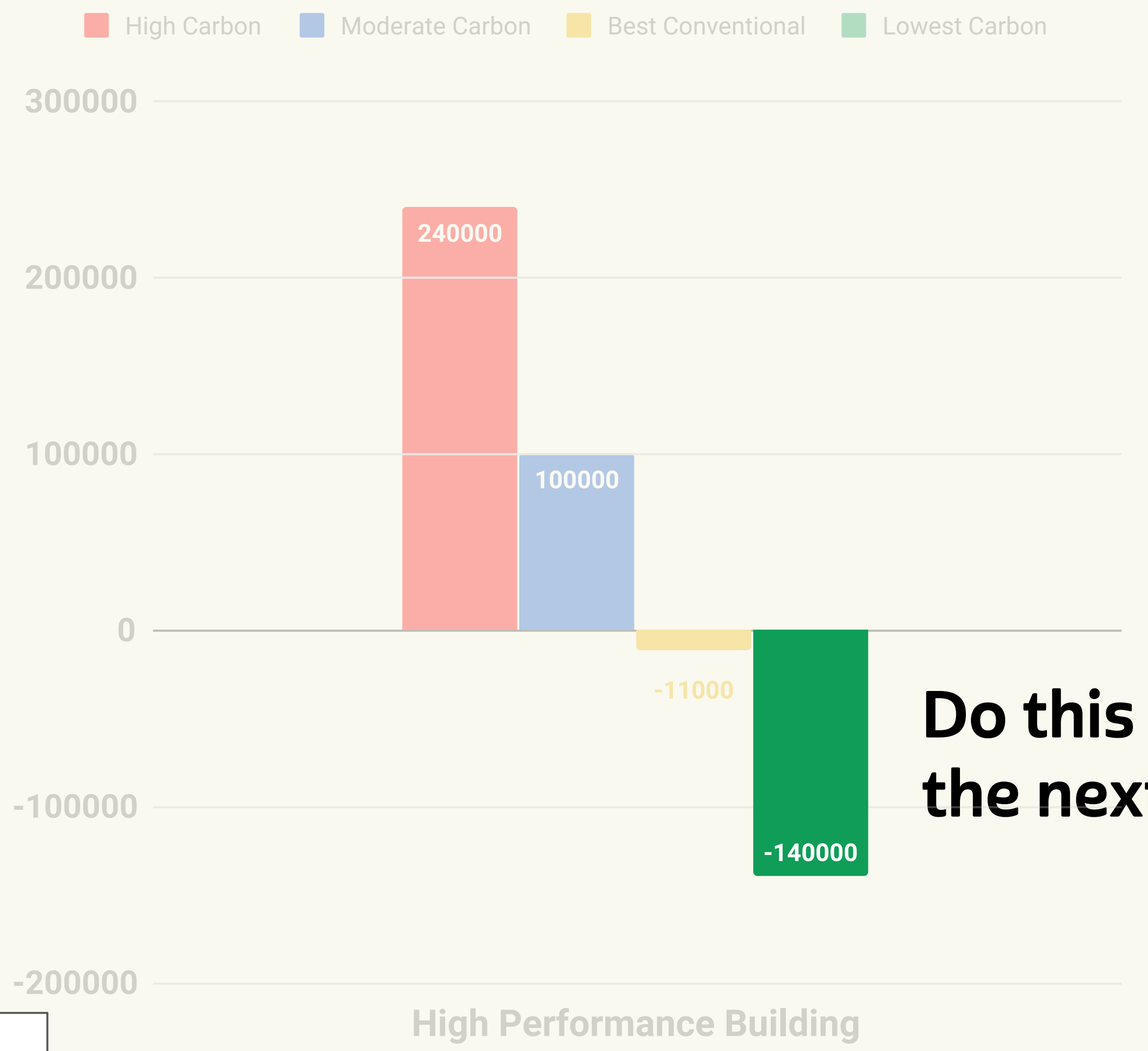


Do this within the next 2-3 years.

Multi-Unit Building Embodied CO2e Emissions



Do this within the next 5 years!

Multi-Unit Building Embodied CO2e Emissions

Resources for Getting There

- Embodied Carbon Network
- Carbon Leadership Forum
- Architecture 2030
- International Living Future Institute - “Zero Carbon” Certification
- Powerhouse Certification
- One Click LCA
- Tally LCA (Revit)
- Athena Impact Estimator
- BEES Online Database
- ICE Database