

Beyond ESG: The Carbon Footprint of the Homes We Build

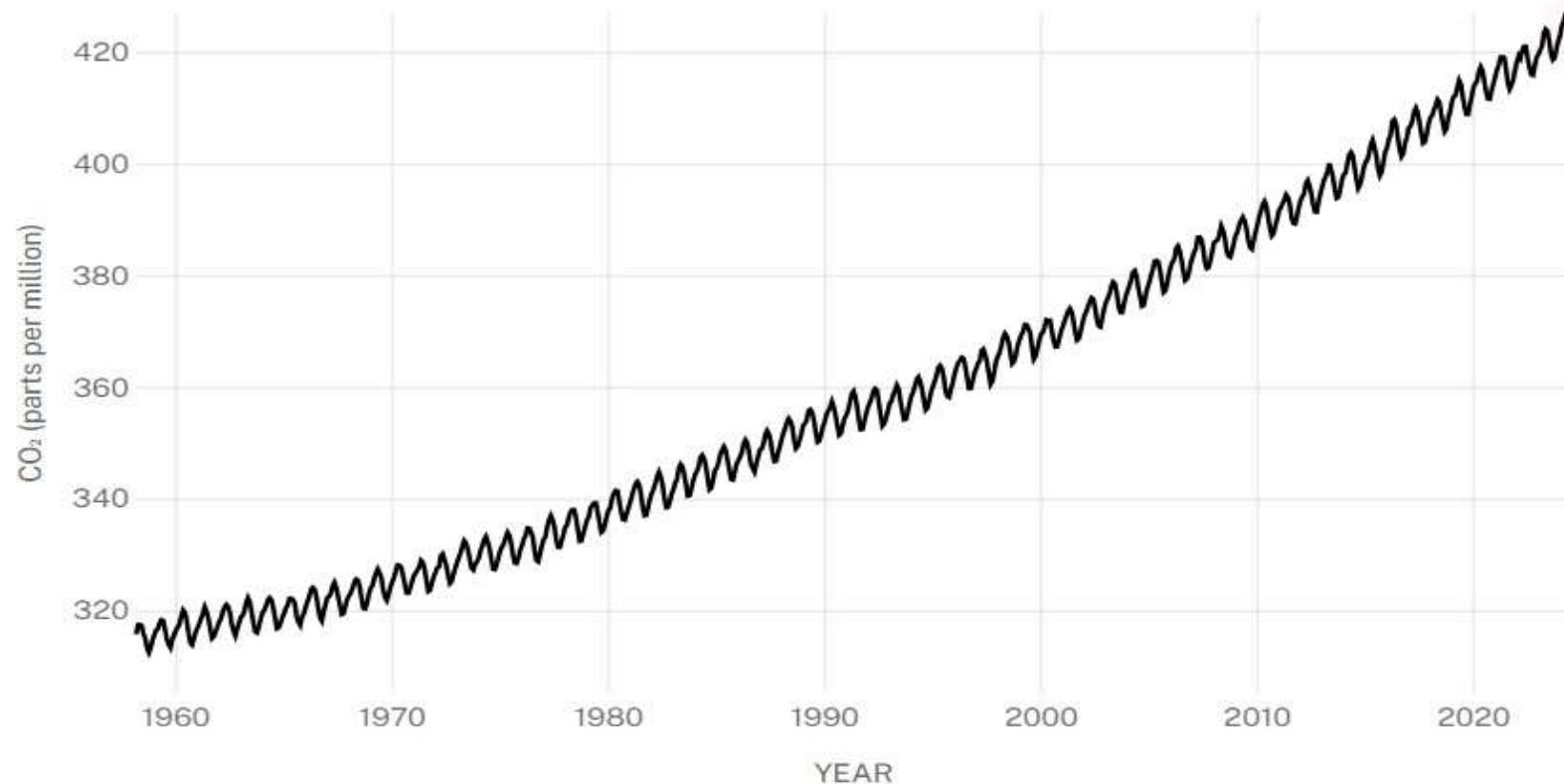
EEBA Summit 2024
Salt Lake City, Utah

Steve Byers, EnergyLogic
Gene Myers, Thrive Home Builders

Regardless of politics, climate change is real.

DIRECT MEASUREMENTS: 1958-PRESENT

Data source: NOAA, measured at the Mauna Loa Observatory



CO2 levels are rising.

My perspective, over my lifetime.



THE RESULTS

In 1951, there were
311.8 ppm
carbon in the atmosphere.

Today, there are
421.55 ppm
carbon in the atmosphere.

That's an increase of
↑ 109.75 ppm
during your lifetime thus far.

These levels are speeding up. As a comparison, carbon only increased
22.30 ppm
during the 73 years **before** your birth.

Carbon dioxide in the atmosphere is measured in parts per million (ppm).

Data from 1937-2011 is sourced from [NASA's Goddard Institute for Space Studies](#).

Data from 2012-2023 is sourced from the August de-seasonalized averages from [NOAA's Global Monitoring Laboratory](#).

My granddaughter's perspective, when she is my age.



What will her world be like?

Scenario / Data	Temperature Rise (2100)	Atmospheric Concentrations (2100)	Annual CO ₂ e Emissions (2100)
Confirmed Proposals As of March 1, 2011	4.0°C	800 ppm CO ₂ 1060 ppm CO ₂ e	103.40 Gt

Publication Source Climate Interactive Scoreboard
ppm = parts per million | Gt = gigatonnes = 1 billion tonnes
* NOAA-ESRL

When I was born: 311.8 ppm
When she was born: 421.55 ppm
When she is my age: 800-1060 ppm

In Colorado, the evidence is all around us.



Rocky Mountain National Park

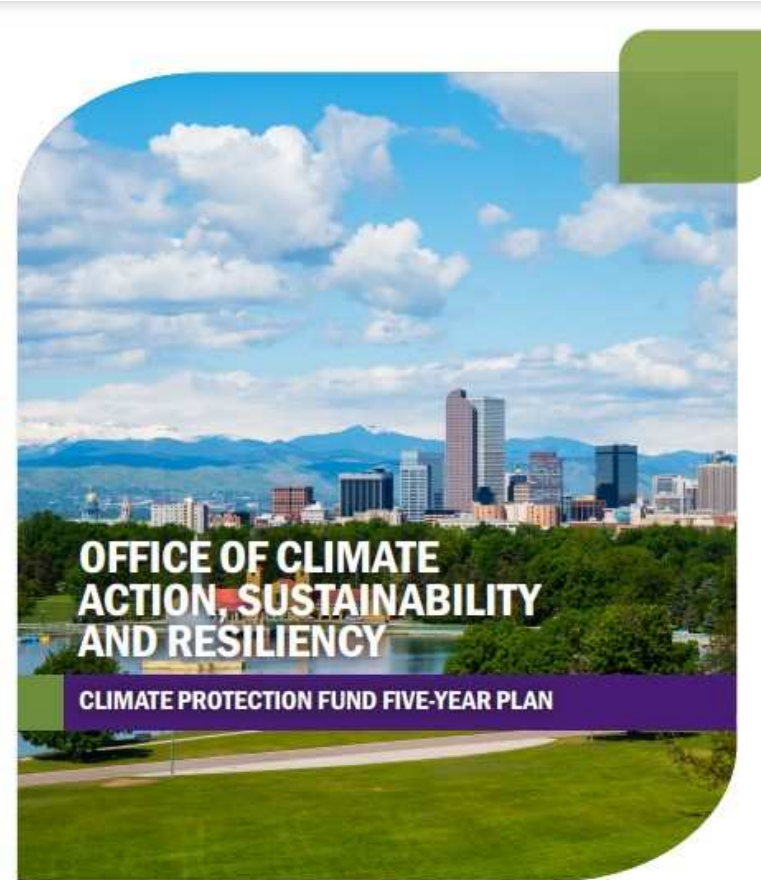
Its west portal is dead.



Credit: NASA

Credit: Michael Wentz, University of Colorado Boulder

Our cities and towns have adopted climate action plans, without state or federal policy.



Our customers are expecting our homes to be part of the solution.

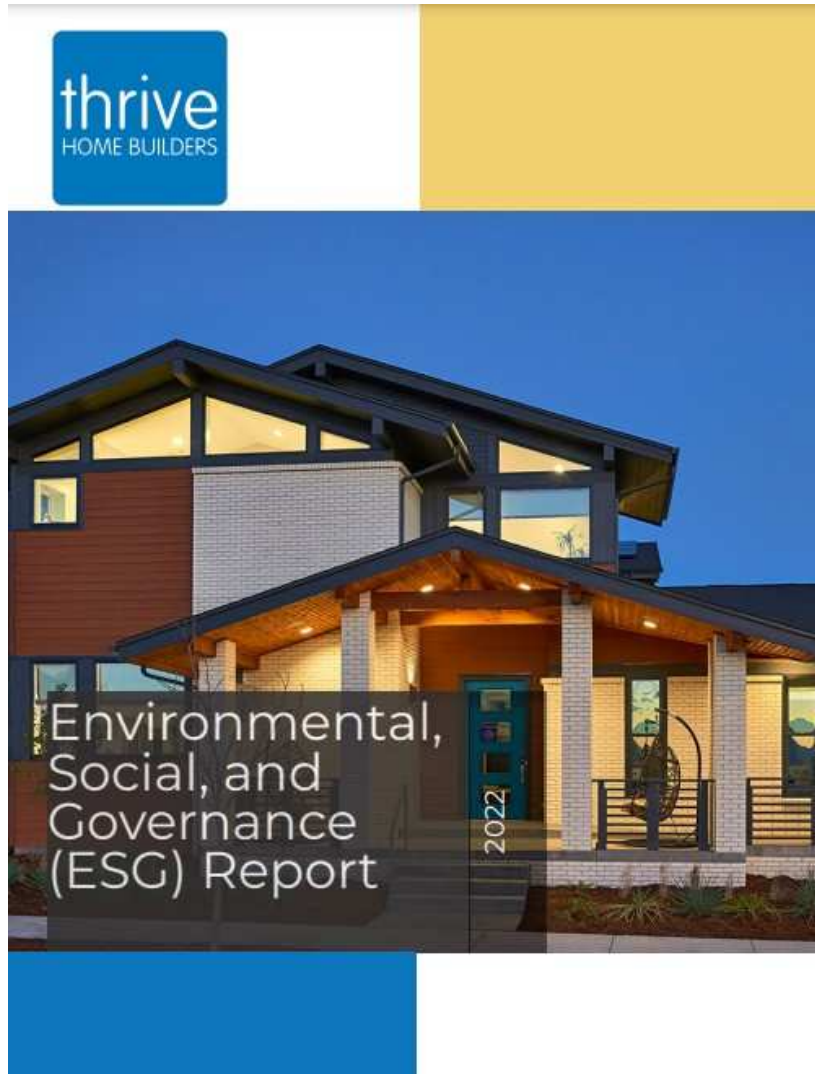


What is a builder to do? EEBA builders have a headstart.



- **Energy efficiency**
- **Indoor air quality**
- **Water conservation**
- **Carbon reduction**

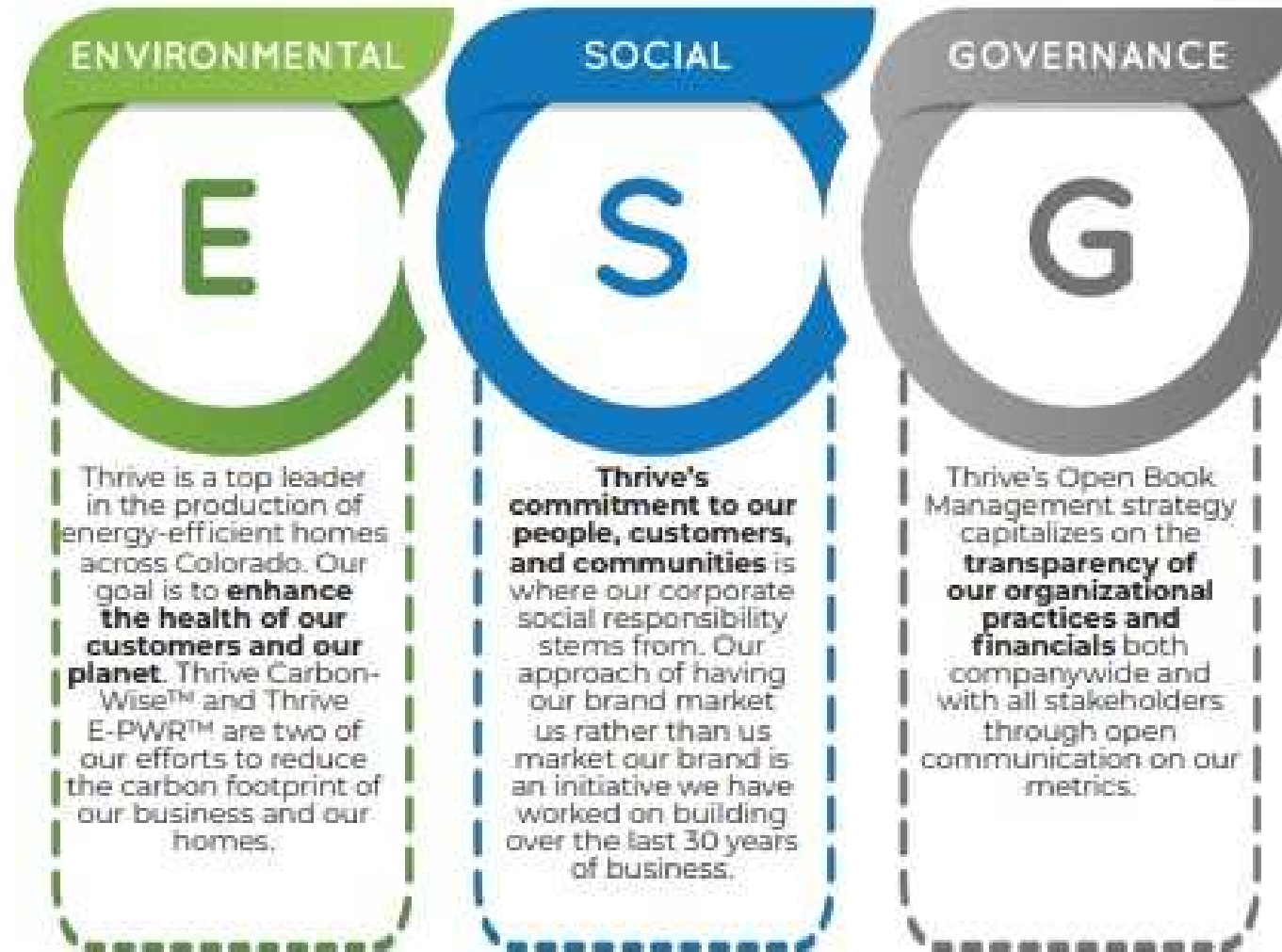
In 2023 Thrive published our first ESG report.



Credibility with our:

- **Cities and towns**
- **Lenders**
- **Partners and**
- **Customers**

We hired a consultant and followed corporate ESG orthodoxy.



Was it worth it? Yes and No.

Yes

- It gave us perspective on what really matters.



No

For a company like Thrive, wading through the UN SDG's and much of the Social and Governance content was tedious and perhaps insignificant, compared to our REAL impact.

If builders are serious about addressing climate change, what matters most is the carbon footprint of the homes we build.

For our 2024 Sustainability Report, we are focused on what we think matters most.



+



=



Corporate Footprint + Embodied Carbon + Operational Carbon = Our total footprint

Our corporate carbon footprint.

Thrive's 2021 Market-Based GHG Emissions	
Scope 1 GHG Emissions	98.23 CO ₂ e in metric tons
Scope 2 GHG Emissions	164.20 CO ₂ e in metric tons
Total Scope 1 & 2 GHG Emissions	262.43 CO ₂ e in metric tons
Total Scope 1 & 2 GHG Emissions Activity-Related Intensity	1.08 CO ₂ e in metric tons per 1,000 SF of Home Delivered

1.24 metric tons CO₂e
per 1,000 SF of Home Delivered in 2021

Thrive's 2021 Location-Based GHG Emissions	
Scope 1 GHG Emissions	98.23 CO ₂ e in metric tons
Scope 2 GHG Emissions	203.13 CO ₂ e in metric tons
Total Scope 1 & 2 GHG Emissions	301.36 CO ₂ e in metric tons
Total Scope 1 & 2 GHG Emissions Activity-Related Intensity	1.24 CO ₂ e in metric tons per 1,000 SF of Home Delivered

1.08 metric tons CO₂e
per 1,000 SF of Home Delivered in 2021

The homes we built in 2023.



71 Homes Completed
13 Single Family
58 Townhomes



Average HERS Score 25

The embodied carbon of the homes we build.



Embodied carbon—also known as embodied greenhouse gas (GHG) emissions—refers to the amount of GHG emissions associated with upstream—extraction, production, transport, and manufacturing—stages of a product’s life. --Environmental Protection Agency

Put simply, embodied carbon is the carbon footprint of a building or infrastructure project before it becomes operational.



Thanks to Eric Holt, Professor of the Practice

Franklin Burns School of Real Estate and Construction Management



First we need to know what is in our homes.



MiTek[®]

We begin with a bill of materials generated by Mitek software.

We are repurposing software used to design and build floor cassettes, wall panels and roof trusses.

Then we use a carbon calculator to determine the footprint.



+



=



ENVIRONMENTAL
PRODUCT
DECLARATION



Embodied Carbon Metrics You Could Use.



Single Family

179 *CO₂e Average

0.048 *CO₂e Per Square Foot

Townhouse

41 *CO₂e Average

0.022 *CO₂e Per Square Foot

* Metric tons

The operational carbon of the homes we build.



Operational carbon is the amount of carbon emitted from the energy used to operate a building or infrastructure.

This includes energy used for:

- Heating
- Cooling
- Ventilation
- Lighting
- Hot water
- Equipment
- General power usage

What a HERS Rater can do



- **Assess operational carbon**
- **Assess impacts on operational carbon**
- **ANSI/RESNET/ICC 301 2022 Addendum B CO2e Rating Index**
- **Uses hourly CO2e emission rates and electricity generation emission projections as published by the National Renewable Energy Laboratory (NREL).**
- **Combines these values with the hourly energy consumption given by the calculation of the HERS Index to provide a new metric valuing the carbon emissions when energy is used.**

Sample output – Carbon Index (CO2e)

Address	Residence Type	Current Version HERS Index	Current Version IAD Save	Carbon Index	Total Reference (CO2e) [tons/yr]	Total Rated Carbon Dioxide Equivalent (CO2e) [tons/yr]	Delta
2348 Central Park Way	Townhouse, end un	39	0.23	126	2.82	3.54	-0.72
2338 Central Park Way	Townhouse, inside	28	0.25	114	2.64	3	-0.36
2334 Central Park Way	Townhouse, inside	24	0.25	106	2.46	2.61	-0.15
2027 Squib Lane	Single family detach	26	0.27	46	4.83	2.21	2.62
3004 Helmsman St	Single family detach	27	0.27	35	5.63	1.95	3.68

Understanding CO2e

Average HERS Index	25
Average Carbon Index	81
Total Rated CO2e/Year	2.40
Townhouse avg Carbon Index	90
Single Family avg Carbon Index	42

SF CO2e avg	2.08
TH CO2e avg	2.5

- Heating reference
- Cooling reference
- How Water reference
- Lighting and appliances reference
- Onsite generation reference

Understanding CO2e

Residence Type	Current Version	
	HERS Index	Carbon Index
Townhouse, end	39	126
Townhouse, insid	28	114
Townhouse, insid	24	106
Townhouse, end	29	108
Townhouse, end	23	101
Townhouse, insid	19	90
Townhouse, end	26	109
Single family deta	28	33
Townhouse, end	26	111
Townhouse, insid	18	94
Townhouse, end	31	107
Townhouse, insid	28	109
Townhouse, insid	23	95
Townhouse, insid	28	96
Townhouse, end	26	101
Single family deta	26	46
Single family deta	27	35
Single family deta	48	55
Single family deta	22	38

HERS Index and Carbon Index

RESNET's HERS® Carbon Index

HERS CARBON INDEX

The US energy system is changing
First-of-its-kind carbon rating index addresses critical issue of greenhouse gas emissions.

The Standard:
Based on ANSI/RESNET/ACC 301-2019
Standard "CO₂e Rating Index"

Provides a more accurate metric to measure emissions: addresses when energy is used, as well as how much of it is used

How it works:

A RESNET accredited HERS software will take the information entered for a HERS Rating and calculate the HERS® Carbon Index Score. No additional inspections needed.

HERS Rating Data → RESNET HERS Software → HERS Carbon Index Score

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

Zero Carbon Homes Reference Home Existing Homes

LESS CARBON MORE CARBON

How can it be used?

- ✓ Usable for local climate change initiatives
- ✓ Utility incentive programs
- ✓ Consumer awareness
- ✓ Can be used in Environmental, Social and Governance (ESG) reporting
- ✓ Can be a basis for green bonds

Uses hourly CO₂e emission rates and electricity generation emission projections as published by the [National Renewable Energy Laboratory \(NREL\)](#)

Combines these values with the hourly energy consumption given by the calculation of the HERS® Index to provide a new metric valuing the carbon emissions when energy is used.

- Relationship
- Functional threshold of HERS
 - Without renewables
 - With renewables
- Offsets to get the “last mile”

What a HERS Rater Can't Do

- **Anything about the reference home**
 - **Accuracy of operational carbon due to portfolio approach on utilities**
- **Currently, can't assess embodied carbon via the energy modeling tools – stay tuned**
- **Advisory Committee to Investigate the Embodied Carbon Standard Development**

What RESNET is Doing

- **Embodied carbon via energy modeling tools**
- **Advisory Committee to Investigate the Embodied Carbon Standard Development**
- **RESNET has begun the process of developing an ANSI candidate standard for calculating CO2e emissions based on metered data for ratings.**

Appropriate Resolution

- **Good not great**
- **We shouldn't let the perfect be the enemy of the good**

However...

- **The 2006 IECC is not the appropriate benchmark**
- **The code a home is built to is the right benchmark**

ESG for Building

- <https://www.greenbuildermedia.com/esg-for-building>
- Specifically designed for building



Carbon Offsets

What is a carbon offset?

- A carbon offset is a certificate representing the reduction of one metric ton (2,205 lbs) of carbon dioxide emissions, the principal cause of climate change.

How are carbon offsets generated?

1. By capturing and destroying a greenhouse gas that would otherwise be emitted into the atmosphere. An example of this is a methane gas capture project at a landfill.
2. By producing energy using a clean, renewable resource that eliminates the need to produce that same energy from fossil fuels, the burning of which releases greenhouse gas into the atmosphere. An example of this is wind power.
3. By capturing and storing (or “sequestering”) greenhouse gases to prevent their release into the atmosphere. An example of this is a project that promotes the healthy growth and maintenance of forests.

Carbon Offsets

4707 metric tons
\$12/metric ton

**\$56,484 to offset total
embodied carbon for
2023**

**We can purchase offsets
to compensate for the
footprint of the homes we
build.**

Discussion and Thanks!

