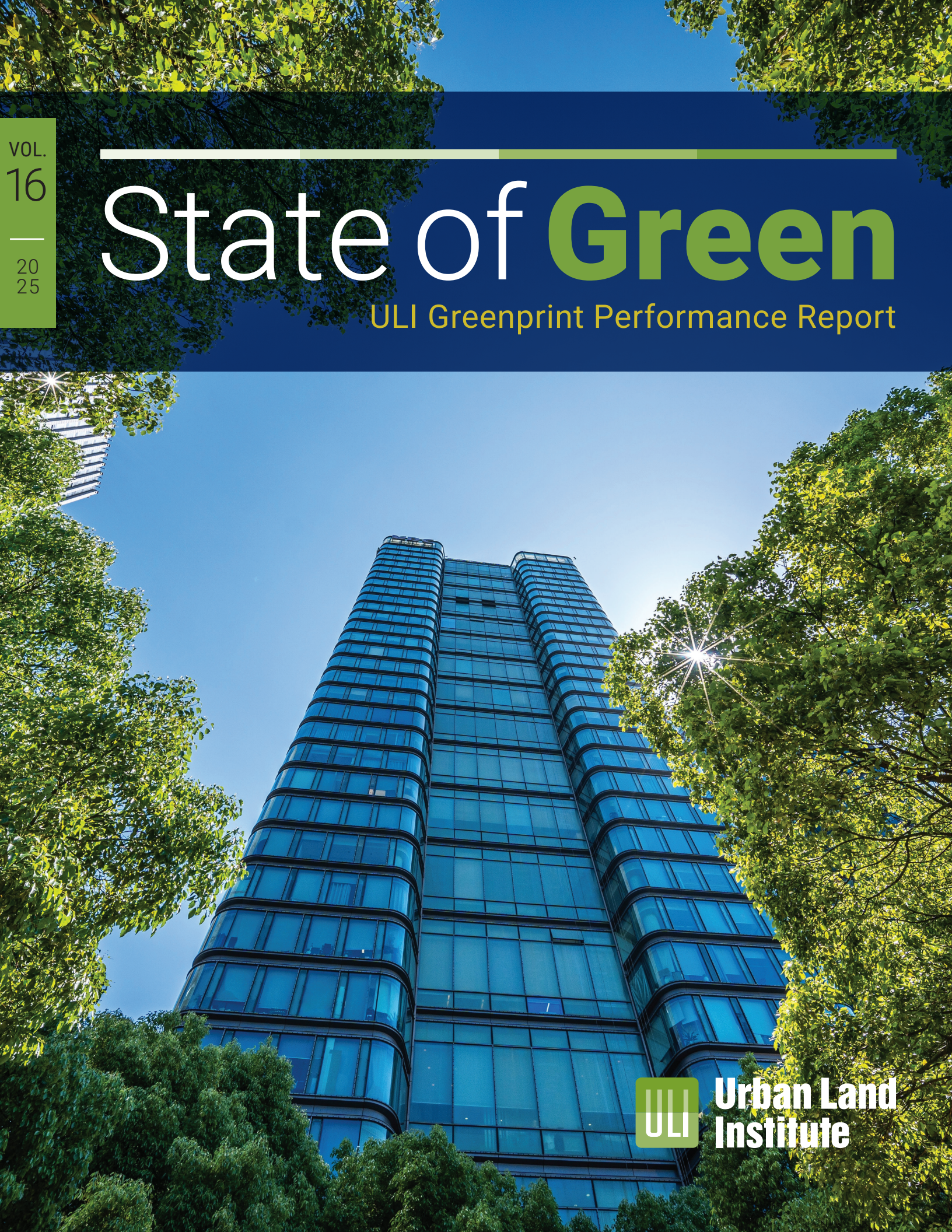
VOL. 16

2025

# State of Green

## ULI Greenprint Performance Report



Urban Land Institute

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Urban Land Institute
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Washington, DC 20036-4948

# About ULI

The Urban Land Institute is a global, member-driven organization comprising more than 48,000 real estate and urban development professionals dedicated to advancing the Institute's mission of shaping the future of the built environment for transformative impact in communities worldwide. ULI's interdisciplinary membership represents all aspects of the industry, including developers, property owners, investors, architects, urban planners, public officials, real estate brokers, appraisers, attorneys, engineers, financiers, and academics. Established in 1936, the Institute has a presence in the Americas, Europe, and Asia Pacific regions, with members in 84 countries. More information is available at uli.org. Follow ULI on X (formerly known as Twitter), Facebook, LinkedIn, and Instagram.

## Randall Lewis Center

The ULI Randall Lewis Center for Sustainability in Real Estate envisions a net zero, resilient, healthy, and inclusive world where every person, community, and business thrives. To achieve our vision, the Center accelerates action for sustainability in real estate and cities by cultivating leadership and knowledge, catalyzing adoption of sustainability practices across the real estate value chain, helping solve land use and real estate challenges, and advancing policy solutions. The Center pursues these goals through its four main programs—Decarbonization, Urban Resilience, Healthy Places, and ULI Greenprint—working closely with ULI members and partners to produce publications on cutting-edge issues, host global convenings, provide community technical assistance, and organize leadership networks. Discover transformative practices for real estate and land use at uli.org/sustainability. Connect with the Lewis Center at sustainability@uli.org.

# Contents

# Introductory Letter

A lot has changed in real estate sustainability in the past year. A new U.S. administration turned away from climate action as state and local governments leaned in. Europe proposed delaying and scaling back regulations in its Omnibus proposal, while countries including Japan and Singapore introduced disclosure requirements in Asia Pacific. Data center expansion, electrification, and aging infrastructure are affecting electricity rates while insurers are raising premiums and tightening underwriting standards in response to increasing physical climate risk.

In times of change, communities such as Greenprint come to the forefront to help real estate members navigate complexity together. Greenprint brings together sustainability practitioners from 130 real estate companies to "reduce carbon and build value," by sharing best practices, learning together, and building tools to decarbonize their portfolios. Greenprint members understand that decarbonization is not just good for the environment—it's good for business. In the past year alone, Greenprint members have

- **Stayed on top of the latest trends** by joining more than 100 Greenprint members-only discussions and webinars on topics ranging from net zero building certifications to innovative social programs.
- **Funded ULI research for the industry** including *The Developer's Guide to Embodied Carbon*, *Pumping Up Sustainability: Myth-Busting Heat Pumps in Commercial Real Estate*, *Sustainability Unboxed: Delivering on Logistics and Distribution Warehouses*, and five primers on net zero tenant engagement.
- **Partnered across the value chain** on initiatives including ULI developer and utility convenings, the ECHO Project, and the low-carbon steel initiative in China.

The results? Over the past 15 years, Greenprint members have steadily reduced their collective emissions. This year, I am pleased to report that members have achieved a 6 percent reduction in like-for-like and year-over-year carbon emissions. Notably, European assets reported a 13 percent reduction.

| | | | |
|---|---|---|---|
| **130 member companies** | **8.6 billion sq ft (799 million sq m)** OF PROPERTY HELD | **$4.2 T (€3.6 T)** ASSETS UNDER MANAGEMENT | **26,500+ properties** |

In the year ahead, Greenprint will leverage the newly created ULI Impact Lab, which unites ULI's work across sustainability, housing, capital markets, and advisory services, to help members take strategic action on their decarbonization and resilience goals. ULI applauds its Greenprint members for continuing to lead the way and we look forward to another successful year together.

Blakely Jarrett, Vice President, ULI Randall Lewis Center for Sustainability in Real Estate

# The ULI Greenprint Community

## Real Estate Members

A global community of real estate owners, investors, and developers committed to leading the market and advancing sustainability across their portfolios:


CABOT

CalPERS

CapitaLand

CBRE
Investment
Management

CIM

CITY
DEVELOPMENTS
LIMITED

CLARION PARTNERS

CommonWealth
partners

Group

CRESCENT
COMMUNITIES

CROW HOLDINGS

CROWN
RESORTS

DRA
GON
COR
龙地

DWS

elme

EQT EXETER

Equity Residential

extended
STAY
AMERICA

FCP

FORT KNOX
SELF STORAGE

G6
Hospitality

GAL
VAN
IZE
CLIMATE
SOLUTIONS

G|I|D

GLP

Goldman
Sachs

GREAT
WOLF
LODGE

GROSVENOR

恒 隆 集 團
HANG LUNG GROUP

HEITMAN
A REAL ESTATE INVESTMENT MANAGEMENT FIRM

HILLWOOD
A PEROT COMPANY®

Hines

Home Partners
of America

HORIZON
INDUSTRIAL PARKS

HIP
Hotel Investment
Partners

Howard Hughes
THE HOWARD HUGHES CORPORATION®


HUDSON
PACIFIC
PROPERTIES


IDI Logistics


이지스자산운용
IGIS Asset Management


iQ


JAMES CAMPBELL COMPANY LLC


Jamestown


JBG SMITH


JapanCor


J.P.Morgan
Asset Management


Kayne Anderson
Real Estate


kereby


KILLIAN PACIFIC


KILROY


KKR


KORAMCO


LaSalle


LBA
REALTY


Leaf
Living


lendlease


LINK


領展
LINK


LIVCOR


LOGICOR


LONGFELLOW™


MACQUARIE


MetLife
Investment
Management


Mileway


MILL CREEK
RESIDENTIAL


MORGAN CREEK | VENTURES


NEO


NUCLEUS
OFFICE PARKS


nuveen
OFFICEFIRST
PARAMOUNT GROUP
PEMBROKE
PGIM
PIMCO
PROLOGIS
PRP
Real Estate Investment Management
PURE INDUSTRIAL
QTS
Revantage
RUDIN
Sage Homes
Sentinel
SHOPCORE PROPERTIES
SKANSKA
SL GREEN REALTY CORP.
SPONDA
ST.MODWEN
STOCKBRIDGE
TA REALTY
testa
THE GREEN CITIES COMPANY
THE OFFICE GROUP
TOG | FORA
EST. 1947
TOWER
TISHMAN SPEYER
TRICON RESIDENTIAL
UNICO
UNITED PROPERTIES
CREATING DEEP ROOTS
VALUE RETAIL CHINA
VISTRIA
VORNADO
REALTY TRUST
WPT
CAPITAL ADVISORS
LIVING

## Innovation Partners

Technology and service providers who contribute innovative best practices that advance sustainability with Greenprint members and in the built environment broadly:

Audette
effecterra A Public Benefit Corporation
ENERGY IMPACT PARTNERS
First Street
TANGIBLE

## Strategic Partners

Industry actors who engage with Greenprint and its members in the market on topics of relevance to Greenprint's mission of reducing carbon emissions and increasing building value:

ARUP
BBP BETTER BUILDINGS PARTNERSHIP
Better Buildings U.S. DEPARTMENT OF ENERGY
BOMA International
CLF Carbon Leadership Forum
CRREM CARBON RISK REAL ESTATE MONITOR
ENERGY STAR
Global Alliance for Buildings and Construction
GRESB
NREV
THE KRESGE FOUNDATION
nbi new buildings institute
NEW YORK STATE OF OPPORTUNITY. NYSERDA
Robert Wood Johnson Foundation
RMI ENERGY. TRANSFORMED.
UNEP
USDN urban sustainability directors network
WORLD GREEN BUILDING COUNCIL

# About This Report

For the real estate industry, improved environmental performance can reduce operating expenses, increase tenant demand, lead to more efficient management of natural resources, and increase property value. This report tracks industry progress on improved performance using Greenprint-member properties as a proxy to demonstrate the progress that can be achieved industrywide. These benchmarks can be used by a range of stakeholders (e.g., academic researchers, sustainability practitioners, policymakers) as a reference point for analysis on multiple facets of real estate sustainability.

Volume 16 includes the Greenprint member portfolio's analysis of year-over-year changes from 2023–2024 in operational carbon, energy, water, and waste, as well as annual benchmarks by property type for calendar year 2024. The report also includes portfolio-level data collected on progress toward Greenprint's Net Zero by 2050 Goal for all companies aligned across all three tracks.

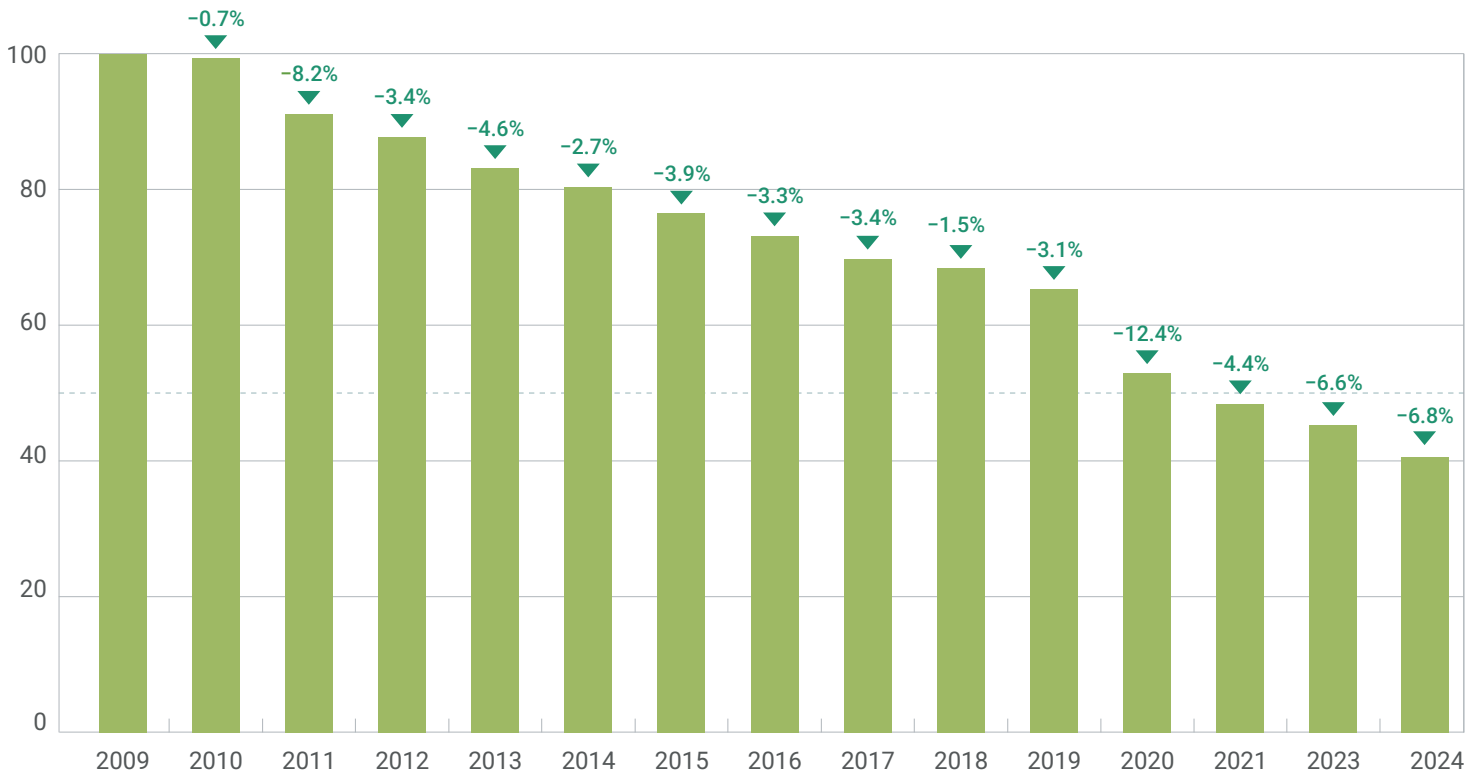
Greenprint's *State of Green* operational data collection template is aligned with GRESB's data submission template to support the industry's movement toward streamlined reporting. The year-over-year, like-for-like, and annual benchmarks were split into whole-building, base-building, and tenant spaces data to enhance transparency. Unless otherwise noted, all data is whole building.

Greenprint also collects optional refrigerant and embodied carbon data. Participating members submitted carbon dioxide equivalent refrigerant emissions data for individual assets, or across their entire portfolios. Participating members also submitted asset-specific embodied carbon data. The refrigerant reporting template was created using the Greenhouse Gas Protocol and edited with expert advice. This will likely be aligned with industry-recognized reporting standards as they become available.

# Annual Results: Global 2023–2024

Greenprint has been tracking year-over-year, like-for-like percent reductions in absolute carbon emissions since 2009.

ULI GREENPRINT CARBON EMISSIONS REDUCTIONS OVER TIME



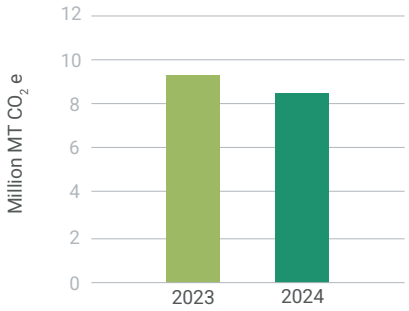
Every year, Greenprint compares member portfolios' performance of assets across energy, water, waste, and carbon. Data provided below refers to whole-building data only.

## 2023–2024 YEAR-OVER-YEAR PERFORMANCE, GLOBAL

**Whole-Building Data**

### $CO_2$ EMISSIONS

▼ −6.8%

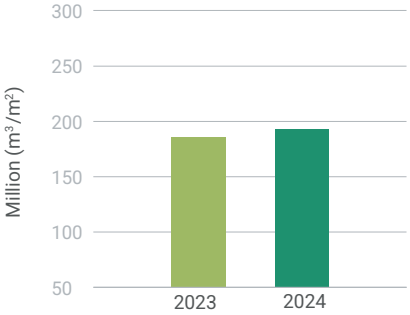



2023: 8,741,317 MT $CO_2$e
2024: 8,144,533 MT $CO_2$e

11,762 PROPERTIES

### WATER USE

▲ +6.2%

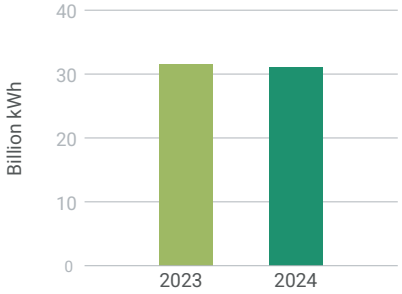



2023: 186,970,369 $m^3$
2024: 198,654,537 $m^3$

7,634 PROPERTIES

### ENERGY USE

▼ −0.8%

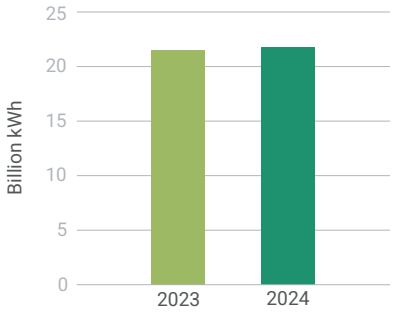



2023: 31,414,377,267 KWH
2024: 31,148,263,193 KWH

11,387 PROPERTIES

### ELECTRICITY USE

▲ +0.5%

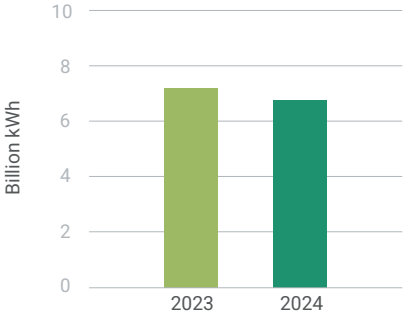



2023: 22,514,402,984 KWH
2024: 22,638,228,346 KWH

11,336 PROPERTIES

### FUEL USE

▼ −4.6%

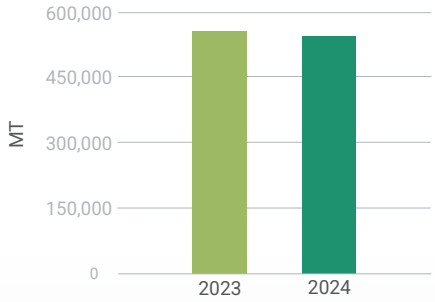



2023: 7,205,279,037 KWH
2024: 6,876,543,323 KWH

5,865 PROPERTIES

### LANDFILL WASTE

▼ −1.7%

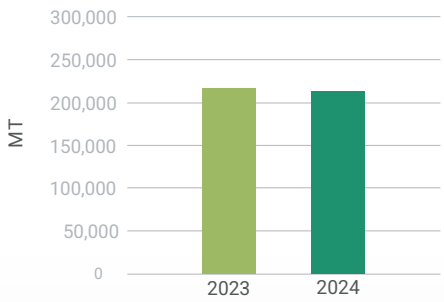



2023: 575,768 MT
2024: 566,038 MT

3,317 PROPERTIES

### WASTE DIVERSION

▼ −5.6%




2023: 229,422 MT
2024: 216,539 MT

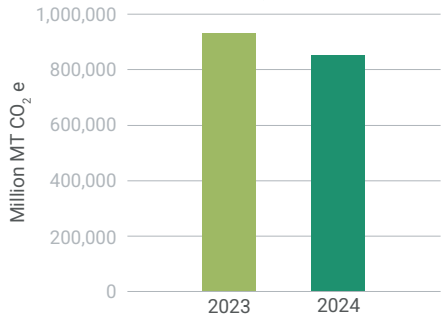
2,151 PROPERTIES

# 2023–2024 YEAR-OVER-YEAR PERFORMANCE, GLOBAL

## Base-Building Data

### $CO_2$ EMISSIONS

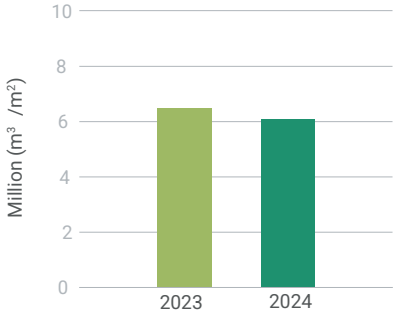
▼ −10.1%




2023: 750,649 MT $CO_2$e
2024: 674,694 MT $CO_2$e
2,231 PROPERTIES

### WATER USE

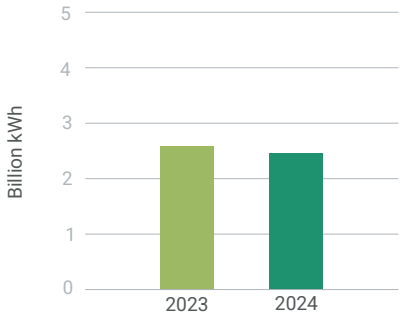
▼ -3.8%




2023: 6,311,417 $m^3$
2024: 6,069,259 $m^3$
508 PROPERTIES

### ENERGY USE

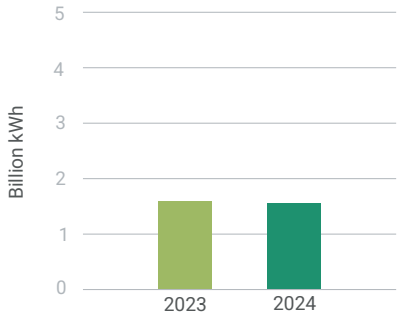
▼ −2.5%




2023: 2,750,701,312 KWH
2024: 2,682,755,113 KWH
2,041 PROPERTIES

### ELECTRICITY USE

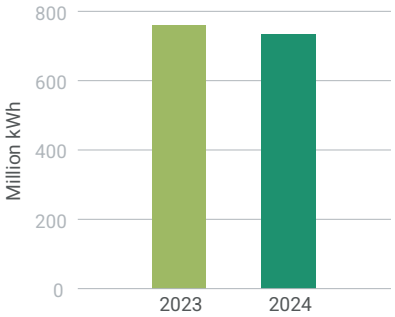
▼ −2.0%




2023: 1,666,225,550 KWH
2024: 1,632,654,142 KWH
2,028 PROPERTIES

### FUEL USE

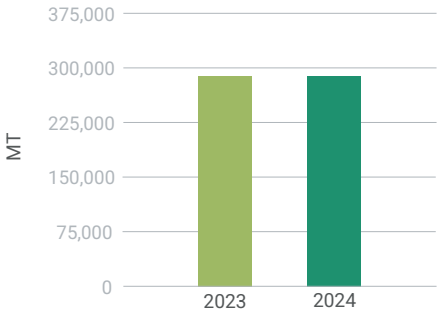
▼ −2.1%




2023: 788,256,174 KWH
2024: 771,334,816 KWH
1,066 PROPERTIES

### LANDFILL WASTE

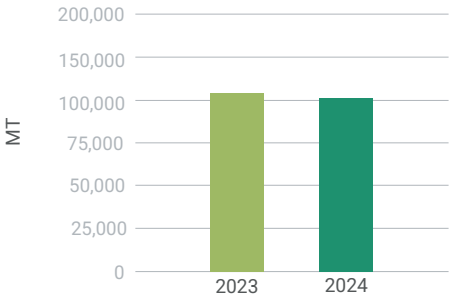
▼ −0.7%




2023: 288,169 MT
2024: 286,222 MT
1,305 PROPERTIES

### WASTE DIVERSION

▼ −3.4%



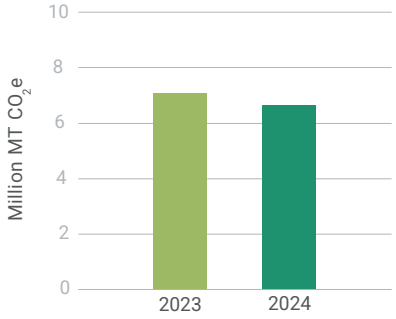

2023: 103,800 MT
2024: 100,310 MT
1,107 PROPERTIES

# 2023–2024 YEAR-OVER-YEAR PERFORMANCE, AMERICAS

**Whole-Building Data**

## $CO_2$ EMISSIONS

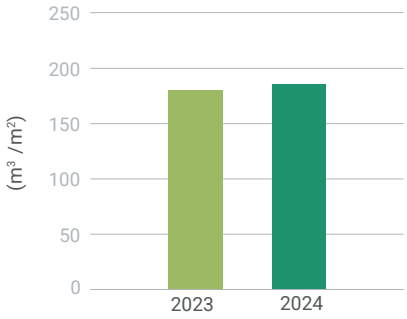
▼ −5.6%




2023: 7,041,565 MT $CO_2e$
2024: 6,650,507 MT $CO_2e$
6,737 PROPERTIES

## WATER USE

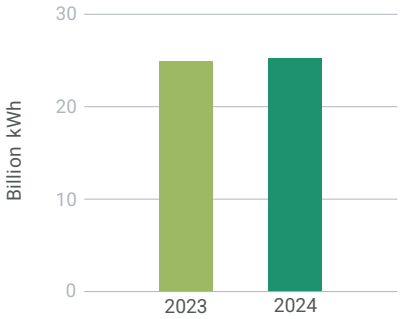
▲ +7.1%




2023: 171,118,885 $m^3$
2024: 183,246,727 $m^3$
4,721 PROPERTIES

## ENERGY USE

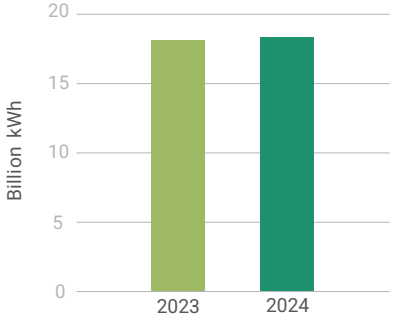
▲ +0.002%




2023: 24,409,200,216 KWH
2024: 24,409,685,975 KWH
6,691 PROPERTIES

## ELECTRICITY USE

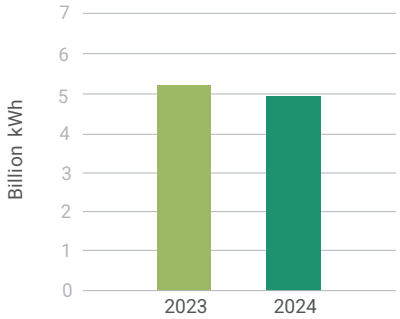
▲ +1.3%




2023: 18,170,079,984 KWH
2024: 18,399,707,971 KWH
6,739 PROPERTIES

## FUEL USE

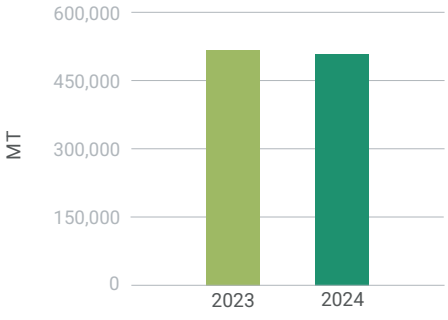
▼ −4.3%




2023: 5,179,809,371 KWH
2024: 4,956,474,974 KWH
3,541 PROPERTIES

## LANDFILL WASTE

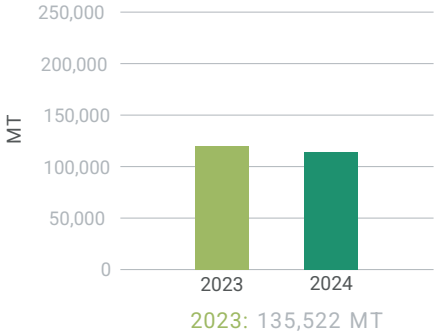
▼ −1.5%




2023: 499,973 MT
2024: 492,226 MT
2,626 PROPERTIES

## WASTE DIVERSION

▼ -6.6%



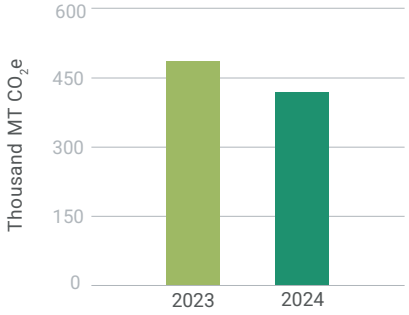

2023: 135,522 MT
2024: 126,644 MT
1,573 PROPERTIES

# 2023–2024 YEAR-OVER-YEAR PERFORMANCE, ASIA PACIFIC

## Whole-Building Data

### $CO_2$ EMISSIONS

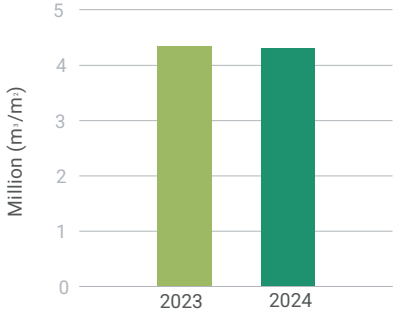
▼ -8.4%




2023: 471,722 MT $CO_2e$
2024: 432,278 MT $CO_2e$
601 PROPERTIES

### WATER USE

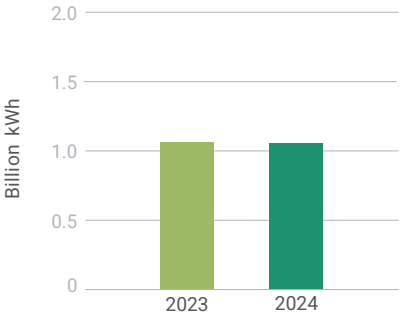
▼ -0.8%




2023: 4,379,445 $m^3$
2024: 4,342,748 $m^3$
524 PROPERTIES

### ENERGY USE

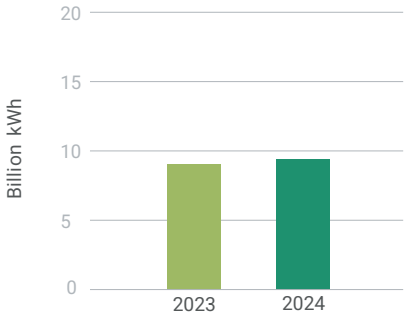
▼ -0.7%




2023: 1,018,302,365 KWH
2024: 1,011,266,415 KWH
589 PROPERTIES

### ELECTRICITY USE

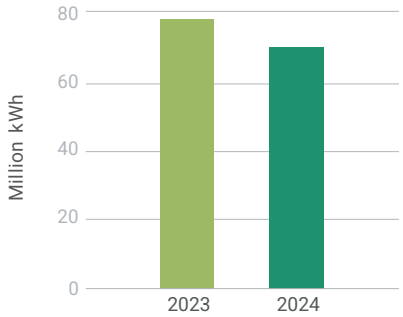
▲ +0.2%




2023: 929,676,529 KWH
2024: 931,354,124 KWH
590 PROPERTIES

### FUEL USE

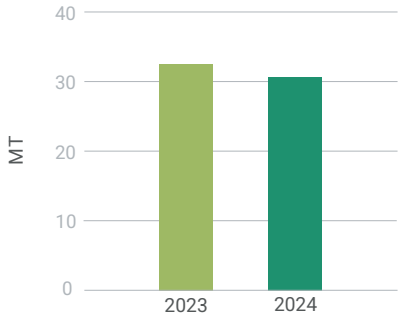
▼ –12.2%




2023: 79,608,488 KWH
2024: 69,872,230 KWH
116 PROPERTIES

### LANDFILL WASTE

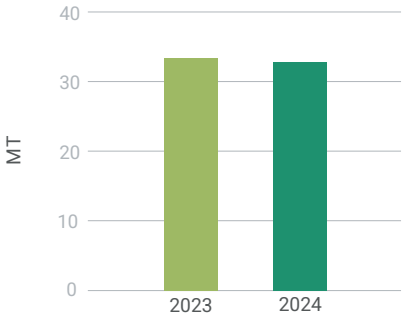
▼ –5.8%




2023: 32,706 MT
2024: 30,817 MT
162 PROPERTIES

### WASTE DIVERSION

▼ –4.2%



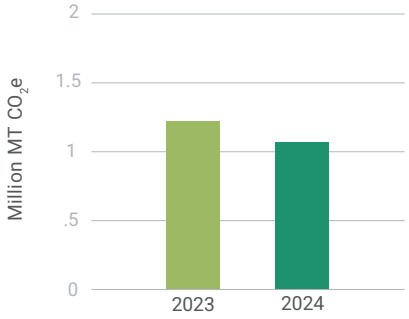

2023: 33,961 MT
2024: 32,551 MT
72 PROPERTIES

# 2023–2024 YEAR-OVER-YEAR PERFORMANCE, EUROPE

## Whole-Building Data

### $CO_2$ EMISSIONS

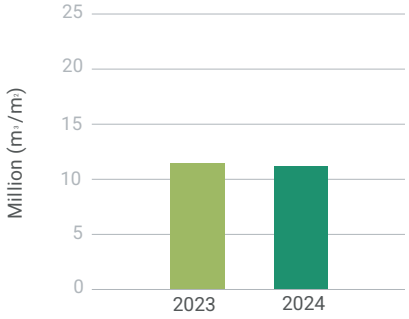
▼ −13.7%




2023: 1,251,725 MT $CO_2e$
2024: 1,080,728 MT $CO_2e$
4,426 PROPERTIES

### WATER USE

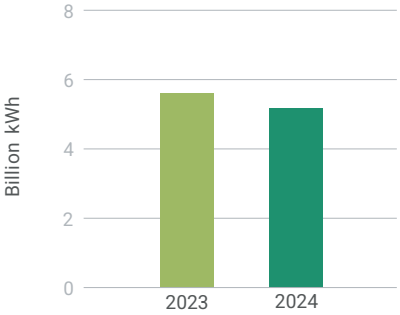
▼ −3.0%




2023: 11,619,465 $m^3$
2024: 11,267,058 $m^3$
2,387 PROPERTIES

### ENERGY USE

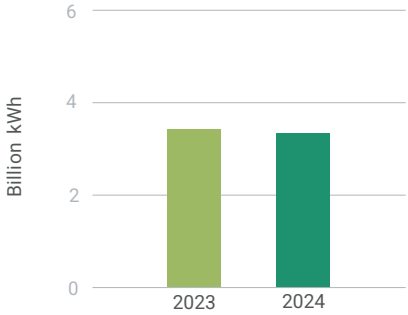
▼ −3.9%




2023: 5,898,499,345 KWH
2024: 5,666,126,292 KWH
4,098 PROPERTIES

### ELECTRICITY USE

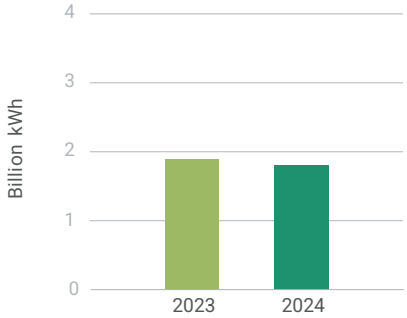
▼ −2.4%




2023: 3,362,317,078 KWH
2024: 3,280,464,281 KWH
3,997 PROPERTIES

### FUEL USE

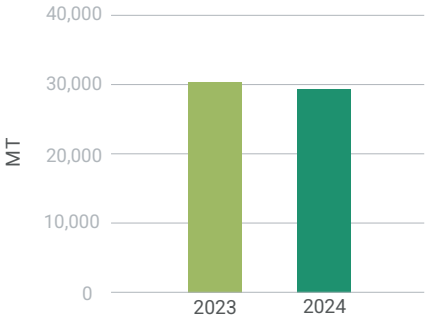
▼ −4.9%




2023: 1,929,835,164 KWH
2024: 1,835,062,444 KWH
2,202 PROPERTIES

### LANDFILL WASTE

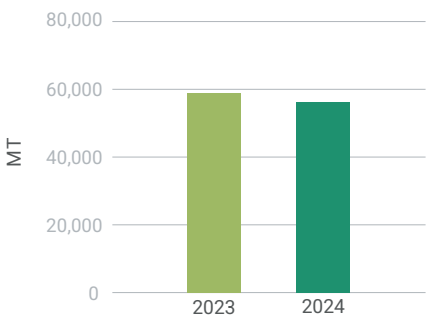
▼ −2.7%




2023: 30,430 MT
2024: 29,619 MT
520 PROPERTIES

### WASTE DIVERSION

▼ −4.3%




2023: 58,969 MT
2024: 56,436 MT
510 PROPERTIES

# Deep Dive on Performance

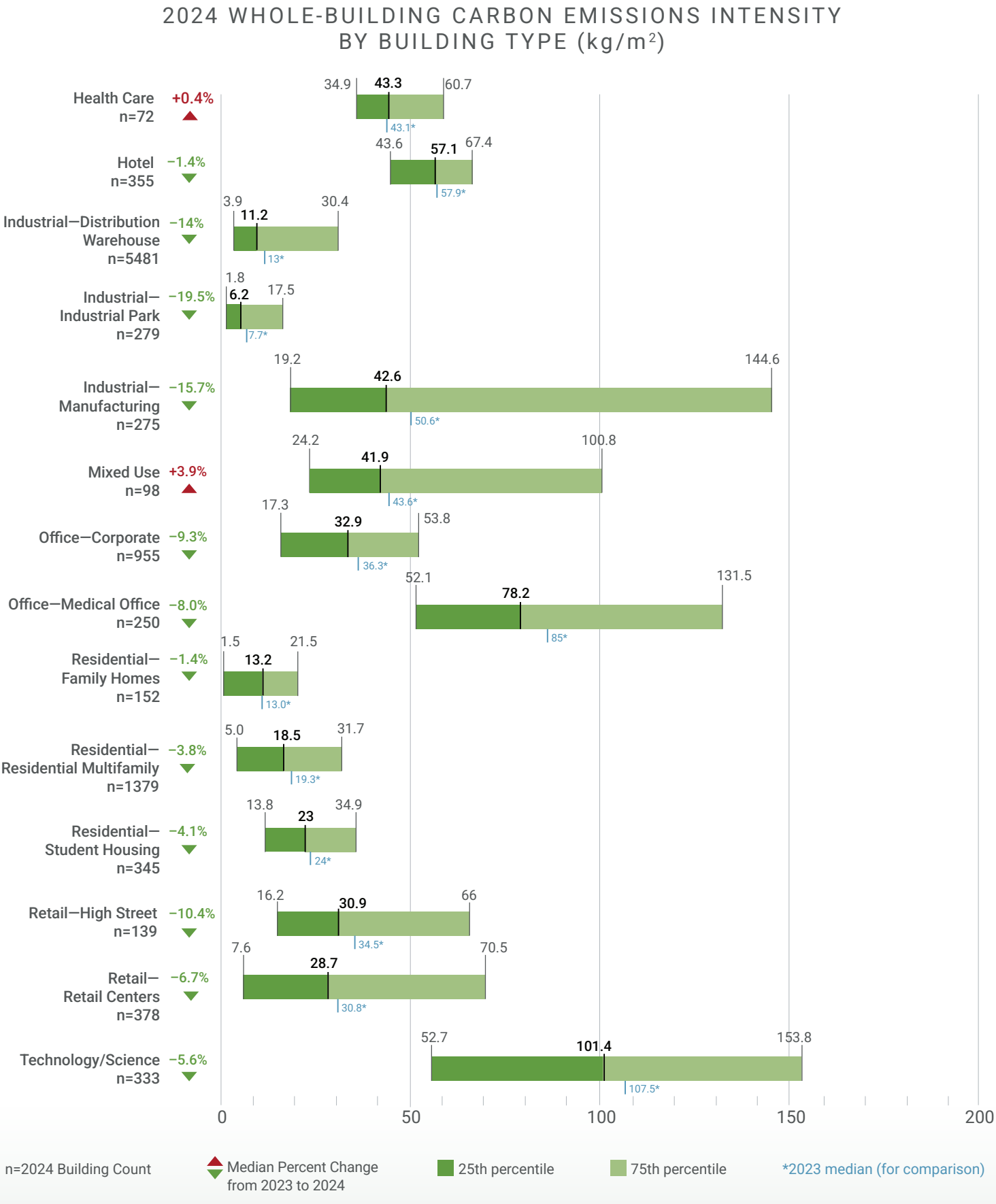
Greenprint members can report data for the whole building, or the base building and tenant spaces.

- Whole-building data represents the entire asset's environmental data. Base-building data can be used when the landlord controls the common areas and shared services.
- Tenant spaces data can be reported to the landlord if the landlord does not control the utilities.

When reporting, Greenprint members provide absolute carbon emissions, energy use, water use, and waste data. After analysis, Greenprint reports carbon, energy, and water intensities, which are the total consumption divided by the asset size. These intensities help to compare performance across buildings.

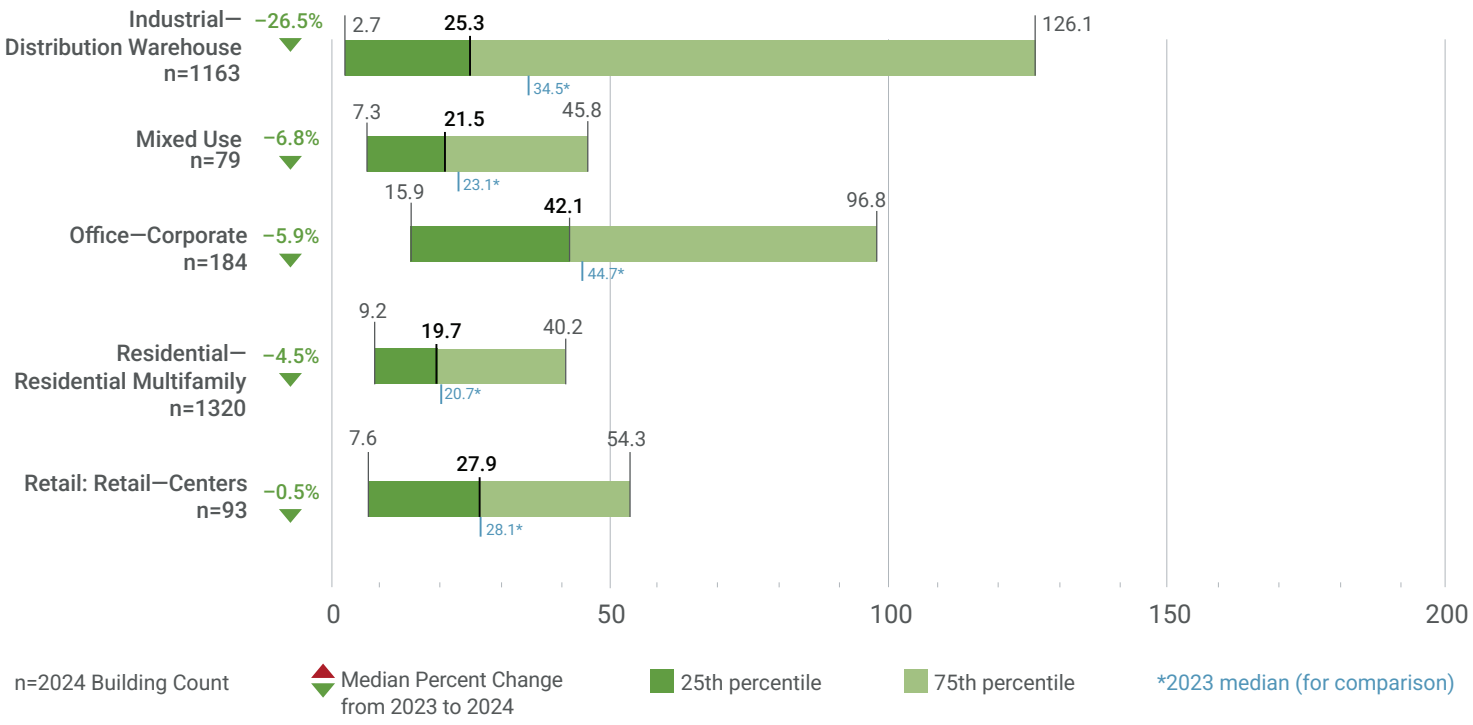
# Carbon

*Carbon Emissions Intensity by Building Type*



# Carbon

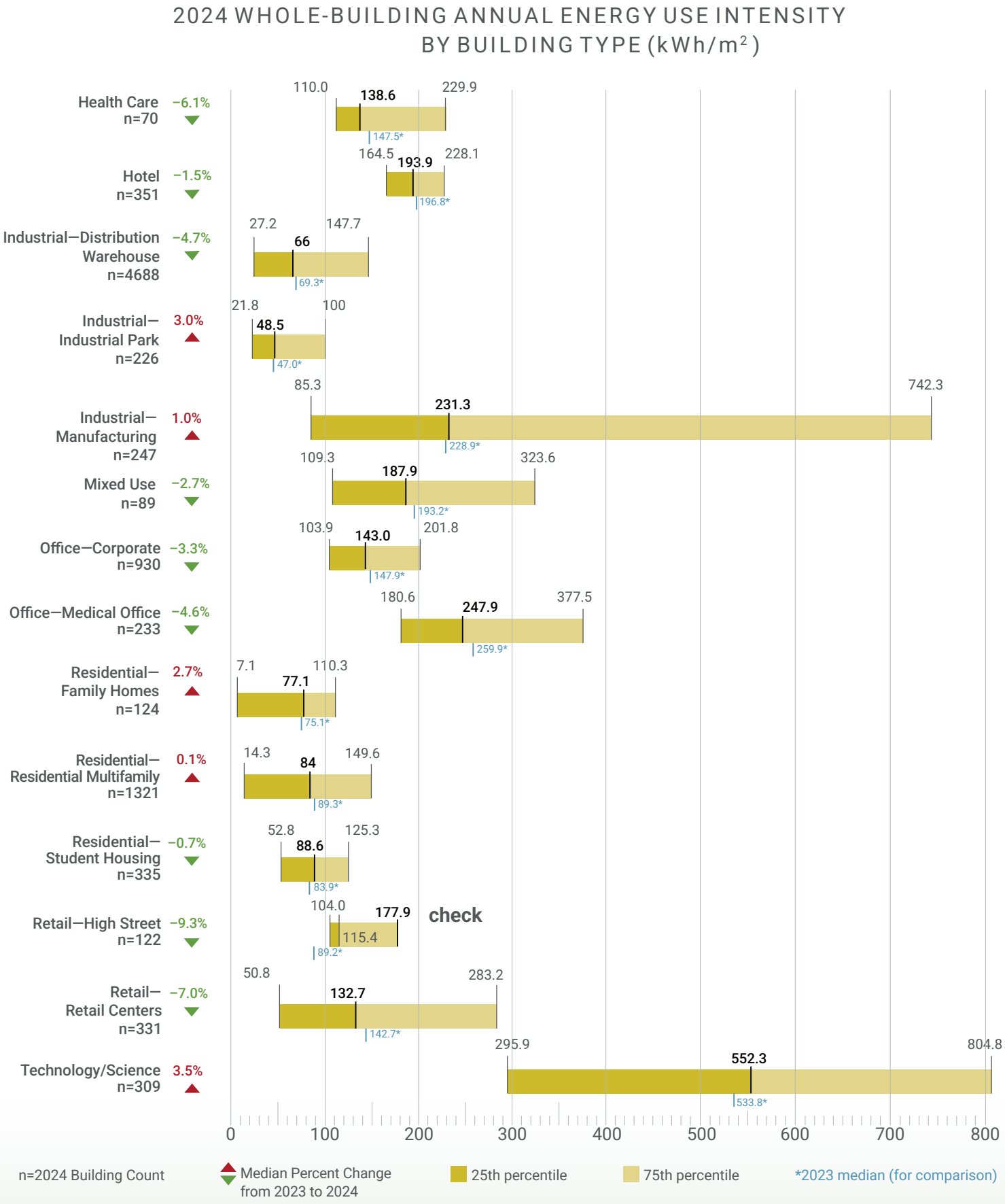
## 2024 WHOLE-BUILDING CARBON EMISSIONS INTENSITY BY BUILDING TYPE (kg/m²)*



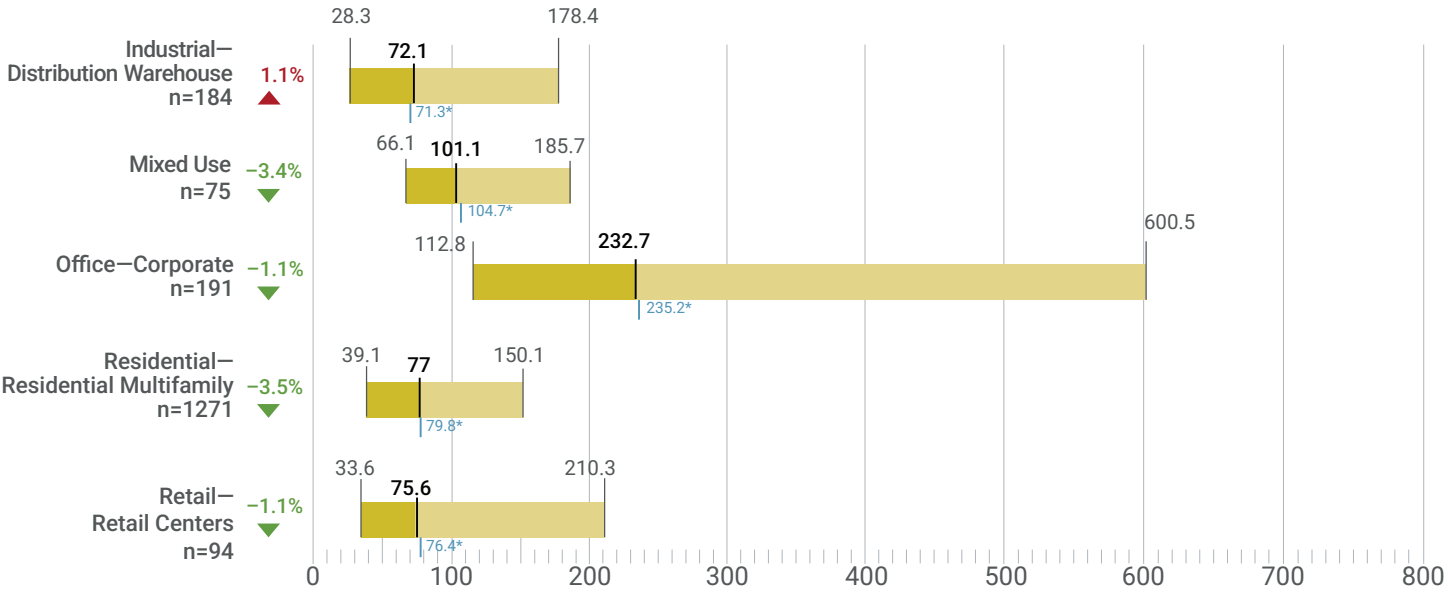

*Some property types are not listed because they did not meet the minimum number of buildings reporting to maintain anonymity.

# Energy

*Energy Performance by Building Type*



## 2024 BASE-BUILDING ANNUAL ENERGY USE INTENSITY BY BUILDING TYPE (kWh/m²)




n=2024 Building Count

Median Percent Change from 2023 to 2024

25th percentile

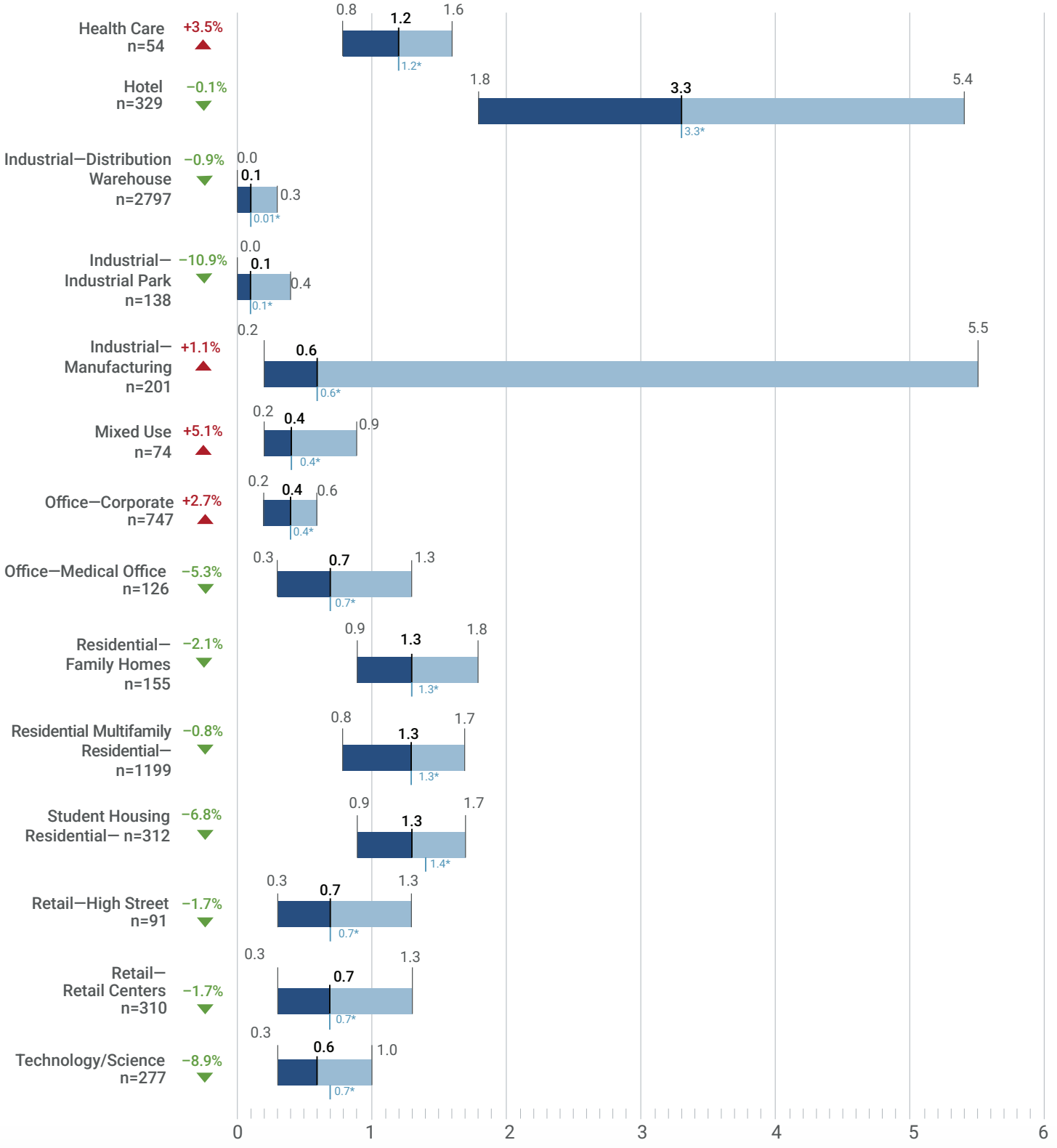
75th percentile

*2023 median (for comparison)

# Water

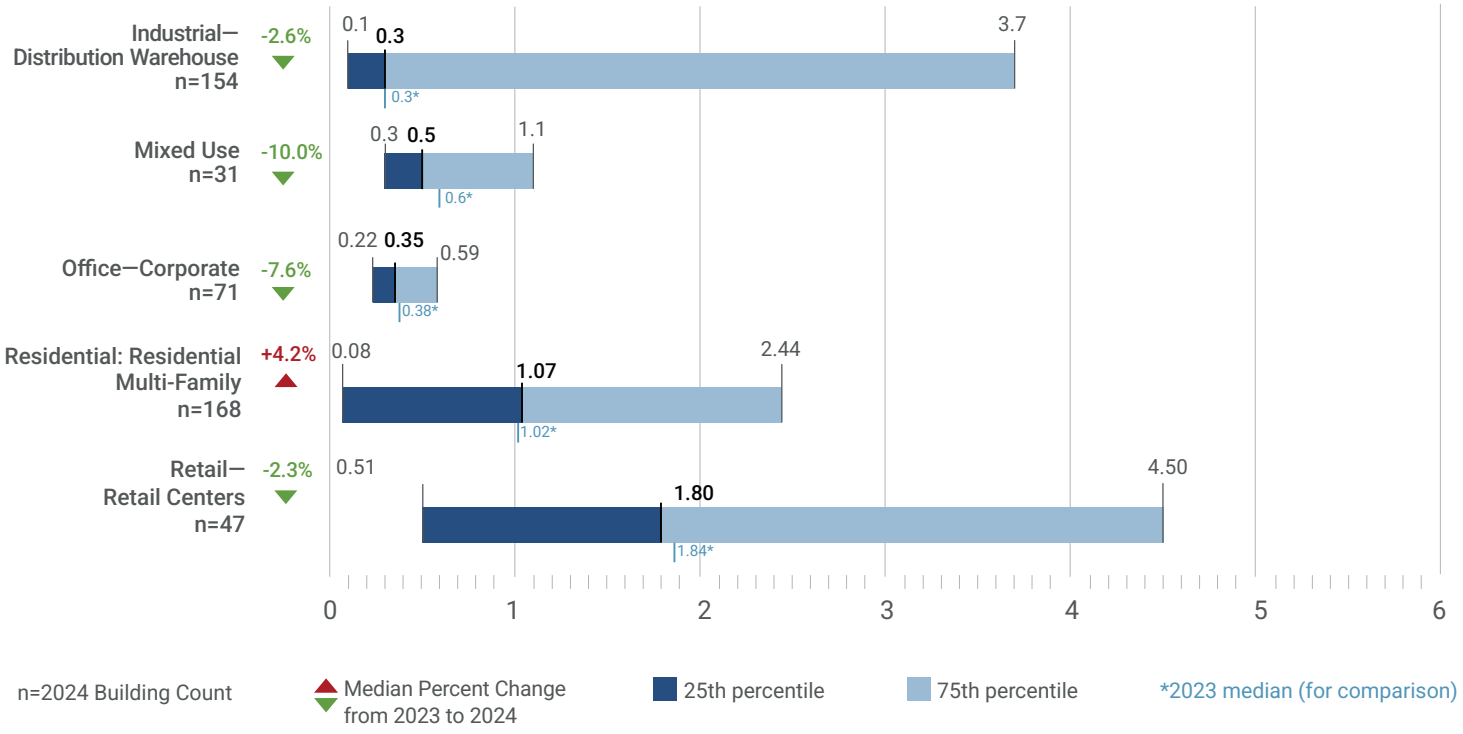
*Water Performance by Building Type*

## 2024 WHOLE-BUILDING WATER USE INTENSITY BY BUILDING TYPE ($m^3/m^2$)




n=2024 Building Count | Median Percent Change from 2023 to 2024 | 25th percentile | 75th percentile | *2023 median (for comparison)

## 2024 BASE-BUILDING WATER USE INTENSITY BY BUILDING TYPE ($m^3/m^2$)




n=2024 Building Count

Median Percent Change from 2023 to 2024

25th percentile

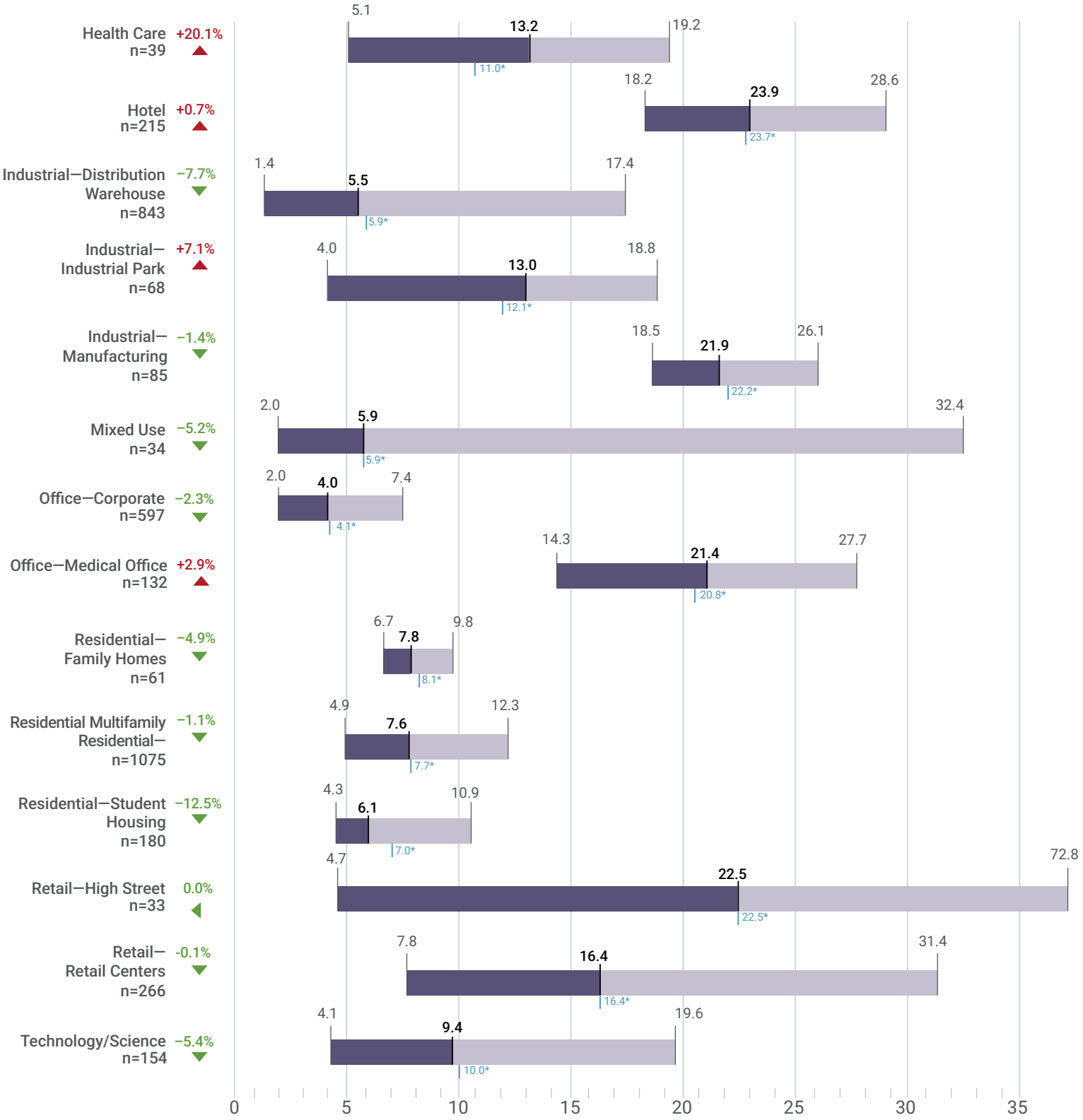
75th percentile

*2023 median (for comparison)

# Waste

*Waste Performance by Building Type*

## 2024 WHOLE-BUILDING WASTE USE INTENSITY BY BUILDING TYPE (kg/m²)




n=2024 Building Count

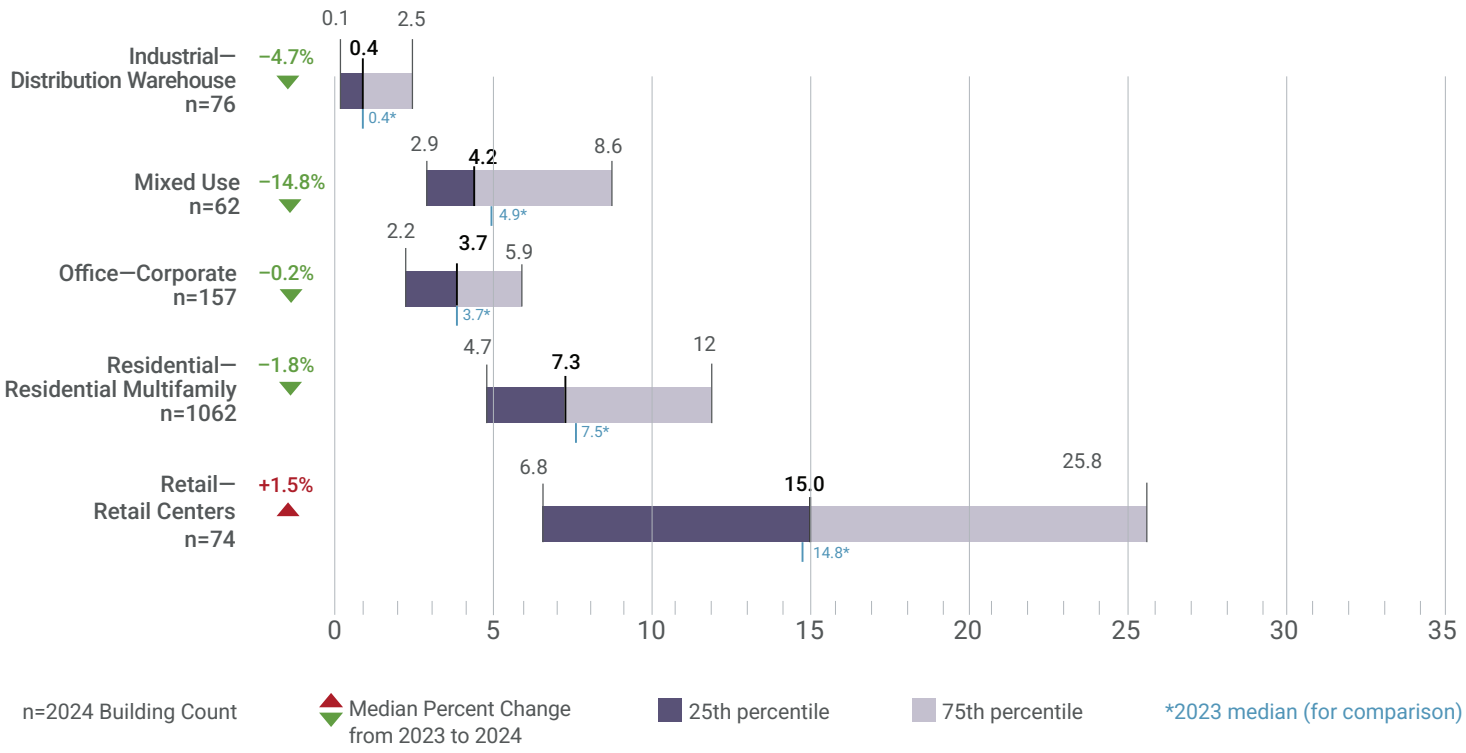
Median Percent Change from 2023 to 2024

25th percentile

75th percentile

*2023 median (for comparison)

## 2024 BASE-BUILDING WASTE USE INTENSITY BY BUILDING TYPE (kg/m²)

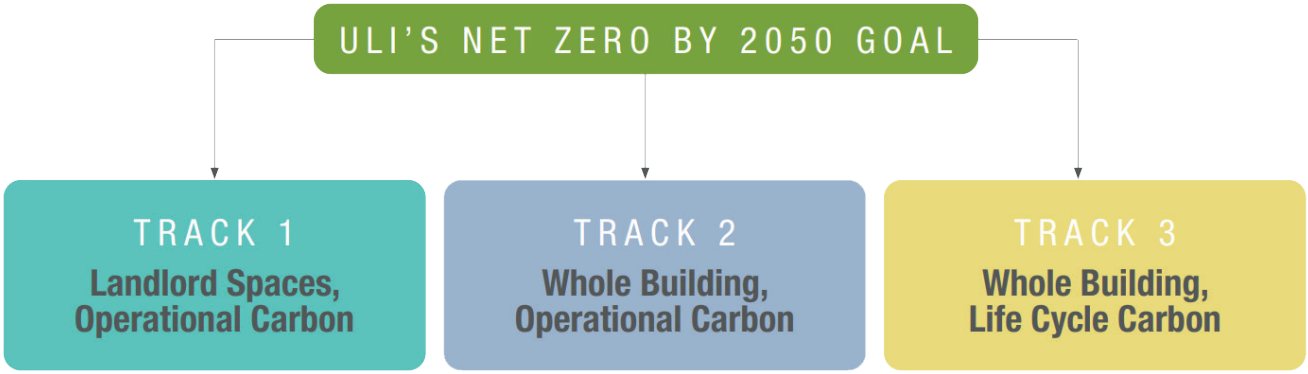



# Net Zero Carbon by 2050

Thirty-five Greenprint members are aligned to Greenprint's optional Net Zero by 2050 Goal, representing more than $2.7 trillion in assets under management. Greenprint defines a net zero portfolio as highly energy efficient and fully powered from on-site and/or offsite renewable energy sources and offsets.

Greenprint measures members' progress toward these goals by tracking their collective improvements in energy efficiency, purchase of power from green utilities, and increased investment in on- and off-site renewable energy and offsets. Learn more about the Greenprint Net Zero by 2050 Goal.

Recently, the Net Zero by 2050 Goal was expanded to three tracks so member companies could align with the most relevant track to their internal goals.




Greenprint member companies publicly aligned with the Net Zero by 2050 Goal include:

TRACK 1

Landlord Spaces, Operational Carbon. Equivalent to ULI's original Net Zero by 2050 Goal

Aligners to this track will pursue net zero operational carbon by 2050 in spaces under landlord operational control.

bxp Boston Properties* (2025) · BRIDGE · Brookfield Properties · CIM · CP Group (2040) · City Developments Limited · CLARION PARTNERS · elme · 恒隆集團 Hang Lung Group · HEITMAN (2030) · KILROY* (2020) · LaSalle · MetLife Investment Management · MORGAN CREEK VENTURES · NEO* · PEMBROKE (2035) · PGIM · RUDIN · SKANSKA · SL GREEN REALTY CORP · THE GREEN CITIES COMPANY · UNICO · WPT CAPITAL ADVISORS

* Indicates an organization has already achieved the goal. Year in parentheses indicates an organization has an earlier timeline than 2050.

TRACK 2

Whole Building, Operational Carbon

Aligners to this track will pursue net zero operational carbon by 2050 at the whole-building level, in both landlord and tenant spaces.

Breakthrough Properties

CommonWealth partners

Hudson Pacific Properties *

(2025)

Jamestown

nuveen

Paramount Group

PIMCO

PROLOGIS®

(2030)

Tishman Speyer

The Tower Companies

Vornado Realty Trust

(2030)

TRACK 3

Whole Building, Life Cycle Carbon

Aligners to this track will pursue net zero operational carbon and embodied carbon at the wholebuilding level, in both landlord- and tenant-controlled spaces.

lendlease

(2025)

* Indicates an organization has already achieved the goal. Year in parentheses indicates an organization has an earlier timeline than 2050.

The data tables that follow present all committed member companies' reported emissions broken out by scope, as well as all forms of onsite and offsite renewable energy produced or purchased/acquired both in aggregate and by specific category where available.

To calculate committed member companies' Scope 2 emissions for this Net Zero Carbon Breakdown, Greenprint used the location-based accounting method described by the GHG Protocol Corporate Accounting and Reporting Standard, due to lack of available emissions data using the market-based method, unless Scope 2 market-based data was provided by the member, while recognizing the lower precision of the location-based method. This may change in future years if market-based emissions data becomes more widely available from committed member companies.

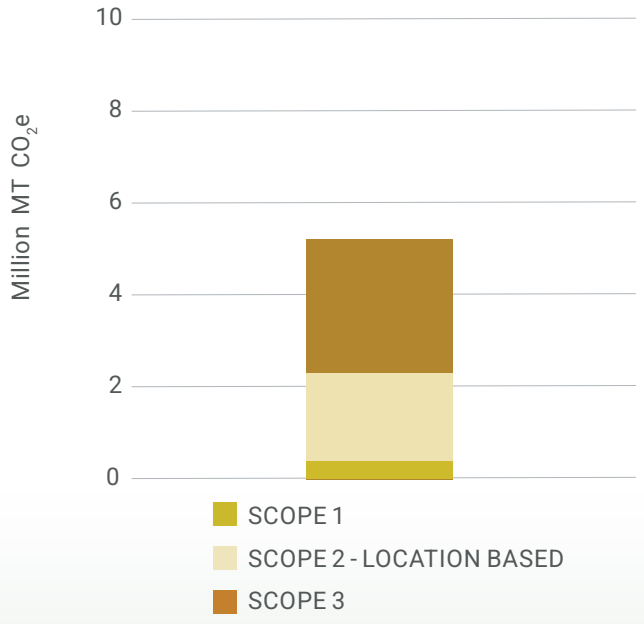
For the entire Greenprint portfolio's Scope 2 emissions calculation, emissions data using the market-based method was sufficiently robust and was used due to its greater precision and incorporation of multiple renewable energy purchasing instruments. Location-based data was used as a substitute where market-based emissions were not provided.

## 2024 ULI GREENPRINT NET ZERO BY 2050 GOAL BREAKDOWN

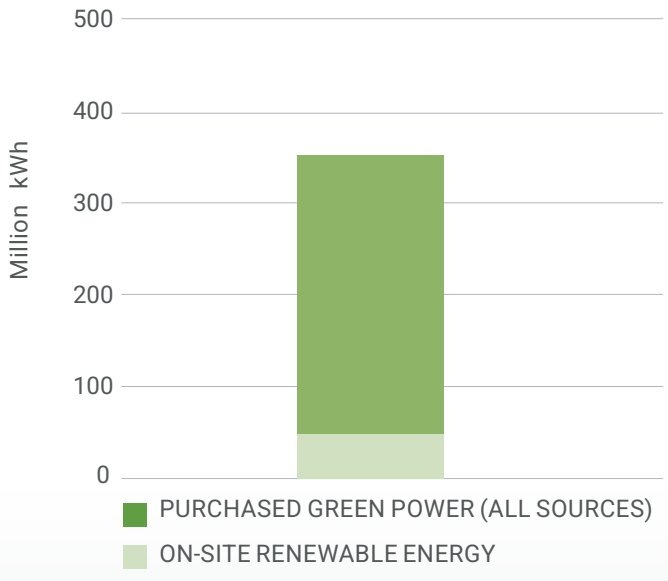
| Total Emissions | |
|---|---|
| **Total emissions (Scope 1, 2, and 3)**<br>11,321 assets 307,581,243 $m^2$ | **7,987,672 MT $CO^2e$**<br>**25.97 kg per $m^2$** |
| Scope 1 emissions | 434,917 MT $CO^2e$<br>1.41 kg per $m^2$ |
| Scope 2 emissions (location based) | 2,352,236 MT $CO_2e$<br>7.65 kg per $m^2$ |
| Scope 3 emissions | 5,200,518 MT $CO_2e$<br>16.91 kg per $m^2$ |

| Total Renewable Energy and Offsets | |
|---|---|
| **On-site renewable energy (kWh)** | **499,145,424 kWh**<br>**2% of total energy** |
| **Green power (purchased/acquired, all sources)** | **3,529,714,653 kWh**<br>**16% of total energy** |
| Physical PPAs, competitive or utility products, CCAs, self supply (kWh) | 1,712,260,617 kWh<br>8% of total energy |
| Unbundled RECs | 1,042,729,780 kWh<br>5% of total energy |
| **Purchased carbon offsets** | **78,647 MT $CO_2e$** |

### 2024 TOTAL OPERATIONAL CARBON EMITTED




### 2024 TOTAL RENEWABLE ENERGY



# Embodied Carbon

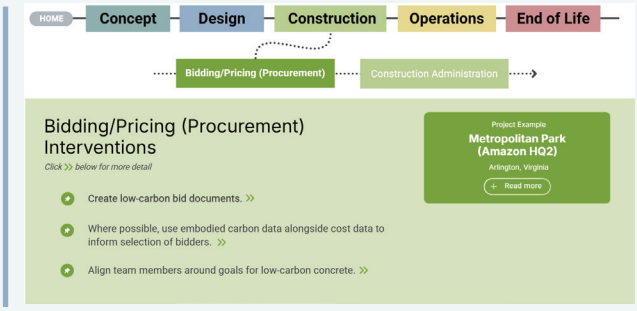
When considering a building's lifetime emissions, there are two categories—*operational carbon* and *embodied carbon*. Operational carbon includes everything it takes to operate a building, such as electricity consumption or fuel consumption. Embodied carbon includes the materials to create, transport, construct, decommission, and deconstruct a building (see graphic below). Embodied carbon from materials and construction can account for half of a building's lifetime emissions.

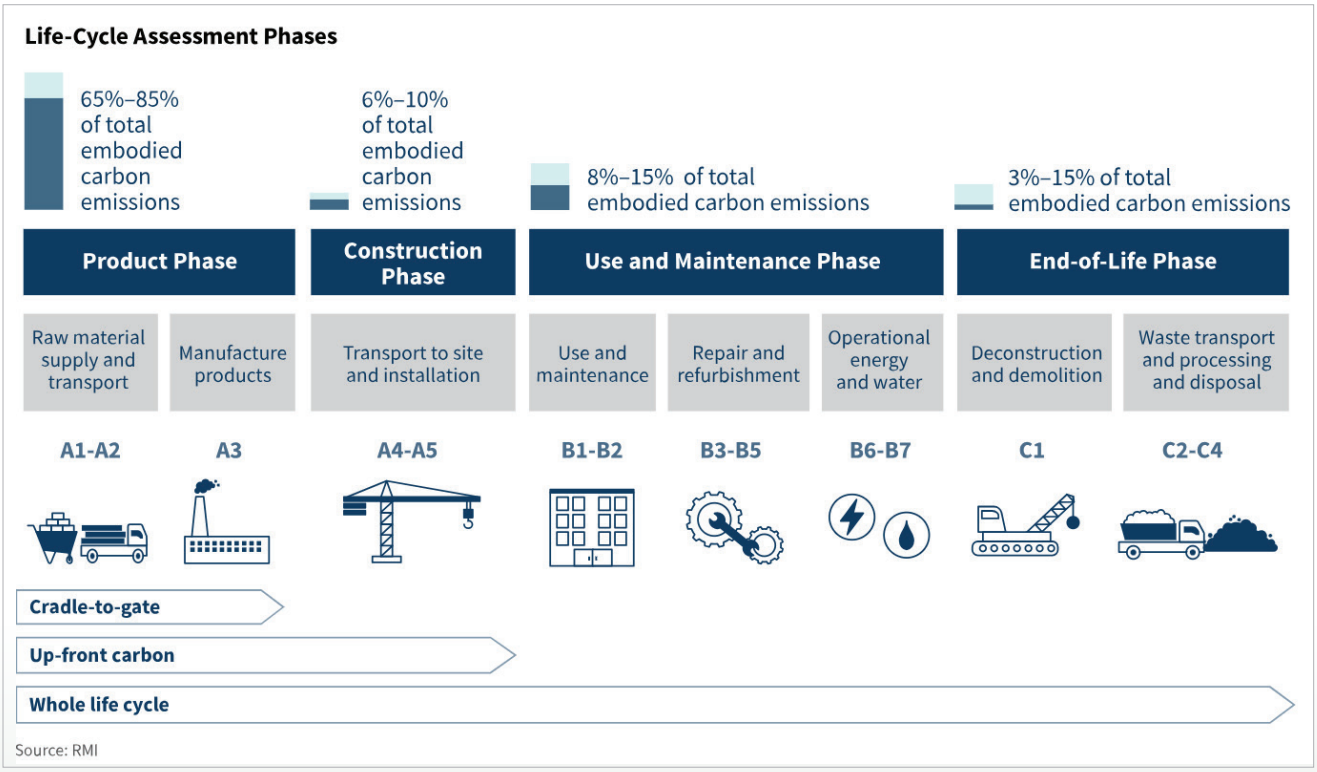
Embodied carbon is becoming a more relevant metric as new regulations and investor requirements drive industry change. For example, Vancouver, Canada, requires embodied carbon reporting requirements for all building rezonings since 2017. Boston, Massachusetts, will require all projects to report on embodied carbon and all large projects to conduct an embodied carbon emissions life cycle assessment analysis.

## Relevant ULI Resources

The Global Green Building Policy Dashboard helps building owners navigate regulations globally across 81 markets. This interactive dashboard can be filtered by location and covers policies across climate resilience, energy and building performance standards, electric vehicle requirements, and more.

*The Developer's Guide to Embodied Carbon* guides the real estate industry through intervention points to reduce their embodied carbon. This interactive tool includes project examples and ways to engage throughout the development process.



# Embodied Carbon Data

Greenprint members voluntarily reported building-level embodied carbon data for the third year, covering buildings completed between 2019 and 2024. Members reported their total metric tons of $CO_2$ A1 through A5 embodied carbon emissions.

More buildings were reported for *State of Green* Volume 16, compared to Volume 15, demonstrating continued market action on embodied carbon measurement and reductions. All assets reported are based in the United States.

In addition to reporting data, Greenprint's embodied carbon subgroup meets to remain up to date on industry initiatives related to embodied carbon. ULI has joined the Carbon Leadership Forum's Embodied Carbon Harmonization and Optimization (ECHO) Project for regular meetings to assist in policy-making and standards-setting efforts. This collective aims to rapidly reduce embodied carbon in built environments and ensure that projects in the United States follow the same definitions.

Finally, Greenprint partnered with other organizations to lead a low-carbon steel initiative in mainland China to bring together the steel industry and developers. An outcome of this initiative is a joint statement detailing a commitment of signatories to improve the transparency and quality of carbon emissions data for steel production, as well as to consider low-carbon steel during procurement. Through structured roundtables and collaborative tool development, this work aims to bridge the gap between buyer requirements and supplier capabilities, ultimately enabling real projects to achieve higher low-carbon steel penetration without excessive cost premiums. The initiative is currently exploring next steps and funding to scale up low-carbon steel procurement from China.

## GREENPRINT MEMBER-REPORTED EMBODIED CARBON OF NEW CONSTRUCTION AND MAJOR RENOVATION PROJECTS

| Region | Asset Type | Average Embodied Carbon Intensity (kg $CO_2e/m^2$) |
|---|---|---|
| **Mid-Atlantic** | Office, Corporate | 422.49 |
| | Office: Corporate: High-Rise Office | 424.92 |
| | Residential: Multifamily: High-Rise Multifamily | 1,039.75 |
| **New England** | Residential: Multifamily: Mid-Rise Multifamily | 407.20 |
| | Office: Corporate: High-Rise Office | 449.05 |
| | Office: Corporate: Low-Rise Office | 40.88 |
| | Office: Corporate: Mid-Rise Office | 408.84 |
| | Residential: Multifamily: High-Rise Multifamily | 489.25 |
| | Retail: High Street | 40.88 |
| | Technology/Science: Laboratory/Life Sciences | 212.60 |
| **West Coast** | Office, Corporate | 279.27 |
| | Residential: Multifamily: High-Rise Multifamily | 353.79 |
| | Technology/Science: Laboratory/Life Sciences | 408.84 |

# Refrigerant Emissions

Refrigerant emissions are considered a Scope 1 or "direct" type of emission, meaning they occur *directly* from a source meaning they occur directly from a source controlled by an organization. Other types of Scope 1 emissions include emissions associated with fuel combustion in boilers or furnaces for a building. Refrigerants are a material used during the refrigeration or air conditioning process and help to move heat through a system. There are dozens of refrigerant types in use today, and different refrigerants are better suited to different environments or contexts. Refrigerants must be handled, installed, and disposed of carefully because they are prone to "leaking," or being released into the atmosphere.

Some refrigerants used by commercial real estate are being limited in their creation and import. These refrigerants, such as R-22 or R-410A, are extremely potent greenhouse gases. One kilogram of R-22 is equal to the impact of almost 1,800 kilograms of carbon dioxide in the atmosphere. Commercial real estate has made impressive progress in cutting its carbon dioxide emissions as we have detailed in this report. However, if these refrigerants are mishandled or leak they could erase much of that progress.

Real estate is working to consistently measure and report on refrigerant emissions, as well as refrigerant management plans to reduce and mitigate potential leaks. A refrigerant management plan has four key pieces:

- Develop and maintain an inventory of systems that use refrigerants.
- Use a process or system to track changes including replacement and refrigerant leakage.
- Use licensed service contractors and conduct permitted replacements.
- Retire leaky or old systems in a way that allows for refrigerant recovery.

ULI published an *Urban Land* article detailing refrigerant use and considerations. ULI will continue to educate the industry as this space continues to evolve.

# Refrigerant Emissions Data

For the second year of refrigerant data collection, members reported more than 11,200,000 square meters (120,500,000+ square feet) of building refrigerant data. This is three times more data than was reported last year. These buildings were mostly located in the United States and a few were located in Europe. Refrigerant data collection requires coordination on all levels to acquire accurate data. Greenprint plans to collect this data optionally from members annually moving forward.

**11,200,000+ $m^2$**

TOTAL $m^2$ REPORTED

HCFC-123, HFC-134A, R12, R-123, R-1233zd(E), R-134A, R-407C, R410A, R-417A, R-422D, R-22

TYPES OF REFRIGERANTS REPORTED

As a U.S. Department of Energy Better Buildings Ally, ULI engaged in the Better Climate Challenge Working Group on Shifting to Low-Impact Refrigerants to understand and share updates and guidance on refrigerant emissions reductions with its members. This white paper details the recommendations for the U.S. Department of Energy as the industry works toward lower-impact refrigerants. As more members build capacity on this topic, Greenprint will support the industry on its journey to tackle refrigerant emissions.

# Guide to Report Terms and Charts

**ULI maps property types to GRESB-classified property types.**

### BASE BUILDING FLOOR AREA
Square meters for which energy is supplied by central building services to common areas and possibly to lettable/leasable areas.

### CARBON INTENSITY
Annual carbon emissions divided by gross floor area, including CDP (formerly the Carbon Disclosure Project) Scope 1 and 2 emissions at minimum and Scope 3 emissions if member companies choose to do so.

### EMBODIED CARBON
The greenhouse gas emissions arising from the manufacturing, transportation, installation, maintenance, and disposal of building materials.

### ENERGY USE INTENSITY (EUI)
Annual energy consumption divided by gross floor area. This report uses site EUI, which is equal to energy used on site divided by floor area.

### GLOBAL WARMING POTENTIAL (GWP)
Allows comparisons of the global warming impacts of different gases. Specifically, it is a measure of how much energy the emission of 1 ton of a gas will absorb over a given period of time, relative to the emission of 1 ton of carbon dioxide ($CO_2$). The larger the GWP, the more that a given gas warms the Earth compared to $CO_2$ over that time period.

### MEDIAN
The value lying at the midpoint of a distribution of observed values.

### NET ZERO
ULI Greenprint defines a net zero portfolio as highly efficient and fully powered by on-site and off-site renewable energy sources and offsets.

### REFRIGERANTS
Heat transfer mediums used in refrigeration, air conditioning, and heat pumps.

### REFRIGERANT EMISSIONS
The most common refrigerants are hydrofluorocarbons (HFCs). HFCs are humanmade fluorinated chemicals, and extremely potent greenhouse gases, with GWPs that can be thousands of times more potent than $CO_2$ in contributing to global warming.

### RENEWABLE ENERGY CERTIFICATE (REC)
A market tool that represents the property rights to the environmental, social, and other nonpower attributes of renewable electricity generation. RECs are issued when one megawatt-hour of electricity is generated and delivered to the electricity grid from a renewable energy resource.

### TENANT SPACE FLOOR AREA
Square meters of a building that are leased; can be landlord or tenant controlled.

### WASTE DIVERSION
Reducing waste sent to a landfill through reduction of waste generation, recycling, reuse, or composting.

### WHOLE BUILDING FLOOR AREA
The building's gross floor area in square meters.

# Guide to Report Terms and Charts

## ULI Asset-Type Definitions

ULI follows asset-type definitions outlined by GRESB.

### HEALTH CARE
Properties used for the purpose of primary health care. Examples may include but are not limited to hospitals, clinics, physical therapy centers, and mental health centers.

### HOTEL
Includes hotels, motels, youth hostels, lodging, and resorts.

### INDUSTRIAL: DISTRIBUTION WAREHOUSE
Industrial buildings used for the purpose of storing, processing, and distribution of goods to wholesalers, retailers, and/or consumers.

### INDUSTRIAL: INDUSTRIAL PARK
An industrial business park is an area zoned for the purpose of industrial development, where (lightweight) industrial properties are grouped together with offices. Examples may include but are not limited to industrial estate, trading estate, and enterprise zone.

### INDUSTRIAL: MANUFACTURING
Industrial properties used for the purpose of manufacturing, otherwise known as a factory or manufacturing plant.

### INDUSTRIAL: OTHER
Other industrial properties that do not fit in the aforementioned property types.

### MIXED USE
Mixed use properties containing two or more property types in their spaces.

### OFFICE: CORPORATE
Office properties.

### OFFICE: MEDICAL OFFICE
Examples may include but are not limited to offices specifically used for the purpose of medical administration, secondary research, or other purposes, exclusive of the property types specified for health care center.

### OFFICE: OTHER
Other office properties that do not fit in the aforementioned property types.

### RESIDENTIAL: FAMILY HOMES
Includes both single-family homes and multidwelling units not including apartment blocks. A single-family home is a separate, freestanding residential property. A multidwelling family home includes those such as two-flats, duplex, semi-detached, and townhouses. Synonyms include single-family home, single-detached dwelling, detached house, single-family residence, separate house, freestanding house, townhouse, duplex, condominium, semi-detached, villa.

### RESIDENTIAL: RESIDENTIAL MULTIFAMILY
Multifamily residential buildings.

### RESIDENTIAL: STUDENT HOUSING
Residential properties used for the purpose of housing students, otherwise known as student apartments, student houses, student residences, student quarters, and student accommodations.

### RESIDENTIAL: OTHER
Other residential properties that do not fit in the aforementioned property types.

### RETAIL: HIGH STREET
Retail properties located on the high street in a particular area, usually terraced properties located in the city center or other high-traffic pedestrian zones.

### RETAIL: RETAIL CENTERS
Includes the following types of retail centers: enclosed centers for retail purposes consisting of multiple retail stores connected with internal walkways; properties comprising more than one retail store, restaurant, or other business, in an open-air configuration where each establishment has an exterior entrance to the public and there are no internal walkways; retail centers that consist of both enclosed and unenclosed spaces, often including retail stores as well as leisure amenities; Big box, single-tenant retail properties.

### RETAIL: OTHER
Other retail properties that do not fit in the aforementioned property types.

### TECHNOLOGY/SCIENCE
Includes the following types of technology/science buildings: properties specifically designed and equipped to meet the needs of high-density computing equipment, such as server racks, used for data storage and processing (typically, these facilities require dedicated uninterruptible power supplies and cooling systems); data center functions may include traditional enterprise services, on-demand enterprise services, high performance computing, internet facilities, and/or hosting facilities; properties that provide controlled conditions in which scientific research, measurement, and experiments are performed or practical science is taught.

## Greenprint Benchmark Data Thresholds

Benchmarks presented in this report represent the full suite of data provided by members, irrespective of lease type or occupancy level. The Greenprint like-for-like analysis excludes buildings with less than 24 months of data collected, with over 50 percent change in energy use from year to year, or with energy use intensities outside 3.15 and 3,153 kilowatt-hours per square meter. The analysis does not account for additional variables, such as heating and cooling degree days, vacancy rates, hours of operation, and occupant density. The analysis does not normalize for changes in building performance due to COVID.

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