

Radford University's 2022 Greenhouse Gas Inventory

July 1, 2021 – June 30, 2022

Summary

Radford University conducts an annual inventory of its greenhouse gas emissions. The process collects data about emissions sources related to university operations and calculates the association between these operations and greenhouse gas emissions. The inventory described here encompasses Fiscal Year 2022 (July 1, 2021 through June 30, 2022). The data included in the inventory is the most up-to-date and accurate information available and provides a comprehensive snapshot of the University's greenhouse gas emissions, or carbon footprint, in 2022. During this time, Radford University's estimated net greenhouse gas emissions totaled **37,845.61 metric tons of carbon dioxide equivalent (MTCO₂e)**.

This report summarizes the 2022 Greenhouse Gas Inventory (GGI), provides important information pertaining to certain measured criteria, and benchmarks Radford University's 2022 performance against university inventories conducted since 2010 (the baseline year for RU's greenhouse gas inventory).

Introduction

In 2009, Radford University became a signatory of the American College & University President's Climate Commitment (now called the Carbon Commitment). As such, the University pledged to pursue net carbon neutrality and to provide students with the knowledge and skills they need to be successful in meeting the challenges of the 21st Century. The ACUPCC requires that signatories conduct a GGI during the first year of participation to establish a baseline emissions calculation. The participant then submits a GGI annually, as it enables the university to analyze emissions sources, track progress towards target goals, and ultimately reduce the campus's contribution to climate change. Radford University has conducted a GGI each year since 2010.

In 2021, former Radford University President Hemphill signed the Carbon Commitment, reaffirming Radford University's commitment to pursuing net carbon neutrality. In November 2021, at the charge of former university President Brian O. Hemphill, the [President's Task Force on Sustainability](#) began work on developing a new sustainability and climate action plan that aligns with the University Strategic Plan and Master Plan and provides a pathway for achieving the goals established in Radford University's [Carbon Commitment](#). This new plan, [The Path to 2040: The Radford University Sustainability and Climate Action Plan](#) was formally adopted by the Radford University Board of Visitors on December 2, 2021.

Radford University now has a new action plan for pursuing net carbon neutrality by 2040 and a wide range of other sustainability-focused goals and strategies.

Methods

For the initial GGI in 2010, Radford University selected the Clean Air-Cool Planet Campus Carbon Calculator (CCC) as the tool for calculating and analyzing its emissions, as it was the preferred tool of the ACUPCC. The CCC was developed and managed by the University of New Hampshire. Radford University used the CCC for each GGI from 2010 – 2017. In 2018, the University of New Hampshire launched SIMAP (Sustainability Indicator Management & Analysis Platform), a new web-based platform for analyzing greenhouse gas emissions and suspended support for the CCC. Radford University now uses SIMAP to assess the University's carbon footprint. All data from previous inventories is now in SIMAP.

Organizational Boundary: The 2022 GGI includes emissions data for all Radford University buildings under operational control of the university. For this inventory, the organizational boundary includes the Radford Campus, all University-leased buildings in Radford that operate as part of the Radford Campus, and the Selu Conservancy. The University pays the utility bills for these buildings and has some control over the building systems and how they are operated. This inventory does not include Radford University Carilion or Radford University operations in the Roanoke Higher Education Center, the Southwest Virginia Higher Education Center, in Danville, or in Martinsville. These are shared spaces that are under the operational control of another entity.

Data Collection: The GGI process requests information and support from many individuals, departments, and offices. The data included in the inventory is the most up-to-date and accurate information available and provides a comprehensive snapshot of the University's greenhouse gas emissions in 2022. Some assumptions and estimations were necessary due to limitations in the data. These assumptions and estimations are accepted industry standards and are outlined below.

- **Faculty, Staff, & Student Commuting:** The Sustainability Office oversaw a new commuter assessment for the 2020 – 2021 fiscal year. A Geospatial Science student, under direct supervision of Dr. Stockton Maxwell, used a GIS model with the home address data of each commuter parking pass holder. The model calculated the shortest driving distance between each address and the Radford University campus. The student then extrapolated the daily mileage for the entire year by estimating the number of commuting days per year for each classification of permit holder – students, faculty, and staff. For students, faculty, and staff without commuter parking passes, the Sustainability Manager gathered information about these commuters and made informed assumptions about their method of travel. A commuter modality survey is

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needed to more accurately assess modes of transportation for employees and students that do not hold a commuter parking pass.

The 2021 – 2022 GGI uses the commuter survey from 2020 – 2021 and made the following assumptions.

- Faculty and students commuted to and from campus 5 days a week for 30 weeks.
- Staff, including AP Faculty and classified/non-classified employees, represent a wide range of employees. These employees commute to campus 5 days per week for 46 weeks per years.
- **Directly Financed Air Travel:** SIMAP calculates total air travel mileage using the Average Cost per Mile of commercial air travel. All employee air travel is processed through Christopherson Business Travel, which provides the total cost of directly financed air travel.
- **Study Abroad Air Travel:** SIMAP calculates total air travel mileage using the Average Cost per Mile of commercial air travel. The Center for Global Education and Engagement provides the total cost of commercial air travel for student and employee travel in their program to the Sustainability Office.
- **Solid Waste:** All Radford University trash is transferred to the Cloyd's Mountain Landfill in Pulaski County, VA. The landfill weighs all trash per load delivered. At the landfill, Ingenco Distributed Energy is operating a landfill gas capture and electricity production operation. This greatly reduces the greenhouse gas emissions of our landfilled trash and is reflected by the calculations in SIMAP.
- **Paper:** Radford University Procurement and Contracts provided the data on purchased paper. The paper figure is limited to general purpose/copier paper purchases from different suppliers and does not include every type of paper utilized within a year by the University. General use and copier paper are delivered in reams, and single ream of paper weighs 4.75 pounds. This weight is used to estimate the total pounds of paper used.

Radford University's Sustainability Manager worked with the university's Energy Manager to initiate the GGI process. Radford University's Energy Manager collected most of the data related to facilities and operations, Scopes 1 and 2, by reaching out to the appropriate manager or department contact from each category. The Sustainability Manager collected all of the Scope 3 data and demographic information.

During the data processing phase, the Sustainability Manager entered the data into SIMAP where appropriate and processed other data into units that are compatible with the tool. When

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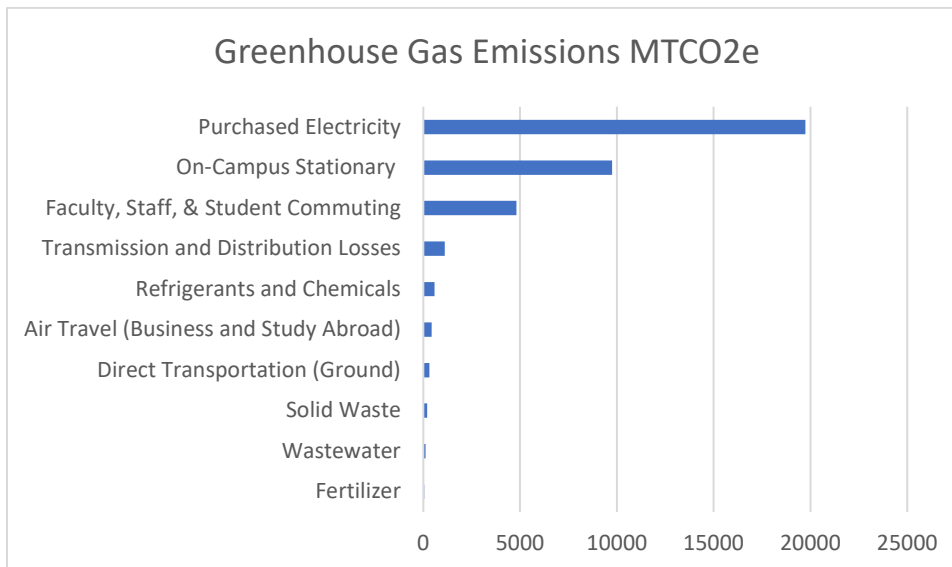
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the data processing was complete, the Sustainability Manager and other university employees began analyzing the results for any omissions or unusual discrepancies.

Results and Discussion

SIMAP processes all data with emissions conversion factors and calculates energy consumption, amounts of three different greenhouse gases, emissions from each source and scope, and total metric tons of carbon dioxide equivalent (MTCO₂e).

Top 10 Sources	Greenhouse Gas Emission MTCO ₂ e
Purchased Electricity	19,737.76
On-Campus Stationary (Steam Plant, Propane)	9,753.50
Faculty, Staff, & Student Commuting	4,806.20
Transmission & Distribution Losses	1,104.65
Refrigerants & Chemicals	583.71
Air Travel (Directly Financed and Study Abroad)	423.84
Direct Transportation (Ground)	318.80
Solid Waste	198.91
Wastewater	122.43
Fertilizer	42.41



Emissions by Scope

Emissions sources can be categorized based on their origin and are referred to as Scopes 1, 2, and 3. Scope 1 emissions are produced on campus and are directly related to operations. This includes on-campus steam production, mobile fuel usage, refrigerants, and fertilizers. Scope 2 refers to off-campus emissions sources that are directly linked to campus operations, primarily

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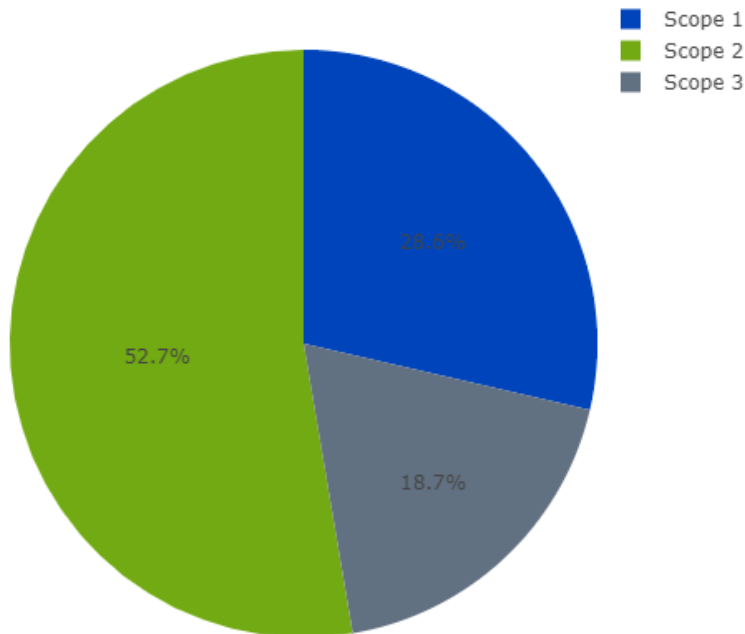
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purchased electricity. Scope 3 emissions are indirect emissions linked to university activities. These emissions include university travel, solid waste disposal, water treatment, and employee and student commuting.

Approximately 52.7% of Radford University's emissions are Scope 2, from purchased electricity. Scope 1 emissions sources account for 28.6% of total emissions, produced primarily by burning propane and natural gas on campus, along with on-campus vehicles. The remaining emissions are considered Scope 3, and account for 18.7% of total emissions. These are primarily commuting, business air and ground travel, and wastewater.

2022 Greenhouse Gas Emissions by Scope	Greenhouse Gas Emissions MTCO ₂ e
Scope 1: Direct emissions sources from campus. Includes steam plant, propane, mobile fuel use, fertilizers, etc.	10,726.37
Scope 2: Direct, off-campus emissions. Includes purchased electricity.	19,737.76
Scope 3: Indirect emissions linked to university activities. Includes business travel, study abroad, solid waste, commuting, wastewater, etc.	7,008.17

Carbon: 2022



Top 5 Emissions by Source

1. **Purchased Electricity – 52.7% of Total Emissions:** Purchased electricity, a Scope 2 emission source, continues to be the university's largest emissions source. During FY2022, Radford University purchased 39,877,661 kilowatt hours (kWh) of electricity from the City of Radford's Utility. The approximate fuel mixture for producing electricity in the university's eGrid Subregion, RFC West, is used to calculate these emissions.

Purchased electricity produced 19,737.76 MTCO₂e in FY2022.

2. **On-Campus Stationary Sources – 26% of Total Emissions:** These emissions sources are Scope 1 emissions and represent stationary (non-mobile) fuel sources consumed on the Radford University campus. In FY2022, the university used 4,516 gallons of propane (LPG), and 183,294.45 MMBtu of natural gas. Natural gas is the primary fuel source burned in Radford University's Steam Plant to generate steam for heating on-campus buildings. Propane provides heat sources for several on-campus and off-campus university-owned or operated buildings.

On-campus Stationary produced 9,753.50 MTCO₂e in FY2022.

3. **Faculty, Staff, and Student Commuting – 9.61% of Total Emissions:** This is a Scope 3 emission source. Faculty parking pass holders (56% of all faculty) have an average, round-trip daily commute of 32 miles. Staff parking pass holders (79% of all staff) have an average, round-trip daily commute of 12 miles. Student commuter parking pass holders (40% of all students) have an average, round-trip daily commute of 32.2 miles.

Commuting weeks per year for faculty and students is calculated at 30 weeks per year, and for all other employees 46 weeks per year. Faculty, Staff, and Student commuting produced 4,806.20 MTCO₂e in FY2022.

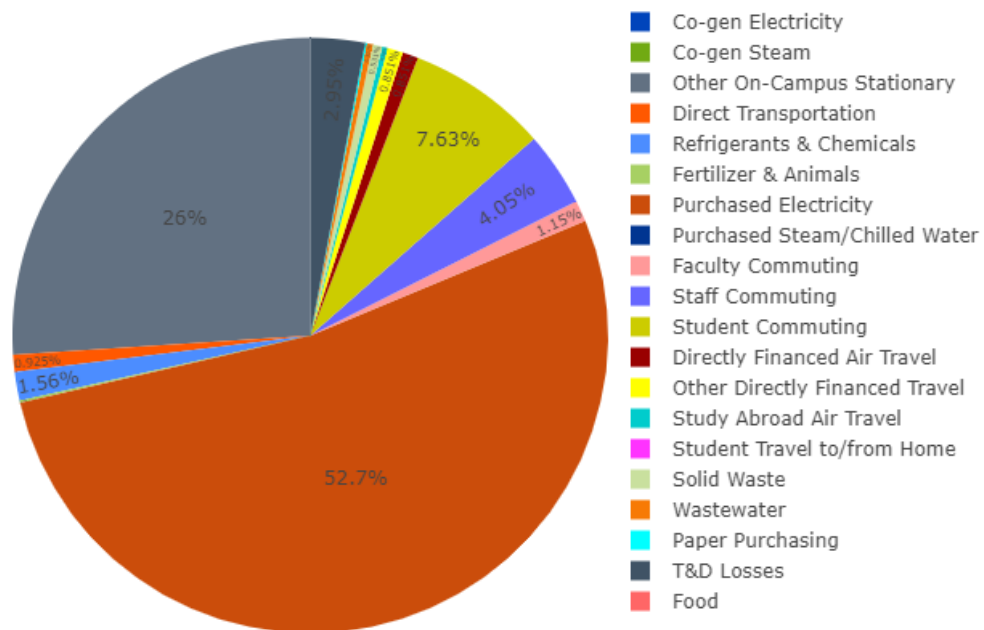
4. **Transmission and Distribution Losses (T&D Losses) – 2.95% of Total Emissions:** T&D Losses account for the electricity that is lost between the power station and the final user. The U.S. Energy Information Administration (EIA) estimates that T&D losses average about 5% of the electricity that is transmitted and distributed annually in the United States.¹ T&D Losses will increase or decrease based on the amount of electricity that the University purchases and/or the sources from which it is produced, and is currently 2.94% of total emissions. This emissions source is considered Scope 3. T&D Losses produced 1,104.65 MTCO₂e in FY2022.

1. Frequently Asked Questions. How much electricity is lost in transmission and distribution in the United States. U.S. Energy Information Administration: Independent Statistics & Analysis. <https://www.eia.gov/tools/faqs/faq.php?id=105&t=3>. Feb 16, 2017.

5. **Refrigerants and Chemicals – 1.56% of Total Emissions:** Refrigerants and chemicals include refrigerants used to charge air conditioners, refrigerators, and freezers. Refrigerants are powerful greenhouse gases, having a higher global warming potential per unit than other sources. As such, when unintentionally released into the atmosphere they contribute significantly to the University’s carbon footprint. This emissions source is considered Scope 3.

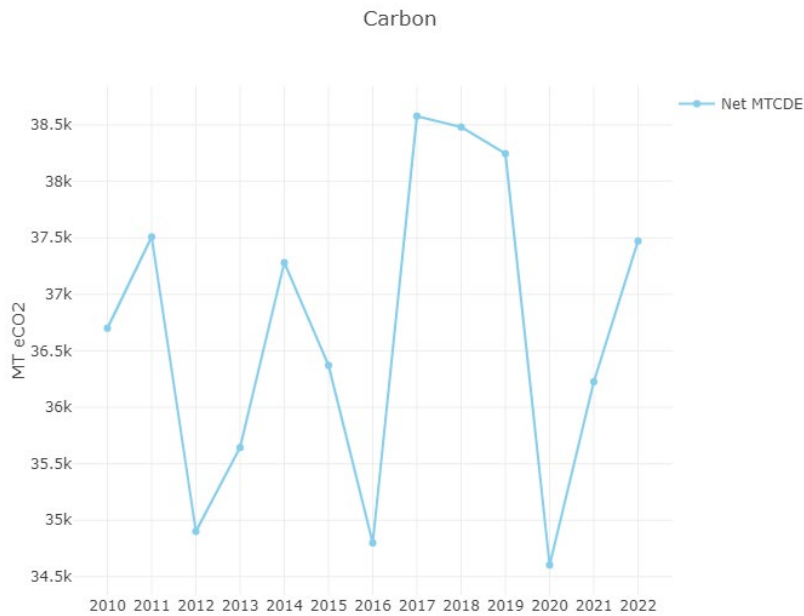
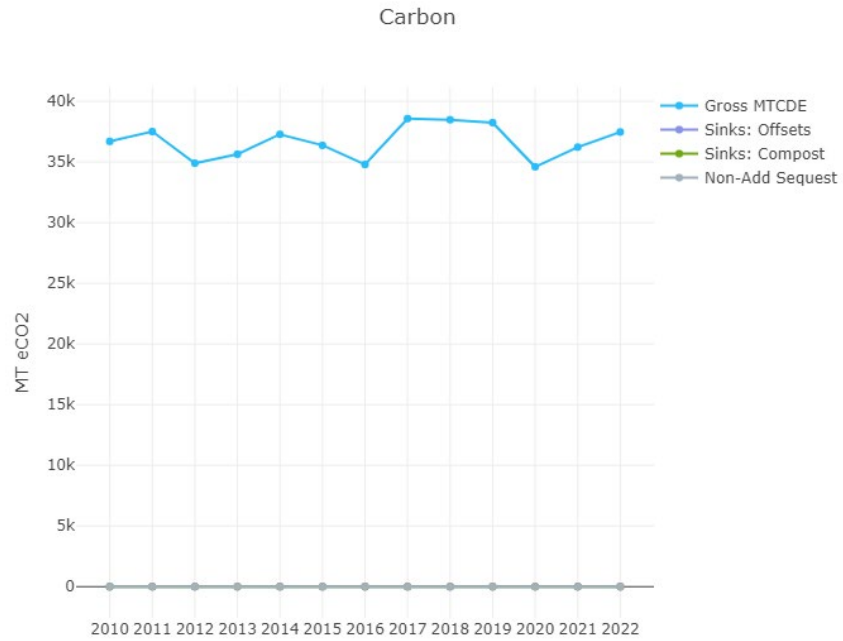
Refrigerants and Chemicals produced 583.71 MTCO₂e in FY2022

Carbon: 2022



Normalization and Trends

1. Radford University's total net greenhouse gas emissions (MTCO₂e) are higher than in 2010, but have decreased since 2016.



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Total Emissions during FY2022 are less than the 2010 Greenhouse Gas Inventory “Business As Usual” projection for total emissions in 2022.

- Total emissions increased from 36,700.23 MTCO₂e in 2010 to 37,845.61 MTCO₂e in 2022; an increase of 1,145.38 MTCO₂e or approximately 3%.
- The “Business as Usual” projection for 2022 was over 55,000 MTCO₂e, an increase of approximately 18,300 MTCO₂e, or approximately 33%.

2. Emissions per square foot are lower than in 2010, but increased slightly between 2021 – 2022.

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Buildings are the primary consumer of electricity and steam on the Radford University campus. Together, with T&D Losses, these account for nearly 80% of the University’s total emissions. Since 2010, the gross square footage of total building space has increased 423,541 square feet, a 14% increase. Since 2016, much of this new building space is “energy intensive” space in

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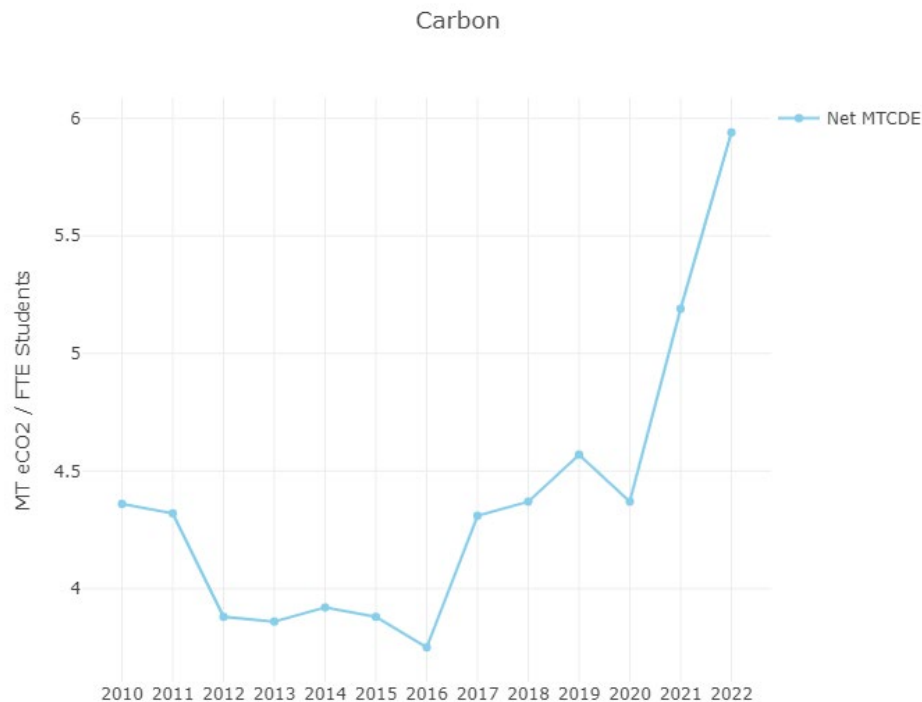
laboratories in Center for the Sciences (115,000 square feet) and the College of Humanities and Behavioral Sciences (143,600 square feet), and in FY 2019, the addition of 77,660 square feet of off-campus apartment space.

In 2010, net greenhouse gas emissions per 1000 gross square feet was 14.04 MTCO₂e, as compared to 12.34 MTCO₂e in 2022, a 12% decrease.

3. Emissions per student (FTE Enrollment) have increased.

In 2010, FTE Student Enrollment was 8,558, as compared to 6,304 in 2022, a decrease of 26%. During this same period of time and net greenhouse gas emissions have increased 3%.

As such, emissions per student (FTE Enrollment) increased from 4.29 MTCO₂e in 2010 to 5.94 MTCO₂e in 2022, an increase of 28%.



Appendix

A. Links to Other Reports & Resources

- The Path to 2040: The Radford University Sustainability and Climate Action Plan: https://www.radford.edu/content/dam/departments/administrative/Sustainability/path-to-2040-/ThePathto2040_Web.pdf
- Radford University Initial Greenhouse Gas Inventory Narrative, 2010: <https://www.radford.edu/content/dam/departments/administrative/Sustainability/Documents/greenhouse-gas-narrative.pdf>
- Second Nature: <http://reporting.secondnature.org/>
- SIMAP – Sustainability Indicator Management & Analysis Platform: <https://unhsimap.org/>
- STARS – Sustainability Tracking, Assessment, and Rating System: <https://stars.aashe.org/>