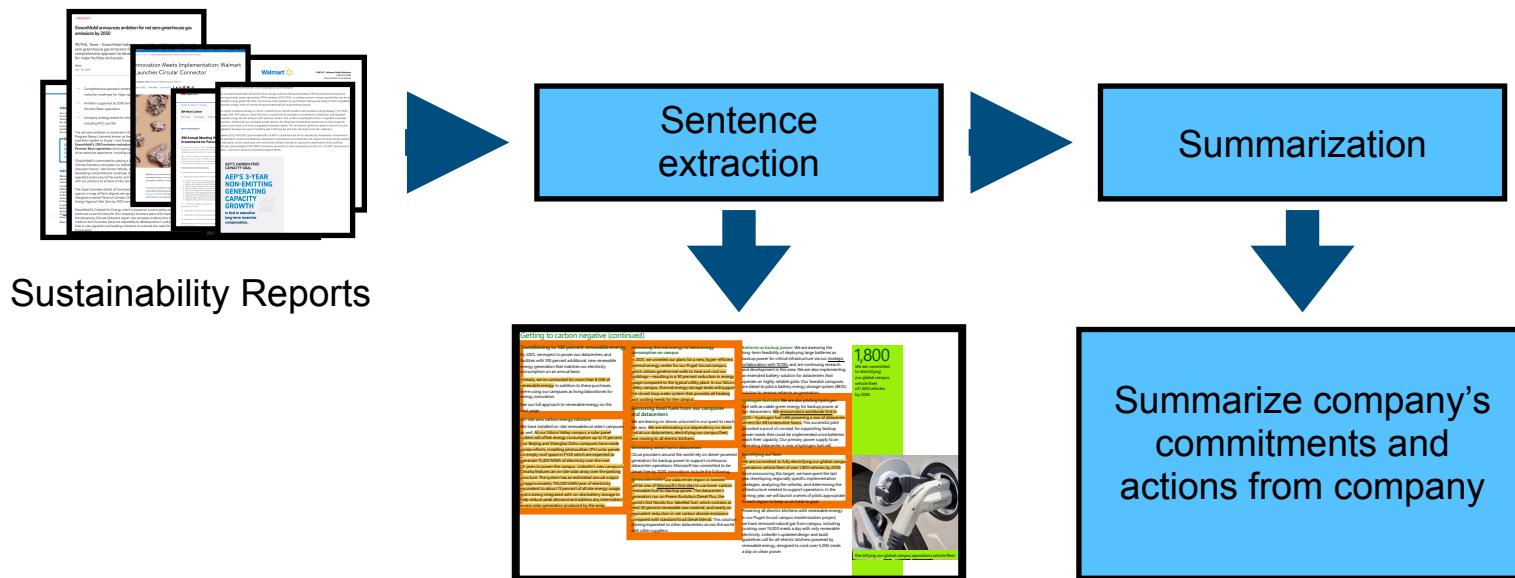


Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Feasibility study:
 - Given a sustainability report as input perform the following:
 - Extract sentences that describe specific actions that companies are taking in reducing greenhouse gas emissions
 - Summarize information on company actions



Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results
 - 10 randomly selected companies from a list of 72 companies:
 1. Eli Lilly
 2. 3M
 3. Bristol Myers Squibb
 4. Johnson & Johnson
 5. Abbott
 6. Boeing
 7. UPS
 8. Merck
 9. Walmart
 10. Tesla

Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results
 - 10 randomly selected companies from a list of 72 companies
 - For each company the input is their sustainability report (in pdf format)

Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results - Eli Lilly
- Automatically extracted sentences from the report:

From 2012 to 2020, we achieved a 26% reduction in absolute emissions. In 2021, we achieved a 9% absolute emissions reduction versus 2020. This reduction was partially driven by energy efficiency improvements and an increase in the use of renewable electricity including the startup of our solar array in Kinsale. In 2021, 9.6% of our purchased electricity came from renewable sources. A large portion of this renewable electricity is delivered through our utility providers to our sites in Alcobendas, Spain; Kinsale, Ireland; and Bracknell, UK. In 2021, we reduced our energy consumption by 2.9%. In 2021, 9.6% of our purchased electricity was secured from renewable sources. We have reduced GHG emissions at key facilities by leveraging solar energy. These projects include: Kinsale – In July, 2021, Lilly started up a 20-acre solar array in Kinsale, Ireland consisting of over 12,600 solar panels, which at the time of construction represented the largest solar development in Ireland. The solar array is expected to provide up to 15% of the site's purchased electricity, resulting in an estimated 2,350 tonne reduction in the site's annual carbon footprint. Manufacturing facilities in Fegersheim, France and Sesto, Italy have solar arrays of 62 kW and 145 kW, respectively. In 2019, Lilly India began operating a rooftop solar array on its administrative building in Gurugram (Gurgaon), India. The 40-kW capacity solar panels will help reduce Lilly's carbon footprint in the city – a key priority due to rising pollution levels. The solar panels supply approximately 10% of the site's energy needs.

7/7/22, 10:29 AM Environmental | 2021 ESG Report | Eli Lilly and Company <https://esg.lilly.com/environmental#tab-control-tab4>

Scope	Not previously reported	Previously reported
Scope 1	Not previously reported	157,000
Scope 2	Not previously reported	466,000
Scope 3	Emissions (metric tonnes CO ₂ e)	263,000
	235,000	176,000
	Total Energy Consumption (million BTUs)	6,650,000
	6,400,000	6,200,000
	6,100,000	Direct Energy Consumption (million BTUs)
	1,730,000	1,690,000
	1,700,000	1,600,000
	Indirect Energy Consumption (million BTUs)	4,920,000
	4,700,000	4,500,000
	4,500,000	Renewable Electricity
	Not previously reported	7.0%
	9.6%	100% Renewable Electricity
	100%	9.6% Carbon Neutral (Market-Based Scope 1 and Scope 2)
	Carbon Neutral	623,000 tonnes CO ₂ e
	Enhance Tracking and Reporting of Full Value-Chain Emissions (Scope 3)	N/A
	On track	Footnotes Note:
	Some segments do not add up to totals due to rounding.	The decision to purchase offsets will be made based on the remaining emissions that cannot be eliminated.
	These projects include chiller replacements, building air handler optimizations and air flow reduction initiatives.	
	Nominations represent a significant accomplishment, and the awards recognize our employees for helping Lilly achieve energy and GHG emissions reduction goals.	
	Green Logistics Greenhouse Gas Emissions (Location-based)	(1) 2018 2019 2020 2021 2
	Greenhouse Gas Emissions (Market-Based)	(1) 2018 2019 2020 2021 2
	Skip to main content	Menu.
	The combined heat and power (CHP) system will significantly improve the resiliency of our Puerto Rico manufacturing operations and will also result in lower energy expenses and reduced GHG emissions.	

Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results - **Eli Lilly**
- Automatically generated summary of the extracted sentences:

In 2021, Lilly reduced energy consumption by 2.9% and achieved a 9% absolute emissions reduction versus 2020. This reduction was partially driven by energy efficiency improvements and an increase in the use of renewable electricity, including the startup of their solar array in Kinsale.

In 2021, 9.6% of Lilly's purchased electricity came from renewable sources.

Lilly has installed solar arrays at their Kinsale, Ireland; Fegersheim, France; Sesto, Italy; and Gurugram (Gurgaon), India sites. These arrays are expected to provide up to 15% of the site's purchased electricity in Kinsale, resulting in an estimated 2,350 tonne reduction in the site's annual carbon footprint.

Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results - 3M
- Automatically extracted sentences from the report:

3M's goal is to achieve carbon neutrality by 2050

Goal: improve energy efficiency, indexed to net sales, by 30% by 2025 Goal: increase renewable energy to 50% of total electricity use by 2025 In 2019, we achieved our 2025 goal by surpassing 25% renewable electricity.

Goal: reduce Scope 1 and 2 market-based GHG emissions from our 2019 baseline by at least 50% by 2030, 80% by 2040, and be 100% carbon neutral in our operations by 2050 As part of our strategic focus on empowering Science for Climate, we increased our interim target from 25% to 50% renewable electricity by 2025, toward our ultimate goal of 100% renewable electricity by 2050.

As of 2021, 3M improved energy efficiency, indexed to net sales, by 14.2% toward a goal of 30% by 2025 In 2019, we achieved our 2025 goal by surpassing 25% renewable electricity.

3M has reduced Scope 1 GHG emissions by 82.3% since 2002, providing a direct and immediate reduction of our carbon emissions.

During this same timeframe, we achieved a 75.0% reduction in absolute Scope 1 and 2 location-based GHG emissions.

Since 2019, 3M reduced Scope 1 GHG emissions by 26.4%, and achieved a 26.1% reduction in absolute Scope 1 and 2 market-based GHG emissions.

GHG emission reductions are achieved through a variety of methods: improving process and equipment efficiency, upgrading equipment, reducing our demand for energy use, increasing our use of renewable electricity, and implementing and maintaining emission control technologies.

Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results - 3M
- Automatically generated summary of the extracted sentences:

3M has improved energy efficiency, indexed to net sales, by 14.2% toward a goal of 30% by 2025.

In 2019, the company surpassed its goal of 25% renewable electricity.

It has reduced Scope 1 GHG emissions by 82.3% since 2002, and achieved a 75.0% reduction in absolute Scope 1 and 2 location-based GHG emissions.

Since 2019, 3M has reduced Scope 1 GHG emissions by 26.4%, and achieved a 26.1% reduction in absolute Scope 1 and 2 market-based GHG emissions.

These reductions have been achieved through a variety of methods, such as improving process and equipment efficiency, upgrading equipment, reducing energy demand, increasing renewable electricity use, and implementing and maintaining emission control technologies.

Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results - **Bristol Myers Squibb**
- Automatically extracted sentences from the report:

We have photovoltaic installations at five sites in the U.S., Switzerland and China, providing a combined annual electricity output of 3,632,000 kWh, equivalent to taking
Between 2019 and 2020, the total contribution made equates to 6,723 metric tonnes of CO₂ sequestered—equivalent

Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results - **Bristol Myers Squibb**
- Automatically generated summary of the extracted sentences:

The company has photovoltaic installations in the U.S., Switzerland, and China.

These installations have a combined annual electricity output of 3,632,000 kWh.

The company's photovoltaic installations have sequestered 6,723 metric tonnes of CO₂ between 2019 and 2020.

Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results - **Johnson & Johnson**
- Automatically extracted sentences from the report:

Progress: Produced or procured 52% of electricity from renewable energy sources.

Progress: 34% reduction in Scope 1 + 2 carbon emissions vs. 2016 baseline.

Progress: +1% increase in greenhouse gas (GHG) emissions – Scope 3 (upstream) vs. 2016 baseline.

Johnson & Johnson maintains more than 50 on-site renewable energy systems in 17 countries and has executed multiple deals for off-site renewable electricity procurement.

In 2021, Johnson & Johnson signed four new renewable Power Purchase Agreements (PPAs)—one in North America and three in Europe—as well as two Utility Green Tariff contracts in the United States.

These On-Site Generated Energy Use by Type (TJ)*

We continued to expand the installation of on-site solar arrays at our facilities, with new installations in 2021 in China, Colombia, South Africa and Thailand.

New this year was the introduction of on-site PPA structure in the form of multiyear “energy as a service” contracts at two sites, enabling GHG-reduction benefits without the need for capital investment.

At one of the largest manufacturing sites in South Africa, the Cape Town installation represented the first renewable electricity initiative for Johnson & Johnson in South Africa.

In Europe, we identified opportunities to switch deliveries from our Belgium distribution center to Denmark, France and Spain from air to road—significantly reducing the carbon emissions with minimal impact to customer service.

Biocatalysis and organocatalysis enable a reduction in the use of organic solvents and generate lower levels of organic waste, resulting in fewer GHG emissions.

Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results - **Johnson & Johnson**
- Automatically generated summary of the extracted sentences:
 - The company procured 52% of its electricity from renewable energy sources
 - The company has a 34% reduction in Scope 1 + 2 carbon emissions from 2016
 - The company has a 1% increase in greenhouse gas emissions from Scope 3 (upstream) from 2016
 - The company has installed solar arrays in China, Colombia, South Africa, and Thailand
 - The company has a biocatalysis and organocatalysis program to reduce the use of organic solvents and generate lower levels of organic waste, resulting in fewer GHG emissions

Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results - Abott
- Automatically extracted sentences from the report:

Throughout 2021, absolute Scope 1 and 2 emissions production increased by 3.3% compared to 2020.

When adjusted for sales, Scope 1 and 2 emissions decreased 17% over this same time period.

More than 200 metric tons CO₂e annual reduction were realized by installing a boiler oxygen management system in our three steam boilers.

Another project to upgrade cooling-tower fins, louvres and in-fills resulted in an annual reduction of about 250 metric tons CO₂e. This switch also resulted in a financial saving, plus an environmental benefit of an annual GHG emission reduction of about 20 metric tons.

In 2021, we purchased 190 million kWh of low-carbon and renewable energy, resulting in savings of 80,000 metric tons of CO₂e.

In addition, we also generated 1.8 million kWh from solar installations at eight of our sites.

Scope 1 and 2 Carbon Emissions Intensity — Normalized to Sales Metric Tons CO₂e per \$ Million Sales Scope 1 and 2 Carbon Emissions 1,000 Metric Tons CO₂e

Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results - **Abbott**
- Automatically generated summary of the extracted sentences:

Emissions production increased by 3.3% in 2021 compared to 2020

200 metric tons of CO₂e were saved by installing a boiler oxygen management system

250 metric tons of CO₂e were saved by upgrading cooling-tower fins, louvres and in-fills

190 million kWh of low-carbon and renewable energy were purchased in 2021

1.8 million kWh were generated from solar installations at eight sites

Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results - **Boeing**
- Automatically extracted sentences from the report:

Throughout 2021, absolute Scope 1 and 2 emissions production increased by 3.3% compared to 2020.

When adjusted for sales, Scope 1 and 2 emissions decreased 17% over this same time period.

More than 200 metric tons CO₂e annual reduction were realized by installing a boiler oxygen management system in our three steam boilers.

Another project to upgrade cooling-tower fins, louvres and in-fills resulted in an annual reduction of about 250 metric tons CO₂e. This switch also resulted in a financial saving, plus an environmental benefit of an annual GHG emission reduction of about 20 metric tons.

In 2021, we purchased 190 million kWh of low-carbon and renewable energy, resulting in savings of 80,000 metric tons of CO₂e.

In addition, we also generated 1.8 million kWh from solar installations at eight of our sites.

Scope 1 and 2 Carbon Emissions Intensity — Normalized to Sales Metric Tons CO₂e per \$ Million Sales Scope 1 and 2 Carbon Emissions 1,000 Metric Tons CO₂e

Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results - **Boeing**
- Automatically generated summary of the extracted sentences:

Emissions increased by 3.3% overall in 2021

When adjusted for sales, emissions decreased by 17%

200 metric tons of CO₂e were saved by installing a boiler oxygen management system

250 metric tons of CO₂e were saved by upgrading cooling-tower fins, louvres, and in-fills

20 metric tons of GHG emissions were saved by switching to a new system

80,000 metric tons of CO₂e were saved by purchasing low-carbon and renewable energy

1.8 million kWh were generated from solar installations at eight sites

Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results - UPS
- Automatically extracted sentences from the report:

Increase Electricity From Renewable Sources to 25 Percent by 2025 In 2020, total electricity being generated from renewable sources reached 7.8 percent.

This includes several rooftop solar arrays on UPS facilities and procurement of almost 88% renewable electricity within our European operations.

2025 In 2020, we continued investing in alternative fuels for our ground fleet, purchasing 142 million gallons of alternative fuels, which represented 22 percent of our total ground fuel usage.

2035 We have seen a 14% reduction in CO₂e per package from 2010 to 2020.

Starting from a base year of 2020, we will reduce the CO₂e per package delivered by 50% by 2035.

By 2025 25% renewable electricity for facilities (existing goal).

100% renewable electricity for facilities.

50% reduction in CO₂ per package delivered for global small package (2010 baseline).

UPS discloses our Scope 1, Scope 2 and Scope 3 greenhouse gas (GHG) emissions, along with an extensive breakdown of our GHG reporting policies in indicator 305 of our GRI Index.

TCFD 4(b) Disclose Scope 1, Scope 2 and, if appropriate, Scope 3 greenhouse gas emissions, and the related risks.

Even in the absence of such legislation, the Environmental Protection Agency could move to regulate GHG emissions, especially aircraft or diesel engine emissions, and this could impose substantial costs on us.

Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results - UPS
- Automatically generated summary of the extracted sentences:

In 2020, total electricity being generated from renewable sources reached 7.8 percent, this includes several rooftop solar arrays on UPS facilities and procurement of almost 88% renewable electricity within our European operations.

In 2020, we continued investing in alternative fuels for our ground fleet, purchasing 142 million gallons of alternative fuels, which represented 22 percent of our total ground fuel usage.

We have seen a 14% reduction in CO2e per package from 2010 to 2020.

Starting from a base year of 2020, we will reduce the CO2e per package delivered by 50% by 2035.

By 2025 25% renewable electricity for facilities (existing goal). 100% renewable electricity for facilities.

50% reduction in CO2 per package delivered for global small package (2010 baseline).

Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results - **Merck**
- Automatically extracted sentences from the report:

These projects will address approximately 35 percent of our company's Scope 2 emissions by collectively adding 145 megawatts (MW) of solar and wind energy to the grid.

These agreements follow a 2018 U.S. wind VPPA, which has added 60 MW of new renewable energy capacity, while providing our company with the associated renewable energy credits.

Our company recently signed three virtual power purchase agreements 40 percent of our U.S. fleet are now partial-zero-emission vehicles (PZEV), and we are expanding our use of hybrid vehicles.

Over 50 percent of the vehicles being utilized in our Asia/Pacific markets are hybrids.

Approximately nine percent of our total Scope 1 and 2 GHG emissions are associated with our vehicle fleet.

Renewable energy generated and used onsite (Scope 1) 4.0.05%

Renewable energy generated and used onsite (Scope 1) 4.9.1%

On Track: 37.7% of our purchased electricity comes from renewables

From 2019 to 2020, we reduced our year-over-year Scope 1 and Scope 2 market-based GHG emissions by eight percent due to our continued focus on energy efficiency and an increased utilization of renewable energy.

The decrease in SOx emissions from 2019 to 2020 can be attributed to the use of fuel with a lower sulfur content.

Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results - Merch
- Automatically generated summary of the extracted sentences:

The company is adding 145 megawatts of solar and wind energy to the grid, which will address approximately 35 percent of the company's Scope 2 emissions.

The company has signed three virtual power purchase agreements, and 40 percent of the company's U.S. fleet are now partial-zero-emission vehicles (PZEV).

The company has expanded its use of hybrid vehicles, and over 50 percent of the vehicles being utilized in the company's Asia/Pacific markets are hybrids.

From 2019 to 2020, the company reduced its year-over-year Scope 1 and Scope 2 market-based GHG emissions by eight percent due to the company's continued focus on energy efficiency and an increased utilization of renewable energy.

Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results - Walmart
- Automatically extracted sentences from the report:

Walmart has committed to science-based targets (SBTs) for emissions reduction—including achieving a 35% reduction in absolute scopes 1 & 2 emissions by 2025 and a 65% reduction by 2030 (vs. 2015 base year)—on the way to achieving zero emissions in our operations by 2040.

We are also committed to engaging suppliers through Project Gigaton™, an ambitious effort to reduce or avoid one billion metric tons (a gigaton) of GHG emissions in the global value chain by 2030.

We achieved a 17.5% reduction in combined scopes 1 and 2 emissions between our 2015 calendar year baseline and 2020.³⁹ To continue our progress, we are focused on renewable energy procurement, energy efficiency, refrigeration, transportation and stationary fuels.

Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results - Walmart
- Automatically generated summary of the extracted sentences:

Walmart has committed to reducing emissions by 35% by 2025 and 65% by 2030, with the goal of being emission-free by 2040.

They have already achieved a 17.5% reduction in emissions between 2015 and 2020. -

Their focus going forward will be on renewable energy procurement, energy efficiency, refrigeration, transportation, and stationary fuels.

Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results - **Tesla**
- Automatically extracted sentences from the report:

In 2021, the global fleet of Tesla vehicles, energy storage and solar panels enabled our customers to avoid emitting 8.4 million metric tons of CO₂e. The 6.8 million metric tons of vehicle CO₂e savings estimate is based on the net CO₂e savings during the use-phase of a Tesla vehicle compared to an ICE vehicle with a real-world fuel economy of ~24 mpg (of which 0.9 million metric tons was avoided through annual renewables matching for the global Supercharger network and home charging in California).

The 1.6 million metric tons of solar + storage CO₂e savings estimate is based on CO₂e avoided through generation of zero-emission electricity from Tesla solar panels, including energy stored and later dispatched from our energy storage products.

Geographic distribution of our deliveries (both vehicle and solar), grid mix at the country, state and province level and upstream emissions are reflected in these figures.

Using Data Science to Extract and Summarize Information on How Companies are Reducing Greenhouse Gas Emissions

- Initial results - Tesla
- Automatically generated summary of the extracted sentences:

In 2021, the global fleet of Tesla vehicles, energy storage and solar panels enabled our customers to avoid emitting 8.4 million metric tons of CO₂e

The 6.8 million metric tons of vehicle CO₂e savings estimate is based on the net CO₂e savings during the use-phase of a Tesla vehicle compared to an ICE vehicle with a real-world fuel economy of ~24 mpg (of which 0.9 million metric tons was avoided through annual renewables matching for the global Supercharger network and home charging in California).

The 1.6 million metric tons of solar + storage CO₂e savings estimate is based on CO₂e avoided through generation of zero-emission electricity from Tesla solar panels, including energy stored and later dispatched from our energy storage products.