# ADVANCING OUR PLANET

**With our planet facing severe sustainability challenges, including urban congestion, population growth and climate change, we believe we must play our part in protecting and conserving it for future generations.**

**Our founder, Henry Ford, believed in the idea of conservation.**

The word sustainability may not have existed back then, but the concept of doing more with less did. This lies at the very core of our company. Sustainability is in our DNA.

**We have a responsibility to reduce the GHG emissions from our vehicles and operations to help tackle climate change.**

Our 2°C "glide paths" are our long-term roadmap for migrating our vehicle and fuel technologies towards more efficient and lower-carbon options, in line with the Paris Climate Accord.

**We continue to research, develop and use renewable and recycled materials in our vehicles.**

Our supply chain is complex but we're committed to ensuring that the materials we use are sourced responsibly and include more sustainable alternatives to petroleum-based plastics.

**We have comprehensive programs to help us reduce energy and water use, emissions and waste in our operations, and use more renewable energy.**

We have already met our goal to reduce operational GHG emissions per vehicle by 30 percent by 2025, 88 Ford sites have achieved true zero waste to landfill status and Ford was named in the CDP Water Security "A List" for the fourth year in a row.

## Highlights

**100%**

RENEWABLE ENERGY FOR ALL MANUFACTURING PLANTS GLOBALLY BY 2035

**5.5%**

ABSOLUTE REDUCTION IN GLOBAL WASTE SENT TO LANDFILL IN 2018

**7.8%**

ABSOLUTE REDUCTION IN GLOBAL WATER USE FOR MANUFACTURING IN 2018

## Sustainable Development Goals

THROUGH OUR WORK IN ADVANCING OUR PLANET WE ARE CONTRIBUTING TO THE FOLLOWING UN SDGS:


# REDUCING OUR VEHICLE FOOTPRINT

**Climate change was identified as one of the most important issues in our recent human rights assessment, due to the impacts of extreme weather events, rising sea levels, droughts and water shortages. We share the responsibility for reducing GHG emissions, starting with those associated with the use of our vehicles.**

Climate change is an important concern for our business and our stakeholders. We used the International Energy Agency's (IEA) 2°C scenario and a 1.5°C sensitivity analysis from the Intergovernmental Panel on Climate Change to inform our understanding of the implications of climate change.

Stabilizing atmospheric $CO_2$ concentrations is extremely challenging and will require a major effort on a global scale. Over the past decade, we have continued to evolve our approach, addressing the issues associated with climate change while pursuing the opportunities of a changing world. This includes helping limit the global temperature increase to less than 2°C, by delivering $CO_2$ reductions in line with the Paris Climate Accord.

## A Commitment to Transparency

We have published an annual sustainability report for the past 20 years, and regularly provide submissions to several third-party indices and climate change reporting organizations. This year, we have also produced our first Climate Change Scenario Report. It details our vision for new mobility solutions and the transition to a low-carbon economy, and assesses the resilience of our strategies for managing climate risk.

### Our Aspirational Goals

- We support $CO_2$ reductions consistent with the Paris Climate Accord
- We aspire to achieve zero air emissions from our facilities
- We will use 100 percent renewable energy for all manufacturing plants globally by 2035
- We will achieve true zero waste to landfill across our operations
- We will eliminate single-use plastics from our operations by 2030
- We will make zero water withdrawals for manufacturing processes
- We aspire to use freshwater for human consumption only
- We aspire to only use recycled and renewable plastics in our vehicles globally

## REDUCING OUR VEHICLE FOOTPRINT CONTINUED

### CLIMATE CHANGE STRATEGY

**Doing our share to meet the collective challenge of climate change is a key responsibility and a strategic priority for Ford.**

#### Our Strategy at a Glance

For more than a decade, we have developed a comprehensive approach that helps us address the issues associated with our changing climate. We are focusing on three key areas:

- Electrification including a range of new hybrid and fully electric models by 2022
- The improved efficiency of hybrid and conventional internal combustion engine vehicles
- Efficient, state-of-the-art manufacturing

Our strategy is also shaped by external factors, including government policies, physical risks such as extreme weather and other effects of climate change, market trends and the growing desire among consumers for more sustainable vehicles.

> *For further detail on these and other risk factors, see the Ford Annual Report 2018 (Form 10-K), page 14.*

#### How We Developed Our Approach

We have assessed what it would take to do our part in efforts to limit global temperature increase to less than 2°C, in line with the Paris Climate Accord, and address the most serious consequences of climate change.

- Based on climate science and modeling by recognized authorities, including the IEA, we developed a model of global and light-duty vehicle (LDV) $CO_2$ emissions from different regions
- We calculated the 2°C stabilization emission reduction levels for LDVs over time, resulting in "$CO_2$ glide paths" for the LDV sector, taking into account regional differences in vehicle size and fuel consumption, biofuel availability and market growth
- We then calculated Ford-specific glide paths ($CO_2$ reduction goals) for our new vehicle lineups across our major operating regions, and applied the methodology to determine reduction targets for our facilities
- To incorporate the latest scientific knowledge, we review our glide path model every year and carry out major updates every five years

Our $CO_2$ model is not intended to provide the "answer," but a portfolio of possible vehicle and fuel solutions in a carbon-constrained world.

Our reduction targets are an approximate guide to cumulative $CO_2$ reduction, rather than a precise limitation of annual emission rates.

#### Delivering Long-Term Reductions Across Our Lineup

We periodically review our vehicle development plans to assess how they align with our goals to reduce $CO_2$ emissions over the long term. However, these reductions will vary from year to year, due to market forces that are beyond our control, such as energy price fluctuations, changes in consumer demand and regulatory requirements. We are investing heavily in vehicle electrification and connectivity, which we believe will facilitate long-term reductions in $CO_2$ emissions.

#### Refining Our Model

We first developed an LDV path in 2007. Recognizing the long timeframe of climate science, we update our glide path model's assumptions and input data every five years. After our last major revision in 2017, we moved to a 2°C temperature stabilization pathway specific to LDVs.[6] In 2018, we adjusted the model to account only for the physical $CO_2$ emissions from our vehicles and decoupled it from regional regulatory requirements. We also evaluated a 1.5°C sensitivity scenario.

Between these major updates, we conduct other assessments to understand how our model is affected by global changes such as economic conditions, biofuel availability and regulations. In 2018, we reviewed the effects of recent LDV regulatory incentives, the phasing out of some car lines in North America and our plans for increased electrification.

As climate science, alternative fuels and technologies advance, we will continue to refine and adjust our science-based $CO_2$ targets, and explore how best to factor in non-$CO_2$ emissions.

#### 2°C Scenario Analysis Framework

To evaluate climate change risks and opportunities, investors are leading efforts to establish common strategy and planning assessment tools, such as the Task Force on Climate-related Financial Disclosures (TCFD). Frameworks established for the oil and gas industries evaluate how policies, technology, and market and climate trends could impact their business strategies and capital planning.

In a similar vein, Ford is engaging with Ceres, a nonprofit organization encouraging companies to take stronger action on climate change, to develop and validate a framework for the automotive industry.

> *For more information, please download our Climate Change Scenario Report and our TCFD index.*

**We support $CO_2$ reductions consistent with the Paris Climate Accord**

6 IEA. Energy Technology Perspectives 2016. OECD/IEA, Paris (2016).

## REDUCING OUR VEHICLE FOOTPRINT CONTINUED

### VEHICLE EMISSIONS

**To help reduce the GHG emissions associated with the use of our vehicles, we are committed to making more efficient, lower-impact vehicles and technologies accessible at scale.**

There is no single way to improve fuel efficiency or vehicle $CO_2$ emissions, so we take a portfolio approach, offering smarter choices across three areas:

| Vehicles | Fuel | Customer |
|---|---|---|
| Affordable, accessible lower-carbon options:<br>– Electrified vehicles<br>– New engine/ transmission technologies<br>– Electrical system improvements<br>– Aerodynamic improvements<br>– Weight reductions<br>– Advanced powertrain options | Evaluating, developing and introducing vehicles that use lower-carbon fuels:<br>– Electricity<br>– Biofuels<br>– Compressed natural gas (CNG)<br>– Liquefied petroleum gas (LPG) | Enabling customers to choose different vehicles and fuels, and how those vehicles will be driven and maintained<br>Promoting "eco-driving" through training, information and vehicle technology |

**28.9**[7]

FORD U.S. CORPORATE AVERAGE FUEL ECONOMY, COMBINED CAR AND TRUCK (MILES PER GALLON)

**312**[8]

FORD U.S. $CO_2$ TAILPIPE EMISSIONS PER VEHICLE, COMBINED CAR AND TRUCK (GRAMS PER MILE)

### Our Plan for Reducing Vehicle $CO_2$ Emissions

Our science-based global strategy aims to reduce the GHG emissions from our vehicles, as well as through our operations. Encompassing our Sustainable Technologies and Alternative Fuels Plan, the strategy seeks to deliver high-quality vehicles that meet consumer needs while also responding to the risks presented by climate change.

Our industry currently faces major challenges in this area. As well as regulatory uncertainty in the United States, consumers are switching from cars to trucks and SUVs. In response, we will be scaling back car production in the United States to just the Mustang. In fact, by 2020, 90 percent of our North American portfolio will be pickups or sports utility and commercial vehicles.

We are also electrifying many of our fleet offerings to reduce $CO_2$ emissions. Ford is investing more than $11 billion to get electrified vehicles on the road even faster. Our plan is to electrify our most popular vehicles, including launching the all-new Ford Explorer and Ford Escape hybrids this year along with the new F-150 hybrid in 2020 in North America. We are also on track to launch our Mustang-inspired all-new all-electric SUV next year and an all-electric F-150 in the future.

U.S. fuel prices have been low in recent years and customers are placing other vehicle attributes, such as performance, connectivity and infotainment, above fuel efficiency. Nonetheless, we will continue to improve fuel economy and reduce $CO_2$ emissions across our vehicle portfolio over the long term.

Internal combustion engine (ICE) vehicles will continue to dominate vehicle sales globally for the foreseeable future. However, they will slowly be displaced by electric and other lower emission options as technologies and infrastructure develop, and as cities like London, Paris, Madrid, Hamburg and Shanghai place restrictions on ICE vehicles.

Understanding that alternative technologies do not meet all consumer needs, at least for now, we continue to design and develop advanced ICE technologies that meet those needs while minimizing impact on the environment.

The transition to more sustainable mobility will be facilitated by an increasingly electrified and connected mobility ecosystem. In 2018, we announced our vision for the Transportation Mobility Cloud (TMC) being developed by Autonomic as a web-based platform for smart connected mobility services. The TMC can provide improved access to mobility and connectivity, reduced congestion and lower GHG emissions associated with vehicle use. We are working with the U.S. Department of Energy's National Renewable Energy Laboratory and the RAND Corporation to quantify the potential sustainability benefits of connected mobility facilitated by services such as the TMC, and plan to discuss the findings in future reports. Read more about the TMC.

7 Includes FFV credits. Does not include A/C or Off-Cycle credits.

8 Includes FFV credits and Advanced Technology Multipliers. Does not include A/C or Off-Cycle credits.

## REDUCING OUR VEHICLE FOOTPRINT CONTINUED

### Global Technology Migration Path

| | NOW (<2020) | NEAR (2020–2025) | FAR (2025+) |
|---|---|---|---|
| | | - Offer existing technologies at high volume<br>- Reduce vehicle weight<br>- Expand electrification | - Offer electrification and alternative fuels at high volume |
| **Policy/Mobility** | Progress cross-industry and government discussions to increase the minimum octane rating<br>Develop self-driving vehicles, connected vehicles (CVs) and smart mobility technologies | Engage in cross-sector GHG mitigation discussions<br>Introduce advanced self-driving vehicles, CVs and smart mobility technologies | Improve sustainability by integrating vehicle technologies, low-carbon/renewable fuels and smart mobility solutions<br>Engage in cross-sector GHG mitigation projects |
| **ICE** | Make EcoBoost® engines widely available<br>Continued introduction of advanced engine/after-treatment technology to reduce emissions | Develop advanced technologies to further improve gasoline engine/EcoBoost® powertrain efficiency and performance<br>Expand and optimize gasoline engine/EcoBoost® technologies in conjunction with electrified and alternative fuel applications and improved fuel properties<br>Further develop ICE technology to enhance capability and affordability in key vehicle segments<br>Innovation to meet future local air quality vehicle tailpipe emission standards | Continue optimizing engine technologies and improving engine efficiency for electrified applications<br>Identify and incorporate advanced technologies that are compatible and synergistic with low-carbon/renewable fuels<br>Deliver technology for continued reductions in criteria and particulate emissions |
| **Electrification** | Launch a 30+ mile plug-in hybrid electric vehicle (PHEV)<br>Launch all-new, fourth generation front and rear-wheel drive hybrids, including Escape and Explorer in 2019 and F-150 in 2020<br>Develop Electrification Lifestyle customer solutions<br>Develop all-electric F-150 and global commercial van | Launch additional hybrid and fully electric vehicle models<br>Launch all-electric F-150 and global commercial van<br>Launch all-electric flexible vehicle architecture<br>Launch 300-mile range, Mustang-inspired, all-electric utility<br>Make hybrids and plug-in hybrids available in more than 50 percent of nameplates<br>Expand access to global charging infrastructure<br>Launch Electrification Lifestyle customer solutions | Expand Electrification Lifestyle customer solutions<br>Integrate TMC and electrified vehicle ecosystem to maximize customer value and environmental benefits |
| **Alternative Fuels** | Develop spark ignition and compression ignition technologies compatible with low-carbon/renewable fuels<br>Offer flex-fuel vehicles (FFVs)<br>Make CNG-prepared engines available where demand exists | Improve vehicle and powertrain capability to leverage renewable fuels<br>Expand vehicle capability for renewable fuels | Evolve technologies in response to progress in low-carbon/renewable fuels |
| **Energy Management, Electrical Architecture and Efficiency** | Make electric power steering widely available<br>Migrate battery management systems globally<br>Make ongoing aerodynamic improvements | Incorporate additional aerodynamic improvements<br>Develop intelligent energy management technologies, e.g., waste heat recovery | Leverage connectivity and advanced driver assistance systems for optimized energy management |
| **Transmission and Driveline** | Expand 8- and 10-speed variants to replace 6-speed automatic transmissions | Make advanced conventional driveline technologies widely available<br>Increased advancements in engine/transmission systems optimization<br>Develop electrified transmission and driveline technologies across all platforms and powertrain configurations | Expand the functionality of transmission and driveline technologies in support of next-generation electrified and self-driving vehicles |
| **Weight Reduction** | Develop advanced lightweight materials and associated manufacturing processes for significant weight reduction | Optimize vehicle systems for weight and introduce new materials and designs for further weight reduction | Continued focus on weight reduction using advanced materials and processes |
| **Mobility Solutions** | Introduce Ford car and Ford bike sharing<br>Invest in scooter sharing for first- and last-mile journeys | Extend sharing in regions<br>Extend FordPass functionalities including parking finder, etc.<br>Roll out intermodal platforms | Devise City of Tomorrow solutions |
| **Hydrogen Fuel Cell Vehicles** | Research and development of fuel cell technology and its integration into vehicles | Continued research and development<br>Limited deployment of test fleets as appropriate for market conditions | First commercial fuel cell vehicle applications |

## REDUCING OUR VEHICLE FOOTPRINT CONTINUED

### TAKING A LIFE CYCLE APPROACH

**We want to understand the impacts of our vehicles and services over their entire life cycle so that we can manage them more effectively. This holistic view makes us better positioned to reduce our environmental footprint, through the materials and energy we use to make our vehicles, and the emissions they generate during use.**

We use a range of analytical tools to identify and measure the potential environmental impacts of our vehicles or services over their lifetime, from the acquisition of raw materials, through vehicle production, distribution and use, to end-of-life disposal or recycling.

#### GHG Emissions in the Vehicle Life Cycle

In terms of GHG impact, vehicle operation is the main source of emissions. Total GHGs emitted depend on many factors, including the number of vehicles on the road and the way they are driven. We use the GHG Protocol methodology and actual vehicle testing to estimate emissions from vehicle use.

**2018 GHG Emissions From Ford Operations and Use of Sold Vehicles**

| | Metric tons |
|---|---|
| Ford Facilities | 4.38 m |
| Per Vehicle | 0.73 |
| Use of Sold Vehicles | 134 m |

Much of our efforts focus on improving tailpipe or tank-to-wheels (TTW) emissions. However, we continue to study well-to-wheels (WTW) impacts, which include the production (well-to-tank, WTT) and consumption (TTW) of fuel during vehicle use. WTW emissions vary with vehicle, engine type and energy source, including electricity.

When comparing vehicles, diesels generally have lower lifetime GHG emissions than their gasoline-powered equivalents and, in vehicles with alternative powertrains, $CO_2$ emissions vary with the carbon intensity of the fuel production process. Therefore, the emission benefits of lower-carbon options such as battery electric vehicles (BEVs) and PHEVs are maximized when the electricity comes from renewable sources such as wind or solar power.

While WTT impacts are part of the total vehicle life cycle, they are not within our control and are not suitable as key performance indicators for the automotive industry. We look to address these impacts separately, in collaboration with fuel and electricity producers, infrastructure developers and governments.

#### Applying Our Findings

We use life cycle tools to support our research and development, and assess the environmental and cost impacts of different materials. We are currently studying the energy and GHG emissions associated with producing carbon fiber automotive parts, and comparing them to any fuel savings they can provide. Life cycle assessment (LCA) is a valuable tool for comparative material and technology assessments, but its complexity excludes a complete vehicle analysis of the Ford portfolio.

In addition, our researchers have contributed to a cradle-to-grave LCA that explores the costs and GHG emissions of current and future technology for LDVs. The analysis provides a life cycle picture of emissions and illustrates the importance of the availability of low-carbon fuels at scale for a sustainable mobility future. The research was published in the journal *Environmental Science & Technology*.

### IMPROVING FUEL ECONOMY

**We use a variety of approaches to improve the fuel economy of our gasoline- and diesel-powered vehicles, guided by our Sustainable Technologies and Alternative Fuels Plan. Improving fuel economy goes hand in hand with our work on electrification.**

#### Advances in Engine and Transmission Technologies

##### Gasoline Engines

Thanks to turbocharging and direct fuel injection, our range of EcoBoost® engines lead our efforts to improve fuel efficiency and reduce $CO_2$ emissions in gasoline-powered vehicles. This award-winning fuel-saving

## REDUCING OUR VEHICLE FOOTPRINT CONTINUED

technology is now available on more than 80 percent of our nameplates, and has now been used in 8 million engines worldwide.

We are developing new technologies to improve fuel economy, performance and emissions for multiple powertrain options, such as advanced boosting, reduced friction, and advanced fuel injection and ignition. We also continue to assess how low-carbon renewable fuels can help reduce $CO_2$ emissions, and we continue to expand electrified and hybrid models into more segments and markets to meet evolving customer requirements.

Reflecting some of the progress we've made in gasoline engines, the 2.0-liter inline four-cylinder gasoline direct injection engine with Auto Start–Stop in the 2018 Transit Connect Cargo Van is E85-compatible.

### Advanced Transmissions and Drivelines

We continue to advance our front- and rear-wheel-drive transmissions to increase efficiency and improve vehicle performance while enabling quick, smooth shifts, and we are further developing driveline technologies including low-friction, all-wheel-drive systems.

The 10-speed automatic transmission, first incorporated into the 2017 F-150 4x2 and 4x4 models, is now also used in our new Ford Expedition and Lincoln Navigator, improving powertrain efficiency and vehicle performance.

### Diesel Engines

In specific markets, and for segments such as light commercial vehicles and heavy-duty vehicles, diesel engines offer excellent drivability, along with reduced $CO_2$ emissions and fuel consumption, especially with heavy loads. Modern diesel engines can achieve 20–30 percent better fuel economy than comparable gasoline engines.

In North America, we're offering two new advanced diesel engines: the 1.5-liter EcoBlue® engine in our 2019 Transit Connect and the 3.0-liter Power Stroke, the first diesel engine for an F-150. Both demonstrate the fuel efficiency and performance of progressive diesel engines. As our plans develop further, we will focus on sustainable fuels; our advanced diesel engines are already compatible with biodiesel.

### Reducing Vehicle Weight

We use advanced lightweight materials to reduce fuel consumption wherever practicable. For example, when we switched to an aluminum body on the 2015 F-150, it shed 700 pounds. This led to improved fuel economy while providing increased payload and towing capability. Building on this success, we have also taken 200 pounds off the 2018 Lincoln Navigator, 300 pounds off the 2018 Ford Expedition and 350 pounds off the 2017 Ford Super Duty by switching to aluminum.

Further progress has come in the form of graphene, a carbon-based material 200 times stronger than steel but incredibly light. Starting with the Ford F-150 and Mustang, we will eventually add graphene to the fuel rail covers, pump covers and front engine covers in all our vehicles.

In collaboration with Eagle Industries and XQ Sciences, the breakthrough has been to determine how very small amounts of graphene can enhance foam materials to achieve significant improvements. In recent tests, internal noise reduced by 17 percent. Graphene-enhanced foam was also shown to improve mechanical properties by 20 percent and heat endurance by 30 percent.

Read more about our long-term goal to only use recycled and renewable plastics in our vehicles.

## ALTERNATIVE FUELS AND POWERTRAINS

**Our plan to develop sustainable technologies involves researching and developing alternative powertrains and fuel options across all our vehicles, giving customers more choice.**

### En Route to Lower-Carbon Fuels

To support global climate stabilization, we have developed a roadmap to guide our efforts. This approach informs how we migrate our vehicle, powertrain and fuel options toward lower vehicle $CO_2$ emissions and improved fuel efficiency.

## REDUCING OUR VEHICLE FOOTPRINT CONTINUED

### Global Fuels Migration Path

| Fuel Option | NOW (<2020) | NEAR (2020–2025) | FAR (2025+) |
|---|---|---|---|
| **Gasoline and Diesel** | Growth of fossil fuel availability continues with developments in extraction technologies | Gasoline/diesel fuel properties improve | Increasing fraction of liquid renewable hydrocarbons in fuel portfolio<br>Further gasoline/diesel fuel properties improvements to support advanced vehicle technologies |
| **Electricity (HEV, PHEV, BEV)**<br><br>**See Scaling Up Electrification [link to Innovation]** | Electricity grids start to transition to low-$CO_2$ future<br>Implementation of renewable energy, including solar and wind | Electricity grids continue to transition to low-$CO_2$ future<br>Fleet programs confirm grid/infrastructure readiness for PHEVs and BEVs<br>Grid/infrastructure and standardization support expansion of PHEVs and BEVs | Clean electricity further enhances the benefit of PHEVs and BEVs |
| **Renewable Biofuels** | First generation biofuel production increases along with feedstock growing technique and processing improvements | Renewable fuel capacity expands in select markets<br>Second generation biomass-based fuel production technology matures | Renewable fuel capacity expands in all markets<br>Greater contribution by second generation biomass-based fuels |
| **CNG and LPG** | CNG and LPG available in limited markets | CNG expands in commercial fleets<br>Availability increases with demand and production capacity | CNG from alternative/renewable sources |
| **Hydrogen** | Steam reforming of natural gas | Increased share of hydrogen from renewable sources | Further increased share of hydrogen from renewable sources |

### What's New in Alternative Fuels and Powertrains?

#### Cleaner City Air

Our PHEV Ford Transit Custom van is the centerpiece of a multimillion-dollar project to improve air quality in some of Europe's major cities. A 12-month trial began last year in London, and the project has now been extended to Valencia, Spain and Cologne, Germany. The project will assess how the fleet of prototype vehicles, running solely on electric power, might contribute to cleaner air targets, as well as make some urban journeys more efficient.

#### In Charge of the Electric Vehicle Network

Along with several other manufacturers, Ford is a founding partner of IONITY, a pan-European joint venture to develop a regional fast-charging network for electric vehicles. Together, we plan to build 400 charging stations in key locations by 2020, with the first ones already appearing in Germany, France, Italy, Switzerland and Denmark.

#### StreetScooter Work XL Hits the Streets

We're partnering with Deutsche Post DHL Group to produce electric delivery vans. Almost 150 StreetScooter Work XLs – a Ford Transit chassis fitted with a battery-electric drivetrain – were introduced last year to support the group's urban delivery service in Germany. With plans to build 2,500 more, around 1,000 had hit the streets in Cologne by the end of 2018.

## REDUCING OUR VEHICLE FOOTPRINT CONTINUED

### Vehicles Powered by Alternative Fuels

| | Renewable Biofuel Vehicles | CNG and LPG Vehicles | Hydrogen Fuel Cell Vehicles (FCVs) |
|---|---|---|---|
| **Fuel** | **Ethanol**, made from fermented corn sugars or sugar cane, is usually blended with gasoline (e.g., E15, E22 or E85); ethanol from non-food feedstocks is technically feasible<br>**Biodiesel**, made from soy, canola, rapeseed, corn or palm oil, or animal fats, and mixed with fossil diesel (e.g., B7, B20) | CNG<br>LPG | Hydrogen fuel cell system – converts stored hydrogen to electricity |
| **Benefits** | Biofuels made from renewable resources reduce $CO_2$ emissions<br>Next-generation biofuels made from plant cellulose use stems and leaves, reducing competition for food crops | Lower $CO_2$ and life cycle GHG emissions than gasoline or diesel vehicles<br>Lower non-$CO_2$ emissions | Zero-emission electric vehicles<br>Only water and low-temperature heat are by-products |
| **Models** | E85 FFV: Escape, F-150, Super Duty, Transit Connect, Kuga<br>B20: F-150, F-250/F-350 Super Duty, Transit, Transit Connect | Wide range of commercial vehicles: F-150, F-250, F-350, Transit, Transit Connect, F-X50 cutaway, F-X50 chassis cab. Additionally, a Fiesta LPG variant will be offered | As hydrogen refueling infrastructure expands and consumer interest builds, fuel cell model availability will meet demand |

### $CO_2$ Savings vs. Gasoline (E10) in the United States

| Powertrain/ Fuel | TTW[1] $CO_2$ emissions | WTW[2] $CO_2$ emissions |
|---|---|---|
| HEV | 28% | 28% |
| PHEV[3,4] | 45% | 37% |
| BEV (grid-average electricity | 100% | 56% |
| BEV (renewable electricity) | 100% | 100% |
| E85[5] | 2% | 27% |
| CNG | 25% | 19% |
| LPG | 11% | 13% |
| FCV[6] | 100% | 41% |
| Diesel | 15% | 14% |
| B7 (Europe)[7] | 15% | 17% |
| B20 (United States)[7] | 15% | 24% |

1 2015 U.S. Vehicle efficiency from Elgowainy, A. et al. (2016) Argonne National Lab report number ANL/ESD-16/7.
2 WTW from GREET 2015.
3 Average grid electricity mix (GREET 2017).
4 PHEV has c.20 km all-electric range.
5 Ethanol from corn.
6 Hydrogen from steam methane reforming of NG at central plant.
7 Biodiesel from rapeseed (RME).

## REDUCING OUR VEHICLE FOOTPRINT CONTINUED

### ADDRESSING NON-$CO_2$ EMISSIONS

**We are working hard to reduce emissions of non-$CO_2$ pollutants through our research, vehicle development and operations, in accordance with increasingly stringent vehicle emissions standards around the world.**

#### Standards Continue to Tighten

ICEs emit hydrocarbons, carbon monoxide, nitrogen oxides and particulate matter during combustion. These pollutants can reduce air quality in urban areas, potentially affecting people's health.

We continue to comply with all global criteria emission standards as they are introduced, including the Tier 3/LEV III standards in the United States and the Real Driving Emissions standard in Europe.

Despite large reductions in vehicle emissions and substantial improvements in air quality in many cities in recent decades, due to the enforcement of such standards, countries such as Norway, France and the U.K. have announced sales bans for ICEVs or 100 percent zero-emissions vehicle sales targets in the 2025–2040 timeframe. We question whether such bans are needed and have raised the question "How low should we go?" for future vehicle criteria emissions. The answer will have profound implications for automotive and fuel companies, and for the future economic and environmental health of urban areas. Our research is covered in an article published in *npj Climate and Atmospheric Science*.

**Regional Emissions Standards**

| | United States | Europe | China | Other Regions |
|---|---|---|---|---|
| **Already Compliant or Surpassing** | Environmental Protection Agency (EPA) Tier 2 regulations<br><br>California's Low Emission Vehicle II (LEV II) program | Euro 6 tailpipe emissions standards Phase II | National stage-5 emission standards | **India**: Bharat Stage IV<br><br>**Brazil and Argentina**: PROCONVE L-6 and standards based on Euro 5<br><br>**Middle East**: Standards based on Euro 2, Euro 3 diesel and Euro 4 |
| **Becoming Compliant as Phased In** | EPA Tier 3 standards<br><br>California's LEV III standards, closely aligned with the EPA's Tier 3 program | Euro 6d Real Driving Emissions (RDE) standards<br><br>Euro 6 evaporative emissions standards Phase II | National stage-6 emission standards | India's Bharat Stage VI (BS VI) standards |

#### Beyond the Tailpipe

With vehicle tailpipe emissions decreasing, other emissions are getting increasing attention. We are monitoring research in the area of non-tailpipe emissions. Through our Restricted Substance Management Standard, we have:

- Prohibited GHGs such as perfluorocarbons and sulfur hexafluoride
- Replaced all chlorofluorocarbon refrigerants with hydrofluorocarbons (HFCs), which do not contribute to ozone depletion and have significantly lower global warming impacts

Globally, we continue to lower non-$CO_2$ GHG emissions. In the United States and Europe, we have replaced HFC-134a with HFC-1234yf – a compound with a lower global warming potential – in many of our passenger cars. The lack of servicing infrastructure limits the use of HFC-1234yf in other markets, but we remain committed to further reducing non-$CO_2$ emissions.

### USING SUSTAINABLE MATERIALS

**The materials it contains are a key aspect of a vehicle's sustainability. We aspire to use renewable, recycled and lightweight plastic materials that have a reduced lifecycle impact, and that provide equivalent or superior performance to existing materials. We also aim to reduce and eventually eliminate single-use plastics.**

#### Building on Our Sustainable Materials Legacy

We have been using sustainable materials since the company's inception. Henry Ford advocated for the reduce/reuse/recycle model and for industry and agriculture to use both the products and by-products of the other. He researched and demonstrated the applications of many plant-based materials, such as in coatings, vehicle body panels made from soy bean-based plastic and wheat-straw-filled steering wheels.

Given the finite nature of fossil-fuel-based materials and evolving consumer expectations, that work continues today. These materials are lighter, improving fuel economy and other performance criteria, and contain less carbon. They also provide our engineers with more options and create new revenue streams for farmers and other stakeholders.

The need to meet evolving regulations about recyclable material is also fueling progress. For example, the EU ELV (End-of-Life Vehicle) Directive requires an increasing amount of recycled materials to be used in Europe, with

## REDUCING OUR VEHICLE FOOTPRINT CONTINUED

a focus on plastics made using post-consumer and post-industrial sources. The proposed EU Strategy for Plastics may require the use of a further 10 million tons of recycled plastics, from across all industries, by 2025.

This challenges our design teams, suppliers and other partners to use more renewable content, decreasing our reliance on virgin petroleum-based materials. This will take a significant amount of research and cooperation to ensure we meet or exceed strict performance requirements.

With a long-term ambition to go beyond zero and create positive impacts where possible, our sustainable materials strategy encompasses origin (virgin, renewable or recycled), sourcing and processing methods, life cycle emissions and end-of-life disposal.

### Recycled Materials

Much of our initial progress to date has been achieved by using recycled materials, which comprise up to 20 percent of a modern car. Recycled materials keep waste out of landfill, reduce pressure on natural resources and can reduce both energy consumption and costs. However, these materials must deliver the same or superior quality, appearance and performance as virgin materials.

Many metals are regularly recycled and contain a considerable amount of recycled content. In some cases, we are able to recycle production scrap back into the same use through "closed-loop recycling." For example, the aluminum scraps from the stamping of window openings are collected and turned into body panels.

There is considerable potential for recycling more non-metallic materials from outside Ford. Over the past 20 years, Wellman/PRET has supplied Ford with around 350 million pounds of nylon from recycled, post-consumer carpet, which has found a second life as molded engine components. This is enough to carpet downtown Detroit 42 times. And last year, we launched an extension dash panel on the 2019 Ford Edge made using recycled tires. The cost-saving material, which has improved heat and soundproofing performance, was a finalist in the Environmental category of the 2018 Society of Plastics Engineers' Innovation Awards.

We are also looking at incorporating other by-products and waste streams, such as turning post-consumer detergent containers and milk bottles into blow-molded components, and have tested composites made using ocean plastic waste. However, we acknowledge that marine waste is often degraded and lacks the consistent quality needed in automotive materials.

### Renewable Materials

Our scientists have been exploring ways to replace petroleum-based plastics with plant-based materials since 2000. We were the first to use soy bean-based foam in 2007, on the seatbacks and cushions of the 2008 Mustang, and over the past decade, we have produced more than 20 million vehicles containing this foam. This equates to using about 625 billion soy beans, saving more than 250 million pounds of $CO_2$ from entering the atmosphere.

Over the years, our research program has expanded to include a wide range of foams, plastics and composites derived from renewable resources. Today, we can proudly claim to use around 300 parts made using soy, wheat, rice, castor, hibiscus, tree cellulose, jute and coconut (see box), and we're exploring applications for tomato skin, bamboo, agave fiber, dandelion roots and algae as well. We also work with several companies, suppliers and universities to find new applications for captured $CO_2$.

**Recycled Material Use[9]?**

- **Rubber from post-consumer tires:** underbody covers and exterior mirror gaskets
- **Aluminum recycled at some Ford factories:** truck bodies
- **Recycled plastic bottles:** carpeting and wheel liners
- **Scrap cotton from T-shirt and denim jean production:** interior padding and sound insulation
- **Post-industrial/post-consumer PET from recycled bottles:** seat fabrics
- **Post-consumer nylon carpeting:** cylinder head covers

**What's in a Typical Vehicle?**

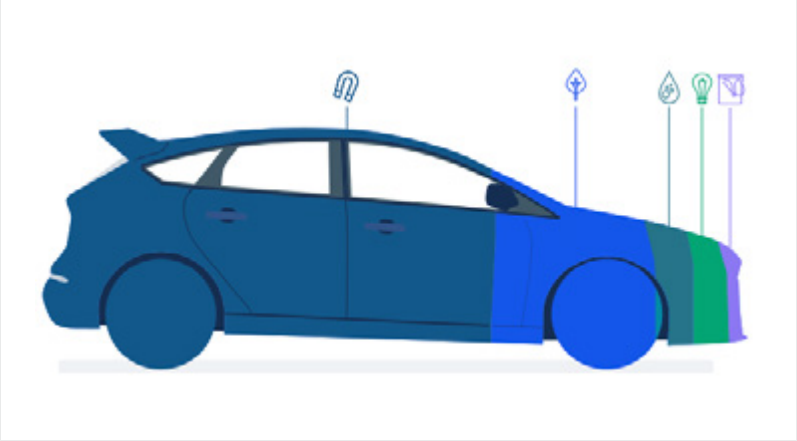
Around 40,000 parts...

from 1,200 Tier 1 production suppliers...

using 1,000 materials...

and 10,000 chemical substances...

- 75% metals (steel, aluminum, magnesium, titanium)
- 17% plastics, elastomers, textiles and natural materials
- 4% fuels and consumable liquids (engine oil, lubricants)
- 3% electronics, ceramics, glass and other compounds
- 1% miscellaneous (paint, adhesives, sealants)



9 Vehicle and region specific.

## REDUCING OUR VEHICLE FOOTPRINT CONTINUED

Last year, we introduced a tree-based cellulose hybrid material in the consoles of the Lincoln Continental – an industry first that won Ford a coveted Environmental Innovation Award from the Society of Plastics Engineers in 2018. The material not only boasts improved mechanical properties compared to the traditional material, but is 24 percent lighter, reduces GHG emissions and cuts costs by 13 percent. We are now looking to use this material in other applications such as door panels and instrument panel substrates.

**We aspire to only use recycled and renewable plastics in our vehicles globally**

### Eliminating Substances of Concern

By monitoring and managing the materials we use in our vehicles, we can be sure we meet relevant local and global regulations to phase out substances of concern. We have made notable progress in eliminating or reducing our use of a range of materials including hex chrome, lead, mercury and copper.

We have phased out all EU REACH Authorization-Listed substances that have reached their sunset dates, after which they cannot be used in the EU without authorization from the European Chemicals Agency. We also lead, chair or participate in several industry association working groups, including the Global Platform for Sustainable Natural Rubber and Drive Sustainability, and advise governmental agencies about developments in global substance restrictions.

**Renewable Material Use[10]?**

- **Castor bean oil**: nylon fuel lines and soft-touch foams in instrument panels
- **Soy-based polyurethane foam**: seat backs, cushions and head restraints
- **Rice hulls**: reinforced plastic in electrical harnesses
- **Coconut husk fibers**: reinforced plastic trunk liners
- **Cellulose-reinforced plastic**: replaced fiberglass in armrests and consoles
- **Wheat straw**: reinforced plastic in storage bins
- **Kenaf** (a species of hibiscus): molded plastic door parts

### Reducing End-of-Life Impacts

In theory, at least 95 percent of a vehicle is recoverable at the end of its useful life, but getting the final fractions can be prohibitively energy- and labor-intensive. Nonetheless, we aim to maximize what is recoverable through the careful selection of materials and by engaging with dismantlers.

For example, none of our current components contain mercury but we work with the U.S. EPA, state authorities, dismantlers, steelmakers and environmental groups to encourage the recycling of mercury switches in older vehicles. Around 15,270 pounds of mercury had been recovered by the end of 2018.

And as part of our voluntary Go Green Dealer Sustainability Program, many U.S. dealership service centers collect the headlights, bumpers and windshield-wiper motors removed during servicing for potential reprocessing, reimbursing dealers accordingly. The parts are either cleaned, machined and tested before being sold as remanufactured parts, or dismantled and recycled for use in new applications.

## ADVANCING THE CIRCULAR ECONOMY

### Materials Manufacturing

We use many bio-based materials and agricultural by-products in our vehicles, including rice hulls, soy, coconut fibers, wheat straw and jute, as well as recycled materials such as nylon carpeting, cotton scraps and plastic bottles. We also recycle aluminum scrap from our stamping plants.

### Vehicle and Parts Manufacturing

We strive to reduce our carbon footprint through energy efficiency and by using more renewable energy. We are also reducing our use of freshwater through new waterless technology and by using alternative sources, including wastewater from other businesses. Many of our buildings are LEED-certified for their sustainable energy, lighting and heating systems, and we have 88 facilities that send zero waste to landfill. In addition, our packaging contains recycled, renewable or recyclable materials.

### Distribution

Our efforts to make our transport and distribution more sustainable include aerodynamic features on our trucks and training on fuel-efficient driving techniques. Network planning helps optimize routes and payloads, avoiding any empty journeys, and we switch from road transport to lower-carbon modes wherever feasible.

### Dealership and Servicing

Ford dealerships are continually improving their utility and energy efficiency through the Go Green Dealer Sustainability program, and many reprocess the parts removed during servicing for reuse.

### Vehicle Use

To reduce the $CO_2$ emissions associated with driving our vehicles, we give customers a wide choice of models and fuels. Our smarter vehicles include a range of developments, such as new engine, transmission and powertrain technologies, aerodynamic improvements and weight reductions. We also continue to develop vehicles that are electrified or use biofuels and other lower-carbon fuels. We also have many partnerships to provide sustainable mobility solutions and services, from shuttles and ride sharing to Spin e-scooters.

### End of Life

Across Europe, Ford owners can access a free take-back network, with sites ensuring our vehicles are treated responsibly at the end of their useful life. Other industries also recycle and reuse a range of parts, from tires to batteries, from the automotive industry.

10 Vehicle and region specific.

# SUSTAINABLE OPERATIONS

**In managing the impacts of production operations directly under our control, we are striving to move from reducing any negative impacts to make a net zero or even positive contribution.**

Maximizing the efficiency of our operations is the key to lowering GHG emissions and facility energy use. This has involved using the Science-Based Targets initiative methodology to develop glide path targets specific to our manufacturing operations. These are based on climate science and the need to limit the rise in global temperature to under 2°C.

We are also looking for ways to reduce our footprint by:

- Increasing our use of renewable energy, towards 100 percent by 2035
- Focusing on responsible water stewardship, as we plan to achieve zero water withdrawals in our operations and only use freshwater for human consumption
- Achieving true zero waste to landfill across our operations, wherever practicable, and eliminating single-use plastics from our operations

> *Read more about how we're sharing best practices to help reduce the environmental footprint of our entire supply chain.*

**500,000**

MWH OF LOCALLY SOURCED WIND POWER PURCHASED IN DETROIT – OUR LARGEST-EVER RENEWABLE ENERGY PROCUREMENT AND A STEP TOWARDS OUR GOAL OF 100% RENEWABLE ENERGY FOR ALL MANUFACTURING SITES BY 2035

**100%**

RENEWABLE ENERGY FOR ALL MANUFACTURING PLANTS GLOBALLY BY 2035

## ENERGY AND EMISSIONS

**At our manufacturing plants and other sites, rethinking the way we use energy is crucial to lowering our facility GHG emissions and playing our part in addressing climate change. As well as maximizing efficiency, we also look for ways to make a more positive impact by using more renewable energy, setting a more aggressive target to reduce operational emissions and making our transport more fuel efficient.**

### Ford's New Global Carbon Reduction Strategy for Manufacturing

Building on the success of our last strategy, through which we achieved our goal of a 30 percent reduction per vehicle eight years early, we have announced a new global Carbon Reduction Strategy for manufacturing, with a significant emphasis on renewable energy initiatives and a continued focus on low-emission sources and energy efficiency. This strategy targets an absolute reduction of 18 percent by 2023, exceeding the requirement of the IEA ETP2017 Beyond 2°C Scenario pathway for Ford's manufacturing operations.

We have also established an aspirational goal to achieve 100 percent renewable energy for all manufacturing plants globally by 2035.

### Collaborating with DTE Energy on Local Wind Power

In February 2019, we announced the procurement of 500,000 megawatt hours of locally sourced Michigan wind energy through DTE Energy's MIGreenPower program: the largest renewable energy procurement in our history. The Dearborn Truck Plant (home of the F-150), the Michigan Assembly Plant (where we make the Ranger and Bronco) and several other new buildings on our Research and Engineering and Corktown campuses, will be powered by 100 percent locally sourced renewable energy by January 2021.

We support the use of renewable energy where the project can be tied to the energy-using facility, either directly or through a local distribution utility, instead of purchasing Renewable Energy Credits, which may be far removed geographically.

### Reducing Emissions and Energy Use

To drive down energy use and GHG emissions from our manufacturing processes, we invest in state-of-the-art facilities and lean production techniques. Driven by our Plant Energy Team, our comprehensive Energy Management Operating System focuses our efforts in three key areas:

- Assessing and improving how our facilities operate
- Collecting, storing and managing data and analytics
- Securing a reliable supply of energy for our manufacturing plants

We participate in GHG emissions reporting and trading and adhere to a number of national carbon reduction initiatives.

### Lowering GHG Emissions from Our Facilities

In 2010, we set an ambitious goal to reduce GHG emissions per vehicle produced by 30 percent by 2025. We're proud to say we reached that goal eight years early through initiatives such as installing more than 100,000 LED lights and updating our painting operations.

In 2018, we reduced our absolute emissions by 1.1 percent. This reduction in operational emissions – 0.05 million metric tons – is the equivalent of more than 10,000 passenger vehicles being driven for one year. In 2018, we also reduced global volatile organic compound emissions by 1.7 percent compared to 2017 and by 4.2 percent since 2016.

### Committed to Green Buildings

Ford is a member of the U.S. Green Building Council and supports its industry-standard LEED (Leadership in Energy and Environmental Design) rating system. Committing to green buildings in our operations, we follow the basic principles of resource and process efficiency, life cycle assessments, health and safety and environmental performance. We currently have 26 LEED-certified buildings around the world.

We continue to implement a range of best practices in our new facilities, from advanced water treatment and waste reduction systems to energy-saving technologies.

Twenty-four of our U.S. plants are also part of the U.S. Department of Energy's Better Buildings, Better Plants program. This national public–private partnership initiative aims to reduce industrial energy intensity by 25 percent over 10 years against a 2011 baseline.

## SUSTAINABLE OPERATIONS CONTINUED

### Emissions From Logistics Operations

From receiving parts and components from suppliers to delivering finished vehicles to dealerships, our logistics operations represent a significant opportunity to educe our environmental impacts, particularly with regard to emissions.

To minimize the impacts of our inbound and outbound freight, we examine every opportunity to reduce the miles we travel and explore more fuel-efficient and lower-carbon modes of transport. Overseen by our Material Planning and Logistics organization, our environmental initiatives are coordinated at a regional level. They include:

- Updating our fleets to ensure we comply with the latest requirements of ISO 14001 and other regulatory standards
- Improving the efficiency of our network to reduce emissions
- Measuring and reporting freight GHG emissions
- Optimizing packaging to protect components and finished vehicles in transit

#### How We're Reducing Freight Emissions

Freight emissions are dependent on a wide range of inter-related factors, including the type of transport used, equipment efficiency and network design. We seek to achieve emissions reductions by improving the efficiency of our processes, by adopting new technology and by using alternative modes of transport.

**Measuring and Reporting Freight Emissions**

Quantifying and reporting our freight emissions helps us minimize our total life cycle carbon emissions and reduce our overall environmental footprint. We measure all GHG emissions, including nitrous oxide and methane, using the "$CO_2$ equivalent" ($CO_2e$) approach. Our logistics partners help by collating data from across our networks in a global scorecard.

We also work with industry bodies, university partners and standards agencies to improve our reporting and methods, such as the Scope 3 GHG Emissions Standard. Continuing to adapt our methodology as necessary, we began to take account of WTW emissions resulting from the production of the fuel and energy we use for freight in Europe in 2018.

We also encourage others in our industry to improve their measurement and reporting of GHG emissions, through the AIAG in North America, the Department for Transport in the U.K. and Odette International in Europe.

| Network Efficiency | Drivers | Vehicles | Other Transport Modes |
|---|---|---|---|
| Improved route planning | Training in fuel-efficient driving techniques | Using the latest engine technologies | Using rail, sea and river transport to reduce emissions and road miles |
| Regional distribution centers to coordinate deliveries | | Modifying equipment (e.g., deflectors, speed limiters) | Multi-modal solutions (e.g., "SWAP bodies": trailers for both road and rail) |
| "Milk run" routes with several collection points | | Packaging designs to carry extra loads | |
| | | Improving load density for fewer trips and lower fuel consumption | |

## WATER USE

**Access to safe, clean water and adequate, accessible sanitation has been identified as one of our salient human rights issues. Water is also critical to many areas of our operations. We acknowledge our responsibility to use and manage water sources efficiently and sustainably, especially in water-stressed countries such as India, South Africa and Mexico.**

### Our Water Strategy

Our long-term water strategy reflects the need to understand water challenges in their local context. Our extraction policies and practices are designed to ensure that our operations do not negatively impact access to water for other users.

Throughout the world, we use a variety of water sources but focus on reducing our usage of freshwater: the main source of drinking water. Our long-term goal is to reduce our use of freshwater in our manufacturing operations to zero, by utilizing non-water-based technologies and tapping into alternative sources such as other companies' greywater and wastewater.

### Leadership on Water

Ford is one of more than 140 companies that endorses the UN Global Compact CEO Water Mandate. We're also proud to be one of only 31 publicly listed companies (out of 2,111 participating companies) to appear in the CDP Water Security "A List", the only automaker to be recognized in this way. We have been on the A-List for four consecutive years.

For more information, see Ford's response to the CDP.

### Reducing Water Use in Our Facilities

Our target, to reduce water use per vehicle produced by 30 percent from 2015 to 2020, represents a significant challenge but it's a vital step forward if we are to manufacture vehicles without withdrawing any drinkable water. In 2018, we reduced our absolute operational water use by 7.8 percent, contributing to an overall reduction of 65 percent (a saving of 10.9 billion gallons) since 2000.

To help us reduce our water consumption further, we're introducing more water-efficient processes and technologies such as a data monitoring center to better measure our water use.

The Flat Rock Assembly Plant in Michigan has installed a system that allows the plant to reuse their wastewater treatment plant effluent in the paint shop. At full production,

## SUSTAINABLE OPERATIONS CONTINUED

this system has the potential to save approximately 60 million gallons of water per year.

### Collaborating With Our Suppliers

**14.5%**

ABSOLUTE REDUCTION IN WATER USE SINCE 2010

We recognize that we can't tackle water issues by ourselves and that our water impact doesn't stop at our factory walls – it includes the impacts of the suppliers who make parts and components for us. That's where our PACE program comes in, helping us to foster partnerships with suppliers and solve challenges by sharing best practice.

Eight Ford suppliers participating in PACE report that they expect to save an estimated 480 million gallons of water from 2018 to 2030 – enough to fill 730 Olympic-sized swimming pools – according to data collected in 2019. PACE participants report that their largest water savings were achieved through better cooling water management, including closed-loop systems and reusing process water and reverse osmosis reject water.

In addition to the full PACE program, we are launching a new streamlined version, FastPACE in the Asia Pacific region. Selected suppliers received an Excel-based toolkit containing hundreds of leading practices and actions to address air emissions, energy use and water use. Suppliers are encouraged to set and report progress towards long-term reduction targets.

### What is Freshwater?

The GRI defines freshwater as surface water, but our broader definition includes both surface water and groundwater, in line with the United States Geological Survey: "*all water other than oceans and other saline water.*"

## WASTE REDUCTION

**The automotive industry is resource-intensive, so we work hard to optimize efficiency, generate less waste and repurpose or recycle any waste we generate wherever we can. This keeps it out of landfill and provides us with an additional supply of valuable resources.**

### Meeting Our Waste Targets

To continue to reduce the amount of landfill waste associated with vehicle production, we set ourselves a challenging target: to reduce waste to landfill by 40 percent per vehicle between 2011 and 2016. We exceeded this, reducing waste to landfill by 65 percent. Reflecting our ongoing efforts, we have now reduced waste to landfill, on a per-vehicle basis, by more than 49 percent over the last five years.

In 2018, Ford facilities around the world sent approximately 20,000 metric tons of waste to landfill, 50 percent less than in 2014.

### Taking Further Action to Cut Waste

We have now entered the second phase of our global waste strategy. This includes a key focus on waste minimization and management priorities, driving our efforts to reduce costs and sustain our true zero waste to landfill status through:

- Less waste generated, targeting waste streams within individual plants control as well as high-volume waste streams:
  - Paint sludge: 10 percent reduction over three years
  - Wastewater treatment plant sludge: 10 percent reduction over three years
  - Expendable packaging
- More sustainable waste disposal:
  - General trash: 15 percent reduction over three years
  - Eliminating single-use plastics across our global operations
- Continuing to send less waste to landfill globally:
  - Annual reduction in waste to landfill of 7 percent per vehicle
  - Additional facilities to achieve true zero waste to landfill (ZWTL) status

### Going for Zero

When a facility acquires ZWTL status, it means that absolutely no waste goes to a landfill site. To date, 88 Ford sites have achieved ZWTL.

To ensure that more of our plants and facilities reach ZWTL status, we continue to implement a range of waste reduction initiatives, including:

- Investing in new technologies and programs that minimize waste
- Standardizing how we track and sort waste to aid recycling and reuse
- Focusing on the five main sources of waste to landfill at each facility
- Working with suppliers to increase the use of eco-friendly packaging

### Reducing the Impact of Packaging

Packaging plays an important role in ensuring that components reach our facilities in good condition. As well as protecting its contents, our standard packaging maximizes payload and reduces cost; standardized containers also make packaging more transferable between suppliers.

We continually work to share best practice between regions and always review the packaging of components and parts before we launch a new vehicle, to find opportunities for improvement. In many locations, we have contracts with packaging providers to collect and store packaging for our suppliers and forward it to where it is needed next.

Our packaging guidelines require supplier-provided packaging to have a neutral (or positive) environmental footprint, achieved through true zero waste to landfill and the use of 100 percent recycled, renewable or recyclable materials.

- We aspire to achieve zero air emissions from our facilities
- We will achieve true zero waste to landfill across our operations
- We will eliminate single-use plastics from our operations by 2030
- We will make zero water withdrawals for manufacturing processes
- We aspire to use freshwater for human consumption only

# MINIMIZING OUR SUPPLY CHAIN IMPACT

**We rely on thousands of suppliers to provide the materials, components and services we need to make our vehicles. By sharing best practices, we can help them lower their costs, improve quality and meet their own sustainability targets. This not only reduces the environmental impacts of our supply chain but of the whole automotive industry.**

The automotive supply chain is complex, with many tiers between the original source of the materials and manufacturers such as Ford. Our supply chain includes suppliers of parts and components for vehicle production, as well as indirect suppliers of facilities, equipment, materials and services.

We work closely with our suppliers to build their capacity and ensure sourcing transparency. For materials of concern such as tin, tantalum, tungsten, gold, cobalt, mica and rubber, suppliers may be invited to support initiatives that improve due diligence or required to provide information to verify that the materials in the parts and components supplied to Ford have been sourced responsibly.

Since 2003, we have conducted more than 1,100 third-party external supplier audits and more than 1,500 follow-up assessments globally across all commodities.

Our long-term objectives are to:

- Engage with our supply chain to understand its carbon and water footprints
- Work with selected suppliers to reduce our collective environmental footprint, by encouraging target setting and sharing best practices for reducing energy and water use, $CO_2$ emissions and waste
- Improve the transparency of mineral sourcing within our supply chain while improving the capacity of conflict-free smelters
- Continue efforts to source purchases from veteran-, minority- and women-owned businesses

### Our Supply Chain

| Operations | Production Suppliers | Indirect Suppliers |
|---|---|---|
| **$120** billion global spend on goods and services | **1,200+** Tier 1 supplier companies | **10,000** supplier companies |
| **67** Ford manufacturing sites | **60+** countries | **600+** commodities |
| | **4,400+** supplier sites | |
| | **100,000+** parts manufactured | |
| | **500+** commodities sourced | |

## UNDERSTANDING OUR SUPPLIERS' IMPACT

**As well as directly managing the impacts of Ford-owned and operated facilities, we also have a responsibility to help our suppliers reduce their environmental footprint while ensuring social standards are upheld.**

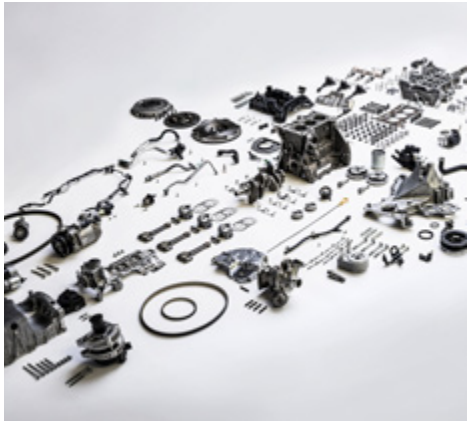
To better understand our suppliers' GHG emissions and water use, and to identify "hotspots", we survey a selection of them every year, using the CDP Supply Chain program's Climate Change and Water Security questionnaires.

We select production suppliers, as well as indirect suppliers of logistics and information technology services, based on their emissions or water intensity, their geographic footprint and the strategic nature of their relationship with us.

These two surveys provide us with qualitative and quantitative information about how our suppliers manage environmental risks and impacts, and maximize opportunities.

### Building Supplier Capability Through PACE

Our supply chain sustainability initiative, PACE, was developed to reduce the overall environmental impact of Ford and our supply chain partners. PACE enables us to share the best practice examples we've implemented with 50 strategic suppliers so that they can be replicated. We encourage our Tier 1 suppliers to extend the reach of the program by cascading the information down their own supply chains.



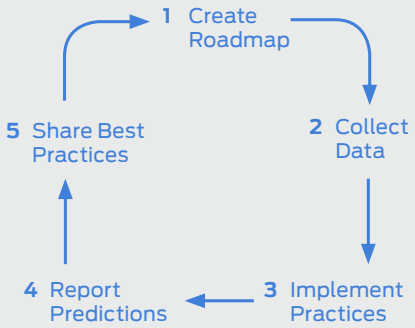
| Suppliers that are: | 2017 | 2018 |
|---|---|---|
| Integrating climate change into their business strategy | 81% | **84%** |
| Reporting a water-related target or goal | 69% | **81%** |
| Reporting an emissions reduction target or goal | 66% | **73%** |

**257**
SUPPLIERS SURVEYED USING CDP SUPPLY CHAIN QUESTIONNAIRE (81% RESPONSE RATE)

**214**
SUPPLIERS SURVEYED USING CDP WATER QUESTIONNAIRE (73% RESPONSE RATE)

## MINIMIZING OUR SUPPLY CHAIN IMPACT CONTINUED

### PACE at a Glance




1. Suppliers create long-term plans for improving environmental performance
2. Baseline environmental data is recorded
3. Successful approaches are selected and replicated
4. Performance improvements are measured and progress against the baseline data is reported
5. Best practice examples are updated and shared among our suppliers and our own facilities

### Engaging With Key Suppliers

As well as PACE, we engage with our key strategic suppliers through our Aligned Business Framework (ABF). This dialogue helps to drive quality and innovation, identify operational synergies and encourage collaboration in areas such as ethical business practices, working conditions and responsible sourcing. To manage sustainability issues with these ABF suppliers:

- Ford verifies that the supplier has a code of conduct that aligns with our own Policy Letter 24
- The supplier provides internal training to ensure its employees understand and comply with the code of conduct – Ford validates their processes to ensure ongoing alignment
- The supplier also verifies that its own suppliers are compliant with our shared standards and expectations

### Our ABF Network

114 suppliers comprising:

- **84** production suppliers and 30 indirect suppliers
- **13** of these are minority-, veteran- and women-owned suppliers

Of our 84 production suppliers:

- **100%** have codes of conduct aligned with our Policy Letter 24
- **81%** have governance systems covering their operations and supply chains

> *Download a list of our ABF Suppliers*

### Recognizing Supplier Excellence

We honor our suppliers for outstanding performance and achievements with our World Excellence Awards. At the 20th annual ceremony, held in May 2018, Ford recognized 56 suppliers from across the globe with awards spanning safety, quality, sustainability, diversity and smart technology. Four companies also received Special Recognition awards.

### Collaborating With Industry Partners

To amplify our efforts and encourage alignment throughout the automotive supply chain, we participate in several industry forums.

- As a founder of the AIAG's Environmental Sustainability Advisory Group and member of the Greenhouse Gas Work Group, we help integrate environmental sustainability, water benchmarking and GHG management across the sector. Along with other OEMs, we developed one-day supplier training programs for GHG emissions, Scope 3 emissions and water management, which provide guidance on calculations and sustainability strategy development
- We have worked alongside other members of the Environmental Science Work Group at the RBA to implement best practice and cross-industry collaboration. We were the first automaker to join the RBA and, as part of our membership, we adopted the Validated Audit Protocol. In 2018, we conducted 30 new audits across a range of suppliers. Through direct engagement, those suppliers improved their scores by more than 50 points between initial and closure audits, reinforcing our combined commitment to improving working conditions. Read more about the RBA audit process
- Through our membership of the Suppliers Partnership for the Environment – a collaboration among automotive OEMs, their suppliers and the U.S. EPA – we are working to advance responsible battery management at vehicle end-of-life, increase biodiversity and reduce waste