



DESIGNING FOR THE ENVIRONMENT

OUR OPPORTUNITIES

- Developing innovative sustainable design solutions while delivering outstanding customer- and brand-focused products
- Developing materials that involve a less resource-intensive manufacturing process and do not result in waste at end of life
- Educating employees, supply chain partners and stakeholders about the benefits of sustainable materials and processes
- Creating end markets for byproducts and other discarded materials that would otherwise go to landfill
- Adopting construction and manufacturing processes that minimize resource consumption

OUR CHALLENGES

- Using tools and methodologies to measure environmental impacts of our materials and products
- Developing common ways to better define sustainable materials on an industrywide basis
- Identifying markets for end-of-life materials in fluctuating global commodities markets
- Minimizing operations water sent off-site by maximizing stormwater use on-site

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Sustainable Materials

As we transform our business to support production of electric vehicles (EVs), we are rethinking how all of our vehicles are made and designing them with a mindset focused on reducing environmental impacts throughout their life cycle.

The most environmentally friendly vehicle is not only electric—it's circular. The idea of circularity—whereby resources and materials are reused on a continual basis—is growing in importance. Today, we enable, by mass, more than 85% reuse or recycling of our current vehicles at the end of their life. Additionally, we will continue to enable 100% reuse or recycling of returned EV batteries at the end of life.

Over the next decade, we aim to achieve at least 50% sustainable material content in our vehicles, measured by total vehicle weight. We have defined sustainable materials as those that reduce dependence on nonrenewable resources and/or minimize disruption to the environment or key natural resource systems. These may range from renewable materials, including bio-based to highly recyclable resources, such as glass or aluminum, that can be reprocessed an indefinite number of times without requiring additional mineral resources. Through verification and certification methods, we ensure the authenticity of those materials and the achievement of our key sustainability goals for manufacturing, including resource preservation and carbon footprint reduction.

Focusing on each part of the equation—a material's origin, its design into a part and that part's destination at the end of vehicle life—allows us to make the most meaningful impact possible. Nevertheless, with thousands of parts that comprise a vehicle design, our work toward

our sustainable materials goal is complex and spans many cross-functional teams including:

- Design
- Material engineering
- Product engineering
- Purchasing and supply chain
- Sustainable workplaces

We are focusing on specific material categories, as well as specific vehicle components, programs and brands. Components within these categories are being examined to determine sustainable improvements; analyzing potential tradeoffs between material costs, sustainability, performance and other features. Internally, we are developing new measurement tools to evaluate material sustainability. As we replace conventional materials with more sustainable materials, we will work to ensure that vehicle performance remains constant in every type of driving condition and for the life of the vehicle. The [GMC HUMMER EV](#) uses an alternative material for all applications that would otherwise use leather. Once a more sustainable material is identified, we also consider when to introduce the new material into the vehicle design and production cadence based on performance, environmental impacts and other factors.

Recycled Content in GM Vehicles

GM is working to increase the sustainable materials used to make our vehicles. While these materials are not all available on all vehicles, each improvement provides valuable insights and brings us closer toward our goal.

RECYCLED THERMOPLASTIC POLYOLEFIN



Cowl Vent Grill

200K

pounds of plastic diverted

POSTCONSUMER NYLON FIBER



Window Support Brackets

3M

pounds of plastic recycled

RECYCLED PC/PBT PLASTIC



License Plate Brackets

200K

pounds of plastic diverted

RECYCLED PET PLASTIC MADE INTO FIBER



Wheelhouse Liners

100M

water bottles recycled

RECYCLED PC/ABS PLASTIC



Radio Brackets

175K

pounds of plastic diverted

RECYCLED TIRES AND PLASTIC CAPS



Ultra Capacitor Barrier Shield

5K

tires saved and 20,000 pounds of plastic diverted



IN ADDITION TO THESE IMPROVEMENTS, WE HAVE IDENTIFIED MULTIPLE COMPONENTS WITH POTENTIAL FOR RECYCLED CONTENT IN THE FUTURE. AMONG THE EXAMPLES:

- Bin Mats
- Console Retainers
- Cup Holder Liners
- Door Trim
- Fans and Fan Shrouds
- Headliner/Rear Shelf
- Interior Bezel, Brackets and Trim Ring
- Floor Carpet
- Seat Fabrics
- Rear Cargo Bin

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With support from our supply base, we are committed to use at least 35% recycled plastic yarn in all future seat insert fabrics, and 100% recycled yarn in future seat bolster fabrics, overhead fabrics, floor carpets and floor mats. Given GM's global scale, this means significant amounts of plastic will be diverted from waste and reused. We also will avoid a certain amount of carbon emissions and water used in the fabric-making process.

In 2020, a cross-functional team worked to identify recycled plastic opportunities for future vehicles. The team sought feedback from internal experts and select supplier partners by hosting collaborative events on the topic. As a result, we expanded the number of recycled plastic types approved for vehicle application and established criteria for integrating recycled plastic resins into future vehicles.

Beyond these examples, we are continually researching new and innovative materials that will help us mitigate our environmental impact while driving customer-focused design and innovation. Plant-based materials, biofabricated materials, regenerative farming and lower-impact leather tanning practices, as well as alternatives to chrome, are among the emerging practices and materials that we are striving to design into GM products.

Measuring Material Impacts

Internally, we are developing new measurement tools to evaluate material sustainability, including renewable and recycled content. GM is collaborating with experts to evaluate tools to measure material social and environmental impacts. This evaluation includes life cycle analyses (LCAs) and environmental product declarations (EPDs). Select supplier LCAs will include data from “cradle to gate”—or raw material extraction through delivery to GM. Beyond gathering information about recycled and renewable content, we will measure environmental impacts like equivalent GHG emissions, total energy consumption, water consumption and end-of-life treatment as reused, recycled, composted, landfilled or burned to produce energy as waste to energy. In this way, we will develop a clearer picture of progress, not only toward our sustainable materials goal, but also our zero-emissions vision.

Battery Recycling

Given GM's 25 years of experience developing EVs, we already have robust programs in place that enable 100% reuse or recycling of EV batteries at the end of life. Since 2013, we have partnered with Oak Ridge National Laboratory on the use of end-of-life EV batteries for backup

power. Today, data centers at Milford Proving Ground and the SAIC-GM-Wuling facility are re-using EV batteries in exactly this manner, as stationary power sources for backup power. Also at Milford, we are using the batteries to balance our use of the grid with an objective to achieve zero net annual energy use for the office building at the facility. To further increase value and reduce carbon footprint, GM is working with the Department of Energy, U.S. Advanced Battery Consortium and directly with recyclers to advance lithium ion battery recycling, and exploring recycled materials that could reduce the need for raw mined materials.

Sustainable Packaging

We have established a companion sustainable materials working group that is dedicated to sustainable packaging. A multidisciplinary group has been tasked with developing a packaging goal and collecting data to better understand GM packaging specifications and requirements. The group is working closely with suppliers and external partners to innovate around current practices and embed circular economy principles in packaging procurement and design. The current priority for this new group is to develop our road map for success that takes into account the full life cycle of our packaging and carbon analysis of the various opportunities.

As part of this work, GM has partnered with WestRock as the preferred supplier for all consumer-facing



↑ General Motors and Ventec Life Systems team members sign the sustainable shipping boxes before delivering the final group of V+Pro critical care ventilators to complete the 30,000-unit order for the U.S. Department of Health and Human Services—to help fight the COVID-19 pandemic

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packaging. WestRock prioritizes recycled content input in their sourcing, averaging 35% to 55% recycled content in corrugated boxes and 100% recycled content in coated boards. Any virgin material used in our packaging produced by WestRock going forward will be certified by the Sustainable Forestry Initiative (SFI).

As of year-end 2020, approximately 7,000 parts for GM Customer Care & Aftersales (CCA) were packaged in WestRock's sustainable consumer-facing packaging. This scope and volume is expected to expand rapidly. In 2021, use of sustainable packaging from WestRock will increase in GM North America CCA facilities and Tier I supplier facilities, and will launch for the first time in Korea and Brazil. In addition to embedding sustainable materials in the packaging, WestRock has partnered with the Sustainable Workplaces team on a recycling project to create new packaging out of used cardboard from GM sites.

Another recent packaging success story has been around the ventilators, masks and face shields that GM produced in response to the COVID-19 pandemic. The boxes used for these products, provided by supplier Menasha, contain 33% to 95% recycled content, with remaining materials coming from SFI-certified sources.

Sustainable Natural Rubber

The tire industry consumes around 70% of the world's natural rubber, and demand is increasing. Most of the world's rubber today comes from Southeast Asia. As demand grows, so too does pressure to convert ecologically valuable and sensitive tropical forests into more rubber plantations which, in turn, puts pressures on local communities that could threaten their fundamental human rights.

Recognizing the importance of taking action to limit the social and environmental impacts from natural rubber production, General Motors became the first automaker to commit to sustainable natural rubber in 2017, and in 2018 became a founding member of the Global Platform for Sustainable Natural Rubber (GPSNR).

GPSNR is a multistakeholder initiative whose goal is to transition the natural rubber supply chain to a more sustainable model. The initiative now has more than 100 members, including OEMs; tire manufacturers; rubber producers, processors and traders; NGOs; and smallholder farmers. One of the group's most significant accomplishments in 2020 was the creation of a members' sustainability policy framework. All members will be expected to adhere to this framework, which covers

economic, social and environmental aspects of sustainability and will help protect ecological health, local livelihoods and fundamental human rights. The policy will be released publicly within the next year and will be one of the most sweeping sets of commitments aimed at increasing the sustainability of a commodity.

Sustainable Materials Beyond the Vehicle

GM's commitment to sustainability extends into global construction projects as well. In 2020, GM recycled over 140,000 tons of wood, metal, concrete and plastic produced in construction projects and found reuse initiatives for over 105,000 tons of concrete, soil, asphalt and other materials. Three key examples of GM's sustainability commitments applied in construction projects are found at GM's Factory ZERO, Spring Hill and Ultium Cells LLC (located in Lordstown).

Factory ZERO is a critical plant for GM's electric future and a model of environmental sustainability. The most reuse cases for construction this year were applied at Factory ZERO, which is located in Hamtramck, Michigan—a culturally rich, 2-square-mile city nestled in the middle of Detroit. GM's construction initiatives at Factory ZERO consider environmental and social sustainability by optimizing water management and communicating with the city mayor and leaders along the way.

Factory ZERO is located on a previously developed manufacturing site where GM is leveraging stormwater management and catering to biodiversity. Stormwater will flow through bio-swales, promoting infiltration, native revegetation and wildlife. All stormwater has extended detention in three ponds on site, and GM will recycle stormwater to reduce clean potable water use, reducing discharge to, and further treatment costs for, the city. GM is working with suppliers like Walbridge, Ghafari, Smith Group, Arcadis and more to ensure the construction projects are applying advanced technologies that accelerate GM's sustainability commitments.

Another example of green construction is GM's application of CarbonCure, a concrete that absorbs 25 pounds of CO₂ for every cubic yard that is laid. GM used CarbonCure this year in the development of a three-bay body shop extension and is evaluating additional uses for the concrete in other construction projects. Lastly, the Ultium Cells LLC construction site has been spending time developing 130+ acres of high-quality wetlands to replace wetlands impacted by the new electric vehicle battery cell manufacturing plant.



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Waste Minimization

Beyond using sustainable inputs in our vehicles, there are other ways we can reduce the volume of waste we generate and the impact we have.

Goal:

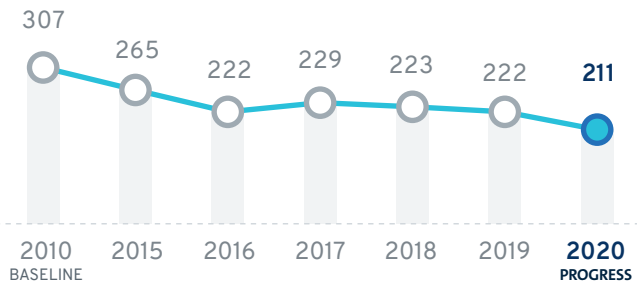
90%

or more diverted operational waste from landfills by 2025.

GM has made steady progress in reducing our operational waste intensity over the past decade. In 2020, we completed the last year of progress toward our goal to reduce waste intensity by 40% and achieve 150 landfill-free sites against a 2010 baseline.

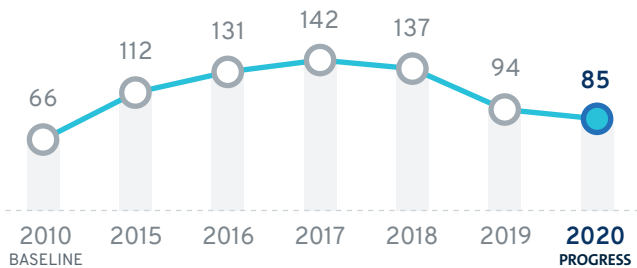
We successfully achieved our initial landfill-free goal between 2014 and 2015 and the second stretched target in 2016. Our strategic restructuring process in 2018 made GM more agile and profitable, but reduced the number of landfill-free sites to 85 in 2020. To take advantage of new advancements in waste management, GM is launching our new Zero Waste circular economy program. This will entail diverting 90% or more of our operational waste from landfills across targeted facilities by 2025. Importantly, waste must also be diverted from use in any type of incineration, making this goal more thorough than a landfill-free target. This program is one of the most comprehensive in the automotive industry, covering solid, liquid and hazardous waste. The Zero Waste program will also enable innovation in the recycling industry, which is a critical component in achieving our diversion target. Between 2017 and 2019, GM diverted an average of 81% of our total waste from landfills or incineration. This figure will be the baseline against which we measure progress toward our 2025 goal.

Reduce Waste Intensity by 40% (kg/Vehicle)



Over the past decade, we've reduced waste intensity by 31%—progress that fell short of our 2020 goal due to reduced production volumes and impacts from facilities closed as part of our strategic global footprint divestments.

Reach 150 Landfill-Free Sites



Original goal and stretched targets were achieved ahead of time in 2016. Some landfill-free facilities were closed as part of our strategic global footprint divestments, resulting in 85 landfill-free facilities in 2020.

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As in the past, innovation, adoption of new technologies and engagement with suppliers both upstream and downstream will help us lead in this area. For example, certain wood pallets are made to particular specifications and cannot be shredded and used as mulch. Rather than sending these materials to landfills, we are working with our design team and upstream suppliers to transition to pallets that are returnable, eliminating the need for disposal after a single use.

Along the same lines, our Gravataí assembly plant in Rio Grande do Sul, Brazil, undertook a packaging optimization project in which they reduced and eliminated unnecessary packaging from shipments and replaced single-use packaging with returnable materials. Through these efforts, the plant will save 205 tons of wood, 85 tons of cardboard and 30 tons of plastics per year. Similarly, our Joinville manufacturing facility in Santa Catarina, Brazil, took a “containerization” approach to waste reduction. By working with suppliers, they transitioned from components that were delivered individually packaged to bulk packaging that significantly reduced cardboard and plastic waste by 233 tons per year. We’re also working with suppliers in Mexico to reduce returnable packaging. Our plants in Mexico recycle most waste, including sending metal to be re-ground into new products or to be reused within GM, and reusing plastic byproducts in pallets, bags and more.



External Engagement and Partnerships

In early 2021, GM, Ford and Stellantis formed a Sustainable Materials Working Group at the U.S. Automotive Materials Partnership LLC (USAMP), which is a subsidiary of the U.S. Council of Automotive Research LLC (USCAR). USCAR is the collaborative technology company of the three U.S. automotive OEMs. The team’s first major program is chemical recycling of automotive shredder residue (ASR), the remaining material—consisting of plastics and other organic materials such as fabric, rubber, glass and polymers—after shredding an end-of-life vehicle. In order to recycle ASR, USAMP is working with PADNOS and Eastman Chemical Company. PADNOS



Reducing Landfill Waste Beyond Our Facilities

We’re engaging local community stakeholders worldwide on waste reduction. In Colombia, GM works with a local solid waste management company, a local public school and United Way Colombia on replicating aspects of GM’s landfill-free program within the community. We have also partnered with EcoWorks, a local nonprofit, to support the recycling of plastic into plastic-composite bricks for prefab housing. In Ecuador, GM’s progress on food waste is informing a food waste reduction project at the Universidad San Francisco de Quito.

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To further increase awareness of sustainability topics, the Sustainable Workplaces team organized a second Sustainability Symposium in 2020.

will demonstrate a cost-effective, energy-efficient, closed-loop process that requires minimal mechanical recycling and processing of ASR to prepare it for use as a feedstock for Eastman's Carbon Renewal Technology (CRT) processes. This circular economy solution will result in cost-effective recovered plastic constituents that can be reformulated for automotive components.

GM leads working groups with other automotive OEMs through the Automotive Industry Action Group (AIAG), and Suppliers Partnership for the Environment (SP). Last year, a SP working group released packaging guidelines supported by Ford, Stellantis, GM, Toyota and Honda.

GM is a signatory to the EPA America Recycles Day pledge. As part of our commitment to reduce waste generation, we collaborate with EPA and other pledge signatories to enhance the nation's recycling system, helping to create a sustainable path for a circular economy to protect the environment. To do so, we are working with other companies in three groups: to promote education and outreach, strengthen secondary materials markets and enhance measurement. We also are partnering with the U.S. Department of Energy on their zero-waste pilot program, which will provide methods for data tracking and benchmarking. We are one year into a two-year partnership with the agency, after which they will share their lessons learned.

Employee Engagement on Waste Reduction

Because best practices account for so much of waste minimization efforts, environmental engineers in both manufacturing and nonmanufacturing operations receive state-of-the-art zero waste training focused on ways to achieve GM's Zero Waste goal. We have introduced an online sustainability course, available to all employees globally, to support our new sustainability goals. The course covers environmental, social and governance-related aspects of corporate sustainability.

To further increase awareness of sustainability topics, the Sustainable Workplaces team organized a second Sustainability Symposium in 2020. The event was held virtually, as a weeklong series of lunch and learns and a fireside chat with our Chief Sustainability Officer, and other members of the Office of Sustainability. Lunch and learn session topics included the pillars of GM sustainability goals of Greenhouse Gas, Fuel Economy and Sustainability; Zero Waste; Water; Sustainable Materials; and Energy. Each consisted of an expert presentation of the topic, GM's progress, an employee call to action and time for questions and answers.



↑ All office tenants and restaurants at the Renaissance Center, GM's global headquarters in Detroit, participate in a compost program. Scraps are used to create nutrient-rich compost that is used in urban gardens throughout the city, including GM's Beaubien Garage rooftop garden. Produce from the garden is donated to a local restaurant, which makes donations equal to the food's value to an organization that serves Detroit's homeless.



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Water Stewardship

Water is a scarce resource that we must manage efficiently, especially in water-stressed areas. While GM's operations are not overly water-intensive, we do use water in the vehicle manufacturing process and make it available for the people in our facilities.

We are committed to responsibly using water while taking actions that preserve water quality and support conservation across our operations, in our supply chain and in the communities in which we operate. Our commitment to water stewardship has been recognized by being named to CDP's 2020 Water A List, the third time we have earned this recognition.

GM plans to reduce the water intensity of our operations by 35% by 2035, compared to a 2010 baseline. This new target builds on progress over the past decade that saw our water intensity decrease from 4.77 to 3.97 cubic meters per vehicle.

We also have signed the CEO Water Mandate—a UN Global Compact Initiative—joining other global business leaders to address key challenges around water security and further aligning to the UN Sustainable Development Goals. Moving forward, we will map our water progress and achievements against the mandate's six core commitment areas: Direct Operations; Supply Chain and Watershed Management; Collective Action; Public Policy; Community Engagement and Transparency.

There are important interconnections between GM's water goals, energy goals and overarching vision of a zero-emissions future. Electricity generation from renewable resources such as wind and solar requires almost no water, according to the Energy Information Administration. As a result, making progress in one area can bring benefits in others.

Water usage is managed on a local basis, with each facility working toward its own targets for year-over-year improvement. Innovative approaches have allowed facilities to continue production without disruptions, even in water-stressed areas. For example, our Joinville plant in Brazil has upgraded its wastewater treatment system, increasing its reverse osmosis capacity with a new configuration of filters and tanks to allow for more wastewater reuse. The plant also installed piping to allow it to better harvest and reuse stormwater.



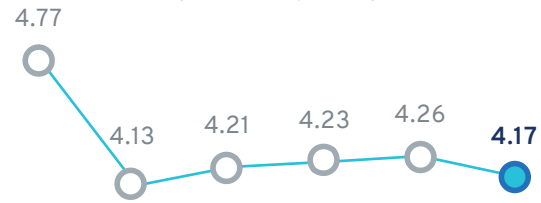
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Within our supply chain, we typically focus on areas with the greatest water impact, such as our paint operations. We also evaluate water usage at the vehicle component level. Some of the parts that have the highest life cycle water impacts are frame assemblies, steel parts, carpets, seats, engine blocks, heads, tires and wheels. GM is working closely with suppliers to understand their water use and help them unlock opportunities for improvement.

Local facility knowledge provides information on water supply impacts for current operations, and we use the World Resources Institute’s Aqueduct tools that map water risks such as floods, droughts and stress, using open-source, peer-reviewed data for future forecasting. We mitigate risks in current operations with either alternate supply or water reuse, working with local utilities. GM engages with over 300 suppliers through CDP Water Security Supply Chain and other organizations like AIAG.

We also engage employees at our manufacturing facilities through water treasure hunts, focused activities where groups come together to seek out new ways to reduce our consumption. A recent water treasure hunt in South Korea engaged more than 20 employees and led to water use reduction opportunities equal to almost 100 Olympic swimming pools.

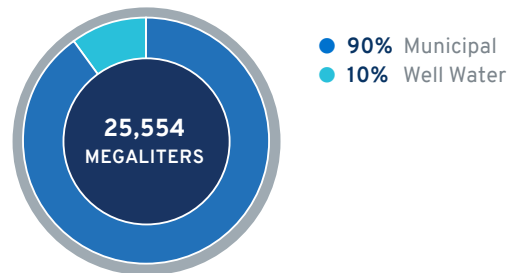
Water Intensity
(Cubic Meters/Vehicle)



Year	2010	2016	2017	2018	2019	2020
BASELINE						

Due to a 27% reduction in vehicle production volume in 2020 as a result of the pandemic, GM reduced water intensity by only 13% in 2020 compared to 2010. There is a fixed water component for plant operations even during shutdown. With conservation and efficiency projects we were able to reduce absolute water use by 23% in 2020 from 2010.

Total Water Withdrawal From All Areas, by Source
(Percent)



Water from third parties or Municipal systems provides 90% of use in our operations.



Conserving Water, Protecting Life

In the forests of South America, conserving watersheds means protecting habitat for thousands of species and safeguarding ecosystems that act as carbon sinks. GM has established partnerships with environmental organizations helping protect land in Argentina, Ecuador and Colombia. In Ecuador, GM partners with the Fondo de Agua water trust on the eastern Andean mountain range, helping to protect nearly 2,200 acres of highland plateau that provides water for the city of Quito. Protecting land through this partnership allows us to offset our Ecuador plant’s water and carbon footprints. In Colombia, a partnership to restore native forest habitat surrounding Bogotá contributes to watershed conservation and habitat protection for 15 endangered bird species.