Resource dependency

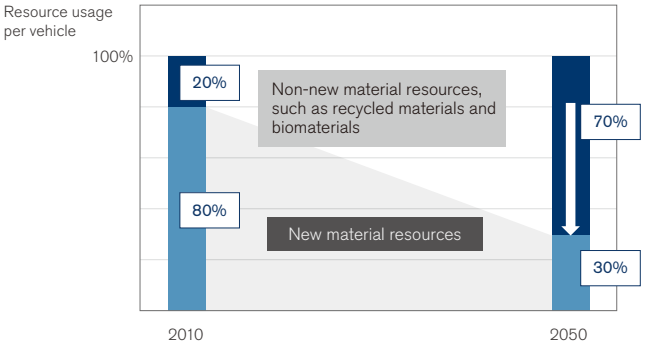
Resource dependency policies and philosophy

With the aim of maximizing the value of resources, Nissan has been targeting green growth while raising the efficiency of resource use to the ultimate level and using more renewable resources and recycled materials.
In working toward the long-term vision of using materials that do not rely on newly mined resources for 70% of the materials used in each vehicle in 2050, we will strive to minimize the use of natural resources and maintain new resource usage at 2010 levels.

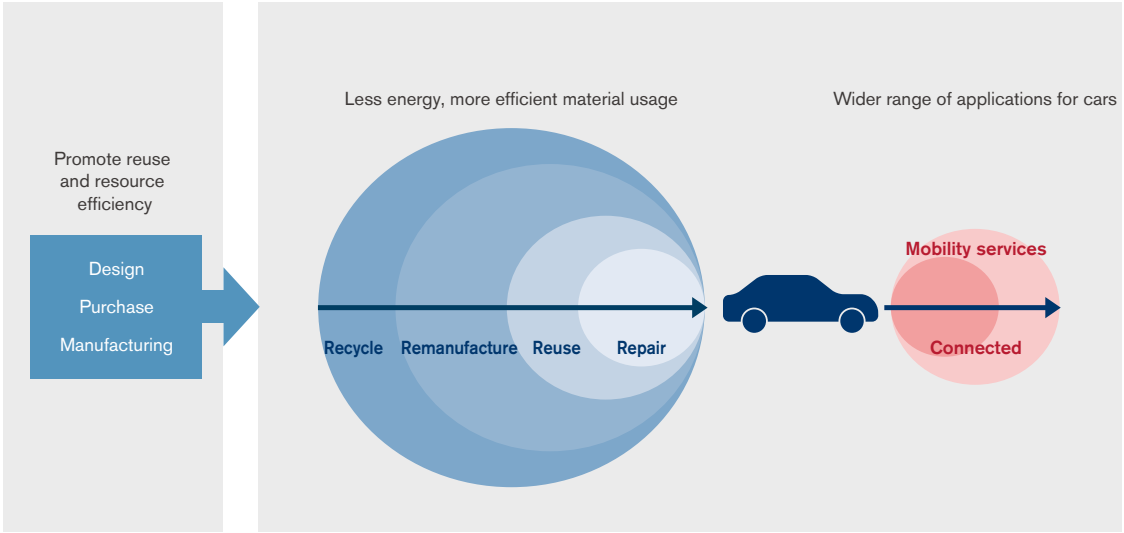
Resource dependency management

In order to use the earth's precious and limited resources efficiently, we have focused our efforts on the closed-loop recycling of steel, aluminum, and plastic —three kinds of material which account for a large proportion of vehicle content yet also have a major impact on the environment.
As part of the Nissan Green Program 2022 (NGP2022), Nissan is developing systems for using resources efficiently and sustainably across their entire life cycle and has adopted the concept of the "Circular Economy" to maximize the value it provides to customers and society. In an attempt to use resources efficiently with less energy, we will promote the use of recycled materials and recycling end-of-life vehicles, while striving to incorporate reusable resources in our activities at the design, purchasing, and manufacturing stages. We are using fewer resources overall, both through appropriate use of chemical substances and by making vehicles lighter. We will continue to promote the efficient use of resources with further reduced energy requirements and the expanded use of repaired and rebuilt parts for customers' repairs as well as the secondary use of EV batteries in the vehicle use stage, and foster the development of biomaterials and dieless forming technology for practical use.
Another focus is to increase the value cars manufactured in this way provide to society and ensure that cars can be put to best use by promoting electrification and autonomous drive in our products, pursuing connectivity and providing mobility services such as ride sharing.

Long-term vision for reducing resource dependency



Nissan's circular economy concept



Resource dependency: Achievements

Reducing dependence on newly extracted resources to 70% by 2022

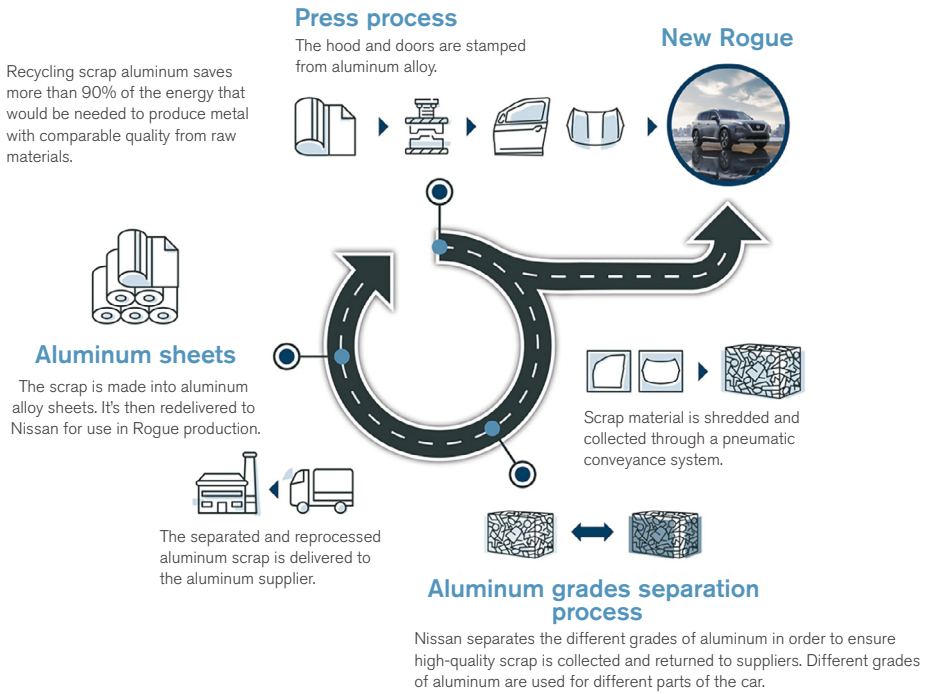
Nissan has implemented a policy of minimizing the use of newly extracted natural resources and maximizing the use of recyclable materials from the early development stage while also making structural improvements to facilitate recycling. We are also reducing the use of resources in the manufacturing process and making more efficient use of resources.

In NGP2022, our goal was to cut the use of newly extracted resources to 70% per vehicle in fiscal 2022. We intended to increase the use of recycled materials in our vehicles on a global scale, including Japan, Europe, and North America, in cooperation with our suppliers.

Initiatives to expand use of recycled materials (Ferrous and nonferrous metals)

In fiscal 2022, ferrous metals accounted for 61% of the materials used in our automobiles by weight. Nonferrous metals made up another 15% and resins 13%, with miscellaneous materials making up the final 11%. To further reduce our use of natural resources, we are advancing initiatives to expand the use of recycled materials in each of these categories.

We are taking steps to reduce the steel and aluminum scrap left over in the manufacturing process, and working globally with business partners to collect and reuse this scrap as material for new vehicles through closed-loop recycling initiatives.



Currently, at Nissan Motor Kyushu and plants in North America and Europe, where X-Trail, Rogue and Qashqai are manufactured, we are collaborating with aluminum manufacturers to adopt a closed-loop recycling process that recycles aluminum scraps generated during manufacturing into aluminum alloy sheets for automobiles. The sorting and collecting of scrap in this process control impurities, realizing horizontal recycling without quality deterioration, which contributes to reductions in the amount of newly mined resources (aluminum ingots) used.

Initiatives to expand use of recycled materials (Resins)

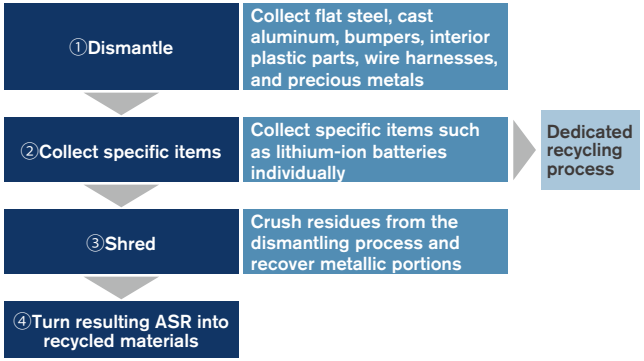
In addition to our initiatives to expand the use of recycled steel and aluminum, Nissan also strives to use more recycled resins.
As a closed-loop recycling initiative, we are collecting finished bumper scrap generated at our plants and sending it to our Oppama Plant, where we process it by removing the paint film and recycling it. These recycled resins have been given new life as bumpers in the Nissan LEAF and many other new vehicles. This initiative was expanded to Dongfeng Motor Co. (DFL), our joint venture in China, where they have been used to produce replacement bumpers since 2014.
Additionally, exchanged bumpers collected from dealerships are being recycled as materials used in under covers and for other components.
We collected and recycled approximately 87,000 bumpers in fiscal 2022, representing 57% of bumpers removed at Japanese dealerships. Furthermore, 30% of the automotive shredder residue (ASR) processed at dedicated processing plants is made from resins. In order to use these resins in automobiles, we are running a number of R&D projects on topics such as optimizing the recycling process for resins recovered from ASR, and conversion of auto waste plastic into oil. *1

Research on optimization of ASR recovered resin recycling process. Left photo is ASR and right photo is resin recovered from ASR.

End-of-life vehicle recycling

Nissan considers the three Rs —reduce, reuse, and recycle —from the design stage for new vehicles. Since fiscal 2005, all new models launched in the Japanese and European markets have achieved a 95% or greater recyclability rate.*2
We have also joined forces with other automotive companies to promote the recycling of end-of-life vehicles (ELVs) through dismantling and shredding.
Based on Japan's End-of-Life Vehicle Recycling Law, Nissan has achieved at least 95% effective recycling rate of ELVs in Japan since fiscal 2005. In fiscal 2022, we achieved a final recovery ratio for ELVs of 99.5%*3 in Japan, greatly exceeding the target effective recycling rate of 95% set by the Japanese government.

ELV processing flow



Since 2004, Nissan and 12 other Japanese auto manufacturers have supported ASR recycling facilities, as called for in Japan's End-of-Life Vehicle Recycling Law, as an integral part of a system to recycle ASR effectively, smoothly, and efficiently. Nissan is taking an important role in this joint undertaking.
We have also established a take-back system for ELVs in Europe. This network of Authorized Treatment Facilities was developed for individual countries in collaboration with contracted dismantlers, contracted service providers, and governments in alignment with a European ELV directive.
Additionally, Japan Automobile Manufacturers Association, Inc. (JAMA) established a common scheme for recovering used lithium-ion batteries along with a system for processing these batteries appropriately, and put both into operation in fiscal 2018.

*1 These R&D projects are undertaken as part of our recycling optimization support business using surplus money from recycling fees deposited for three specified components (refrigerant, airbags, ASR) based on Japan's End-of-Life Vehicle Recycling Law. Click here for more information on the implementation of Nissan's project to advance recycling (Japanese only). https://www.nissan-global.com/JP/SUSTAINABILITY/ENVIRONMENT/A_RECYCLE/R_FEE/SAISHIGEN
*2 Calculated based on 1998 JAMA definition and calculation guidelines (in Japan) and ISO 22628 (in Europe).
*3 Based on Nissan research

Developing biomaterials

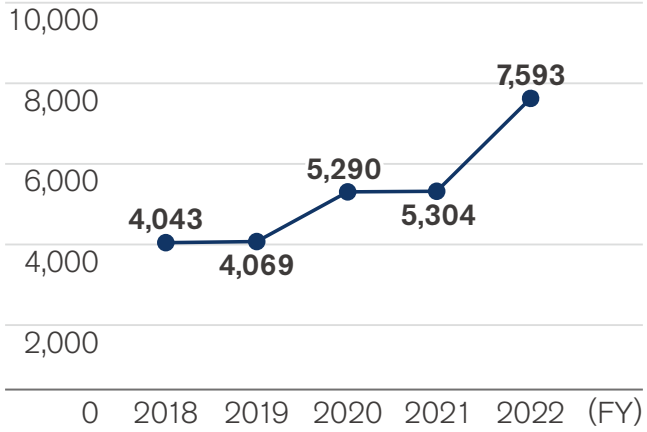
Nissan is promoting technical research to replace plastics and other resin materials used in automobiles with biomaterials derived from plants.
NGP2022 contained concrete goals for biomaterials development, and these materials are already being used in cars. For example, the coverings on the seats in the Nissan LEAF are made using biomaterials.

Seat coverings made from biomaterials in Nissan LEAF

Proper use of regulated chemical substances

Nissan revised its standard for the assessment of hazards and risks in the Renault-Nissan Alliance, actively applying restrictions to substances not yet covered by regulations but increasingly subject to consideration around the world. As a result, the number of defined chemical substances covered in fiscal 2022 rose to 7,593. These steps are thought to be necessary for future efforts in the repair, reuse, remanufacture, and recycle loop for resources. *1

Defined Chemical Substances (Substances)



Expansion of remanufactured parts

Parts with the potential for recycling include those reclaimed from ELVs, as well as those replaced during repairs. In Japan, we collect and thoroughly check the quality of these secondhand parts. These parts are sold as Nissan Green Parts in two categories: remanufactured (recycled) parts, which are disassembled and have components replaced as needed, and reusable (used) parts *2, which are cleaned and tested for quality.
In NGP2022, we enhanced the deployment of Nissan Green Parts in Japan, Europe and North America, aiming for twice the parts coverage in 2022 compared to 2016. This initiative provides customers who seek to use cars for a long period of time with the new option of using remanufactured parts.

Example of Nissan Green Parts in Japan

Alternator

Air conditioning compressor

Starter motor

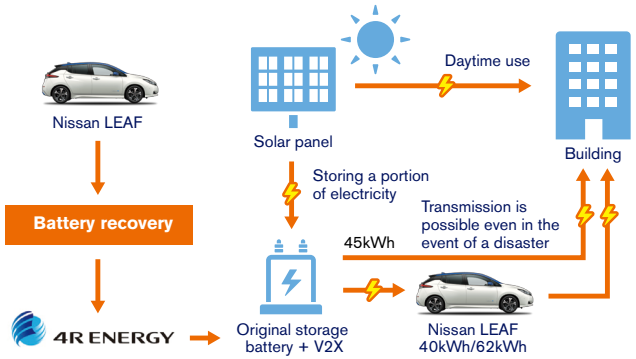
*1 Click here for more information on chemical substances governance. >>> P060
*2 Not available at some retail outlets.

Promotion of 4R for second-life use for lithium batteries

Lithium-ion batteries used in Nissan's EVs retain capacity well beyond the useful life of the vehicles themselves. The "4R" business models —which reuses, refabricates, resells, and recycles lithium-ion batteries —allows for their effective use as energy storage solutions in a range of applications, thus creating a much more efficient energy cycle of battery use.

4R Energy*1 is actively engaged in the development and production of various battery storage systems built with used Nissan LEAF batteries at the Namie facility. One example of these efforts is the development of stationary power storage systems that reuse batteries used in the Nissan LEAF for the purpose of enhancing resiliency. Since September 2019, this reuse stationary power storage system (40 kWh) has been used in trials for procuring electricity using renewable energy at ten 7-Eleven convenience stores in Kanagawa Prefecture. Additionally, in conjunction with IKS Japan Co., Ltd., we are developing new models with Vehicle to Everything (V2X) functions that can also utilize electric power from EVs, sales of which launched in fiscal 2020 and are proceeding apace.

Overview of proof of concept for procuring electricity through renewable energy

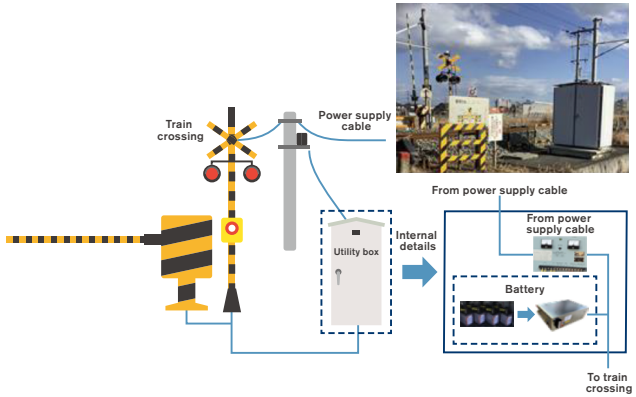


In addition, recycled lithium-ion storage batteries "EneHand Green (the trading name of 4R Energy)" were developed for East Japan Railway Company (JR East) as a power source for railroad crossing security equipment by reusing modules from the used 24kWh batteries recovered from the Nissan LEAF. The system features longer service life and lower operating costs compared to conventional lead-acid battery power supplies.

Field trials began in January 2021 on the Joban Line, followed by trial installations (5 units) at train crossings on the Joban and Mito Lines, and advanced installations (10 units) of the production version.

In fiscal 2022, the system was introduced at approximately 160 train crossings with high battery use and therefore high impact. The system will be used at more train crossings over time.

Reused Nissan LEAF batteries be utilized at JR East train crossings



At the same time, 4R Energy acquired the world's first UL1974*2 certification in June 2019, which is an international evaluation standard for evaluating repurposing batteries and has been certified by a third-party organization for reusage and refabricating processes and product manufacturing with an emphasis on safety. Furthermore, in recognition of these activities, in October 2019 4R Energy was presented with the Frost & Sullivan*3 "2019 Strategy Innovation and Leadership Award," and in March 2020, in conjunction with Nissan, 4R Energy and Nissan won the "Sixth Annual Japan Resilience Award 2020," sponsored by the Association for Resilience Japan.*4

Further, in recognition of efforts to reduce CO_2 emissions, Nissan and 4R Energy received the "Minister

*1 4R Energy Corporation was launched in 2010 as a joint venture between Nissan and Sumitomo Corporation in anticipation of the increasing need to utilize reusable lithium-ion batteries more effectively as the EV market expands. Given Nissan's engagement in establishing EV battery reuse and refabrication technologies and the increasing number of used batteries collected, in March 2018, operations commenced at Japan's first base and plant for the reuse and refabrication of used lithium-ion batteries, located in the town of Namie, Fukushima Prefecture.

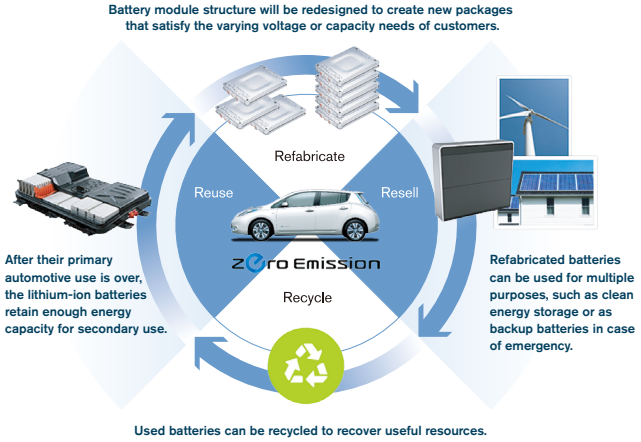
*2 The UL1974 Standard for Evaluation for Repurposing Batteries defines the process for determining and classifying the suitability of usage when battery packs, modules, or cells used to drive EVs have finished their intended period of use. Evaluating reused batteries in accordance with this process enables the provision of reused batteries that are safe and give a clear understanding of remaining capacity to meet a variety of demands.

*3 Frost & Sullivan provides research and consulting services in 80 countries and over 300 major markets through a global network of more than 40 locations.

*4 In light of the results of the National Resilience Minister's Private Advisory Committee National Resilience Roundtable, to ensure the Fundamental Plan for National Resilience is executed smoothly, the council aims to build a resilient nation with cooperation among industry, academia, government, and the private sector.

of the Environment Award in the Development and Commercialization Category, Mitigation and Adaptation Division" for "CO_2 reductions through the spread of electric vehicles and Japan electrification action 'Blue Switch' activities."
We are extensively involved with 4R business model activities globally as well.

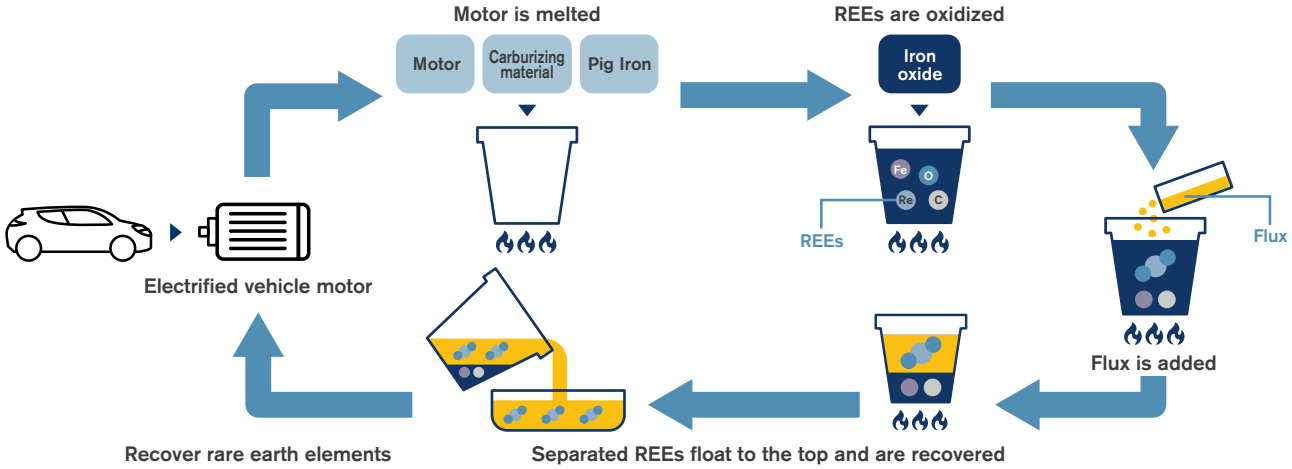
Recycled resource circulation facilitated by the Nissan LEAF



Reducing use of scarce resources

Permanent magnet motors for EVs, HEVs, and e-POWER use scarce resources called rare earth elements. Reducing their usage is important because rare earth elements are unevenly distributed around the globe, and the shifting balance of supply and demand leads to price fluctuations.
Nissan has continuously reduced the use of heavy rare earth elements, and in 2020, the Note e-POWER adopted magnets with 85% less heavy rare earth elements compared to 2010. Furthermore, the 2022 Nissan ARIYA uses an electrically excited synchronous motor without permanent magnets.
As a new initiative, Nissan is also promoting the development of rare earth metal recovery technologies from drive motor magnets. Up to now, in order to recycle magnets used in motors, multiple processes including manual disassembly and removal of the magnets have been required, making economic efficiency an issue. Nissan and Waseda University collaborated to establish technologies for recovering rare earth metals in highly pure states through direct dissolution using borate as a flux, eliminating the need to dismantle the motor rotors. Currently, we are conducting trial testing using motors that did not meet our shipping standards in order to put them to practical use.
In these ways, with respect to motors, which are a key technology, Nissan is engaged in developments corresponding to the circular economy concept, from reducing the amount of rare earth metals used to reuse that utilizes resources efficiently and sustainably.

Recycling process for rare-earth elements (REEs) used in electrified vehicle motors



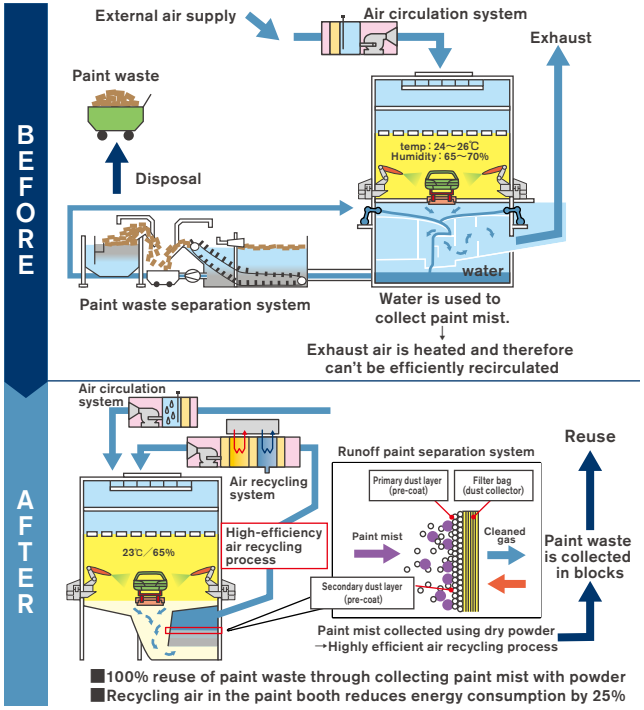
Resource dependency: Achievements in waste reduction

Thorough measures for waste materials

Nissan actively promotes measures based on the 3R (Reduce, Reuse, Recycle) approach in its production processes whenever possible, striving to minimize the waste generated and maximize recycling efficiency by thorough waste sorting. At the end of fiscal 2010, we achieved a 100% Recycling rate at all of our production sites in Japan, including five manufacturing plants, two operation centers, and five affiliates. Overseas, we have reached 100% Recycling rates at plants in Mexico, Brazil, and elsewhere. Under NGP2022, we undertook initiatives to reduce waste from our production factories by 2% annually in Japan and 1% annually worldwide as compared to business as usual (BAU*1). As part of such efforts, we are reducing packaging materials used in import and export parts shipping, working with Renault to repeatedly use plastic and returnable containers*2 for the distribution of parts between overseas bases. Furthermore, we have optimized parts shape at parts design stage which is called logistics simultaneous activities to reduce the volume of packaging materials used. We also contribute to waste reduction by selecting recyclable materials at the packaging material selection stage and are actively engaged in the development of recycling technologies for carbon fiber reinforced plastics (CFRP).

Promoting recycling with dry paint booths

Recycling is also being promoted at the Nissan Intelligent Factory, which began operations in 2021.
Conventionally, residual paint in the air during the painting process has been mixed with water and disposed of as waste. By employing dry booths that do not use any water, 100% of the paint mist is collected in the plant and recycled as a substitute for the auxiliary agent used to remove impurities in the iron casting process.



Waste

Waste generated globally in fiscal 2022 amounted to 157,982 tons, same level as 158,199 tons in fiscal 2021.
Waste generated globally from production sites in fiscal 2022 was 149,999 tons★, same level as 150,945 tons in fiscal 2021. *3

	Unit	2021	2022
Total	ton	158,199	157,982
By region			
Japan	ton	52,386	51,069
North America	ton	51,062	52,007
Europe	ton	33,895	36,577
Other	ton	20,857	18,329
By treatment method			
Waste for disposal	ton	7,208	8,688
Recycled	ton	150,991	149,293

*1 Business As Usual
*2 Returnable containers: Containers for packing parts that can be returned to the sender after parts delivery and used repeatedly. Nissan has adopted a folding structure in consideration of transportation efficiency at the time of return.
*3 Click here for more information on Resource dependency (Facility waste). >>> P154

★ This figure is subject to assurance by KPMG AZSA Sustainability Co., Ltd. For details, please see here. >>> P058