

# ENVIRONMENTAL STATEMENT BMW GROUP 2018

## ENVIRONMENTAL PROTECTION IN PRODUCTION



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## Foreword

We at the BMW Group are convinced that the way to secure the future of our company is through sustainable business practices. Logically, therefore, sustainability is a fundamental principle of the BMW Group.

In environmental protection, which is a central element of sustainable business, we strive for continuous improvement with the help of management systems such as EMAS, in order to comply with our environmental responsibilities to even higher degree. However, this aspiration does not end at the factory gate: we expect a reduction in environmental impact from our partners too.

We are on the right track with our activities: in addition to positive feedback from various stakeholders, in independent evaluations we have been ranked as a leader for several years.

*Ursula Mathar*



**Ursula Mathar, Head of Department Sustainability and Environmental Protection**

## Introduction

The BMW Group's "Number ONE Next" strategy aims to make the company a leading provider of premium products and premium services for individual mobility. For the BMW Group, that includes the principle of sustainability. It has set itself the goal of anchoring sustainable business across the entire value chain and in the underlying processes - and thus creating added value for companies, the environment and society. In order to continue to meet the expectations of various stakeholder groups in this regard, we regularly hold stakeholder dialogs.

Environmental management is part of our commitment to sustainability. The BMW Group systematically improves resource efficiency in its global production network and has set itself concrete goals to be achieved by 2020. For each vehicle produced, energy/water consumption, process wastewater, waste for disposal and VOC emissions must each be reduced by 45% (base year: 2006). In addition, the BMW Group has the vision of meeting 100% of its energy needs from renewable energies. In 2017, we have already achieved this goal at our European production sites.

Specifically, the following improvements per vehicle produced \* were achieved in 2017:

<b>Energy consumption</b>	<b>-36.5%</b>
<b>CO<sub>2</sub> emissions</b>	<b>-61.0%</b>
<b>Waste for disposal</b>	<b>-79.6%</b>
<b>Water consumption</b>	<b>-31.9%</b>
<b>Process waste water</b>	<b>-51.2%</b>
<b>Solvent emissions</b>	<b>-59.0%</b>

\*Efficiency figures calculated from resource consumption of vehicle production divided by the total number of vehicles produced incl. Joint Venture (BBA), excluding vehicles from contract manufacturing (Magna Steyr, Nedcar).

On average, between 2006 and 2017 the BMW Group reduced its resource consumption and emissions per vehicle produced by 53.2%.

Environmental protection management includes the early integration of environmental aspects into all important investment decisions, the targeted implementation of the company's internal Best Practice approach, and continuous monitoring and tracking of all relevant environmental indicators.

The environmental management system of the BMW Group has the goal of achieving optimum environmental protection within the corporate strategy and target framework. It takes into account the needs of our stakeholders and the entire life cycle of our products and services. Environmental protection is an integral part of the company's internal structures, workflows, and processes. These take account of:

- Impact on the environment,
- Legal and other requirements,
- Internal and external information and communication on environmentally relevant topics.

The BMW Group appointed an environmental protection officer way back in the early 1970s, and since then it has been continuously improving its environmental footprint. The progress made can be seen, among other things, in the company's position in the Dow Jones Sustainability Index: under this globally-recognized family of sustainability indices, the BMW Group is the only automobile manufacturer to have been ranked among the top companies from the start. In 2017, the BMW Group was once again the only German car manufacturer to be included in the Dow Jones Sustainability Indexes (DJSI) "World" and "Europe," making it the only company in the automotive industry with an uninterrupted listing since the index was established.

Further information can be found in our Sustainable Value Report 2017, chapter Further Key Figures.

## Scope

The rules for sustainability and environmental protection are binding for all BMW Group companies, i.e. for BMW Group AG and domestic and foreign companies in any legal form bound under company law and with a stake of over 50% ("Group companies"). For companies controlled jointly with a third party (joint ventures), these regulations apply by agreement with the respective third party.

The EMAS Group statement applies together with the plant-specific parts for the sites:

Location	Registration number
Bayerische Motoren Werke AG: Plants 01.10 and plant 01.30, Munich	D-155-00206
Bayerische Motoren Werke AG: Plants 2.10, 2.20, 2.23, 2.27, 2.30, 2.40, 2.41, 2.50, 2.70, 2.72 Dingolfing	D-163-00043
Bayerische Motoren Werke AG: Plant 3.10, Berlin	D-107-00105
Bayerische Motoren Werke AG: Plant 4.10, Landshut	D-163-00046
Bayerische Motoren Werke Motoren GmbH: Plant 5.10, Steyr*	no location registration
Bayerische Motoren Werke AG: Plant 6.10, Regensburg and Innovation Park 6.20, Wa-ckersdorf	D-166-00050
Bayerische Motoren Werke AG: Plant 7.10, Leipzig	D-159-00048
BMW Fahrzeugtechnik GmbH: Plant 8.20, Eisenach (100% subsidiary of BMW AG)	D-145-00016

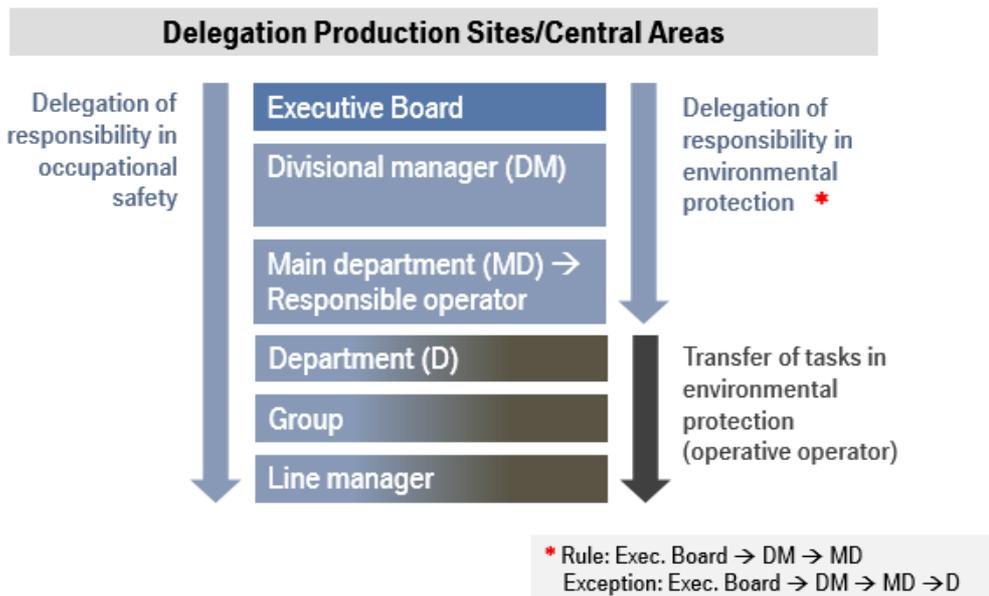
\*Subject to regular environmental audits by the environmental verifier TÜV Süd Landesgesellschaft Österreich.

The environmental management system is established at all production sites of the BMW Group and in the central planning departments. With the exception of the Manaus location, the systems are certified according to DIN ISO standard 14001:2015.



**BMW Group Leipzig plant**

## Environmental Management



### Delegation chain of operator responsibility in environmental protection

The executive board bears overall responsibility for environmental protection. As part of the delegation chain, operator responsibility is transferred to site management. Every facility, every building, and every area of the site is assigned to a person known as an operator. He is responsible for the products, processes, equipment, and technical systems in his area. Operators and employees at the respective locations are supported and advised by specialist environmental protection departments. This involves the environmental management officers and operational officers for waste, water protection and emission control, who drive implementation of production processes that are as environmentally friendly as possible.

At the company level, the Department of Sustainability and Environmental Protection advises the decentralized environmental protection departments. Under its leadership, regular meetings of the Environmental Management Officers of the plants take place in the Environmental Protection Steering Group. The Steering Group coordinates Group-wide environmental protection activities in the Production area. At the same time, cross-technology energy groups exist at the sites, whose task is the continuous optimization of energy consumption in the ongoing production operation. In its vehicle production, the BMW Group follows the Clean Production philosophy. In doing so, the company has committed itself to preventive environmental protection and to systematically and consistently lowering resource consumption and environmental impact in its vehicle manufacturing process. For this purpose, environmentally-relevant reporting ratios are gathered systematically on a monthly basis: energy consumption, water consumption, process wastewater, solvent emissions (VOC) and waste for disposal.

## **EMAS - Regulation for Efficient Environmental Protection**

Implementing the environmental guidelines of the BMW Group calls for environmentally conscious thinking and action throughout the entire organization. To facilitate this, an environmental management system is operated in accordance with the provisions of EC Regulation 1221/2009 and EMAS Regulation (EU) 2017/1505 on the voluntary participation of organizations in a Community eco-management and audit scheme (EMAS). It also includes elements of the internationally-recognized environmental management standard DIN EN ISO 14001. The requirements of these regulations are specified in mandatory specification documents, such as the BMW Group guidelines and instructions, the BMW Group management manual for quality, environmental protection, occupational safety, ergonomics, health management and corporate safety, process descriptions and procedures and work and operating instructions.

## Compliance Management

Responsible and lawful action is one of the basic prerequisites for the entrepreneurial success of the BMW Group. This is an integral part of our corporate culture and forms the basis for the trust that our customers, shareholders, business partners, and the public place in us.

The Executive Board and all employees of the BMW Group are committed to responsible conduct and to compliance with applicable regulations. These form the binding framework for the diverse worldwide entrepreneurial activities of the BMW Group.

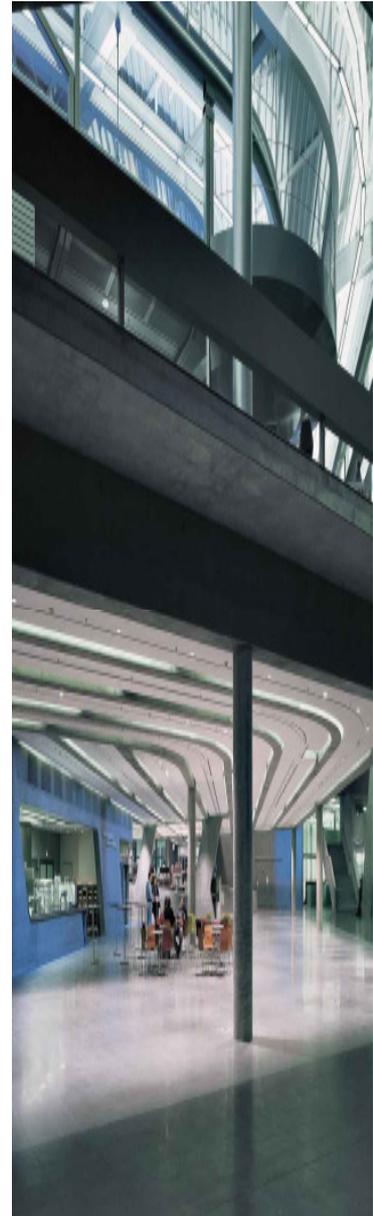
The basis of compliance management is the BMW Group Code of Conduct, in which the Executive Board of BMW AG commits to compliance as a joint task ("Tone from the Top") and makes it clear that legal violations are not tolerated. The Code of Conduct explains the importance of legal compliance and provides an overview of the legal topics relevant to the BMW Group.

In avoiding legal violations, executives have a special responsibility and an exemplary role to play. All BMW Group executives acknowledge this in a written declaration and undertake to inform their employees about the content and meaning of the Code of Conduct and to make them aware of legal risks. Executives exercise their own initiative in regularly checking for observance of the applicable laws and making contact with their employees in this regard. If there are indications of legal violations, these must be rigorously pursued.

Further information on BMW Group Compliance Management can be found both in our Annual Report 2017, Chapter 4, and in our Sustainable Value Report 2017, Chapter 1.3.

## Environmental and Energy Guidelines of the BMW Group

1. The goals of the company: We handle energy and resources responsibly and efficiently and commit ourselves to the sustainable protection of the environment. All BMW Group companies are guided by the International Environmental Charter signed by BMW AG (ICC Charter for Sustainable Development) and by the principles of the UN Global Compact.
2. Duties and responsibility: Environmental responsibility is taken seriously by every business unit. Executives have a special responsibility to implement and live up to the environmental and energy guidelines and to motivate employees in the interests of pursuing this task.
3. Responsible implementation: We will regularly review the success of our environmental measures and make further improvements in environmental protection and energy efficiency wherever necessary. Our Group-wide actions are based on laws, regulations, and standards. Where technical-scientific and organizational knowledge over and above the legal framework for reducing environmental impact exists, and such knowledge is economically justifiable, we will implement it in the spirit of Agenda 21.
4. Group-wide environmental protection: In the design, construction, production and operation of facilities and in other activities, adequate technical and economic facilities are to be used to conserve energy and resources, prevent CO<sub>2</sub> emissions, and minimize any environmental impact. Especially when new production processes and procedures are used, environmental compatibility and the impact on the energy requirement must be included in the overall technical-economic decision. In accordance with the ICC Charter, our goal is therefore to consider the economical use of energy and raw materials, the sustainable use of renewable resources, the minimization of environmentally harmful effects, and the prevention of waste and its safe, environmentally sound disposal. In order to preventively identify, evaluate, and manage all essential environmental aspects, environmental management systems are used.
5. Precautions for emergencies: In the event of a malfunction, the highest priority must be given to the protection of health and the environment. For major incidents, we have developed contingency plans - taking effects across multiple production sites into account - which we constantly adapt to the latest findings.
6. Environmentally-friendly vehicles: In the light of our responsibility for human health and the health of our natural environment, we use the latest technology to increase safety and reduce exhaust emissions, noise emissions, and fuel consumption. By optimizing the design of our products, we ensure that the environmental impact is minimized. In addition



to alternative drives, this includes services and the provision of infrastructures that go beyond the vehicle and which support sustainable mobility.

7. Recycling: To avoid waste, we develop and systematically implement solutions for the recycling of end-of-life vehicles. Our goal is to further promote recycling-optimized product design and the use of secondary raw materials in order to reduce the total consumption of energy and resources from production and operation and to close material cycles.
8. Mobility for the future: Joint planning and cooperation with all areas of politics, society and administration enable the BMW Group to offer future perspectives in which mobility and environmental responsibility are not contradictory. For that reason, we are developing transport concepts and technologies with the ultimate goal of maintaining mobility without negatively impacting quality of life.
9. Involving suppliers: Due to our responsibility for the efficient use of resources and the preservation of ecosystems, we are committed to involving suppliers and service providers of the BMW Group in our energy and environmental policy objectives, and to motivating and encouraging them accordingly. In terms of product environmental compatibility, our suppliers must comply with legal regulations and the BMW Group Sustainability Standard for the supplier network. In order to ensure process-environment compatibility, we expect a certified environmental management system from our suppliers in accordance with DIN ISO 14001 or a derived, recognized, and certified environmental management system for the production site.



**BMW Group Regensburg plant**

## Dialog

The BMW Group is not only responsible for the environmental compatibility of its products and production. Through sustainable action, it is also important to protect people and the environment beyond the boundaries of the plant.

### Taking responsibility

The environmental and energy guidelines of the BMW Group are the basis for action throughout the Group. They require all employees to recognize ecological weaknesses in processes and products and to commit to implementing the resulting solutions. This also applies to external partners such as commissioning parties, suppliers, and contractual partners. To ensure compliance with the principles of action, these are integrated into the environmental management system.



Information resources are:

- **External:** We provide information about our environmental goals and measures in a number of different ways, and dialog with various stakeholders at events, conferences and lectures, and during factory tours. The transparency of our actions is boosted in particular by the reports and brochures, environmental statements of the individual sites, the sustainability report of the entire company, and the websites of the BMW Group and the plants.
- **Internal:** Each employee has a part to play in improving the environmental performance of the BMW Group. Senior management takes the lead as role models, together with training and further education. Suggestions and ideas for improving operational processes and thus also for environmental protection are examined and often rewarded by "cre8" internal ideas management.
- **External partners**  
To an increasing degree the BMW Group is involving its suppliers in environmental issues. The BMW Group expects suppliers to have in place a certified environmental management system in accordance with DIN ISO 14001, or an environmental management system for the production standard which is derived from it, recognized and certified and which takes account of the BMW Group environmental guidelines. Compliance with the law, as well as compliance with BMW Group standards, must be guaranteed. This is based on the standards used for supplier evaluation and selection.

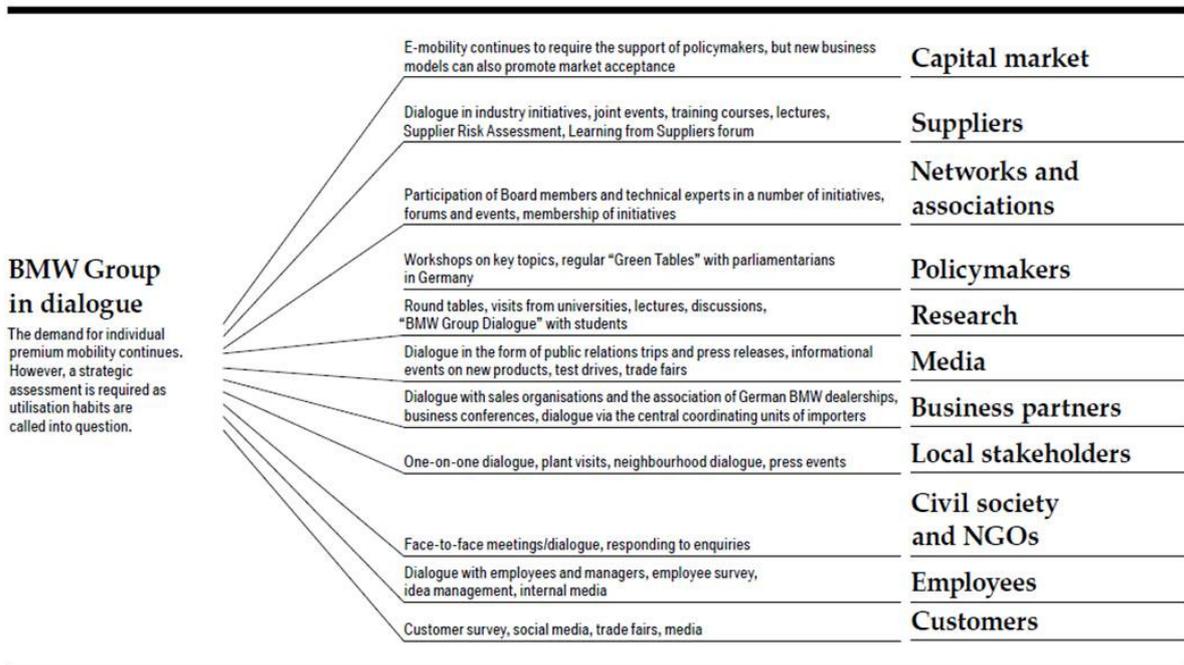


• **Stakeholder dialog**

Customers, business partners, employees and the media, political and scientific decision-makers, non-governmental organizations (NGOs) and investors all place diverse demands on the BMW Group at local and global level. Many of our sustainability goals can only be achieved together with partners from politics, society, science, and industry.

At the same time, interest in information and dialog on sustainability is steadily increasing both in society and on the capital market. As a global company, we are therefore in constant touch with a large number of stakeholders in Germany and abroad. This dialog helps us to identify trends at an early stage, to deepen our social commitment, and to better achieve sustainability goals.

Detailed information on our stakeholder engagement, including the results of the current dialog cycle, can be found in the BMW Group Sustainable Value Report 2017, Chapter 1.2.



**Our approach in dialog with stakeholders**

## Products: Cars, Motorcycles

- **Product responsibility.** We live up to our product responsibility through an ever more resource-efficient production network and holistic recycling concepts, with the incorporation of all sales locations in the sustainability strategy and our unbending commitment to Efficient Dynamics. New technologies help to make our vehicles safer and to continuously reduce the number of accidents. Together with research partners and city administrations, we are developing concepts that will make the transport of tomorrow more efficient and more environmentally friendly. In addition, the BMW Group has comprehensive compliance management systems designed to ensure compliance with legal requirements (see paragraph on Compliance Management above).

- **Approach to product policy and management.** Sustainability is an increasingly important part of premium mobility. For us, this means integrating product responsibility into every facet of our work and actions. A persuasive example of this is the BMW i3 - an automobile which from the outset was developed in line with sustainability goals along the entire value chain. We now



offer nine other models in our fleet as plug-in hybrids (the BMW 2 Series, 3 Series, 5 Series and 7 Series, the BMW X5, and the MINI Countryman). A sports variant, the i3s, has also been developed from the i3. Since 2018, the BMW i8 is now also available as an i8 Roadster and has thus also undergone further development. With a total sales volume of more than 200,000 electric and electrified vehicles, we are on the right track with our sustainability-oriented product policy.

- **Higher performance. Lower fuel consumption. Lower emissions.** The history of our products and of their manufacturing processes is one of a continuous improvement in performance with the greatest possible conservation of resources. With Efficient Dynamics, for example, we now have an effective concept for ensuring long-term individual mobility through consistent reduction in fuel consumption and emissions. At the same time, we are developing groundbreaking answers to questions about the quality, impact and future of our products – throughout their entire life cycle. This concerns the automobile brands – BMW and MINI – as well as our motorcycles. All of this is part of our comprehensive understanding of product responsibility. This begins with the development of vehicles that are efficient and safe for both driver and other road users. It includes development and production processes that help conserve resources and the environment, holistic, high-quality customer care and recycling concepts that ensure that our vehicles have the least possible impact on the environment, including after their useful life. We also ensure this by considering the entire lifecycle of a product (life-cycle analysis) and goals in the context of product development processes. From the perspective of the BMW Group, diesel engines can continue to make a significant contribution to the achievement of national and international CO<sub>2</sub> reduction targets. By means of efficient BMW diesel emission control, all legal emissions requirements are met. Independent

bodies have confirmed the excellent emission values, including in road tests. The technologies for exhaust emission control used for the Euro 5 and Euro 6 diesel models are subject to continuous development. All BMW diesel models produced after June 2018 now feature high-efficiency, multi-stage exhaust emission control featuring an NOx storage catalytic converter and SCR (Selective Catalytic Reduction) system. This also applies to the MINI diesel models, with the exception of the lightweight, compact 3-door, 5-door, and Convertible MINI models.

The engine management system of previous generations of the BMW 5 Series and 7 Series with the niche engine versions BMW M550d xDrive (Sedan and Touring) and BMW 750d xDrive were erroneously programmed using inappropriate software. A software module was used that was not compatible with the exhaust after-treatment system installed in the affected vehicles. Data was mistakenly taken from a software release developed for vehicles with a different emission control system. This results in increased NOx emissions on longer trips, since the regeneration of the NOx storage catalyst is not performed as intended.

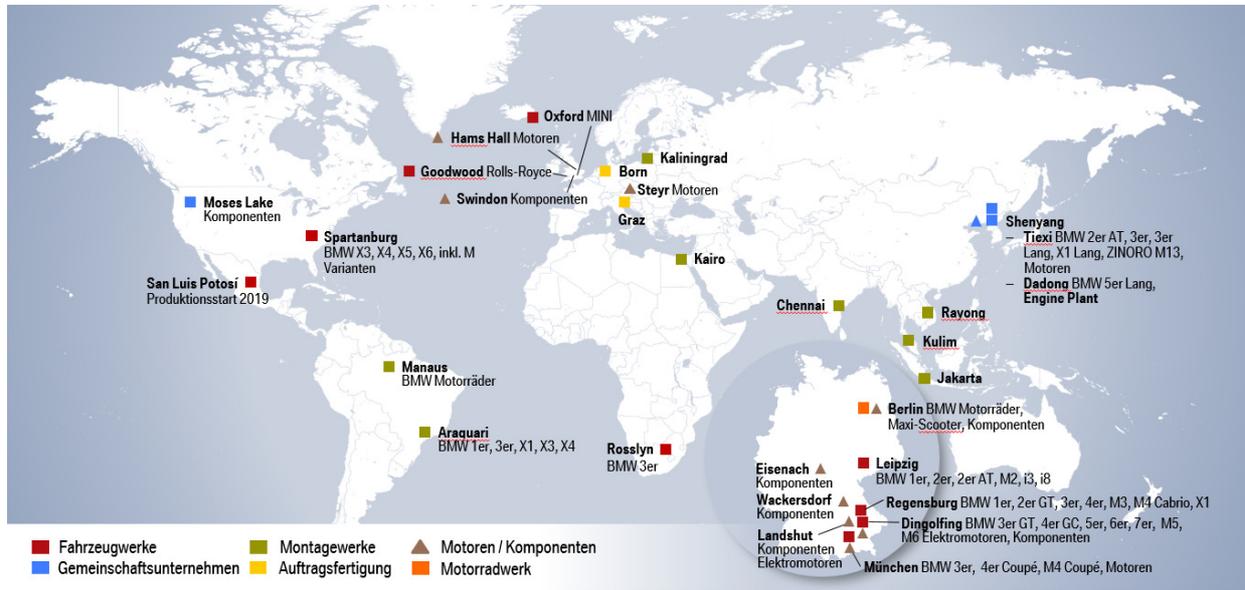
Immediately after the error became known in February 2018, BMW AG decided to issue an emissions-relevant recall for the vehicles affected, in accordance with the vehicle identification number selection, and informed the competent authorities. After agreeing all of the framework conditions, the recall was started in June 2018.

The BMW Group takes the incident very seriously and is committed to a full clarification of the facts. It is providing its full support to the authorities in their work. Irrespective of this, the company had already initiated an internal investigation and is making its existing findings available to the authorities.

To be clear: The error is not in accordance with our standards of process reliability and dependability. The recall ensures that the error is remedied permanently.

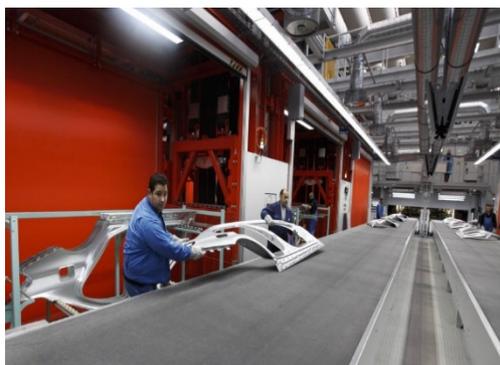
## Technologies

Highly-qualified and motivated people manufacture premium products of the highest quality using state-of-the-art plant technology and sophisticated work processes. In doing so, BMW Group Production stands out through innovation leadership in selected technology fields, with an efficient and flexible international production network and with **new solutions in process and product**. The technologies used at the production sites are listed in the site-specific environmental statements.



**BMW Group production network. 31 production and assembly locations in 14 countries.**

## Forming Technology: Tool and Plant Construction, Press Shops



As specialists in forming technology, the employees in tool and plant construction and in the press shops are enormously important partners for many specialist departments. The spectrum ranges from design and press shop and body construction through to the paint shop and assembly.

### Efficient shaping

In the press shops, steel and aluminum sheets are cut into blanks and then processed into body pressed parts. Since, for the sake of corrosion protection, the blanks are already base oiled by the material suppliers, it is possible to dispense almost entirely with an additional lubricant required for forming, such as diluted emulsions. Fully automated and sound-insulated press lines, transfer presses and highly energy-efficient compact press lines with servo drive technology are deployed here. Extensive oil monitoring systems and oil pans are installed in the facilities and their foundations to prevent the ingress of operating fluids into the foundation of the press or leakage into the soil in the event of a leak. In the press shops, about 40 percent of the material used ends up as metal waste. This is compressed in packaging plants to reduce its volume

and 100% recycled in the material flow. Due to constantly-increasing raw material and energy prices, optimizations are constantly being carried out in all environmentally-relevant processes, in order to make the best possible use of resources.

### Innovative tools

The tool and plant engineering area operates a large number of metalworking machines that contain circulating water-miscible cooling lubricants. The cooling lubricants are analytically monitored and maintained by suitably qualified personnel. Increasingly, minimal lubrication is used, to save resources even more. Toolmaking also operates test presses to test the forming behavior of the tools. The presses are state of the art and optimized for soil and groundwater protection.

Key environmental aspects	What has an impact on the environment	Environmental activity
Waste generation for recycling	Metal waste	<ul style="list-style-type: none"> <li>• Separate collection and recycling of steel and aluminum, along with aluminum alloys</li> <li>• Increased level of material utilization in the planning phase of the components</li> </ul>
Use of materials and substances	Hydraulic oils in presses and emulsions	<ul style="list-style-type: none"> <li>• Monitoring of hydraulic oils and drawing emulsions</li> <li>• Protection of soil and groundwater using oil-resistant coatings and leakage oil retention systems</li> </ul>
Emissions	Vibrations	<ul style="list-style-type: none"> <li>• Vibration isolation of production equipment (presses)</li> </ul>
	Noise emissions	<ul style="list-style-type: none"> <li>• Encapsulation of production equipment (presses)</li> <li>• Use of low-noise press drives</li> </ul>
Energy consumption	Procurement of primary energy	<ul style="list-style-type: none"> <li>• Use of high-efficiency, state-of-the-art presses</li> <li>• Use of state-of-the-art press drives (servo technology)</li> </ul>

### Body Shop



The body shop is the manufacturing area with the highest degree of automation. There, 400 to 600 different parts are gradually assembled to form a paint ready body. In addition to conventional welding processes, innovative joining techniques such as laser welding, bonding or spot-welding bonding are used. Riveting, clinching and screwing are also used - especially if other lightweight materials (aluminum, carbon fiber composite components) are used in addition to higher-strength steels. The manufacturing process begins with the assembly of many individual parts to create sub-assemblies.

Thus the floor assembly, side frames, but also doors and foldings, amongst others, are created using various welding systems, which are connected by means of an automated conveyor system. The body increasingly takes shape as production progresses: The complete floor assemblies are now put together with side frames and roof to create the full body. Lastly, the joints of the stapled body are welded using several thousand welds, and then completed with the front side panel, doors, and foldings. In most cases, industrial robots apply not only laser, spot, inert gas and stud welding, but also the sealant and the adhesive.

New joining methods such as flow drilling, aluminum laser welding and the intelligent combination of various materials such as high-strength steels and aluminum are used to reduce weight. This body offers optimal occupant protection with the lowest possible weight and high rigidity. The intelligent lightweight construction also helps reduce fuel consumption.

<b>Fundamental environmental aspects</b>	<b>What has an impact on the environment</b>	<b>Environmental activity</b>
<b>Welding</b>		
Emissions	Welding emissions, dust, particles, indoor and outdoor noise (empties areas)	<ul style="list-style-type: none"> <li>• Extraction of welding emissions using suction</li> <li>• Exhaust air cleaning using cartridge, hose or pocket filters</li> <li>• Enclosing empties areas, optimizing truck transports</li> </ul>
Energy consumption	Procurement of primary energy	<ul style="list-style-type: none"> <li>• Use of energy-efficient robots</li> <li>• Minimal use of units using compressed air</li> <li>• Water cooling systems for welding electrodes</li> <li>• Hall ventilation with heat recovery</li> </ul>
Waste generation	Electrode cap waste	<ul style="list-style-type: none"> <li>• Electrode caps returned in recycling processes</li> </ul>
<b>Bonding and drying</b>		
Emissions	CO <sub>2</sub> /CO/NO <sub>x</sub> from the pre-gelators	<ul style="list-style-type: none"> <li>• Avoiding exhaust air containing solvents by using solvent-free adhesives</li> <li>• Cleaning oil vapors in the adhesive dryer exhaust air using thermal post-combustion</li> <li>• Increased use of adhesives that do not require an additional heat process</li> </ul>
Waste generation	Adhesive waste	<ul style="list-style-type: none"> <li>• Minimizing adhesive residues through optimized emptying of the containers and optimal application of adhesive</li> </ul>
Energy consumption	Procurement of primary energy	<ul style="list-style-type: none"> <li>• Heat recovery in thermal post-combustion</li> </ul>

## Surface Protection – Paint

Due to the high use of material, energy and water as well as the volumes of waste and wastewater, vehicle painting is one of the process steps with the highest environmental relevance in vehicle production. Up to the point at which the bodywork is transferred to assembly, up to five functional layers are applied, underbody and doublings sealed and cavities conserved. The finished body is hot degreased in a series of immersion baths and then given a thin zinc/iron-phosphate layer to ensure paint adhesion. In some production plants, this is done in an innovative

rotary dipping process, which reduces the volumes of chemicals and wastewater while delivering improved coating quality. This is followed by cathodic dip coating (KTL), in which a paint layer of aqueous dispersion is applied. After a drying process, this results in a uniform, complete primer, which ensures excellent corrosion resistance. The next processing step is seam sealing and application of the underbody protection to the body, with subsequent drying of the applied material. Afterwards, robots automatically apply the second functional layer, the water-based filler. This also undergoes a downstream drying process with exhaust air purification.

Subsequently, the body is given the desired color in the top coat paint line. The water-based, color-giving top coat is virtually solvent-free. After brief intermediate drying of the paint, the last coat - the glossy and protective clear coat - is applied by means of a solvent-containing, two-component clear coat. The exhaust air from the various dryer systems in the entire process is cleaned in thermal exhaust air purification systems.

<b>Key environmental aspects</b>	<b>What has an impact on the environment</b>	<b>Environmental activity</b>
<b>Pretreatment</b>		
<b>Water consumption</b>	Water consumption	<ul style="list-style-type: none"> <li>• Water recycling</li> <li>• Multiple flushing</li> </ul>
<b>Wastewater production</b>	Industrial wastewater containing, for example, oils, heavy metals, surfactants, phosphates	<ul style="list-style-type: none"> <li>• Wastewater treatment plant</li> <li>• Analyte recycling</li> </ul>
<b>Paint shop</b>		
<b>Emissions</b>	Sound (noise)	<ul style="list-style-type: none"> <li>• Silencers, sound forecasts</li> </ul>
	Solvents, dust and particles	<ul style="list-style-type: none"> <li>• Venturi scrubbers on spray booths</li> <li>• Water-based paints for every paint layer</li> <li>• Binding of overspray using dry separation (stone dust)</li> <li>• Cavity conservation with aqueous wax</li> <li>• Reduction in cleaning agent consumption</li> <li>• No transport conservation</li> </ul>
<b>Waste generation</b>	Paint sludge, solvent residues	<ul style="list-style-type: none"> <li>• Paint sludge dewatering / recycling limestone powder</li> <li>• Recycling of solvent residues</li> <li>• Reduction in overspray</li> </ul>
<b>Energy consumption</b>	Procurement of primary energy	<ul style="list-style-type: none"> <li>• Heat recovery in process ventilation systems</li> <li>• Process-controlled regulation</li> <li>• Air cascading</li> <li>• Speed-controlled fans</li> <li>• Demand-dependent switching on/off</li> </ul>
<b>Drying</b>		
<b>Emissions</b>	CO and CO <sub>2</sub> , nitrogen oxides, volatile organic carbon compounds	<ul style="list-style-type: none"> <li>• Exhaust air cleaning by TNV/RNV, RTO or general thermal cleaning methods</li> </ul>
<b>Energy consumption</b>	Procurement of primary energy	<ul style="list-style-type: none"> <li>• Heat recovery - Use of waste heat from air purification processes</li> </ul>

Before the painted body is transferred to assembly, the cavities are sprayed with a water-based wax dispersion. For optimum distribution of the wax in the cavities, the body is tilted after application.

Paint shops such as Oxford (UK), Spartanburg (USA) and Tiexi (joint venture with Brilliance in China) use the Integrated Paint Process (IPP). IPP is currently being successively introduced at the German production sites. This method enables the filler process step and subsequent drying to be eliminated. Through the additional use of dry separation, which ensures separation of the

existing paint from the cabin air without water, a recirculation mode for the cabin air can be realized, reducing energy consumption massively. These processes are gradually being installed as part of replacement or new construction in all paint shops of the BMW Group.

## **Assembly**

Craftsmanship and experience, combined with state-of-the-art plant technology, enable cost-effective vehicle production while maintaining the highest quality and sustainability standards. Systems and operating resources are offered, designed, manufactured, erected and put into operation according to the state of the art. This includes taking energy efficiency measures into consideration in the selection process, as well as preparing the respective energy, media and consumption information as a decision criterion. If required, measuring instruments are also used to secure and monitor consumption figures.

In Assembly, the painted bodies are completed according to the individual ideas of the customers, to create aspirational vehicles.

Power consumption through lighting is one of the biggest energy consumers in Assembly. Targeted shutdown of lighting in production and secondary areas saves energy whenever possible. At the same time, innovative energy-saving lighting technology is used.

The enormous number of variants demands a sophisticated logistics system. Parts and components from internal production and from suppliers arrive at the assembly lines with pinpoint accuracy. Model-specific assemblies such as doors, engines, cockpits, front-ends or seats are fed into the manufacturing process in the correct installation sequence.

During pre-assembly, the engine, transmission, and front and rear axles are assembled to form the drivetrain and bolted to the body during final assembly. Once the vehicle is ready to drive, it is fueled. The filling station is equipped with a gas recirculation system, to minimize emissions in the work area and the environment. After the initial filling with operating fluids, the vehicle is tested on roller dynamometers.

Vehicle distribution takes place largely without surface protection. For this purpose, the BMW Group uses innovative washing methods and/or distribution processes with closed wagons and covered transshipment sites. Vehicle conservation using a wax layer is completely eliminated as a result.

<b>Fundamental environmental aspects</b>	<b>What has an impact on the environment</b>	<b>Environmental activity</b>
<b>Vehicle media filling</b>		
Emissions	Fuel gases	Gases are retained during refueling (hose extraction and gas displacement)
Use of materials and substances	Fuel, brake fluid, coolant water, air conditioning gas, windscreen washer fluid, hydro steering oil	Minimum fueling Replacement coolant 134a by R1234yf
<b>Fitting/installation of supplier parts/components</b>		
Use of materials and substances	Supplied parts, components	Use of recyclable and partially recycled materials
Waste generation	Packaging waste	<ul style="list-style-type: none"> <li>• Use of recyclable materials</li> <li>• Separation by like grade of recyclable packaging</li> <li>• Optimized reusable packaging systems through packaging planning</li> </ul>
<b>Leakage test</b>		
Water consumption	Water consumption	Water circulation guide for leak test cabins

## Drive and Chassis Components



The light metal foundry at the Landshut plant produces engine core components such as crankcases and cylinder heads, which are then further processed in mechanical production. Landshut and Dingolfing also produce the electric motors, range extenders, and high-voltage accumulators as well as engine-gearbox units for BEV and PHEV models.

At BMW Motorenwerke Hams Hall, Munich Steyr and Tiexi, engine components are machined using state-of-the-art combination lines and transfer lines.

## Efficient Engines to Suit Customer Requirements

During engine assembly, the core components from our in-house production, such as crankcase, crankshaft, connecting rod and cylinder head, following successful quality control, are assembled together with components from supplier companies. Following assembly, each engine is subject to a computer-controlled test to ensure it runs correctly. Nowadays, such tests are mainly in the form of cold tests, in which for the sake of the environment the engine is powered electrically rather than with conventional fuel. If a performance test is required (hot test, approximately 0.5% -1.0% of all engines), the majority of the dynamometers are fitted with energy recovery modules that convert the mechanical energy of the braking process into electrical energy and feed it back into the grid. Over the next few years, all dynamometers will be upgraded with energy recovery modules.



Way back in the 1970s, there was as yet little emphasis on recycling or the conservation of resources, nor was there environmental pressure requiring take-back or recycling. Yet the BMW Group was already repairing engines in replacement engine production at the Landshut plant.

### First-class chassis components

The BMW Group has a great deal of expertise in the series production of aluminum chassis. Chassis are produced with complex robotic welding and painting technology, fully automatic machining technology, heat treatment processes, internal high-pressure forming (IHU) and air-assisted forming (LGU). The structural and lightweight design of the BMW chassis developers is significant to the achievement of weight reduction in our products.

Key environmental aspects	What has an impact on the environment	Environmental activity
<b>Machine cutting</b>		
Use of materials and substances	Oils and water-miscible cooling lubricants	<ul style="list-style-type: none"> <li>• Economical use of operating resources</li> <li>• Safe handling of hazardous substances</li> <li>• Conversion to dry machining (minimum lubrication)</li> </ul>
Waste generation	Consumed operating resources, metal-containing sludges, swarf, and scrap	<ul style="list-style-type: none"> <li>• Process optimization in Product Development</li> <li>• Pure grade waste collection for material/energy recovery</li> </ul>
Water consumption	Cooling lubricants and water-based baths	<ul style="list-style-type: none"> <li>• Recycling in emulsion plants and washing machines</li> <li>• Extended life through bath treatment</li> </ul>
Wastewater production	Industrial wastewater containing oil and heavy metals	<ul style="list-style-type: none"> <li>• Wastewater treatment plant Recycling of emulsions and water recirculation into the water cycle</li> </ul>

<b>Test stands for engine hot test</b>		
Emissions	CO and CO <sub>2</sub> , nitrogen oxides, sulfur dioxide, unburned hydrocarbons, dust and particles	<ul style="list-style-type: none"> <li>• Cat. converters on hot test benches</li> <li>• Gas displacement services</li> <li>• Cold test dynamometers</li> </ul>
Energy consumption	Procurement of primary energy	Energy recovery Efficient washing technology Base load management
<b>Hardening, welding, painting</b>		
Emissions	CO and CO <sub>2</sub> , nitrogen oxides, flue gases, solvents	<ul style="list-style-type: none"> <li>• Post-combustion in hardening processes</li> <li>• Protection of employees through object extraction and filters</li> </ul>
Energy consumption	Procurement of primary energy (natural gas and electricity)	Investigation for heat recovery in the hardening process Heat recovery in the hardening process Conversion to efficient induction hardening
Use of materials and substances	Paint procurement	Changeover from disc painting to high-rotation bell-painting

## Component Production

### Light metal foundry

The light metal foundry in Landshut produces engine, chassis, and structural components. Engine components are manufactured at the Tiexi site in China. Only light metal alloys are processed, in five casting processes – low-pressure, gravity, sand, pressure and Lost Foam casting. More than 5 million cast components are manufactured every year.

The world's first inorganic sand core production for mass production is proof of the high production technology standards of the Landshut light metal foundry. The advantage of the inorganic soluble glass-based sand binder are the significantly lower levels of core gas during casting. The burden on both employees and the environment is thus significantly reduced. The BMW Group is breaking new ground in terms of sustainable, environmentally friendly and employee-friendly foundry production.

### Interior

Comfort, function, and individuality are the qualities that customers of the BMW Group expect from the interior of their cars. Seats and cockpits are produced at the Dingolfing, Landshut, Munich and Regensburg (Wackersdorf) plants. A crucial process in manufacturing is foaming. This is how the seat cushions are created, by means of a hitherto unique vacuum foaming system which, due to reduced weight, can achieve a significant increase in the comfort and fatigue strength of the foam parts produced.

### Exterior / painting

The Exterior division is expert in the production and painting of large plastic components. More than 1.1 million plastic outer skin components per year are shipped from the Landshut plant to the BMW Group assembly plants.

In addition to vehicle development, the Exterior division is working on innovative plastic components for the car body. The further development of lightweight construction methods through

the use of new materials is particularly evident in the plastic outer skin of the BMW i8 - which is manufactured in Landshut and then transported to the Leipzig plant for assembly - and in the industrialization of carbon-fiber-reinforced thermoplastic components for structural applications.

### **Carbon-fiber-reinforced plastic (CFRP)**

The starting material for CFRP production at BMW are the carbon fibers produced in the SGL ACF joint venture in Moses Lake (USA) and the textile made from them in Wackersdorf. At the BMW Group plants in Landshut and Leipzig, this textile is used to create the CFRP components for the vehicle.



### **Preforming and packaging**

The cut but still flat layer is cut into textile preforms and shaped into the form of the final component. In the preforming process, the tailored, but still flat, non-crimp fabrics are given their three-dimensional contour. Several of these preformed layer packages (preform blanks) can later be assembled into a larger component. This makes it possible, for example, to produce highly integrated and large-area body components with CFRP, which otherwise could only be realized at great expense in aluminum or sheet steel.

### **Resin injection under high pressure with Resin Transfer Molding (RTM)**

The resin is pressed in a closed mold under high pressure into the preform blanks, thus creating the CFRP component. During this process, the preformed layer structures are injected with resin, also called impregnation. Only when the fibers are combined with the resin and subsequently hardened does the necessary stiffness arise, giving the material its outstanding properties. In Resin Transfer Molding, the resin is injected under high pressure into the preform blanks.

After the resin injection and curing, only detail work, such as accurate cutting of the component contour and the insertion of missing openings, remains to be done. Since the finished CFRP component already has its full stability and thus resistance after the resin treatment, this finishing process is performed by a waterjet cutting system. The BMW Group thinks beyond the product cycle and, in the course of its intensive work with the material, has developed a sustainable recycling concept for pure-graded production waste through to series production capability. A substantial proportion of the fibers can thus be reintroduced into the processes. By means of a special preparation process, fibers are re-formed which can service as a substitute e.g. for primary fiber requirements.

<b>Key environmental aspects</b>	<b>What has an impact on the environment</b>	<b>Environmental activity</b>
<b>Light metal foundry</b>		
Waste generation	Cast waste, used core sand	<ul style="list-style-type: none"> <li>• Recycling of metal waste</li> <li>• Sand treatment plant</li> </ul>
Wastewater production	Used emulsion	Wastewater treatment plant
Emissions	Solvents, dust, sound	Exhaust gas cleaning (wet scrubber, RNV) electrostatic precipitator, dust filter silencer, sound forecasts, inorganic sand core production
Energy consumption	Procurement of primary energy	<ul style="list-style-type: none"> <li>• Waste heat use</li> </ul>
<b>Interior trim – plastic foams</b>		
Waste generation	PU foam residues, consumed operating resources	Pure grade waste collection for material/energy recovery
Use of materials and substances	Polyol and isocyanate foam components, mold release agent and adhesive	<ul style="list-style-type: none"> <li>• Economical use of operating resources</li> <li>• Safe handling of hazardous substances</li> </ul>
Emissions	Particles, aerosols, hydrocarbons	Filtering of dust particles, use of aqueous release agents
<b>Exterior painting</b>		
Emissions	Solvents, dust and particles	<ul style="list-style-type: none"> <li>• Venturi scrubbers on spraying booths</li> <li>• Water-based paints</li> <li>• Fall filter system for cleaning the exhaust air</li> </ul>
<b>CFRP - Preforming and packaging CFRP - Resin injection with resin transfer molding (RTM)</b>		
Energy consumption	Procurement of primary energy	<ul style="list-style-type: none"> <li>• Low energy facilities</li> <li>• Thanks to a new hall concept, process waste heat ensures indoor climate control with low energy consumption</li> <li>• Energy consumption reduction using a system concept</li> </ul>
Use of materials and substances	Non-crimp fabric material, resin, hardener	<ul style="list-style-type: none"> <li>• Use of recycled material</li> <li>• Economical use of operating resources via closed supply system</li> <li>• Safe handling of hazardous substances</li> </ul>
Waste generation	Resinous and non-gummed fiber sections	Preparation for substitution of primary fiber requirements

## **Support from Material and Process Analysis**

With material and process analysis, specialists are available to help solve environmental problems in other areas and to assist with metrological monitoring. These tasks have no particular impact on the environment.

## Motorcycle Production



Motorcyclists the world over trust the quality of BMW motorcycles, which are produced in Berlin, Brazil, and Thailand. The worldwide BMW dealer network and sophisticated production control allow every customer to choose from a variety of different models, colors, and optional equipment. Motorcycle production at the Berlin plant takes place in precisely planned and precisely controlled work steps. Frame and chassis components are created in a combination of automated system technology and manual work. In engine construction,

the components from the machining centers in mechanical production are fitted to boxer, four- and six-cylinder engines. Several highly flexible assembly systems and technologically sophisticated, integrated testing technology are key features of BMW engine assembly.

### Customer-oriented production

Unlike BMW cars, BMW motorcycles still get their brilliant shine partly by hand. The skills of our painting specialists are particularly in evidence here, especially when applying two-color and multi-color finishes, as well as the lines that give our motorcycles their individual character.

In addition to the internal suppliers for frame construction, mechanical manufacturing, paint shop, wheel assembly, drive and suspension systems, external suppliers also ensure that all required parts are available in the right quantity at the right time and in the required quality at the right installation location. At the heart of motorcycle assembly is a ceiling conveyor system with assembly hooks, which permits height adjustment and rotation of the motorcycles and thus ideal ergonomics for employees.

At the end of the assembly line, the motorcycles run through an extensive test program on the roller dynamometer before being carefully packaged and shipped to customers and dealers worldwide. Due to the variety of colors, engine options and optional equipment, more than 10,000 different vehicle variants are possible. Every day, up to 630 different motorcycles in different model series with one-, two-, four- or six-cylinder engines or an electric motor leave the plant. The Berlin plant is able to respond to seasonal fluctuations in demand by means of flexible working time.

<b>Key environmental aspects</b>	<b>What has an impact on the environment</b>	<b>Environmental activity</b>
Waste generation	Consumed operating resources, paint sludge, swarf, metal sludge and scraps, oil-water mixtures	<ul style="list-style-type: none"> <li>• Waste prevention</li> <li>• Pure-graded waste collection for material or energy recovery</li> <li>• Packaging planning</li> <li>• Reusable systems</li> <li>• Internal preparation</li> </ul>
Wastewater production	Industrial wastewater containing, for example, oils, heavy metals, surfactants, phosphates	<ul style="list-style-type: none"> <li>• Recycling of active baths</li> <li>• Wastewater treatment plant for wastewater pre-treatment</li> <li>• Light fluid separator</li> </ul>
Land use Soil stress	Storage/provision of materials hazardous to water	<ul style="list-style-type: none"> <li>• Substitution of materials hazardous to water</li> <li>• Safety pallets</li> <li>• Restraint systems</li> </ul>
Emissions	CO, CO <sub>2</sub> , VOC and NO <sub>x</sub> Noise	<ul style="list-style-type: none"> <li>• Water-based paints</li> <li>• Avoidance of overspray</li> <li>• Thermal post-combustion</li> <li>• Noise register</li> <li>• Soundproofing</li> </ul>
Energy consumption	Procurement of primary energy	<ul style="list-style-type: none"> <li>• Heat exchangers</li> <li>• Energy-saving programs</li> <li>• Cogeneration</li> </ul>
Use of materials and substances	Oils and water-miscible cooling lubricants	<ul style="list-style-type: none"> <li>• Safe handling of hazardous substances (safety pallets)</li> <li>• Economical use of operating resources (circuits, etc.)</li> </ul>
Water consumption	Water consumption for industrial and sanitary purposes	<ul style="list-style-type: none"> <li>• Recycling circuit for emulsion plant</li> <li>• Changeover from open to closed cooling systems</li> </ul>

## Location Services

An efficient supply infrastructure is indispensable for the smooth running of a variety of different processes in the plants. This applies to components, energy, and operating resources as well as to the maintenance of buildings and facilities.

### Logistics for a smooth process

BMW Group Logistics ensures that all components and operating resources are available in the right quantity, at the right time, in the right place, and in the required quality in the production plants. The areas of responsibility include logistics planning, parts supply, foreign supply, order and production control of vehicle production, along with the worldwide distribution of vehicles.

BMW Group logistics ensures that incoming and outgoing traffic is kept at a low level and focuses on the efficient bundling of goods flows and optimum use of transport options. Group-wide use of reusable standard containers reduces transport volumes. All BMW plants have their own rail siding and ship more than half of all new cars by rail. Plant logistics also organizes the appropriate provision of waste for transport to the recycling or disposal companies.

**Supply services:** At the plants, facility management, energy supply and technical services ensure that the function and maintained value of buildings and building-related facilities are ensured at all times. In addition, they ensure a sensible supply of energy and media, with a focus on sustainability and cost-effectiveness. Environmental impacts arise especially in the area of heat and power generation.

Key environmental aspects	What has an impact on the environment	Environmental activity
<b>Logistics traffic</b>		
Emissions	CO, CO <sub>2</sub> , NO <sub>x</sub> and SO <sub>2</sub>	Bundling of goods Use of fold-up/collapsible standard containers Use of rail
<b>Supply - heat and electricity</b>		
Use of materials and substances	Procurement of primary energy resource consumption	<ul style="list-style-type: none"> <li>• Optimum primary energy consumption and high plant utilization and efficiency</li> <li>• District heating systems</li> <li>• Continuous improvement of energy efficiency within the framework of annual energy goals</li> </ul>
Emissions	CO, CO <sub>2</sub> , NO <sub>x</sub> and SO <sub>2</sub>	Use of low-sulfur fuels (natural gas) and low-NO <sub>x</sub> burners
Energy consumption	Resource consumption for the production of secondary energy	<ul style="list-style-type: none"> <li>• Optimizing supply networks, e.g. compressed air networks</li> <li>• Cogeneration</li> <li>• Use of renewable energy sources (e.g. solar and wind power)</li> </ul>
<b>Supply media</b>		
Land use	Storage/provision of materials hazardous to water	Safety measures for hazardous goods warehouses and tank facilities

## Environmental Aspects



In order to improve environmental performance and minimize risks, the environmental impact of production is assessed by analyzing the direct and indirect environmental aspects according to their relevance (high, medium, irrelevant) and, where appropriate, deciding upon measures for improvement. For this, the plants, activities and services are evaluated in relation to the individual processes/process steps in a technology. Furthermore, the opportunities, risks and the interested parties are considered. In doing so, the BMW Group is continuously minimizing its

environmental impact, also taking into account technical and economic factors. The assessment of the environmental aspects is carried out with current scientific findings regarding technological as well as environmental and socio-political developments being included, in multi-site expert teams.

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### Direct environmental aspects

At the heart of this environmental statement are the environmental impacts of BMW Group production, as these are controlled or influenced directly by the organizational unit validated according to EMAS.

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- **Energy consumption**
  - **Emissions**
  - **Use of materials and substances**
  - **Waste generation**
  - **Soil stress / land use**
  - **Water consumption**
  - **Wastewater production**

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### Indirect environmental aspects

Environmental aspects such as product development issues, which cannot directly affect a production plant and which do not emanate directly from the production site, are indirect aspects.

- 
- **Product, design and development**
  - **Transport**
  - **External partners**
  - **On-site service providers**

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#### Explanation and details in chapter

Products – Automotive and Motorcycle  
Indirect aspects  
Stakeholder dialog  
Indirect aspects

## Energy Consumption and Supply

Every kilowatt-hour of electricity and every cubic meter of natural gas that the BMW Group saves in its production processes, pays off many times over. In view of high energy costs which are likely to continue to rise, reduced energy consumption translates directly into added economic value for the company. Since energy production from conventional sources is associated with CO<sub>2</sub> emissions, each kilowatt-hour of energy saved also simultaneously reduces the burden on the earth's atmosphere from the greenhouse gas carbon dioxide.

In addition to increasing the share of renewable energy sources, our goal is therefore to use energy as efficiently as possible. Our vision is for our automobile production to be completely CO<sub>2</sub>-free, where the energy required comes exclusively from renewable sources. In 2017, we have already achieved this goal at our European production sites.

Specifically, by 2020 we aim to reduce energy use per vehicle produced by 45% compared to the base year 2006. At the same time, by 2020 we also want to be a leader in the use of renewable energies. In 2017 we succeeded in reducing energy consumption per vehicle by a further 2.0% compared to the previous year. All in all, this represents an improvement of 36.5% against the base year 2006.

In this regard we have defined the following strategic fields of action:

- Improve energy efficiency:
  - Further development of a holistic energy management system.
  - Continuous improvement of ongoing operations
  - Planning and implementation of energy efficient real estate, facilities and technologies.
  - Use renewable energies.
  - Sensitize, train/qualify and motivate employees and managers in dealing with energy.
  - Using digitization to create automatic analyzes of energy consumption.

Corporate division / process	Activity	Environmental impact	Environmental activity
All divisions	Procurement of primary energy	Scarcity of resources	<ul style="list-style-type: none"> <li>• Use of high-efficiency co-generation units</li> <li>• Heat recovery / Use of waste heat</li> <li>• Energy projects to reduce energy consumption</li> <li>• Use of district heating</li> <li>• Landfill gas utilization</li> <li>• Use of renewable energy sources (e.g. solar and wind power)</li> </ul>

<b>All divisions</b>	<ul style="list-style-type: none"> <li>• Production of secondary energy</li> <li>• Use of useful energy (e.g. compressed air, room heating for building heating, industrial heat for process plants, coolant water, cold water for air conditioning)</li> </ul>	Scarcity of resources	<ul style="list-style-type: none"> <li>• Waste heat use</li> <li>• Use of energy-efficient pumps</li> <li>• Cold production in absorption refrigeration systems</li> <li>• Use of a central control technology</li> <li>• Energy inspections</li> </ul>
<b>Development / Engine production</b>	Engine test benches	Scarcity of resources	<ul style="list-style-type: none"> <li>• Optimized running times of test benches</li> <li>• Cold test in production</li> <li>• Energy recovery by using braking forces</li> </ul>

## Emissions

Due to the process, a number of emissions in the form of air pollutants, noise, and vibrations occur at the production sites. Essential emissions for the production of automobiles and motorcycles are CO<sub>2</sub>, organic solvents (VOC), and noise emissions. Other emissions such as carbon monoxide, sulfur dioxide, nitrogen oxides or particulates are also produced, but to a lesser extent.

Carbon dioxide (CO<sub>2</sub>) is produced by burning fossil energy. Rising CO<sub>2</sub> content in the earth's atmosphere contributes to the greenhouse effect/climate change. Organic solvents keep lacquers and paints on the bodywork in a fluid state. Due to their volatility, these compounds enter the atmosphere and contribute to air pollution and, as precursors, to the formation of ground level photochemical summer smog.

Sound, noise and vibrations are transmitted via the air and the ground. Sound forecasts are used to minimize these effects at the planning stage. When operating the production facilities, the avoidance of behavior-related and technical noise emissions is regularly worked towards. Other sources of noise are construction sites for which the BMW Group, as the client, assumes general responsibility in addition to the contractor.

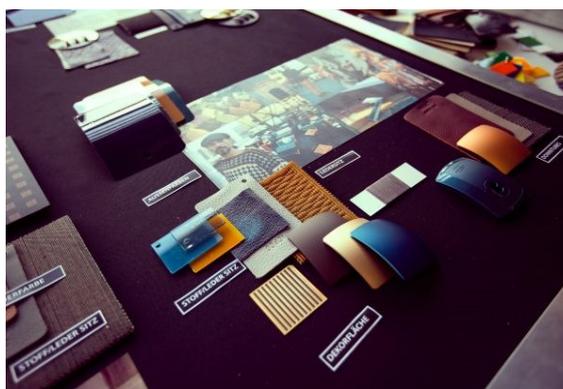
The continuous improvement of operational environmental protection for emissions means the development and introduction of both low-emission and energy-saving processes to keep emissions as low as possible. The resulting air pollutants are mainly due to combustion processes (building and process heating, thermal post-combustion, dryer operation), the use of solvents and the processing of materials that are released into the air in the form of particles and gases. The use of modern technologies has reduced emissions of air pollutants over the years. The introduction of low-solvent or solvent-free painting processes and the combustion of emissions from the main emitters contributed significantly to this.

<b>Corporate division / Process</b>	<b>Activity</b>	<b>Environmental impact</b>	<b>Environmental activity</b>
Paint shop, body shop, light metal foundry, energy supply, drive and chassis	Burning of fossil fuels (e.g. natural gas)	CO <sub>2</sub> : causes anthropogenic greenhouse effect	Reduction in energy consumption Use of renewable energy sources (see: Environmental aspect energy)

systems, test benches		CO: leads to reduced oxygen binding in the blood	Lowering the base load energy (energy consumption at production-free times)
		SO <sub>2</sub> : leads to acidification of waters and soils	Use of low-sulfur fuels
		NO <sub>x</sub> : causes summer smog due to the creation of ozone. Leads to diseases of the respiratory tract.	Optimizing combustion processes
		Resource consumption	Use of district heating
Paint shop	Evaporation processes of aqueous and organic solvents	Summer smog	Use of water-dilutable paints for primer and base coat
		Odors	Use of low-solvent two-component clear coats Thermal or regenerative post-combustion plants
Energy supply (refrigeration systems)	Escape of halogenated hydrocarbons	Ozone depletion in the stratosphere	Substitution Optimized maintenance and operation
Body construction Foundry	Emission of particles via the exhaust air	Environmental stress	Exhaust air filtration to comply with legal specifications
Paint shop Drive and chassis	Emission of particles via the exhaust air	Respiratory tract stress	Electrostatic application processes during the painting process and Venturi scrubbers in the spray booths, dry separation
Production	Production-relevant systems (e.g. ventilation systems)	Noise pollution	Structural noise protection of buildings (building envelope and silencer on ventilation technology)
	Internal traffic (fork-lifts, trucks)		Noise protection measures in the outdoor area by shielding, relocation of noise-intensive work, complaint management
Press plant	Operation of large presses	Vibrations	Encapsulated presses vibration-insulated to the surface or retrofitted with vibration elements
Engine test benches	Combustion of fuels (petrol, diesel)	CO <sub>2</sub> : causes anthropogenic greenhouse effect CO: leads to reduced oxygen binding in the blood SO <sub>2</sub> : leads to acidification of waters and soils NO <sub>x</sub> : causes summer smog due to the creation of ozone. Leads to diseases of the respiratory tract.	Use of controlled cat converters in the exhaust air Optimization of test bench run times Use of braking energy to generate electricity
Facility management	New buildings conversions in the outdoor area	Noise pollution	Use of low-noise machines Complaint management Compliance with limit values

## Materials and Substances

The BMW Group is committed to the sustainable use of materials and substances. Not only does it ensure that the selection and use of materials and chemical substances complies with the law, it also incorporates new scientific findings early in development. The "Approval of Chemical Products" process ensures that worldwide only chemical products approved under industrial hygiene rules are used in the company, and that all necessary safety measures are observed when using these products. This ensures comprehensive protection against chemical products for BMW Group employees, the environment and customers.



Car and motorcycles components of the BMW Group are documented with their materials and chemical ingredients in material data sheets that are entered in the IMDS (International Material Data System) by the suppliers. The associated "Material Data Sheet" process ensures that only materials are used which meet stringent recycling requirements and that contain no hazardous chemical ingredients. Through these two defined processes, the BMW Group checks compliance with legal requirements (e.g. End-of-Life Vehicle Directive, Ordinance on Hazardous Substances, REACH legislation).

Corporate division / process	Activity	Environmental impact	Environmental activity
All divisions	Use of liquid substances such as paints, oils, cleaners, organic solvents, and other process chemicals	Water pollution soil pollution Emissions Resource consumption	<ul style="list-style-type: none"> <li>• Approval of chemical substances</li> <li>• Substitution of hazardous substances</li> <li>• Minimization of consumption</li> </ul>
Product, design and development	Content of critical substances and recyclability in the purchase and use of delivered components in products.	Water pollution soil pollution Emissions Resource consumption	<ul style="list-style-type: none"> <li>• Recording of materials and ingredients from suppliers in material data sheets</li> <li>• Requirements for recyclability</li> <li>• Avoidance of hazardous chemical ingredients</li> </ul>

## Waste



**Zero waste – the vision:** The BMW Group puts into practice the five-level waste hierarchy worldwide, as required by the EU. The five levels are prevention, re-use, recycling, recovery, and disposal. As far as reasonably possible, the highest level of this hierarchy is sought. If a higher hierarchy level is not possible, the most sustainable form of disposal is favored within a level (e.g. separation of different metals at the collection point).

### Monitoring of waste and disposal methods:

An IT-supported Waste Information System (ABIS) allows a precise overview of the waste streams at any time. This allows changes to be detected immediately and avoidance strategies to be systematically developed. All contractors operating in waste management must be certified by independent bodies and regularly undergo a regular waste management audit by the BMW Group's waste management officers.

Corporate division / process	Activity	Environmental impact	Environmental activity
Press shop, light alloy foundry, interior equipment, exterior trim, drive, and chassis systems	Manufacture of body components, components, and drive systems	Scarcity of resources	<ul style="list-style-type: none"> <li>• Waste prevention e.g. through high levels of material usage</li> <li>• Graded separation</li> <li>• Recycling</li> </ul>
Packaging planning, assembly, interior, exterior	Supply of purchased parts, use of packaging material	Resource scarcity, waste generation	<ul style="list-style-type: none"> <li>• Use of reuse and take-back systems</li> <li>• Use of reusable packaging materials</li> </ul>

## Water Usage / Wastewater

Water is an increasingly scarce resource. 40% of the human race live in countries where fresh-water is scarce. For that reason, it will be increasingly important in the future to handle water supplies with care. At BMW, we are continually seeking to reduce water consumption and wastewater throughout the entire BMW Group production network.

Corporate division / process	Activity	Environmental impact	Environmental activity
Production areas	Consumption of process water	Drinking water and groundwater scarcity	<ul style="list-style-type: none"> <li>• Water recycling such as cascade rinsing, grinding water recycling,</li> <li>• recycling circuit for emulsion plants and washing machines, washing and leak testing systems</li> <li>• Bath treatment to extend life</li> <li>• Extraction of near-surface groundwater to protect drinking water reserves</li> </ul>
All divisions	Consumption of sanitation water	Drinking water and groundwater scarcity	<ul style="list-style-type: none"> <li>• Water-saving equipment</li> <li>• Use of rainwater</li> </ul>

Operational activities and production processes give rise to **wastewater** containing oils and heavy metals. Depending on the production process, various pollutants may be present: Heavy metals such as zinc, nickel and copper can accumulate in aquatic organisms and enter the food chain. Oils and grease are water-polluting substances and can pollute bodies of water and thus make them unusable for drinking water production. Solvents are organic compounds that can dissolve other substances without chemically altering them. The effluents from production are treated in in-house wastewater treatment plants, with the ingredients being removed or reduced.

After pre-cleaning, they are transferred to the municipal sewage treatment plants, together with the sanitary wastewater, via the public sewer network. The discharged wastewater is regularly analyzed and monitored in accordance with official requirements. The numerous treatment steps and control measures prevent problems arising during the cleaning process in the municipal wastewater treatment plants. Precipitation water from roads and roofs seeps into the ground or is introduced via a separate drainage system into a receiving water flow (running water).

<b>Corporate division / process</b>	<b>Activity</b>	<b>Environmental impact</b>	<b>Environmental activity</b>
Paint shop, drive and chassis systems, foundry	Water-intensive cooling and washing processes Vehicle paintwork	Water pollution by discharging pollutants into the public drains	Water treatment Limit monitoring
Drive and chassis systems, toolmaking, press shop, light alloy foundry, interior equipment	Use of (cooling) lubricants and liquid operating resources such as machine oils, cleaning agents, lubricants, etc.	Water pollution due to the introduction of oils and grease, surfactants and nitrate	Light fluid separator Ultra-filtration and/or nano-filtration
Paint shop, drive and chassis systems, light alloy foundry, interior equipment	Use acid- or alkaline-based cleaning agents and operating resources	Water pollution by changing the pH value	Substitution of aggressive media Neutralization

## Soil Stress / Land Use

Soil is a non-renewable resource. To ensure its sustainable use and prevent negative soil changes and groundwater contamination, the BMW Group has developed and implemented suitable precautionary strategies and initiatives. Soil protection measures are planned and implemented when selecting new sites, when renovating buildings and making alterations to land, and during operation.



This ensures that land use and soil sealing are minimized. Feasibility studies for site development projects take into account environmental requirements right from the start. By carrying out what is known as a contaminated site survey, with subsequent soil and groundwater investigations (building structures undergo structural analysis), the environmental relevance of the project is determined and evaluated at a very early phase in the planning.

To protect soil and groundwater, suitable measures are taken when handling water-polluting substances in order to prevent risks to the environment, e.g. sealed floor coverings, leak detectors, drip pans, double-walled tanks and pipes. All facilities for handling substances hazardous to water are recorded and evaluated, with measures being derived and documented in a database (AwSV database).

Boreholes with levels are created to monitor groundwater. The chemical-biological composition of the groundwater is analyzed several times a year, with up to 54 parameters being analyzed, depending on the location. At some sites, groundwater simulation models are used. This can be used at any time to predict the spread and effects of possible contaminants. Necessary countermeasures can be initiated at short notice in the event of an incident.

<b>Corporate division / process</b>	<b>Activity</b>	<b>Environmental impact</b>	<b>Environmental activity</b>
<b>Soil stress</b>			
<b>Construction: New construction/extension</b>	Land use of former landowners	Soil stress due to existing contaminated sites	Sampling and, if necessary, full clearance
<b>All divisions</b>	Handling substances hazardous to water such as paints, oils, cleaning agents, organic solvents, process chemicals	Soil stress due to improper storage/handling	<ul style="list-style-type: none"> <li>• Safety equipment for warehouses and filling stations</li> <li>• Safety pallets for in-house transport</li> <li>• AwSV database</li> <li>• Ongoing review of the possibility for reducing and substituting hazardous substances in order to minimize risk</li> </ul>
<b>Land use</b>			
<b>Planning, construction</b>	Construction of buildings, paved areas (paths and squares) and infrastructure	Land use and soil sealing	Function-appropriate plant and production structures
		Rainwater take-off	Logistics concepts
		Impairment to views of the countryside	<ul style="list-style-type: none"> <li>• Creating compensatory areas</li> <li>• Rainwater percolation</li> <li>• High-quality design of industrial buildings, in architecture and design</li> </ul>

## Indirect Environmental Aspects

By indirect environmental aspects we mean environmentally relevant activities, products or services over which the BMW Group has only limited management control and which can only be influenced to a limited degree (e.g. by full contract assignment).



## Transport and traffic

The aim is to reduce the environmental impact of traffic generated by the BMW Group. The main effects of road and rail traffic on the environment and the immediate area are: Energy demand, land use, pollution and CO<sub>2</sub> emissions, together with noise pollution.

Energy consumption due to traffic exhibits the typical environmental impact of gasoline and diesel combustion in all modes of transport. For this reason, the BMW Group constantly strives to reduce the level of inbound and outbound delivery traffic, as well as individual employee traffic, via various measures.

### Reduction in motorized individual traffic

Factory bus systems and discounts for using public transport significantly relieve regional and local traffic. The factory buses, which transport many thousands of employees to the various plants from within a large catchment area, cover a total distance of several tens of thousands of kilometers every working day. They are therefore a significant help in reducing the number of vehicles on the road during rush hour. In order to promote car pooling, the BMW Group is setting up computer-controlled car-sharing centers at its locations.

Corporate division / process	Activity	Environmental impact	Environmental activity
All divisions	Individual transport by commuters	CO <sub>2</sub> emission, other emissions	<ul style="list-style-type: none"> <li>• Factory buses</li> <li>• Subsidized public transport</li> <li>• Car-sharing centers</li> </ul>
Production areas	Traffic from supply logistics	CO <sub>2</sub> emission, other emissions	<ul style="list-style-type: none"> <li>• Optimizing transport volume</li> <li>• Use of low-emission means of transport, increasing capacity utilization for transport vehicles</li> </ul>

## **Efficient transport logistics**

The supply of the worldwide production network, the supply of parts to dealers, and the international delivery of vehicles require complex solution models.

To keep CO<sub>2</sub> emissions as low as possible, we follow the principle "Production follows the market." One measure to reduce CO<sub>2</sub> emissions is the preferred use of CO<sub>2</sub>-favorable energy and transport modes.

For example, the entire rail feed in Germany to supply the international production sites was converted to green electricity, right through to the export sea port. Rail also plays an important role in the distribution of vehicles: more than half of all new vehicles leave our plants by rail.

In addition, and in cooperation with logistics service providers, the first electric and gas-powered trucks are already in operation to supply our plants. Further applications for alternative power-trains and fuels are currently under investigation.

## **On-site service providers**

The production processes of the BMW Group require the outsourcing of individual process steps. However, these outsourced processes are controlled and/or influenced. In this instance, our operating manual "Safety instructions for external companies" is implemented by means of a contractor declaration. Implementation of these specifications is checked on a random basis.

## **Environmental Risks**

The BMW Group strives to maximize the safety of the environment, but there is still a residual risk. Numerous technical and organizational measures have been taken to minimize environmental risks (fire, handling of chemical products). A plant fire brigade is on standby at almost all BMW Group sites, and where this is not the case there is direct emergency communication with the local fire brigade. The main focus is on preventive fire protection.

Specialists from the insurers, and own staff, carry out regular inspections of all facilities. Employees are professionally trained in dealing with emergencies. The plant fire brigades are also equipped for potential environmentally-relevant accidents: Suitably equipped emergency vehicles are on hand. An alarm and hazard prevention plan describes which specific tasks must be performed by the relevant employees in the event of an alarm. For operational disruptions that could affect those outside BMW, the plants have voluntarily set up a company disaster control organization (BKO). The task force responsible for this meets regularly for training purposes.



**BMW Group headquarters Munich**

## Glossary

### A

#### **Agenda 21**

Final document of the UN Conference in Rio in 1992 calling for sustainable development worldwide.

#### **ABIS**

IT-supported waste information system for the business management of waste management.

#### **Contaminated sites**

Old deposits and old sites that give rise to harmful soil changes or other hazards for the individual or for the general public.

### B

#### **BTTP**

Block-type thermal power station for co-generation of heat and electricity, with significantly higher utilization of primary energy.

### C

#### **BMW ConnectedDrive**

Intelligent linking of various driver assistance and information systems. This achieves optimum safety, comfort and environmental relief in road traffic.

### D

#### **Die casting**

Casting process in which liquid metal is pressed at up to 600 bar into a heated steel mold.

**Dow Jones Sustainability Index** Family of indices for companies whose strategy is aligned with the concept of sustainability.

The BMW Group has been a leader in the Dow Jones Sustainability Indexes since 1999.

### E

#### **EMAS**

Abbreviation for "Eco-Management and Audit Scheme", a standard comparable to ISO 14001 for environmental management systems.

#### **Emission**

Discharge of pollutants, noise, heat, light rays, vibrations in air, water or soil.

### F

#### **Fleet consumption**

Numerically-weighted average fuel consumption of the new vehicles registered by a single vehicle manufacturer or the automotive industry as a whole over the reference period.

#### **Chloro-fluoro-hydrocarbons**

(CFCs) These substances destroy the ozone layer in the earth's atmosphere which protects against UV radiation; they have been used to date in the air conditioning and production technology.

### I

#### **ICC Charter**

Business Charter for Sustainable Development, setting out principles for environmental management, adopted in Rotterdam in 1991.

#### **Immission**

Influence of pollutants on air, water and soil.

## **IMDS**

International Material Data System - a common database for the automotive industry worldwide on components, their materials, components, and weights.

## **K**

### **Cold test**

Test procedure for engines in which they are no longer fuel-fired. The cold test saves fuel, avoids emissions, and improves quality.

### **Cathodic dip painting**

Immersion of electrically negatively-charged body shells into enamel baths for surface coating by current flow.

### **Carbon dioxide (CO<sub>2</sub>)**

Non-toxic gas that arises during combustion of hydrocarbons and amplifies the greenhouse effect.

## **CHP**

Combined heat and power (see also: block heating power station).

## **L**

### **Solvents**

Solvents are liquids that can dissolve other substances without chemically altering them. They can have a toxic effect on bacteria and algae, which can lead to considerable impairments, especially in municipal sewage treatment plants.

## **M**

### **Minimum quantity lubrication**

Cooling lubricants are fed in a targeted manner and in very small quantities, with the help of nozzle systems, in order to minimize friction and heat development in mechanical processing.

## **N**

### **Sustainability**

Sustainability considers ecological, social and economic development. The United Nations "World Commission on Environment and Development" defined sustainability in 1987 as development that meets the needs of the present generation without jeopardizing the livelihoods of future generations.

## **O**

### **Ecology**

The science of the mutual relationships between organisms and their environment, the material balance and the energy flows that make life on Earth possible.

### **Overspray**

Paint mist from spray nozzles which does not attach to the workpiece.

### **Ozone**

Special form of oxygen (O<sub>3</sub>).

## **P**

### **PUR**

Polyurethane is a plastic that is used, among other things, for wearing parts and insulation.

## **R**

### **Recycling**

Reuse of materials. Raw materials such as metals, paper or pure-grade plastics can be re-processed into raw material for new products.

**RNV (regenerative Nachverbrennung)**

Regenerative post-combustion (exhaust air treatment)

**RTO**

Regenerative thermal oxidation

**Rotation dipping process**

In this process, the body to be painted is rotated around itself in the immersion bath (ro-dip).

**S****Heavy metals**

Metals with a specific weight of above 4.5 g/cm<sup>3</sup>, such as lead, cadmium, mercury. They have toxic effects on humans, animals and plants. Heavy metals can accumulate in aquatic organisms and thus enter the food chain.

**Summer smog**

Air pollutants formed by the action of sunlight, such as ground-level ozone.

**Stakeholders**

Interest groups in relation to a company. For the BMW Group, these include, in particular, customers, employees and shareholders, as well as interest groups and the municipalities in which the BMW Group operates worldwide.

**Nitrogen oxides (NO<sub>x</sub>)**

Compounds of nitrogen and oxygen that can be produced in combustion processes from constituents in the air.

**Substitution**

Replacement of a term, item, component or substance

**T****Technology**

Science of transformation of raw materials into finished products, methodology in the procedures, totality of extraction and processing.

**TNV (thermische Nachverbrennung)**

Thermal post-combustion plant (thermal treatment of solvent emissions)

**U****Environmental aspect**

The component of the activities, products or services that can interact with the environment.

**Environmental impact**

Change in the environment which is the result of products, activities or services.

**Environmental relevance**

Meaning or importance for the environment.

**V****Validation**

Declaration of validity in accordance with EC Regulation No. 1221/2009 (EMAS III) of the environmental statement, by a state-approved environmental verifier.

**AwSV**

Regulation on facilities for handling water-polluting substances.

## Statement by the Environmental Verifier on the Assessment and Validation Activities



Umweltgutachter

We the undersigned, Ulrich Wegner, EMAS Environmental Verifier for TÜV SÜD Umweltgutachter GmbH, registration number DE-V-0045, licensed for Areas 25, 29, 30 (NACE Code) and Bernhard Schön, EMAS Environmental Verifier for TÜV SÜD Umweltgutachter GmbH, registration number DE-V-DE-V-0321, licensed for Area 29 (NACE Code), hereby confirm that we have assessed whether the sites of the organization listed below, indicated in the general section of the Environmental Statement of the Organization as

### BMW Group

with the registration number listed below, satisfy all the requirements of Regulation (EC) No. 1221/2009 of the European Parliament and of the Council of 25 November 2009 and Regulation (EU) 2017/1505 of 28 August 2017 on the voluntary participation of organizations in a Community Environmental Management and Audit Scheme (EMAS).

By signing this statement, we confirm that

- the assessment and validation have been carried out in full compliance with the requirements of Regulation (EC) No. 1221/2009 and Regulation (EU) 2017/1505,
- the result of the assessment and validation confirms that there is no evidence of failure to comply with applicable environmental legislation,
- the data and information from the environmental statement of the sites give a reliable, credible, and true picture of all the activities of the sites within the areas specified in the environmental statement.

This statement is not equivalent to an EMAS registration. EMAS registration can only be carried out by a competent body in accordance with Regulation (EC) No. 1221/2009. This statement may not be used as a separate basis for informing the public.

Location	Registration no.
Bayerische Motoren Werke Aktiengesellschaft Berlin Plant, Plant 03.10	D-107-00105
BMW Fahrzeugtechnik GmbH Eisenach, Plant 8.2	D-145-00016
BMW Bayerische Motoren Werke AG, Plant 01.10 and Plant 01.30	D-155-00206
Bayerische Motorenwerke AG, Leipzig Plant 7.10	D-159-00048
BMW Bayerische Motorenwerke AG, Dingolfing Plant	D-163-00043
Plants 2.10, 2.20, 2.23, 2.27, 2.30, 2.40, 2.41, 2.50, 2.70, 2.72 Dingolfing	
BMW Bayerische Motorenwerke AG, BMW, Landshut Plant 4.1	D-163-00046
BMW Bayerische Motorenwerke AG, Regensburg Plant and Innovationspark Weckersdorf, Plant 6.1 and 6.2	D-166-00050

Munich, August 20, 2018

Ulrich Wegener

Bernhard Schön

Environmental verifiers of  
TÜV SÜD Umweltgutachter GmbH

This validation is only valid in conjunction with the respective separately validated, site-specific supplements to this general section of the Environmental Statement

## **Masthead**

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