



# INNOVATION FOR SUSTAINABILITY IN THE AUTOMOTIVE INDUSTRY: A CASE OF THE BMW GROUP

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## Abstract

In recent years, there has been significant discussion in the business, academic, and popular press about corporate sustainability. This paper reviews the concepts of corporate sustainability, addresses key drivers that force automobile corporations to compete on innovations toward sustainability, and explores the BMW Group, a leading automotive manufacturer, on how it strategically pursues innovation and management of sustainability.

**Keywords:** Innovation, Sustainability, Automobile Industry



## Introduction

In recent year, there has been significant discussion in the business, academic, and popular press about corporate sustainability. This paper reviews the concepts of corporate sustainability, addresses key drivers that force automobile corporations to compete on innovations toward sustainability, and explores the BMW Group, a leading automotive manufacturer, on how it strategically pursues innovation and management of sustainability.

## Sustainability Defined

While corporate sustainability recognizes that corporate growth and profitability are important, it also requires the corporation to pursue societal goals, specifically those relating to sustainable development — environmental protection, social justice and equity, and economic development. A review of the literature suggests that the concept of corporate sustainability borrows elements from several established concepts. One of which is the concept of sustainable development. Sustainable development is a broad, dialectical concept that balances the need for economic growth with environmental protection and social equity. The term was first popularized in 1987, in *Our Common Future*, a book published by the World Commission for Environment and Development (WCED). The WCED described sustainable development as development that meet the needs of present generations without compromising the ability of future generations to meet their needs. As described in the book, it is “a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations.” Sustainable development is a broad concept in that it combines economics, social justice, environmental science and management, business management, politics and law. It is a dialectical concept in that, like justice, democracy, fairness, and other important societal concepts, it defies a concise analytical definition, although one can often point to examples that illustrate its principles.

The contribution of sustainable development to corporate sustainability is twofold (Wilson, 2003). First, it helps set out the areas that companies should focus on: environmental, social, and economic performance. Second, it provides a common societal goal for corporations, governments, and civil society to work toward: ecological, social, and economic sustainability. However, sustainable development by itself does not provide the necessary arguments for why companies in action should look like.



## Sustainability as the Key Drivers of Innovation

While many companies are still convinced that the more social-beneficially and environment-friendly they become, the more the effort will erode their competitiveness. They believe it will add to costs and will not deliver immediate financial benefits. However, the quest for sustainability is already starting to transform the competitive landscape, which will force companies to change the way they think about products, technologies, processes, and business models. Therefore, there are more and more companies starting their journey to join the race to compete through innovation toward sustainability.

### Sustainability and Business

For those working in business, sustainability will involve considering the long-term consequences of industry and manufacture. Economic sustainability involves developing long-lasting systems of trade, while ensuring that these systems have a lesser impact on the environment than previous methods. Corporate sustainability, meanwhile, focuses upon the environmental and social impact of business actions.

### Sustainability and Investment

One reason for business becoming so interested in sustainability is that good business practices are sought out by investors. Some investors look for a worthy project, so improving sustainability measures can bring them in. Investors may also look at the Life Cycle analysis of a business, which examines the long-term environmental and carbon footprint of a product. Investors can decide not to invest in a company if its carbon dioxide footprint is too large. Companies with proven records in global and local sustainability can make profit through employee productivity, better long-term public following, and investments due to good public reputations.

### Sustainability and Competitiveness

In recent years, as the public has become more aware of the pressure on the environment, it has become clear that businesses that practice sustainability strategies are in fact getting greater profits, and creating their own consumer path.

Sustainability regulation can also assist competitiveness in business, as it forces industry to innovate and create new solutions, driving up profits for those companies that provide the best products. Sustainability has also been shown to produce new demands and markets for businesses.



The rise in consumer demand for sustainability improvements has led to businesses that were not previously interested in green issues suddenly improving their sustainability practices. Experts suggest that this is to improve their competitiveness against other companies.

### **Sustainability and Government Grants**

Another reason for improving sustainability is the recent raft of legislation from governments around the world, designed to encourage businesses to reduce their environmental impact. Carbon emissions, water supply, and energy security are now linked with business costs. Government bodies have also become more persistent at prosecuting businesses that pollute water or air.

### **Sustainability and Business Practice**

Sustainability is good for businesses both as a long-term strategy to improve employee confidence, and as a short-term response to government legislation. Businesses responding to demands for clearly visible sustainability practices are also more attractive to the new class of ethical investors, and regain the costs of managing sustainability through government grants and increased sales to green activists and other members of the community. Ethical business practices may also improve competitiveness between businesses, encouraging growth and bigger profits.

## **The Challenges of Sustainability in the Automobile Industry**

Competition in the automotive industry is characterized by overcapacity, high market saturation, high labor and fixed costs, and the need for constant product development and innovation. Due to mergers, very few global players dominate the automotive market, causing major entry barriers. Owing to a high motorization rate in Europe, demand is largely based on replacement. This has led to a dramatically shortened product life cycle and to constantly differentiating brands and models. Slim margins press automakers to pay more attention to after-sales services to improve profitability.

From the environmental point of view, the crucial issue is a relatively long life span of the industry's products. Thus, about 80% of environmental impacts stem from the usage phase of the car. This offers room for improvement, especially in the design phase (using lightweight materials, improving fuel efficiency, inventing new energy sources). Due to the massive use of cars and their shortening life cycle, end-of-life vehicle is also perceived as an important issue. It is now regulated by the EU, but is also recognized as a CSR issue by the producers themselves. As car manufacturing is characterized by long and numerous supply chains, producers' responsibility should be expanded to the whole supply chain.



From the societal point of view, auto manufacturers are engaging in CSR activities concerning end-of-life-vehicles and producers' extended responsibility for their products, green supply chain management, environmental management schemes, and labor codes of conduct. Concerning quality of work, the automotive industry is shaped by conditions typical to a high-skill high-quality sector. Nevertheless, working conditions vary according to the specific production system of a plant, which is largely dominated by its owner. All leading auto manufacturers tend to offer higher autonomy, job satisfaction, job stability, job flexibility, job safety, and training to workers. As a common pattern, a strong focus lies on ergonomics. Social dialogue and worker involvement is increasingly gaining attention due to two factors: First, worker involvement is a necessary factor for innovation and quality, and employees are difficult to replace and therefore valuable to the company. Second, the core workforce in the automotive industry tends to be well organized, which is a threat if social dialogue fails.

The benefits of cars are clear: they provide a door-to-door transportation system, the means to gaining access to life's necessities and employment, and a source of pleasure and social status. However, despite these benefits there are environmental burdens as well: local air pollution, greenhouse gas emissions, road congestion, noise, mortality and morbidity from accidents, and loss of open space to roads, car parks and urban sprawl.

The automobile industry has had few radical changes over the last 30 years. However, these few changes were often remarkable and had a significant impact on practice and academia. The Toyota Production System ("Just in Time") and the modular consortium are important innovations from the production system perspective. Also, the transfer of the assembly plants to developing countries and global outsourcing are evident changes in the industry's business and operations strategy. Nevertheless, these changes have been insufficient to make the sector more sustainable. As evidence of this the automotive industry is still struggling against economic, environmental and social challenges. The many economic challenges currently facing the industry: notably overcapacity; saturated and fragmenting markets; capital intensity; and persistent problems with achieving adequate profitability. Strong dependence on fossil fuels and large consumption of raw material lead the environmental problems. As a result, in a near future, it is expected that the sector will face strong pressures and take initiatives in order to reduce the environmental burdens from car use and its production process.

The major environmental concerns in the 21st century are atmospheric pollution and its consequences for human health, global warming and ozone layer depletion), scarcity of freshwater, raw material and land availability. The impacts on businesses may be enormous as it was announced by the World Resources Institute's report - Tomorrow's Market: Global Trends and Their Implications for Business.



According to the United Nations, the World's population is forecasted to reach 9 billion people in 2050, mainly because of population growth in developing countries. As emerging economies repeat the historical development patterns of the industrialized countries, rising car ownership and air travel will have major impacts on material consumption, land use, pollution, greenhouse gas emissions, and petroleum demand.

For the automotive sector, atmospheric pollution can result from plant emissions, but mainly on car use because of engine emissions. Depending on the rate of consumption of developed and emerging economies, raw material availability and energy security will strongly be affected. "The growth in car production and usage has been a critical factor in the growth of consumption of numerous resources, especially metals. Given an estimate that China will produce over 6 million vehicle units in 2005, it is expected that there will be significant increases in imports of metals. The rapid and continuous growth of China's vehicle population has also brought great challenges to China's energy resource security." In fact, the production of vehicles in China reached more than 5 million in 2005 and more than 7 million in 2006 and crude oil prices hits US\$ 100-abarrel.

Regarding the relationship between the automobile industry and land use, two major consequences arise: traffic control and final disposal of end-of-life vehicles.

Space for roads and car parks are needed to avoid congestion and improve mobility. As a response to the new environmental concerns, traffic control through alternative types of collective transportation and stricter regulation on car use in urban areas might affect customers and consumers' behavior, therefore, reducing the opportunities for the automobile manufacturers of making profits. Moreover, traffic control will also take place as an attempt of avoiding car accidents that increasingly occur in urban centers and on the motorways.

Last, but not least, companies will need to include product recovery as a new activity in their operations function. As land becomes scarce and the vehicle fleets increases, availability of landfill sites will decrease and, as a result, the costs of final disposal for end-of-life vehicles will probably increase.

A common fact among global companies is the transfer of their manufacturing plants from developed to developing countries in order to access new markets, low labor costs, and also a less strict environmental regulation regime. However, as soon as the new destination meets the basic needs of its society, environmental protection becomes a concern; hence, lenient regulation gets stricter. Thus, in the particular case of the automobile industry, new destinations like China and India are already suffering pressure to adopt the Kyoto Protocol decisions and conserve water, therefore using cleaner processes, by 2012. This makes the threat impact on the industry in just 5 years' time. What is more, the likelihood of adopting such measures is high. However, behind the consequences of this threat there are opportunities for cost reduction due to the fact that pollution means waste.



Regarding raw material shortages, new technology, car designs and recycling processes make this a medium-term threat. Also, the use and discovery of new materials such as aluminium, magnesium, plastics and renewable fibers reduce the likelihood of a shortage of materials. The pressures for waste reduction will positively impact the availability of raw materials. In summary, the severity of this threat might be low in the industry.

A significant threat for the sector may be energy intensity and oil dependency. People that are leaving the line of poverty will start consuming product and services, i.e., energy. The automotive industry will compete among other priorities of World society for the use of energy when the World population will probably be 8 billion people in 2025. Without any radical change on the energy matrix of the automotive sector, oil demand is very likely to exceed supply. Although, technologies related to the use of biofuels, hydrogen and fuel-cells are already being developed; external constraints such as distribution and storage of energy may require radical changes for car automakers in the design of their product and processes.

Car use is by far receiving most attention due to its large consumption of fossil fuels, and therefore emission of greenhouse gases. In fact, the current internal combustion engines have low efficiency and are the target of many policies, e.g., California zero-emission fleet and the Brussels' strategy to turn Europe into a low-carbon economy. For example, the second plans to limit the carbon dioxide emissions to 130 grams per kilometer by 2012. Those policies are already on course and as the average car emissions in Europe are still higher than 160 grams per kilometer, engine emissions control is a very likely and severe threat for the automobile industry. Green car production is at its early stages to create an environmentally-friendly market and some researchers have found that environmental issues still play a minimal role for customers.

Congestion taxes are also among of the proposed solutions to minimize air pollution in urban centers and stimulate citizens to use public transportation. These measures have already been taken in some cities like London, and similar programs are used in Singapore, Sao Paulo and Mexico City. The generalization of this method is still controversial and may be applied only on the most densely populated cities. Moreover, automobile culture is very strong, and mainly, as the car ownership is associated with status besides its purpose of personal mobility, the impact on sales may be low and customers will continue to buy cars for travel and other reasons beyond daily needs such as travelling to work.

Landfill shortages will create pressures on car assemblers to take responsibility for their products after use. Final disposal of scrapped vehicles will become an evident problem as the fleet increases and, what is more, a costlier activity as landfill sites will become scarcer. The recovery of end-of-life cars will require new skills and competences from companies, not only from collecting the scrap, but also to take advantage of valuable components from the car. In addition,



new business models are already in course to transfer ownership, and hence responsibility, from the customer to the manufacturer. Although implementation of such policies worldwide is probably not happening in the next 5 years, this is a likely threat with a high impact due to its complexity for industry to collect, separate, recycle and find a correct destination for end-of-life cars.

It might become clear that the automobile companies would need radical changes in their production systems to cope with those environmental threats; nonetheless, because carmakers are locked into three technological paradigms (all-steel car bodies, internal combustion engines, and multi-purpose vehicles), which tends to favor incremental improvements. In addition, the existing economic and political interdependency between this industry and other sectors (e.g. oil industry) makes radical changes towards higher levels of environmental performance more difficult due to its complexity and extension.

Ultimately, the proposed scenarios here give a general perspective on how automakers could be harmed due to environmental regulation, lack of competitiveness, change of social culture, and scarcity of production inputs. Indeed, different companies can perceive differently each threat, and also, have different capabilities and competences to respond to their implications.

The challenge and opportunity of sustainable mobility is that it represents a major shift in vision and action, on multiple levels, that impacts everything from what and how products are created, to which products are chosen for creation.

## **A Case Study of The BMW Group on Sustainable Strategy and Innovations**

### **Company Overview and Business Model**

Bayerische Motoren Werke AG, usually known under its abbreviation BMW, is a German luxury vehicle, motorcycle, and engine manufacturing company founded in 1916. The BMW Group has its headquarters in Munich, Bavaria, Germany. It has been founded in 1916 as Bayerische Flugzeugwerke AG (BFW). It became Bayerische Motoren Werke Aktiengesellschaft (BMW AG) in 1918.

The BMW Group is one of the most successful manufacturers of cars and motorcycles in the world and its BMW, MINI and Rolls-Royce premium brands are three of the strongest in the automotive industry today. In addition to its car brands, the BMW Group also has a strong market position in the motorcycle industry and is a successful financial services provider. In recent years, the company has also become one of the leading providers of premium services for individual mobility.





The BMW Group is an international company, represented in over 150 countries around the globe. At the end of the year 2015 it employed a total of 122,244 people (2014: 116,324 employees). The company has a large research and innovation network, with 13 locations in five countries around the world. Currently, its production network comprises 30 locations in 14 countries. The worldwide vehicle sales network is currently made up of around 3,310 BMW, 1,550 MINI and 140 Rolls-Royce car dealerships. The company also has around 1,150 BMW Motorcycle dealerships worldwide.

With its brands, the BMW Group offers its customers a broad spectrum of individual mobility in the premium segment. Furthermore, with the BMW i brand, the BMW Group has continued to expand the meaning of the term premium. BMW i is even more strongly characterized by the idea of sustainability; it stands for vehicles that lead the way in terms of electric drive, revolutionary lightweight construction, exceptional design and mobility services that have been designed from the ground up.

BMW Motorcycles also focuses on the premium segment and offers a wide range of products. Innovative technologies and a large number of driving apparel options contribute towards increasing customer safety and comfort.

The financial services segment is a partner to the sales organization, and is represented in over 50 countries worldwide. The largest business area in the financial services segment is loan financing and leasing of BMW brand cars and motorcycles for private customers. Under the brand name Alphabet, the BMW Group has an international multi-brand vehicle fleet business that offers loans to large customers to finance their car fleets. It also provides comprehensive management of company vehicle fleets in 18 countries. This also includes full-service solutions such as the corporate car-sharing program AlphaCity, as well as AlphaElectric, a comprehensive e-mobility solution.

Thinking for the long term and responsible action have always been the basis for BMW business success. In addition to business aspects, other integral parts of the BMW Group's strategy are environmental and social criteria along the entire value chain, product responsibility in all areas as well as a clear commitment to resource efficiency.

## **The BMW Group's Vision and Strategy**

### **Vision**

The BMW Group has set its vision to be the world's most successful and sustainable premium provider of individual mobility. BMW sees global sustainability challenges as an opportunity to develop innovative products and services. In this way, sustainability makes a long-term contribution to the business success of the BMW Group. BMW innovations are not developed to be of benefit to its customers only – BMW also wants them to have a positive impact on society and the environment. BMW wants to achieve a clear competitive advantage with efficient and resource-friendly production processes and state-of-the-art solutions for sustainable individual mobility for its customers.



### Key Strategic Issues

In order to identify which topics may bring opportunities and risks to BMW business today or in the future, and to focus our activities accordingly, BMW uses an “environmental radar” to scan external trends on an ongoing basis. In addition, it carries out a regular materiality process. To do this, BMW analyzes the importance of current sustainability topics, both from the perspective of different stakeholder groups as well as that of the company. Figure 1 shows the result of its materiality analysis 2015.

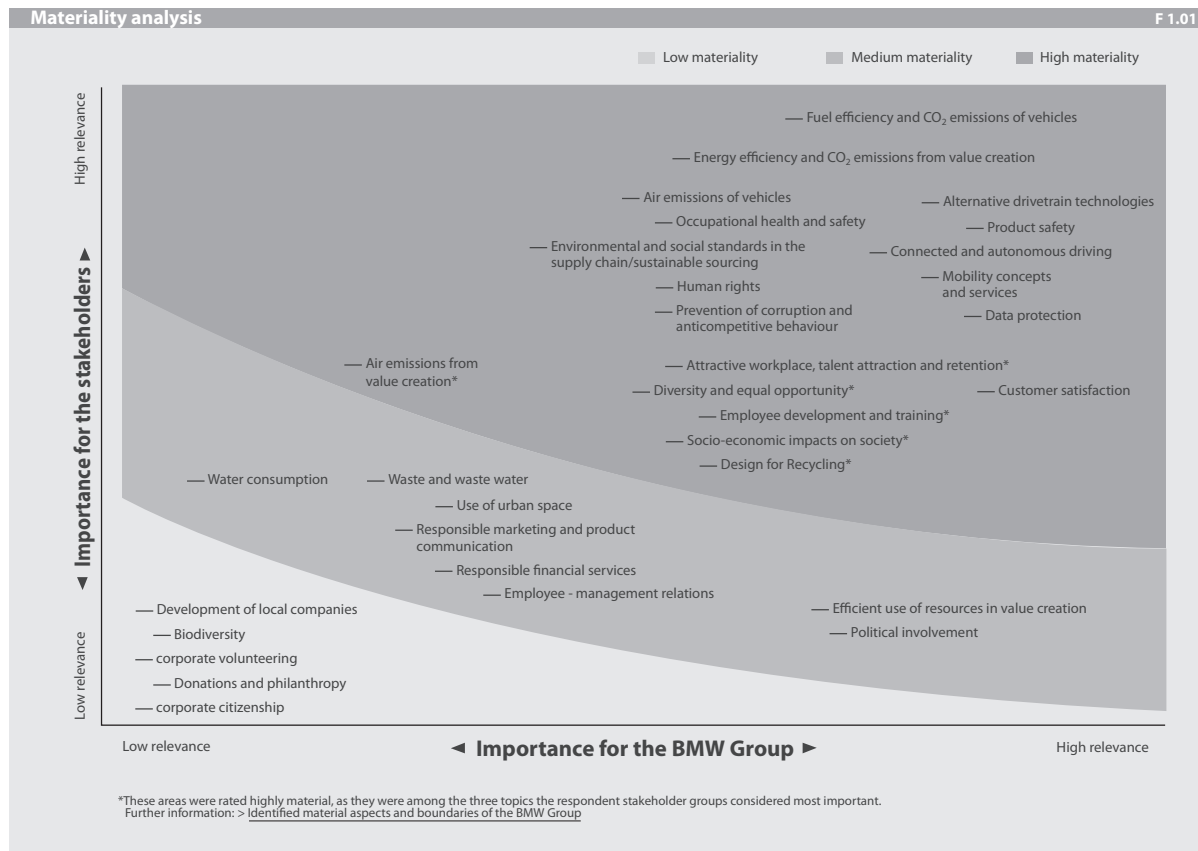


Figure 1: BMW Materiality Analysis Matrix 2015

Source: BMW Group Sustainable Value Report 2015

### Long-term Sustainability Goals

The BMW Group has set itself ten strategic sustainability goals running through to 2020. The goals focus on three areas: products and services, production and value creation, and employees and society. Figure 2 shows the ten long-term sustainability goals. With its long-term sustainability goals BMW Group is fulfilling its vision of being the most successful and sustainable premium supplier of individual mobility. In its opinion, sustainable operations contribute towards higher profits.



### Systematic Integration of Sustainability into the Business Model

The BMW Group systematically integrates sustainability into its business model and along the entire product life cycle and value chain. The key strategic and sustainable issues are brought into considerations and systematically integrated into the BMW strategy. The following sections shows as examples on how sustainability contributes towards the business success of the BMW Group.

- Achieving a competitive edge through the Efficient Dynamics strategy

Strategic corporate planning leads to long-term success. The competitive edge achieved based on the Efficient Dynamics development strategy, which was launched in the year 2000, is one of the reasons why in 2015 the BMW Group had its sixth consecutive record year.

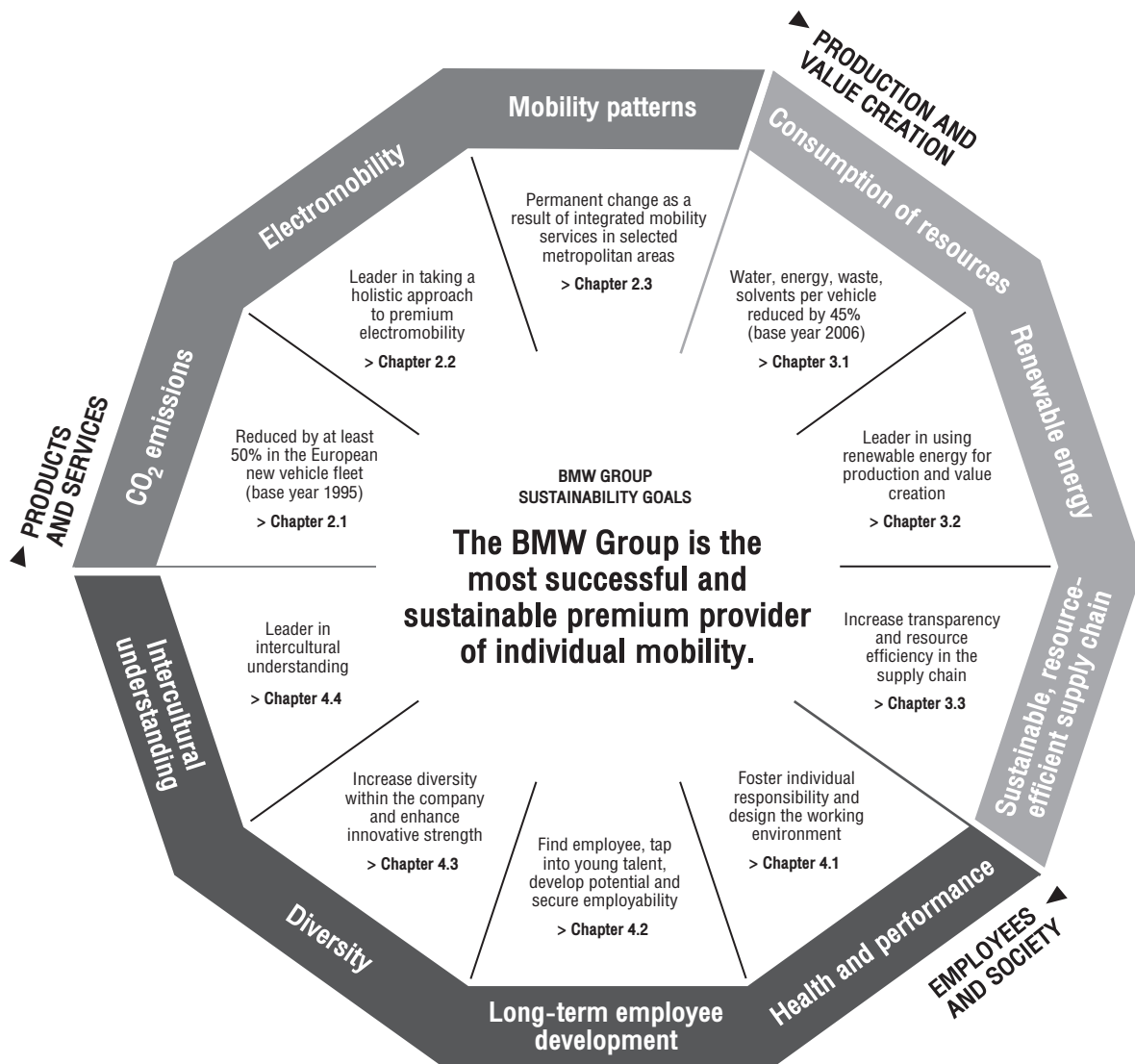


Figure 2. BMW Long-term Sustainability Goals

Source: BMW Sustainable Value Report 2015



- Increase revenues through innovative products and mobility services

Investments in innovative mobility concepts made a considerable contribution towards the company's business success in 2015. One indicator that this is the case is that 24,057 BMW i3s and 5,456 BMW i8s were sold in the year under report. At the end of 2015, just under 580,000 customers were registered with BMW car-sharing service DriveNow (2014: over 390,000), an increase of around 50%. With these products and solutions, the BMW Group also helps its fleet customers achieve their CO<sup>2</sup> targets.

- Reducing costs through resource efficiency

Efficient use of resources reduces risks that can be generated by availability bottlenecks and fluctuations in price. In addition, it makes a direct contribution towards the result by reducing costs, while at the same time being good for the environment. Between 2006 and 2015, the BMW Group was able to significantly reduce energy and water consumption, waste and VOC emissions per vehicle produced in the BMW Group's worldwide production network. As a result, it achieved cost savings of €8.2 million in 2015.

- Remaining competitive through sustainable HR policies

In 2015, the BMW Group was able to further consolidate its position as one of the most attractive employers worldwide. Its leading role in the area of sustainability ensures that its employees identify with and are satisfied with the company and its products. The resulting low attrition rate enables us to keep HR recruitment costs low. In addition, it is our experience that a satisfied workforce leads to higher levels of productivity.

- Savings through Ideas Management

The Ideas Management system at the BMW Group enables all employees to play a part in change within the company by contributing their ideas. The ideas submitted result in improvements to the products and processes as well as cost savings. In 2015, around 4,900 ideas were implemented, leading to €17.5 million in savings. In addition, Ideas Management improves our competitiveness by, on the one hand, reinforcing loyalty to the company and, on the other, fostering motivation as well as entrepreneurial thinking and action.

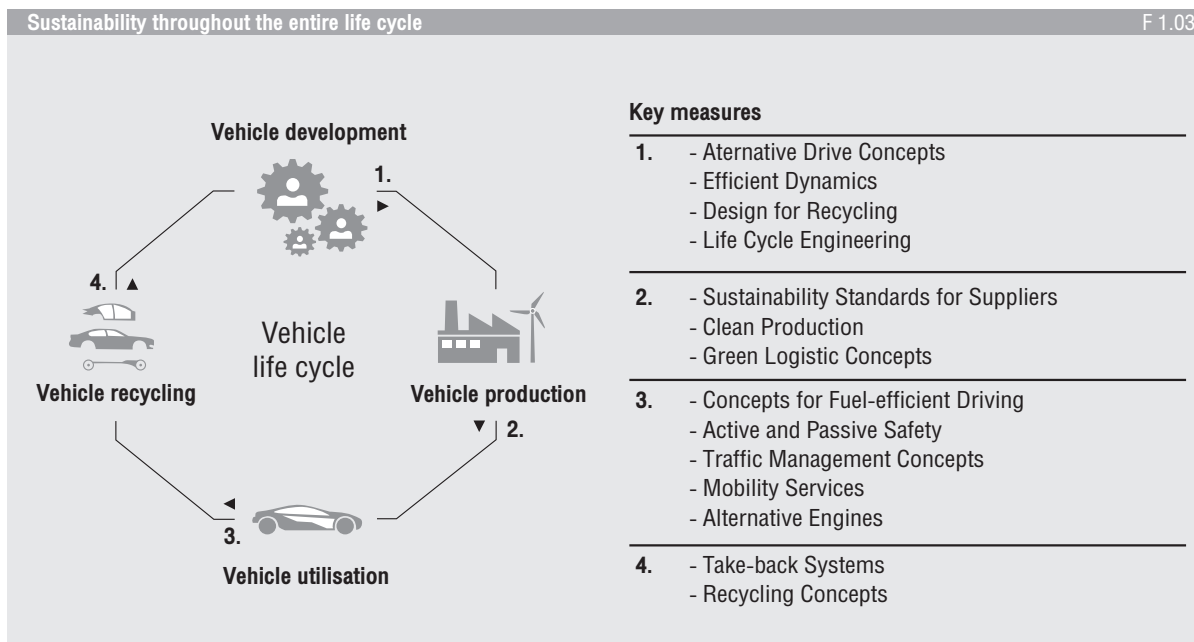
- Fostering innovation by involving employees

The "Innovationswerk" is the BMW Group's internal consulting company for user-focused innovations. The teams help employees to understand future requirements and to generate innovative products and services that users will love. Special facilities at the research and innovation site in Garching, Germany have been set up for work on innovation projects. These allow the project teams to act with empathy and focus in their research work and to optimally apply the tools of design thinking, the lead/extreme user method and strategic consulting.



### Systematically Integration of Sustainability into the Entire Product Life Cycle and Value Chain

A large part of the environmental and social impact caused by a vehicle throughout its life cycle is determined during the initial development stage. Some of the main influencing factors are material selection, production technologies, supplier selection, engine type, as well as the recyclability of the vehicle’s components. Challenging sustainability goals are therefore just as much part of the development process of the vehicle as, for example, cost or weight criteria. The basis for this is holistic accounting, which evaluates the impact of our products along the entire life cycle in terms of environmental, economic and social criteria.



**Figure 3:** Sustainability Throughout the Entire Life Cycle

Source: BMW Sustainable Value Report 2015

Figure 3 depicts sustainability throughout the product life cycle. The BMW Group uses Life Cycle Engineering to increasingly integrate environmental aspects into the design and development of its products. BMW aims to achieve a substantial improvement from one vehicle generation to the next. It manages the implementation of the goals and evaluation of progress by applying the Life Cycle Assessment in accordance with ISO 14040/44. The latest example of this is the new BMW 7 Series. Systematic optimization of the drivetrain as well as more efficient use of resources in materials and production led to a reduction of 25 % in greenhouse gas potential (measured in CO<sup>2</sup> equivalents) throughout the entire life cycle of this vehicle, compared to the previous model.



In line with its principle of Design for Recycling, BMW creates its vehicles in such a way that their components can largely be reused or recycled efficiently throughout the life cycle.

Figure 4 shows how the BMW Group systematically integrate sustainability along the entire value chain.

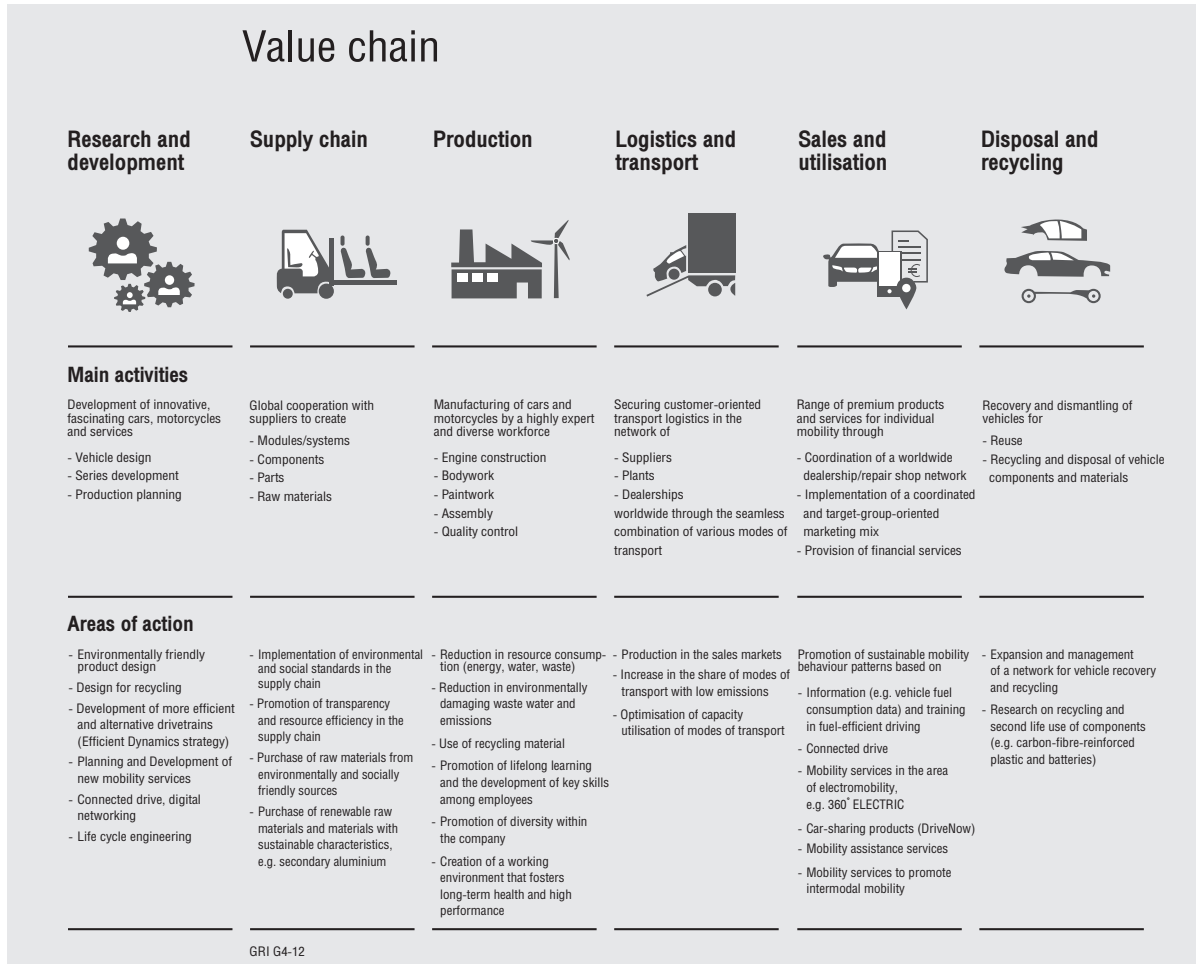


Figure 4. Sustainability throughout the Entire Value Chain

Source: BMW Sustainable Value Report 2015

### Managing Sustainability

The BMW Group manages its business in accordance with responsible corporate governance principles geared to long-term value creation in all areas of the company. The Board of Management governs the enterprise under its own responsibility, acting in the interests of the BMW Group with the aim of achieving sustainable growth in value. It thus determines the strategic orientation of the enterprise and ensures its implementation. The Board of Management is furthermore responsible for compliance with all provisions of the law and internal regulations as well as for adequate risk management and risk



controlling. The Supervisory Board advises and supervises the Board of Management in conducting its duties.

At the BMW Group, sustainability is a component of its corporate strategy. For this reason, its Sustainability and Environmental Protection department has been directly incorporated into its Corporate Planning and Product Strategy unit since 2007, under the mandate of the Chairman of the Board. This unit is responsible for the sustainability strategy and sustainability management worldwide.

Figure 5 presents the organization of sustainability in the BMW Group. The Sustainability Board makes decisions on the longterm alignment of the sustainabilityrelated areas of action. The entire Board of Management is represented on the Sustainability Board, along with the heads of Sustainability and Environmental Protection and of Corporate Communications. The Sustainability Board convenes twice a year to assess the company’s progress on economic, environmental and social issues. In particular, it determines the degree to which sustainability principles have been integrated into the various departments. The Supervisory Board in turn requests progress reports from the Board of Management.



Figure 5. Organization of sustainability in the BMW Group.

Source: BMW Sustainable Value Report 2015



For example, the Supervisory Board has established the Board of Management's obligation to report on the subject of diversity. GRI G444 The Sustainability Circle, which comprises department heads from all divisions, prepares decisions for presentation to the Sustainability Board.

#### **Rewarding Sustainable Business Success**

The Supervisory Board decides on the level of compensation received by members of the Board of Management, orienting its decisions on the sustainable development of the BMW Group. Bonuses are also based in part on personal performance, evaluated primarily according to qualitative criteria. These criteria include ecological innovation (e.g. reduction of carbon emissions), customer focus, leadership accomplishments and the ability to lead change processes.

#### **Summary and Conclusion**

The business success of the BMW Group is built upon innovations on sustainable development that balances three objective dimensions – economic, social, and environment. The BMW Group systematically integrates sustainability into its business strategy, business model, and along the entire product life cycle and value chain contributing to its business success.

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