# Green Low-carbon Cycle Development and New Momentum for Green Development

#### Evonik Industries AG

#### Introduction

The corona pandemic has had a serious impact on societies around the globe. Nobody knows how long the pandemic will last, or how many people will be sickened or lose their lives to the coronavirus. What is becoming clear is that the global financial impact will be severe. In many industries demand has fallen sharply. The chemical industry will also feel the effects of the global recession, but the situation also opens up new opportunities. The chemical industry has demonstrated its willingness to help where it is needed. We are key suppliers to the health care sector, providing disinfectants, medicine, medical devices, laboratory diagnostics, as well as essential materials for protective garments. The chemical industry also provides an enormous variety of products and technologies to other sectors, making it an integral part of their value chains. It is not only in the current corona crisis that the chemical industry is such a vital player. It is a driver of innovation and solutions provider for many of today's global challenges. One of these global challenges is climate change. There is no climate protection without chemistry. The chemical industry makes the world more sustainable, cleaner and healthier. Climate protection is also a technological challenge, and thus, the chemical industry is essential for development of solutions to this challenge – and has been for a long time.

#### China

#### **Background**

During the Eleventh Five-Year Plan (FYP) (2006-2010) period, for the first time in China, the reduction in the intensity of energy consumption and the reduction in total emissions of

major pollutants were identified as binding indicators for national economic and social

development.

In 2009, shortly before the Copenhagen climate summit, the Chinese government

announced that by 2020, China's carbon dioxide emissions per unit of GDP (carbon

intensity) would be 40% to 45% lower than in 2005. As the cornerstone for achieving this

goal, the 12th FYP (2011-2016) includes for the first time a goal of reducing the intensity

of carbon dioxide by 17%. The Plan also added two more binding indicators for ammonia

nitrogen and nitrogen oxides. China also laid emphasis on increasing forest area and

enhancing dependence on renewable energy.

The ecological environmental quality (air, water and soil) was written into the binding

index of the Thirteenth FYP (2016-2020) for the first time, adding further indicators

related to the total emission of regional/industrial pollutants such as Volatile Organic

Compounds (VOCs) and total nitrogen/ phosphorus. It highlights the changes in China's

development philosophy: emphasizing "innovation-driven", "environmental protection"

and improving "people's livelihood and welfare". China's economy is shifting away from

high-speed growth to high-quality development.

The Chinese government attaches great importance to energy conservation and emission

reduction. Various regions and departments at different levels have accordingly adopted

targets and responsibilities and spared no efforts in their implementation. A series of

policies and measures has been created, and numerous key projects and pilot

demonstrations have been launched.

Energy conservation, emission reduction laws and standards systems, as well as

supervision and management systems have been preliminarily established. As a result,

China has basically achieved the promises made in its national mid- and long-term plans

and fulfilled the quota committed in the international conventions, which has made

important contributions to addressing global climate change.

Emission reduction is the foundation to drive green and sustainable development.

It is obvious that energy conservation and emission reduction are of great significance to sustainable development, especially to a country like China that features a mid-to high development pace while a facing shortage of energy resources and the challenges of protecting the environment.

Economic growth needs to be uncoupled from dependence on the growth of energy consumption. Neither should economic growth be based on the cost of environmental pollution, resource depletion or ecosystem damage. As China's economy enters the high-quality development stage, the new development model should cover the three major elements of low energy consumption, low emissions and low pollution. Its essence is to improve the efficiency of resource utilization from all aspects and maximize the use of fast-cycling renewable energy. Energy conservation and emission reduction, driven by efficiency improvement and technological advancement, should be regarded not only as an important starting point, but also as a breakthrough for optimizing the country's economic structure and promoting sustainable development.

# A green low-carbon development is fundamental for China's economic transformation

In the past decades, China's energy consumption has supported its rapid economic development at a growth rate lower than that of China's GDP – and the growth rate of energy consumption has even slowed. China is also currently the world's largest investor and technology leader in renewable energy. Environmental governance in China has won the first victory with prominent improvement in air quality in recent years. Although the government has made important commitments and achieved outstanding progress, China still has a long way ahead in terms of green, circular and low carbon development.

As the world's largest energy consumption country and carbon emitter, China will not stand still in the process of optimizing its industrial structure, improving energy efficiency and curbing pollution. With the acceleration of industrialization, urbanization and the continuous upgrading of the consumption structure, the task of emission reduction is still a demanding one, with huge industrial development potential.

#### Germany

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### Background

The German government introduced the cornerstones of its climate protection goals for 2030 on September 20, 2019, and the cabinet adopted the Climate Action Program 2030 on October 9, 2019. The program calls for pricing harmful CO2 along with subsidies and legal standards for greater innovation and investment to reach the climate action goal 2030, a reduction of greenhouse gas emissions by 55% compared to 1990.

One of the Climate Action Program elements is a new CO2 pricing scheme for transport and heating, to be rolled out from 2021. CO2, which already has a price in the energy sector and for energy-intensive industries under the European emissions trading scheme, will now have a specific cost in transport and construction as well. The national emissions trading system will start in 2021 with a fixed price system, i.e. the price per ton of CO2 is fixed and determined in advance.

Certificates will be sold to companies that distribute fuels for heating and vehicles. Fuel traders will bear the cost for the certificates, as companies distributing heating oil, liquid gas, natural gas, coal, gasoline or diesel will need a certificate for every ton of CO2 emitted by the products they sell as a certificate for pollution rights. The pricing scheme is to start in 2021 with a fixed price of €25 per ton of CO2 for pollution rights. This price will gradually increase to €55 by 2025.

14 percent of all CO2 emissions in Germany (120 million metric tons) are generated in the construction sector. This amount is to be reduced to 72 million metric tons of CO2 per year by 2030. Compared to 1990, the emissions in the transport sector are to be reduced by 40 to 42 percent by the year 2030. The sector must cut its emissions approximately in half by 2030 (compared to 1990), although it had already achieved significant reductions by 2016. Further CO2 savings are expected to result from subsidies for energy and resource efficiency and the expansion of renewable energies. CO2 emissions will also be cut back further in the energy sector, which has posted significant savings in this area for years. The German chemical industry has considerably cut back its greenhouse gas emissions since 1990, in spite of substantial production increases.

The lion's share of the planned CO2 savings in the Climate Action Package comes from the "coal compromise," which the Commission on Growth, Structural Change and Employment developed together with the German mining, chemical industry, and energy union (IGBCE).

It accounts for over one third of the CO2 savings attributable to the sector, making it the largest single item of the program. Coal-fired power plants will only produce 17 GW of electricity by 2030, and none of the country's electricity will come from coal by 2038. The second largest single item in the climate package is the expansion of the share of renewable energies in electricity consumption, an increase by 65 percent by 2030. It accounts for over one quarter of all CO2 reduction plans.

The federal government of Germany supports the ongoing development of climate-friendly technologies in Germany by providing grants and funding for research and development. It is particularly interested in promoting CO2 storage and the production of battery cells. It is also working to draft a national hydrogen strategy. The primary advantages of hydrogen are its ability to easily store and transport energy. This enables a much greater degree of flexibility in the provision of energy. Electricity from renewable energy sources such as wind and solar can be used for the production of hydrogen via electrolysis. This is known as "green" hydrogen. Green hydrogen is indispensable for the move to renewable, sustainable energy sources and is creating new markets. However, the "blue" hydrogen produced by CO2 capture and storage also represents an important contribution to CO2 reduction, at least for the near future. When there is no release of CO2 into the atmosphere during production, blue hydrogen is designated CO2 free. "Gray" hydrogen, by contrast, is not CO2 neutral. In the production process, CO2 is released due to the fact that it is sourced from fossil energy sources such as natural gas. The aim of Germany's national hydrogen strategy is to establish the country as a pioneer in green hydrogen, and in the long-term, to gain market leadership in hydrogen technologies.

# With its Sustainability Strategy, Evonik takes responsibility for a green development

Evonik adopted its Climate and Sustainability Strategy 2020+ in February of last year, establishing a more ambitious goal for the company than the federal government's plan for

all of Germany. Evonik will cut its absolute emissions in half between 2008 and 2025 and will significantly step up its sales of sustainable products. By doing so, Evonik is

underscoring its claim to be a driver of solutions for urgent concerns of the future.

The new Climate and Sustainability Strategy is of dual importance for Evonik. As an

energy-intensive company, Evonik has a vital interest in continuously optimizing its

efficiency and environmental compatibility.

At the same time, sustainable products and solutions are steadily gaining importance for

customers. Accordingly, Evonik will reduce the ecological footprint of its production,

while also increasing its so-called handprint, which results from the use of its products and

solutions in the market. The ecological footprint refers to all negative influences on the

environment caused by humans. In contrast, the handprint represents all positive influences

on the environment.

Evonik's Climate and Sustainability Strategy comprises the components climate, water and

portfolio management. The key climate goal is to cut Evonik's absolute greenhouse gas

emissions in half by 2025 compared to the base year 2008. The Group has already

achieved 30 percent of this objective.

An internal CO2 price will supplement the existing planning metrics as an additional

indicator in an effort to appropriately reflect future price developments for emissions in

major investment decisions. Since water is a central production resource for Evonik, the

previous goal of reducing Group-wide specific consumption will be replaced by a global

water management system.

Keeping in mind the sustainable advancement of the product portfolio, analytical methods

will be directly included in the corporate strategy as well. The data has shown that over 80

percent of Evonik's consolidated sales already have a positive effect on achieving the

United Nations' Sustainable Development Goals.

The chemical industry is a contributor to resource efficiency and sustainability

The chemical industry is a large energy consumer and pollutant emitter. Nevertheless, the chemical industry promotes energy saving, emission reduction and sustainable development through improving energy efficiency, technological innovation and the development of renewable energy products. On the one hand, energy management and full utilization are the primary tasks of emission reduction in the chemical industry. On the other hand, the rapid transformation of cutting-edge chemical technology into energy-saving and emission-reducing products and processes is the important contribution the industry can make to the low-carbon economy, environment and society.

As a specialty chemicals company, Evonik is particularly dependent on energy and raw materials. That makes it even more important to continuously optimize the ecological footprint of production and product applications. Evonik's environmental goals emphasize the company's commitment to becoming the world's best specialty chemicals company.

Evonik achieved the goal of reducing greenhouse gas emissions by 12 percent, originally envisioned for the 2013 to 2020 period, significantly ahead of the planned target corridor. By redefining an absolute reduction target, Evonik is reaffirming its commitment to the resolutions of the Paris Climate Agreement and the goal of establishing a CO2-neutral society.

# The chemical industry is the engineer of the future

As the engineer of the future, the chemical industry holds the key to reaching the objectives of the Paris Climate Agreement. With its innovative solutions, the chemical industry also enables other sectors to reduce their CO2 emissions.

Evonik not only takes part in finding solutions for global challenges, but is also an active player in the development of innovations. The company researches and develops alternative solutions for its customers' products, for its own processes, and for further use of CO2. Evonik already generates over 50% of sales with products that make an important contribution to greater sustainability and improved resource efficiency in their application.

Four of its products, "green" tire technology, amino acids in animal nutrition, foam stabilizers for insulation materials, and oil additives in hydraulic oils help save greenhouse gas emissions of approx. 100 million metric tons of CO2 equivalents. Evonik started up its second methionine plant in Singapore in the past year. The amino acid methionine helps to cover the world's growing demand for meat and thereby contributes to a sustainable supply for the global population. The use of methionine can reduce the livestock industry's emissions of carbon dioxide and other greenhouse gases several times.

Further examples include additives manufactured by Evonik that make wind power and solar plants more efficient and resilient as an important contribution to boosting environmentally friendly energy generation all over the world. Evonik's materials in separators and cathodes have also resulted in more efficient and safer battery designs in electric cars, and Evonik contributes to realizing the conversion of organic waste into green energy. With its innovative membrane technology, the biogas released during either wastewater treatment, household or animal husbandry manure can be simply and efficiently purified, converted into pure biomethane, and directly enter into the natural gas supply network or used as biofuel.

# The chemical industry has established a circular economy as a central component of its activity

However, the reduction of CO2 emissions itself will not be sufficient. Evonik plans to embed CO2 as a raw material in a circulatory system. In collaboration with Germany's Siemens industrial group, Evonik is conducting research into electrolysis and fermentation processes that make artificial photosynthesis possible. Chemicals are then produced using CO2, green energy and bacteria. This technology could potentially be used in any production process that releases CO2. This example shows how important it is to invest in research and development, as well as cross-industry cooperation. Many of these "circular" business models can only be successful via partnerships within the chemical industry as well as with partners from other industries.

Using both recycled and renewable raw materials can help reduce CO2 emissions, and this, in turn, brings us closer to meeting social and political objectives such as the United

Nations Sustainable Development Goals. This is why demands for continued development of circular economy concepts are coming from society and political circles. The new Circular Economy Action Plan of the EU, is setting an ambitious goal: making recycling and reuse a bigger part of every phase in a product's life cycle, especially in high-impact sectors like plastics and construction.

Other nations have also recognized the need for a sustainable economy. China, for instance, included preliminary aspects of a circular economy in its 13th five-year plan (2016-2020).

A circular economy does more than simply help us meet our environmental objectives—it also offers growth potential for the chemical industry. In addition to reducing our dependence on imported fossil-based raw materials, the technological and innovative strengths of the German chemical industry can also make the country an international leader in circular chemical products, services, and business models. A circular economy also offers a chance to help customer industries with their new, circular business models and to better position ourselves as a major innovation driver and problem solver for the key sustainability issues of our day.

#### Policy recommendations

#### China

#### Continue to adjust the industrial structure through technological progress and R&D

Under the new trend of green and low carbon development, the manufacturing industry faces prominent structural contradictions, as well as multiple pressure of energy saving and environmental protection. Thus, the transformation and upgrading of traditional industries with high-tech and applicable advanced technologies is imperative for China.

The pace of firmly eliminating backward production capacity needs to be accelerated and the industry entry threshold should be further increased. The country should strictly control high-energy-consuming and high-emission products. With deeply integrated development of manufacturing and digitalization, high-end, smart, green and service-oriented

manufacturing systems should be established. To improve competitiveness, key industries should aim at international benchmarks to comprehensively improve their product technology, process equipment, energy efficiency and environmental protection. At the same time, the development and expansion of strategic emerging industries such as new-generation information technology, high-end equipment, new materials, biotechnology, new energy vehicles, energy conservation and environmental protection service industry, etc. should be accelerated.

China plays a major role in the world's energy transition and revolution. The proportion of natural gas, renewable energy and other high-quality energy sources keep increasing rapidly. The development of non-fossil energy, especially wind and solar power, is the most dramatic change in China's energy system in the past decade and beyond. The effect of scale supplemented by technological progress has effectively reduced the cost of clean energy production and has further hastened a larger-scale of application. The government shall take firm actions and multiple measures to improve the disordered expansion and tackle the problems of clean energy uptake by the power grid, such as construction of transmission and distribution network, operations, market trading and technological innovation.

To provide important engineering and technical support for accomplishing the tasks of greatly improving energy efficiency and significantly reducing pollutant emissions, major scientific and technological projects should be further implemented, with emphasis on strengthening research and development of key cutting-edge technologies and accelerating their widespread application. Three key areas, industry, construction and transportation, deserve continuous focus to vigorously promote highly energy-efficient and environmental processes, technologies and products.

# Improve policy incentives and promote a market-based mechanism for green development

A series of economic policies such as those on pricing, finance, taxation, and funding for encouraging energy conservation and emission reduction have already been launched. These include measures such as "reward for compensation" for energy-saving renovation

projects in enterprises; mandatory government procurement of energy-saving products; subsidies and tax incentives for encouraging the purchase and use of energy-efficient and environmental friendly products and equipment; green credit and pilot carbon emissions trading, etc.

However, the support and restraint mechanisms are still insufficient, and the supervision approach and regulatory instruments are relatively weak. The government would do well to reduce complexity and interpret the many policies, simplify the processes and make them more clear, transparent and easy-to-understand, which would be more conducive to effective implementation.

In terms of price and charge policies, the reform of resource product prices as well as sewage and waste treatment charges need to be further deepened. Differentiated prices could be applied on products in the encouraged, restricted and eliminated categories of the guidance catalogue for industrial structure adjustment. Penalties should be imposed on enterprises and products whose energy consumption or pollutants emission exceeds the national standards. Formulation of more stringent local standards should be encouraged. Regarding fiscal policies, central and local government should increase investment in energy conservation and emission reduction special funds to accelerate the implementation of key projects and capacity building, to gradually increase the proportion of energy-saving and environmentally-friendly products.

Concerning tax policies, preferential income tax and value-added tax for supporting comprehensive utilization of resources, development of renewable energy and reducing pollution should be implemented. The reform of environmental taxes should be actively promoted. Financial policy should increase the credit support for energy conservation and emission reduction projects and guide various types of venture capital, equity investment, social donations and international assistance funds to increase investment in green development.

Moreover, the role of a market-oriented mechanism of energy-saving and emissionreduction should be exerted, such as increased implementation of energy efficiency labeling and environmental protection product certification, advancing the paid use and trading of pollution discharge rights and expansion of the range of national carbon emission trading as soon as possible, improving the mechanism of ecological compensation, carrying out environmental pollution liability insurance, promoting third-party governance of environmental pollution, etc.

# Develop a circular economy with full force

Circular economy could be regarded as one of the most effective ways for achieving emission reduction from the source and the whole process. The central government has already proposed strategies for developing a circular economy and building a resource-saving and environment-friendly society. Overall planning and effective implementation in key areas is urged to establish industrial chains based on the technological connection between waste and raw materials. In the process of circular transformation of industrial parks, a more sustainable development model of industrial integration, professional work division and logistics cycle will be established.

Take agricultural pollution control as an example. We should attach importance to conservation-oriented agricultural technologies and promote cleaner agricultural production.

Optimization of animal diets and improvement of the breeding efficiency help not only to reduce the demand for feed crops as well as phosphorus and nitrogen-contamination, but also to decrease their methane emissions. Accelerate the collection and treatment of organic waste, such as straw and manure from livestock and poultry farms and build facilities for the comprehensive utilization of resources. Vigorously promote various biogas projects and straw incineration power generation projects. Carry out recycling or bio gradable agricultural membranes. Widen organic fertilizer application and strengthen the use of high-efficiency, low-toxicity and low-residue pesticide as well as the recycling and treatment of pesticide packaging waste.

Promote public participation and advocate a green and low-carbon lifestyle

Publicity and education for sustainability should be strengthened to further enhance the awareness of all citizens. Besides launching special actions and theme activities for family communities, youth, enterprises, rural areas, government agencies, etc., the media shall play a more active role to frequently strengthen education on the resources scarcity and environment challenges, popularize knowledge and skills, publicize best practices and expose negative examples, forming a good atmosphere for the whole society to participate and promote emission reduction. The government should take tougher measures to limit the use of single-use plastics with stronger resolution and intensify the prevention of excessive packaging. A low energy, low consumption, low expenditure lifestyle in terms of clothing, food, housing, transportation, leisure, etc., shall be encouraged, which is more economic, healthy and responsible for a sustainable environment. When emission reduction requirements are truly transformed into the inherent motivation of various social entities, proactive actions will be initiated and implemented without resistance.

## **Germany**

The Climate Action Program 2030 of the German government leaves many questions unanswered. Although it represents a step toward greater climate protection, it is difficult to estimate the program's effectiveness, cost, and ultimate success. We need answers about turning the industry nation Germany into an engine of innovation that conducts business without damaging the climate – while also securing social and economic sustainability. In addition, we need further impulses to make Germany a global technology leader for this transformation.

# Climate protection legislation must also safeguard the energy supply

Putting a price on CO2 is not a panacea and cannot by itself solve the problems encountered on the way to achieving climate goals. The industry also needs alternative sources of energy, to which it can resort before existing technologies become more expensive. Planning for a climate-friendly transformation of the country will be futile if Germany cannot produce enough CO2-neutral energy by itself. For example, that applies to wind power plants. Germany would need 1,400 new plants of this kind a year. That also applies to the expansion of power lines, with an additional 6600 km needed by 2030. It is generally a good idea to end our dependence on fossil energy sources, but so far, electricity

production with wind power and solar energy is still volatile and not sufficient for large scale energy demand for industry at a cost competitive price. As long as we are not able to store electricity efficiently and networks cannot compensate the heavy fluctuations, we still have a long way to go, as safe and affordable electricity is indispensable. As an industry nation, Germany depends on reliable access to electricity at all times to remain competitive. In addition to climate protection, climate protection legislation must therefore define mandatory targets for energy supply security, industrial value creation and job security.

When it comes to CO2 pricing, we need an internationally coordinated approach. If competitors in other regions are not subject to the same conditions as energy-intensive industries in Germany, competition will be distorted. For the chemical industry, the European emissions trading scheme is the key instrument to reach climate protection goals while maintaining competitiveness. Since the scheme provides a legally binding path for reducing emissions, national measures have to take the existing regulations at the European level into account and cannot contradict them. Otherwise, they would be counterproductive, inefficient, and tantamount to double regulations. Based on price markups in the supply chain, the CO2 price will inevitably end up as the responsibility of the industry. Since they already are regulated based on EU emissions trading, companies would be charged twice.

Politicians would therefore do well to prevent unnecessary additional burdens that may put corporate competitiveness at risk.

#### Address climate change with investments and innovations

Sacrifice and prohibitions will not save the world. Rather, we need political framework conditions that help the industry to make climate-friendly investments and drive innovations. We must develop promising products and solutions for the future with innovations to address climate change in Germany. For that, we need much more concrete investment in new technologies and an expansion of infrastructure. Public investments have too long remained at a low level, and we have been making due with existing solutions for far too long. Climate-friendly transformation will most likely be the largest and most expensive undertaking since the establishment of the Federal Republic. It is time for politicians to act. Climate protection needs intelligent products, new business models,

the smart use of digital technologies and a comprehensive understanding of value chains. From raw material sources to production and processing through disposal, recovery or

recycling, good industrial policy is good climate policy.

Innovations are the driving force of sustainability. The lives of over 7 billion people in the world can only become sustainable with innovative products and processes. That's why we need optimal conditions for research and development. They strengthen enterprise competitiveness, secure employment, and promote the development of sustainable production processes and products. It is a positive step that the federal government plans to initiate innovations for climate-friendly behavior with its Climate Action Program 2030 and that it will pursue a technology-friendly approach to promote emission reduction measures.

#### The contributions of the chemical industry for green development must be recognized

The topic of climate protection has become a kind of all-purpose weapon that can be wielded almost anywhere. The issue is presented as a struggle between nature and industry. As our willingness to engage in objective discussions beyond ideology and morality is waning, a lot of trust in the industry has been lost. Germany must demonstrate that environmental and climate protection can be compatible with economic growth and social prosperity. Companies can only be competitive on an international scale if they grow and are profitable. Environmental protection and sustainability should not be seen as contrary to growth and profitability. Rather, they mutually define each other. The chemical industry needs public trust and political support, along with objective and responsible decisions. Given the ecological, economic, and social concerns inherent in sustainability, our goal must be to balance these three dimensions on an equal footing —Planet, People, Profit. Sustainability, particularly in the ecological dimension, can only be achieved with the help of the industry. That presumes that the laws of economic activity are taken into account. Otherwise, we will not be able to meet demands for sustainability.

#### Conclusion

Climate protection will not succeed on beautiful promises and flowery intentions. Rather, the challenge is to establish binding targets, metrics, and clear evidence. The chemical industry is uniquely positioned to offer powerful levers for addressing the sustainability challenges of the future. Hardly any other company has made this claim a greater priority than Evonik. Evonik has turned environmental and climate protection into a key element of corporate responsibility and sees the need to reduce the consumption of fossil energies and to reduce CO2 emissions.

As a specialty chemicals company, Evonik goes beyond chemistry each and every day. As a partner to our customers, we form a network of expertise and perspectives to create sustainable solutions that add value. Evonik is taking on a leading role in its markets and in the development of its industry. Our mission is to make people's lives better. Which is why we see ourselves as "Leading beyond chemistry, to improve life, today and tomorrow."

Future viability is the business, and sustainability the guarantor of success for Evonik. To think about tomorrow means to keep an eye on the environment and on the prosperity of future generations. Evonik will not let up in its efforts and will continue to strive to become the world's best specialty chemicals company. Including in terms of sustainability.