Ministerium für Klimaschutz, Umwelt, Landwirtschaft, Natur- und Verbraucherschutz des Landes Nordrhein-Westfalen





Tackling climate change from the bottom up: The Climate Protection Plan for NRW at a glance





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FOREWORD



Dear Reader,

Protecting the climate is one of the most pressing tasks facing the international community as a whole. As one of the most important centres of energy and industry in Europe, North Rhine-Westphalia (NRW) is responsible for around one third of Germany's greenhouse gas emissions. Germany can only achieve its climate protection goals if NRW takes major steps to protect the climate – and the European Union, in turn, will only be able to meet its targets if Germany proves successful. Both nationally and internationally, NRW is essential to successful climate protection.

In redefining its climate protection policy, North Rhine-Westphalia is making a commitment to the national and international effort to combat climate change. Having launched the Climate Protection Starting Programme in 2011 and passed the Climate Protection Act in 2013, NRW has now drafted its first Climate Protection Plan. This is another major milestone on the road towards a successful climate protection policy based on voluntary measures and participation instead of obligation.

In NRW, we are tackling climate change from the bottom up, involving citizens, businesses and local communities. Climate protection and the energy transition ("Energiewende") are already happening here in NRW – on the roofs and in the basements of our homes, in the production facilities of our industrial companies, in kitchens and canteens, on farms and at the shop counter. With a hitherto unprecedented level of participation, we have drawn on the know-how of businesses, industry, associations, cities and communities as well as the general public to draft our Climate Protection Plan. The result is a Climate Protection Plan that provides the climate protection movement in NRW with additional tools, both for protecting the climate and for adapting our homes and lives to the unavoidable consequences of climate change.

One thing is clear: climate change has most definitely arrived in NRW and cannot be reversed despite our best efforts to protect the climate. Torrential rain and gale-force winds of the kind experienced across Western Europe in early June 2014 will therefore become more frequent, and summer heatwaves will have an impact on people living in urban regions in particular. With the measures outlined in the Climate Protection Plan for NRW, we aim to anticipate the impacts of climate change and make the region more resistant to the effects of extreme weather, thus ensuring that NRW is a safe place for future generations to live in.

This brochure summarizes the first Climate Protection Plan for North Rhine-Westphalia. Please take a closer look and play an active part in climate protection "Made in NRW".

Johannes Remmel Ministry of Climate Protection, Environment, Agriculture, Nature Conservation and Consumer Protection of the State of North Rhine-Westphalia

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THE CLIMATE PROTECTION PLAN FOR NRW – BACKGROUND AND PROCESS

INTRODUCTION

The first Climate Protection Plan for North Rhine-Westphalia has been drawn up by the state government to meet one of the essential requirements of the state's 2013 Climate Protection Act. The Plan outlines the strategies and specific measures needed to achieve the targets for the reduction of greenhouse gas emissions set out in the Climate Protection Act.

The Climate Protection Plan for North Rhine-Westphalia is a programme of action based on existing climate policy activities. It specifies the measures that are to be taken between now and 2020 in order to achieve the targeted 25% reduction in emissions. The Plan is a kind of roadmap for the long-term goal of reducing greenhouse gas emissions by at least 80% between now and 2050; it sets out the options available for action and the strategic decisions to be taken in the coming years. The Climate Protection Plan will be updated every five years to take account of any new technical developments and changes to the basic legal frameworks. In addition to strategies and measures designed to protect the climate, the Climate Protection Plan for NRW also shows how North Rhine-Westphalia can look ahead and prepare for the consequences of a change in climate that can no longer be averted.

NRW'S CLIMATE PROTECTION POLICY A GLANCE

In 2010, the state government launched a new and ambitious climate protection policy. It comprises four key elements: the Climate Protection Starting Programme, the Climate Protection Act, the Climate Protection Plan and KlimaExpo.NRW.

Climate Protection Starting Programme (2011)

A programme of 22 individual climate protection measures. The complete package contains grant and loan schemes worth several hundred million euros, including \notin 200m per year for improving energy efficiency in buildings and a combined heat and power (CHP) incentive programme to the value of \notin 250m spread over several years.

Climate Protection Act of NRW (2013)

The first act passed by a federal state in Germany to protect the climate. The Act stipulates a 25% reduction in greenhouse gas emissions by 2020 and a reduction of at least 80% by 2050.

Climate Protection Plan for NRW (2015)

Defines strategies and measures for achieving the target reductions in greenhouse gas emissions set out in the Climate Protection Act, as well as measures for adapting to the consequences of climate change.

KlimaExpo.NRW

Showcase and laboratory for new ideas in North Rhine-Westphalia. KlimaExpo.NRW will make use of various state-wide events to present successful climate protection projects to a large audience. The objective is to motivate the general public, companies, cities and communities to play a more active role in protecting the climate.

CLIMATE POLICY GUIDELINES: ECOLOGICAL RESPONSIBILITY, ECONOMIC RATIONALE AND SOCIAL JUSTICE

Climate change mitigation and adaptation to climate change are essential elements of the political agenda in North Rhine-Westphalia. In addition to the overriding objectives of reducing greenhouse gas emissions in NRW through more efficient use of resources and energy, promoting energy savings, and developing renewable energy sources, the state government has also defined further fundamental guiding principles for its climate policy.

ENSURING AN AFFORDABLE ENERGY SUPPLY AND STRENGTHENING THE ECONOMY

When implementing climate policy strategies and measures, the main focus should be on ensuring and improving the supply of affordable energy, as well as on strengthening North Rhine-Westphalia's position as an industrial and economic centre. This will be achieved through research into, as well as the development and use of, innovative and sustainable future technologies. At the same time, social injustices must be avoided. Climate protection in North Rhine-Westphalia can therefore also be seen as an industrial policy strategy based on technological innovation and scientific achievements. North Rhine-Westphalia is and will remain an industrialized state as well as a pioneer in ecological industrial policy. In addition, the state government will ensure that, by 2030, the overall footprint of the state administration is carbon neutral.

ADAPTING TO THE CONSEQUENCES OF CLIMATE CHANGE

The state government will also take a forwardlooking approach in terms of adaptation to the unavoidable consequences of climate change. Above all, the state government is striving not only to heighten public awareness of what climate change means, but also to provide information and stimuli for adaptation and to create the structures needed so that all stakeholders can work together to develop the best possible solutions for our adaptation to climate change.



Renewable energy sources: a fundamental part of an energy supply that will continue to be affordable in the future.

BOOSTING ACCEPTANCE OF CLIMATE CHANGE MITIGATION AND ADAPTATION THROUGH BROAD PARTICIPATION

As a matter of principle, the state government has based its climate change mitigation and adaptation policy on dialogue - with cities and communities, economic and conservation associations, utilities, businesses, trade unions, churches and the general public. The state government believes that climate protection and adaptation to the consequences of climate change can only succeed if those affected also participate and are given the opportunity to play an active role in shaping climate policy. The unprecedented levels of participation seen during the development of the first Climate Protection Plan for NRW is characteristic of this political style and will also define North Rhine-Westphalia's future climate policy.

ACTING WITH GLOBAL RESPONSIBILITY: THE CLIMATE PROTECTION PLAN IN THE CONTEXT OF CLIMATE CHANGE AND WORLDWIDE CLIMATE PROTECTION POLICY

In its Fifth Assessment Report on Climate Change, published in 2014, the Intergovernmental Panel on Climate Change (IPCC) showed more clearly than ever that human activities are changing our climate with increasing rapidity. The global mean temperature has increased by 0.8°C since pre-industrial times. Climate change and its impacts can only be contained and managed by drastically reducing greenhouse gas emissions and limiting the rise in global temperatures to 2°C. The international community, every country and every region must come together to master this challenge.

CENTRAL ROLE OF THE STATE GOVERNMENT OF NORTH RHINE-WESTPHALIA IN COLLABORATION WITH MAJOR STAKEHOLDERS IN CLIMATE PROTECTION



In this context, the state government of North Rhine-Westphalia has redefined its climate policy. On the one hand, the state government is promoting ambitious national, European and international targets and frameworks for climate protection. At the same time, the state government is supporting individuals, businesses, cities and communities in their grass-roots efforts to implement local activities to protect the climate and reduce the impacts of climate change, for instance through specific advisory or funding programmes. Such a strong commitment by regions within individual states – such as NRW – can play an important role in achieving climate objectives worldwide.

THE CLIMATE PROTECTION PLAN: DEVELOPING A ROADMAP

North Rhine-Westphalia is on the verge of a major transformation process that will involve the general public, cities and communities, industry, the energy sector, businesses, central municipal organizations, trade unions, associations and other social groups. The state government therefore considered it appropriate to invite representatives of all these groups to come together to exchange ideas and participate in the bottom-up process of drafting the first Climate Protection Plan for North Rhine-Westphalia. Their practical know-how and the experience of all those who are committed to, and implement, climate protection in their various areas contributed significantly to the development of this Climate Protection Plan for North Rhine-Westphalia with all its strategies and measures. Valuable additional information was supplied by studies carried out by the Wuppertal Institute and others.

DEVELOPING CLIMATE PROTECTION STRATEGIES

Six expert working groups on climate protection were set up at the start of the participatory process. They defined relevant fields of action for climate protection in the following sectors: energy conversion; manufacturing and industry; buildings, trade, commerce and services; transport; agriculture, forestry and soil; and private households. In addition, they developed strategies to enable these sectors to reduce their greenhouse gas emissions in the medium and long term. Renewable energy sources are one example of a field of action in the energy conversion sector; the strategies put forward for this field of action include the development of wind energy.

SCENARIO CALCULATIONS

An energy system and greenhouse gas model was used to calculate the potential impact of the strategies developed by the climate protection working groups on the development of greenhouse gas emissions in NRW from the present day until 2050. The calculations are based, on the one hand, on the strategic assumptions agreed upon by the working groups and supplemented in part by the Wuppertal Institute - for instance, in terms of the expected growth of renewable energy sources. On the other hand, it was based on other influencing factors over which North Rhine-Westphalia has only limited control, such as climate protection strategies at federal government and European Union levels. These model calculations yielded a large array of climate protection scenarios indicating

possible future trends in the development of greenhouse gases in NRW. Based on the assumptions made, and with due regard for the effects of emissions trading in Europe, these scenario calculations show that NRW's greenhouse gas emissions can be reduced by up to 29% by 2020 and by up to 82% by 2050, taking 1990 as the reference year.

In the course of an impact analysis, these scenarios were then examined further with regard to their ecological, economic and social impacts. The analysis focused on security of supply, dependence on imported energy, the environment, healthcare, social compatibility and gender, as well as on macroeconomic effects and the impact on employment.

Taking account of this information and other findings from the participatory process, the state government selected and developed strategies with defined measures for each of the sectors and fields of action in the Climate Protection Plan.

DEVELOPING CLIMATE PROTECTION MEASURES

The six working groups proposed and discussed specific climate protection measures for the period up to 2020. In a second phase of the participatory process, businesses, cities and communities, regional planning offices and all interested members of the public were invited to comment on and supplement these proposals at various conferences and events, as well as in an online survey. All proposals and comments were reviewed by the state government when drawing up the Climate Protection Plan and were summarized or modified as necessary. Some proposals were not pursued, for instance if it was already clear that a measure could not be implemented due to the regulatory conditions. Some measures were supplemented. All in all, this process yielded a total of 154 measures with which to achieve the climate protection goals by 2020.

DEVELOPING CLIMATE CHANGE ADAPTATION MEASURES

In the same way as for the area of climate protection, the state government has identified sectors that are highly susceptible to the impacts of climate change. These sectors are referred to here as "fields of action", in keeping with the German Strategy for Adaptation to Climate Change. Four workshops were held at which stakeholders proposed measures to assist the process of adapting to climate change. These measures were allocated to the 16 fields of action, and then commented on and supplemented through a range of further opportunities for participation. The final selection and detailed development of a total of 66 measures was undertaken by the state government based on a sustainability review.



Various expert working groups and workshops were organized to draw up the Climate Protection Plan for NRW.

DIFFERENTIATION AND NETWORKING PHASE

A COMPLEX PROCESS: THE DEVELOPMENT OF THE CLIMATE PROTECTION PLAN FOR NRW AT A GLANCE

CONCEPTION PHASE

Expert working groups (WG) Participation of the public CLIMATE **Climate protection** Online participation CONFERENCE Recommendations WG1 Energy Conversion WG2 Manufacturing and Industry Congress for local communities* WG3 Buildings, Trade, Commerce Congress for companies/businesses** and Services Proposals for fields of action, strategies and measures Workshops for cititzens*** WG4 Transport WG5 Agriculture, Forestry and Soil WG6 Private Households Workshops for regions within NRW Climate adaptation WG1 Education / Information WG2 Rural Areas WG3 Industry WG4 Urban Spaces Scientific advisers Coordination committee Parliamentary sub-committee

* Representatives of cities and communities discussed the practical viability of measures proposed for the Climate Protection Plan for NRW

** Dialogue between industry representatives and the state government

*** Public events at which members of the public discuss ways and means of reconciling planned measures in the Climate Protection Plan with everyday life



II. FIELDS OF ACTION, STRATEGIES AND MEASURES IN THE CLIMATE PROTECTION PLAN

The Climate Protection Plan is a roadmap that forms part of an integrated energy and climate protection policy for NRW. It shows how North Rhine-Westphalia intends to contribute towards achieving the national and international goals set for climate protection, energy efficiency, security of supply, stable prices and the development of renewable energy sources. As a central climate policy programme, the Climate Protection Plan for NRW focuses not only on short-term measures, but also on the longer-term strategic orientation up to the year 2050, as seen from today's viewpoint. For this reason, the Climate Protection Plan has been devised as a "learning system" which will be regularly updated. The state government will adjust the Plan where necessary and, in consultation with the relevant stakeholders, will bring it into line with changes to the underlying situation.

MANDATE FOR ACTION FOR THE STATE GOVERNMENT – OPPORTUNITIES FOR ALL STAKEHOLDERS

The Climate Protection Plan for North Rhine-Westphalia is a clear mandate for action for the state government. For stakeholders outside the state government, the Climate Protection Plan predominantly contains voluntary measures, such as grant and loan schemes, funding for research and development, networking opportunities, information exchange and consulting services, and educational schemes. The purpose of these measures is to support industry, the energy sector, small and medium-sized enterprises, cities and communities as well as the general public, and to motivate them to launch their own climate protection measures and make use of the advantages arising from improving energy efficiency or using renewable energy, for instance.

As Germany's industrial heartland and the state which produces the most energy, North Rhine-Westphalia has a special responsibility for ensuring the success of Germany's energy transition and the achievement of its climate protection goals. With the Climate Protection Plan, the state government is simultaneously aiming to strengthen the competitive international position of NRW as an industrial centre for energy production and using climate protection to drive technological progress. The state government is therefore striving to negotiate corresponding frameworks at both the national and international level: simply transferring CO₂ emissions to other countries would be selfdefeating. With its Climate Protection Plan for NRW, the state government has accepted this responsibility and positioned North Rhine-Westphalia as a pioneer in climate protection.

The government's approach to preparation and participation thus far has created a culture of dialogue that – in itself – constitutes added value. This culture of dialogue will be developed further by the state government as it implements the various measures and updates the Climate Protection Plan.

FUNDAMENTAL STRATEGIES AND GOALS OF THE CLIMATE PROTECTION PLAN

Achieving North Rhine-Westphalia's climate protection goals depends to a large extent on how the relevant stakeholders implement the Climate Protection Plan's strategies and measures in their respective fields of influence and how they respond to the associated funding and participation opportunities. A crucial factor will be to motivate all those sectors that can make the biggest contribution to reducing greenhouse gas emissions. The following key strategies and goals are particularly important for the medium to long term:





SETTING AMBITIOUS TARGETS FOR RENEWABLE ENERGY EXPANSIONS

North Rhine-Westphalia has great potential to expand its use of renewable energy sources: photovoltaic systems in particular can be installed on any suitable roof – and there are plenty available. Wind energy can be harnessed and its potential exploited through the construction of new plants and the refurbishment of existing plants (repowering). Biomass, hydropower and geothermal power can help to stabilize the supply of energy from renewable sources. The target is for renewable energy sources to deliver 30% of NRW's electricity by 2025. Given the national target of producing more than 80% of electricity from renewable energy sources by 2050, NRW is setting the bar appropriately high.

INCREASING ENERGY AND RESOURCE EFFICIENCY

The state government wants to harness the immense potential and the positive trend seen in recent years by actively defining ways to minimize use of energy and resources. There is considerable scope to improve efficiency in all sectors of the economy, as well as in the public and private sectors. Scenario calculations show that it will be possible to boost energy productivity to between 1.5% and 1.8% per year by 2050. The state government wants to leverage this potential and promote the development of energy efficiency; at the same time, it also wants to launch further measures to support the development of energy efficiency markets. By promoting the investment sector, funding innovative and intelligent energy efficiency measures, stimulating energy efficiency markets

and developing financial instruments facilitating investment and the funding of both basic and applied energy research, NRW aims to become the "No. 1 state for energy efficiency" in Germany.

SAVING ENERGY

Alongside the development of renewable energy sources and boosting efficient use of resources and energy, conserving energy is a key factor in achieving a rapid reduction in greenhouse gas emissions. Moreover, it will be easier, quicker and cheaper to achieve the desired share of renewables in the energy mix if considerable energy savings can be realized. The buildings sector offers the greatest potential savings, although considerable energy savings can also be achieved by private households, transport, and industry. Scenario calculations show that, by using technical measures and increasing awareness of energy and climate issues, primary energy consumption can be reduced by 12% to 18% between 2010 and 2020, and by 45% to 59% by 2050. The state government intends to leverage this potential.

DEVELOPING TRIGENERATION

Trigeneration – the combined generation of cooling, heat and power – permits more efficient use of fuels than when power, heat and cooling are generated separately, thus reducing emissions. Simultaneous generation of power, heat and/or cooling makes CCHP an ideal technology for maximizing the efficient use of energy sources. The state government aims to boost the share of CCHP in total electricity generation to at least 25% by the year 2020.

FUTURE OF LOW-CARBON TECHNOLOGIES IN INDUSTRY

Emissions from production processes can be significantly lowered by using low-carbon technologies instead of those used today. Despite the considerable potential, many of these technologies have still to be developed into actual products that can be brought to market. As a starting point for improving energy and resource efficiency, therefore, greater use should be made of the best technologies currently available, with the aim being to switch to low-carbon technologies in the medium and longer term.

Greenhouse gas emissions can be significantly reduced through the development and use of low-carbon technologies only if companies with energy-intensive production processes remain competitive. At the same time, the transition to low-carbon technologies in industry will also help companies to remain competitive. The state government will establish suitable conditions and promote the innovative capacity of industry and research institutions to develop and use low-carbon technologies.

Stepping up research and development in the field of climate protection technologies is therefore a matter of fundamental importance to the state government. Specific plans include competitions for funding research and development that aims to boost resource and energy efficiency. Other key focal points are the further development of flexibility measures and storage technologies, both of which are urgently needed, and the transformation of peak power input from renewable energy sources into gas, heat or chemical feedstocks.



CREATING CARBON-NEUTRAL BUILDINGS IN THE LONG TERM

A large proportion of energy consumption and greenhouse gas emissions can be attributed to the roughly 20 million residential and non-residential buildings in Germany. These emissions must be drastically reduced in order to achieve the climate protection goals set for NRW. Instead of considering only refurbishment of the building shell as an energy-saving measure, the carbon footprint for the residential sector must be considered as a whole. Emissions need to be reduced in all areas, including the provision of heat and hot water, the use of renewable energy sources, and efficient use of household appliances. The state government supports the development of buildings that are largely carbon neutral as a long-term aim.

SUSTAINABLE MOBILITY

Motor traffic is a characteristic feature of North Rhine-Westphalia. The potential for reducing greenhouse gas emissions from this source is immense. However, it will not be sufficient simply to reduce emissions by using the alternative, climatefriendly fuels and drive systems that will be available in the coming years and decades. There will be a need to make changes in the means of transport used (modal share) in both passenger transportation and freight transport. Framework conditions therefore need to be established so that transport



can be used as efficiently as possible, both in terms of climate protection and with regard to macroeconomic aspects. Personal mobility in the form of walking and cycling will be encouraged. In conjunction with freight transport, production and transport chains must become more efficient, for instance through the provision of appropriate IT infrastructure. Strategic courses of action to address the issue of mobility are needed in the coming years.

OPTIMIZING SOIL MANAGEMENT AND ANIMAL HUSBANDRY

Soil management and animal husbandry lead to the emission of nitrous oxides and methane, which are harmful to the climate. The state government aims to reduce these emissions. In the case of soil management, emissions can be reduced by optimizing the use of fertilizers. In the case of animal husbandry, potential savings can be achieved, for example, by using nitrogen-optimized feedstuffs, by optimizing the storage and utilization of manure, and through the choice of penning systems.

ENHANCING CLIMATE AWARENESS AMONG CONSUMERS

North Rhine-Westphalia is the most densely populated state in Germany. Private consumption in the state therefore generates considerable greenhouse gas emissions. There is thus a need to raise awareness among the roughly 17.5 million inhabitants of the effects of their purchase decisions, use and consumption patterns on the climate. Attention should above all focus on exploiting potential savings and increasing energy efficiency when heating rooms and water, when using electrical appliances, and in the development and use of climate-compatible products.

CARBON-NEUTRAL STATE ADMINISTRATION, UNIVERSITIES AND COLLEGES IN NORTH RHINE-WESTPHALIA

The slogan "Climate protection – made in NRW" applies equally to the state administration and to universities and colleges in North Rhine-Westphalia. The joint contribution of the state administration and higher education institutions (HEIs) is of particular



significance in view of their function as role models. Some 300,000 people work for the state government and HEIs in NRW. In addition, the building and property management agency (Bau- und Liegenschaftsbetrieb NRW, BLB NRW) is responsible for around 85% of the roughly 4,600 state-owned buildings and properties.

Initial estimates indicate that, all in all, roughly 1.168 million tonnes of CO_2 are emitted per year by the state administration and HEIs in NRW. The state government's declared aim is to prevent, reduce or offset these emissions by 2030.

ADAPTING TO THE CONSEQUENCES OF CLIMATE CHANGE

When it comes to adapting to those consequences of climate change that can no longer be averted, the state government's aim is to fill knowledge gaps, provide information, raise awareness and provide practical stimuli for implementation. Building on the German Adaptation Strategy of 2009, the state government has listed 16 fields of action in its Climate Protection Plan, made up of more than 60 measures with which it intends to counter the effects of climate change. The fields of action include water management and flood control, disaster management, urban development, forest management, agriculture, industry and commerce, and human health and tourism, among others. The overall aim is to introduce practical measures to reduce North Rhine-Westphalia's vulnerability to the consequences of climate change.



Heatwave 2003: climate change and its consequences are increasingly making themselves felt in NRW.

CLIMATE PROTECTION: SUMMARY OF SECTORS, STRATEGIES AND MEASURES IN THE CLIMATE PROTECTION PLAN

Achieving climate protection goals is a task for society as a whole. All sectors which emit greenhouse gases must contribute towards achieving these goals. When preparing the Climate Protection Plan for North Rhine-Westphalia, the state government identified six sectors which account for most of the greenhouse gas emissions generated in NRW: energy conversion; manufacturing and industry; buildings, trade, commerce and services; transport; agriculture, forestry and soil; and private households. The following sections present the individual sectors with their respective potential for reducing emissions, and give an insight into the strategies and measures by means of which their potential can be increased.



UNEQUAL DISTRIBUTION: SUMMARY OF GREENHOUSE GAS EMISSIONS BY SECTOR. SOURCE: LANUV 2014 (ADAPTED)*

ENERGY CONVERSION

The energy sector is the biggest emitter of greenhouse gases in North Rhine-Westphalia. It accounts for around 48% of all emissions. No other federal state produces more energy – almost one third of the electricity in Germany stems from NRW, and three-quarters of this is generated by coal and lignite-fired power plants. Renewable energy sources supply almost 11% of the total electricity generated. This remains far below the national average of roughly 25% (figure for 2013). One of the most important climate policy strategies in the first Climate Protection Plan for NRW is to increase this share, in keeping with nationwide targets of more than 80% by 2050, and ultimately to produce electricity exclusively from renewable energy

sources. By 2025, more than 30% of electricity is to be supplied from renewable energy sources. To this end, the state government will introduce advisory services, for setting up energy cooperatives, for instance.

This will be supplemented by funding the development of photovoltaic systems, biomass plants, geothermal power plants and hydropower plants, as well as by measures to improve the integration of systems. In the light of these facts, North Rhine-Westphalia will play an active part at the federal level when it comes to shaping future energy markets and supporting efforts to make the Renewable Energies Act (EEG) more efficient, as well as in providing sufficient incentives for the provision of system services, networks and storage locations.

Demand for fossil-fired baseload is declining steadily as a result of developments on the electricity market. However, it will not be possible to phase out fossilfired power plants in North Rhine-Westphalia until a secure supply of electricity based on renewable energy sources becomes available. A further strategy set out in the Climate Protection Plan is therefore to increase efficiency and flexibility in the design and utilization of existing power plants.

Combined heat and power generation is particularly efficient – the aim is therefore to boost its share of the electricity supply from 13% today to at least 25% in 2020, for instance by increasing the use of blocktype thermal power stations, as well as by expanding and increasing the density of district heating networks.

In North Rhine-Westphalia, the target for reducing greenhouse gas emissions in this sector lies between 28% and 32% by 2020 as compared to the reference year 1990. A guideline value of at least 79% is to be achieved by the year 2050. The effects of the European emissions trading system ETS must also be taken into account.



North Rhine-Westphalia is one of Europe's leading industrial centres, with an exceptionally large number of industries with a very high demand for energy and



A climate-friendly component in the supply of energy: biomass block-type thermal power (BTTP) station in Ladbergen.

resources, such as iron and steel or the chemical industry. In total, all the various branches making up this sector emit 76.3 million tonnes of CO_2 equivalents, or 25% of the total greenhouse gases emitted in North Rhine-Westphalia. Industry consequently plays a crucial part in the achievement of North Rhine-Westphalia's climate protection goals.

With its Climate Protection Plan, the state government is not only responding to the challenge of reducing greenhouse gas emissions in this sector, but also to that of ensuring that North Rhine-Westphalia remains an attractive location for energy-intensive industries in the future, too. The key strategies in the first Climate Protection Plan for NRW therefore include the consistent use of available technologies to boost the efficiency of production processes, as well as stepping up the development and future use of low-carbon technologies.

Among other things, the state government will set up a climate protection support centre for businesses and promote improvements in resource efficiency in companies. It will also participate in shaping the necessary frameworks at the national and European level, so that investments in climatecompatible technologies and production processes remain possible, attractive and competitive at the international level. In North Rhine-Westphalia, the target for reducing greenhouse gas emissions in this sector lies between 26% and 31% by 2020 as compared to the reference year 1990. A guideline value of at least 47% is to be achieved by 2050. Here too, the effects of the European emissions trading system ETS must be taken into account.

BUILDINGS, TRADE, COMMERCE AND SERVICES

In the densely populated state of NRW, this sector plays a vital part, due not least to the large number of residential and commercial properties with a correspondingly high demand for energy and heating. This sector emitted over 32 million tonnes of CO_2 equivalents in 2012 — 11% of the total greenhouse gas emissions in North Rhine-Westphalia. To reduce this level, it will be necessary to cut the consumption of energy in residential and non-residential buildings and to make the existing buildings largely carbon neutral in the long term – for instance, by increasing the use of renewable energy sources to supply heat to both new and existing buildings. To this end, the state government will play an active role in shaping the relevant frameworks at the national level, and will support higher state funding for refurbishment projects which aim to save energy, for example. The range of advisory schemes is additionally to be enlarged and funding programmes developed. By 2050 the target is that, each year, 2% of buildings will undergo refurbishment with the aim of saving energy as part of a long-term plan to make existing buildings carbon neutral.

In the area of trade, commerce and services, North Rhine-Westphalia's Climate Protection Plan sets out measures for improving energy control in business enterprises, cities and communities, for instance through the use of an energy management system, as well as measures for saving more energy through crossover technologies. Among other things, these measures include ventilation, airconditioning and lighting systems. The target for reducing greenhouse gas emissions in this sector is around 30% by 2020 as compared to the reference year 1990. A guideline value of at least 81% is to be achieved by the year 2050.



ENERGY AND PROCESS-RELATED GREENHOUSE GAS EMISSIONS BY VARIOUS BRANCHES OF INDUSTRY IN NRW IN 2012. SOURCE: LANUV NRW 2014 $^{\rm 1}$

* Production of paper and board

¹ These figures do not include emissions for electricity and district heating obtained from public power plants, as these are covered completely by the sector energy conversion.



Traffic hub: NRW is one of the regions with the highest traffic loads in Germany.



North Rhine-Westphalia has one of the highest traffic densities in the whole of Germany: roughly half the working population of 8.6 million people commute to work in other cities and communities. The logistics industry with its freight transport is a major and rapidly growing branch of industry in North Rhine-Westphalia. Greenhouse gas emissions in this sector totalled over 34 million tonnes in 2012, more than 90% of which can be attributed to motorized road traffic. Passenger transport accounted for 68%, while freight traffic accounted for 23%.

The primary aim of the strategies and measures defined in North Rhine-Westphalia's Climate Protection Plan is to reduce the greenhouse gas emissions caused by motor traffic, for instance through changes in the mode of transport used. Incentives are to be created that encourage people to walk, cycle or use public transport. In addition to measures designed to make cycling more attractive and improvements to public transport, this also requires a better approach to transport infrastructure planning. The Climate Protection Plan will help improve coordination of urban and transport planning so that short distances can be established or maintained in built-up areas. The state government will ensure the necessary legal framework is in place and will launch specific funding programmes.

GREENHOUSE GAS EMISSIONS BY TRANSPORT CARRIER IN NRW IN 2012 (EXCLUDING GREENHOUSE GAS EMISSIONS FROM RAILWAY ELECTRIFICATION).² SOURCE: LANUV 2014

Carrier	Greenhouse gas emissions by transport carrier in NRW in 2012 (in million tonnes CO ₂)
Passenger traffic and transportation systems (by road)	23.4
Freight transportation (by road)	7.9
Shipping	1.4
Other traffic (and transport)	0.9
Air traffic	0.5
Railway traffic (using diesel-powered vehicles)	0.15

² This summary only takes account of greenhouse gases emitted by diesel-powered rail vehicles. Greenhouse gas emissions relating to electrically operated rail vehicles (railway electrification) are included in the sector energy conversion.

Freight traffic will pose an even greater challenge in the future: forecasts predict that the volume of freight transported by all carriers will increase by 18% between 2010 and 2030, while capacity will increase by 38%. More efficient production and transport chains will be a crucial factor in future, with modern information technology playing an important part. Moreover, the right conditions must be put in place to enable climate-friendly alternatives such as waterways and railways to be integrated into the freight traffic systems. The state government also supports initiatives conducting research into, and promoting wider use of, more efficient alternative drive systems which generate lower greenhouse gas emissions. An additional aim is to identify options that increase the potential use of renewable energies in transport, such as electro-mobility and hydrogen vehicles.

The target for reducing greenhouse gas emissions in this sector is around 8% by 2020 as compared to the reference year 1990. A guideline value of at least 60% is to be achieved by the year 2050.



AGRICULTURE, FORESTRY AND SOIL

North Rhine-Westphalia is not only a major conurbation and an industrial centre, but also an important agricultural and forestry region: forests cover around one third of NRW and roughly half the surface area is used for farming. Greenhouse gas emissions in this sector result primarily from the use and storage of fertilizers, as well as from intensive animal husbandry. Emissions of greenhouse gases from agriculture, including horticulture, in North Rhine-Westphalia amounted to nearly 8 million tonnes of CO₂ equivalents in 2012.

One of the key aims for reducing emissions from agriculture is to ensure that fertilizers containing nitrogen are used efficiently and sparingly. This can be achieved through measures to minimize losses in economic fertilizer management, improvements in application techniques, and the promotion of organic farming. The Climate Protection Plan includes funding and advisory measures for this purpose. Better use must also be made of renewable raw materials in future. Above all, there is considerable potential for improving efficiency through increased use of agricultural residues and wastes as a source of energy. Animal husbandry generates emissions of methane, nitrous oxide and ammonia during digestion and the decomposition of excrement in barns and pens, as well as during storage. Because of their carbon-binding properties, the soil and forests play an important part in reducing greenhouse gas emissions in this sector. Strategies and measures have been drawn up to maintain, protect and extend these carbon storage locations. These include in particular: reforestation; the protection of moorland and rewetting of dried-up former moorlands; permanently preventing the ploughing-up of grasslands; and the use of durable wood products, in



Several million tonnes of greenhouse gas are generated every year through intensive animal husbandry, as well as through the storage and use of fertilizers.



which carbon remains bound for relatively long periods of time. The target for reducing greenhouse gas emissions in this sector is 28% by 2020 as compared to the reference year 1990. A guideline value of at least 27% is to be achieved by the year 2050.



In private households, greenhouse gas emissions are primarily generated through the use of electrical equipment, through the consumption of goods, food and services, through heating the home and hot water, and as a result of mobility. The Climate Protection Plan for North Rhine-Westphalia defines a whole series of strategies and measures to increase the – in some cases considerable – potential savings in these areas. When it comes to electrical equipment, the goal is to boost demand for energy-efficient devices and to educate consumers as to how they can use these devices efficiently; this goal requires the use of information media and advisory tools, as well as funding. Greater public awareness is needed as to the impact of consumption, for instance when selecting or buying products, or through longer or communal use of sustainably manufactured products and by reducing food wastage.

The emission of greenhouse gases in the residential sector is to be reduced, among other things, by increasing the use of renewable energy sources and combined heat and power systems, as well as by refurbishing buildings to save energy and by improving ventilation. The Climate Protection Plan provides for established information and advisory programmes to be continued and for new programmes to be launched. Potential reductions in greenhouse gas emissions in this sector overlap with those in the energy conversion sector and the buildings, trade, commerce and services sector, and have been taken into account accordingly.

CLIMATE CHANGE ADAPTATION: SUMMARY OF FIELDS OF ACTION AND MEASURES IN THE CLIMATE PROTECTION PLAN

In addition to climate change mitigation adapting to the unavoidable consequences of climate change will be the second major challenge in the coming years and decades, and forms an integral part of the Climate Protection Plan for NRW. The Climate Protection Plan lists a total of 66 measures, covering 16 fields of action, which will make North Rhine-Westphalia better able to cope with the impacts of climate change. The following sections briefly outline these fields of action and their specific susceptibility to climate change; the measures in the first Climate Protection Plan for NRW are also briefly summarized below.

🕴 HUMAN HEALTH

Climate change can have a major long-term impact on the health of people living in North Rhine-Westphalia. Illnesses are expected to increase in number, while performance decreases as a result of heat, cold or weather extremes. Pathogens transmitted by ticks and mosquitoes will become more widespread, as will the number of allergies. Greater exposure to UV light may lead to a higher risk of skin cancer and more food-borne infections, while the quality of drinking water will deteriorate. The state government will therefore review the establishment of an integrated health and environment monitoring system and step up research into health risks associated with climate change and promote the transfer of knowledge to stakeholders in the healthcare sector; in addition, it will provide information and raise awareness among relevant public groups. With the aid of suitable panels, such as conferences on healthcare, the state government also intends to raise awareness of climate change adaptation at the municipal level.

WATER MANAGEMENT AND FLOOD CONTROL

The various components making up the water cycle are highly susceptible to climatic changes – from the management of rivers, lakes and reservoirs and the supply of water to settlement drainage and flood control. The state government's aim is to manage bodies of water in such a way that they remain a healthy element in the ecosystem, despite climate change; it aims to improve them within ecological constraints, to optimize the supply of drinking water and service water for people and industry in respect of climate risks, and to reduce the risk of flooding. Among other things, the measures outlined in the Climate Protection Plan therefore strive to mitigate not only the impact of rising temperatures, but also the impact of torrential downpours on settlement drainage systems; to this end, the Plan lists a number of basic investigations, such as evaluation of the susceptibility of river dams and the effect of higher temperatures on the quality of drinking water.

SOIL

Healthy soil is a vital prerequisite for thriving fauna and flora as well as productive farming, and hence for supplying the population with regionally produced food of high quality. In addition, soil is an important compensatory element for the atmosphere and water balance; it is a significant carbon storage element, ensuring the decomposition of organic substances, their transformation and filtration, as well as the mobilization of nutrients. The state government considers it essential to maintain these functions despite changing climatic conditions. The measures outlined in the Climate Protection Plan for North Rhine-Westphalia therefore aim, among other things, to protect relatively untouched soil against increasing erosion, to unseal the surface of urban spaces, to improve the water retention and cooling ability of soil that has been modified by man, and to undertake more surveys of climate-related changes in soil quality.

BIODIVERSITY/ NATURE CONSERVATION

Changes in temperature and precipitation, a diminishing natural supply of water and the growing frequency of extreme weather-related events have a direct impact on species and habitats. Some species which prefer colder conditions are moving away from North Rhine-Westphalia, while other species which prefer warmer conditions benefit from climate change and are becoming more common in NRW. The funding scheme "Biodiversity in cities and communities" represents the state government's plan to implement one measure in the field of action comprising biodiversity / nature conservation in the first instance. Other programmes in other fields of action will also have a positive impact on biodiversity and nature conservation. These synergistic effects will receive targeted support from the state government. Further development of the measures will be closely coordinated with NRW's biodiversity strategy. Interactions with other influences, such as the immigration of non-indigenous species and changes in land use, will also be taken into account.



Major climate factor: relatively untouched soil can store CO₂ and also help to prevent increasing erosion of the soil.



The forests in NRW are sensitive to changes in temperature and precipitation.



AGRICULTURE AND FISHING

As an economic sector, agriculture is particularly affected by climate change. Changes in temperature, precipitation and CO_2 concentration in the atmosphere have a direct effect on plant growth and agricultural output. Moreover, rising temperatures and higher humidity are likely to increase infestation with pests. An increased risk of mass fish deaths is of relevance for lake and river fishing. The aim of the measures contained in the Climate Protection Plan is to investigate the climate risks for various crops in greater detail, to step up adaptation efforts in crop farming – particularly in conjunction with soil cultivation and irrigation – and to bring animal husbandry and aquacultures into line with new climatic conditions.



FOREST MANAGEMENT

Climate change has a particular impact on forests due to the very long planning and development times needed in forest management. Climate change primarily affects forests through the changes expected in respect of temperature and precipitation. Other climatic factors are also involved, such as gale-force winds, as well as indirect factors, such as the higher incidence of pests. Certain indigenous tree species may also prove extremely sensitive to climate change, thus making them less suitable for use in NRW. Among other things, the measures outlined in the Climate Protection Plan aim to improve the basic information and planning foundations relating to climate change, and to support private and communal forest owners in adapting to climate change.

ENERGY SECTOR

The energy sector may also be vulnerable to the effects of climate change. Extreme weather events, for instance, could damage high-voltage networks or conventional power plants which rely on a continuous supply of cooling water. Since security of supply is a factor of crucial importance for this industrial heartland and densely populated region, programmes will be developed in the coming years to ensure that the supply of energy remains stable despite changing climatic conditions. The foundations have been laid by the programme outlined in the first Climate Protection Plan for North Rhine-Westphalia: in a first step, a study will determine the specific vulnerability of the energy supply system in NRW in more detail and establish the basis for crisis management in the energy sector.

FINANCE AND INSURANCE INDUSTRY

Financial service providers help to identify and assess climate-related risks by taking such risks into account in their financial operations and insurance business. The state government is currently investigating the extent to which it can cooperate with the finance and insurance industry when supplying the general public and companies with information and advice. Its aim is to ensure comprehensive protection for the general public that is both affordable and encourages less risky behaviour.

TRANSPORT AND INFRASTRUCTURE

A smoothly functioning transport infrastructure is particularly important in North Rhine-Westphalia, as many other areas of society are dependent on it. However, climate change exposes the transport sector in North Rhine-Westphalia to numerous risks which can temporarily diminish its efficiency. More frequent storms and storms with increasingly strong winds can damage roads, railway lines and power lines, for instance. More frequent or heavier precipitation can reduce traffic safety due to poor visibility and wet road surfaces. Heatwaves and prolonged dry spells in summer can cause damage to roads and other infrastructure. Inland waterways are also vulnerable, as water levels particularly in the river Rhine can drop during extended hot spells; more frequent flood events will also have an impact on the river. Due to high safety standards and the high level of technology, the transport sector is considered to be relatively adaptable. When making future updates to the Climate Protection Plan, the state government will focus more strongly on vulnerable areas in this sector and develop suitable solutions for the relevant areas together with stakeholders in the transport sector.

Industry and commerce can suffer considerably from the effects of climate change – for instance, in the form of more frequent storms, heavy precipitation and floods. Climate change can also have an indirect impact on procurement processes and transport chains, marketing risks in global value chains, and the availability of manpower, raw materials and energy. However, climate change not only gives rise to risks, but also creates a series of opportunities for industry to develop and market innovative products. Examples include energyefficient cooling systems, heat-resistant road surfaces, building methods adapted to the climate, water-saving systems and new services providing more rapid information on hazards. With the measures contained in the Climate Protection Plan for North Rhine-Westphalia, the state government is also seeking to improve the supply of information for industry and commerce, as well as to contribute basic studies on the vulnerability of technical plant and equipment.



Climate change has a direct impact on tourism in North Rhine-Westphalia. While summer tourism may profit from a larger number of days with high summer temperatures, rising average temperatures increasingly cause problems for ski tourism in the uplands. The mild winter of 2013/2014, for instance, resulted in considerably lower revenues in the skiing resorts of the Sauerland region. The state government will assist the tourism industry in preparing location-based adaptation strategies, for instance in the form of year-round programmes, as well as other measures.

BUILDING AND LIVING

Climate change affects buildings in North Rhine-Westphalia in many different ways. Extended heatwaves in summer, more frequent torrential rain and floods, and extreme weather events with hail and squalls can damage the substance and functionality of buildings. Buildings must therefore be made more robust and resistant to climatic effects, while at the same time maintaining the quality of living and working there. The state government has therefore also included initiatives for greening roofs and facades in the Climate Protection Plan.





Incorporating fresh air corridors: urban planning must also respond to rising temperatures due to climate change.



STATE AND REGIONAL PLANNING

State and regional planning plays a significant role when it comes to adaptation to the effects of climate change. Regional planning, for example, can make major provision for the consequences of climate change by securing reserved and priority areas, thus securing run-off and retention areas in a region exposed to flood risks, for example, and also prepare for the enlargement of these areas. Careful management of the development of settlements can alleviate the effects of urban heat islands, for instance by ensuring that fresh air corridors and cold air discharges remain clear, as well as by preserving soil with high cooling capacity. Spatial planning must also be used to secure reserve areas for obtaining water, if required. One of the state government's essential tasks is to provide suitable technical bases for regional planning and to integrate the requirements of climate change adaptation into state development and regional planning. This requires appropriate goals and basic principles, as well as technical contributions.

URBAN DEVELOPMENT AND MUNICIPAL PLANNING

North Rhine-Westphalia has the highest population density in Germany and a large proportion of sealed surfaces. Climate change increases the risk of heat islands forming during extended heatwaves, with a corresponding impact on public health; torrential or steady rain can overload drainage systems in towns and cities, as well as in rural areas. Rural areas are prone to problems such as the potential loss of production in agricultural operations caused by persistent water shortages during extended hot spells. The measures developed for the Climate Protection Plan aim, above all, to support opportunities for climate-conscious urban and district development through specific funding programmes (such as for eliminating green deficits in cities and communities) and advisory programmes.

DISASTER MANAGEMENT

In principle, disaster management has solid foundations in Germany and is even prepared for such extreme climate change-related events as torrential rain and gale-force winds. However, as climate change continues, the need for disaster management will presumably become ever greater. The alarm and hazard defence planning required of administrative and urban districts in accordance with German law on fire protection and assistance will therefore have to be expanded to include climate change so that these additional hazard situations can be dealt with.



Climate change will lead to a growing number of severe weather events causing considerable damage. Disaster management in cities and communities must prepare for this development. The administrative and urban districts responsible for disaster management will receive assistance from the state government in reviewing their alarm and hazard defence planning so that it meets the new requirements resulting from climate change. This assistance will be in the form of scientific reports, for instance. Changes that can be attributed to climate change must also be taken into account when informing and warning the public about extreme weather events, as well as in conjunction with preparatory drills.

Y INFORMATION, EDUCATION, NETWORKS

The parties involved are still not sufficiently aware of climate change and its specific consequences, and many events are simply not associated with climate change. The job of the cross-over area comprising information, education and networks is therefore to pool the various tasks associated with information, awareness-raising and qualification in the area of climate change adaptation and to strengthen the collaboration between educational providers and other transfer institutions. The measures outlined within the framework of the Climate Protection Plan take account of these challenges by improving knowledge bases and developing instruments and methods for the transfer of knowledge.

In this context, advisory programmes must be provided for the general public, and the subject of climate change adaptation must be integrated into school curricula as well as into vocational basic and advanced training.



Information, education and the establishment of networks will promote public awareness of climate change mitigation and adaptation.



INFORMATION FOR SPATIAL STRUCTURE PLANNING IN NRW

The limited space and resources available in densely populated North Rhine-Westphalia are subject to many and varied demands. In order to highlight the spatial requirements of measures for climate change mitigation and adaptation, and to establish the planning requirements necessary for implementation of the climate protection goals, the state government has amended state planning law to create a direct link between the Climate Protection Plan and spatial structure plans. Spatial structure plans must implement those requirements of the Climate Protection Plan which a separate statutory instrument has declared to be binding and which can be secured as goals or principles of spatial planning. Due to the largely parallel procedures employed when drafting the Climate Protection Plan and the new state development plan (LEP) for North Rhine-Westphalia, the clearly identifiable spatial requirements of measures for climate change mitigation and adaptation are already included in the specifications of the current LEP draft. At present, the Climate Protection Plan does not contain any further regionally specific requirements.



In such a densely populated state as NRW, the implementation of climate protection goals requires close, legally binding coordination between spatial structure plans and the Climate Protection Plan.

CARBON-NEUTRAL STATE ADMINISTRATION IN NRW

The state government of NRW has set itself the ambitious goal of ensuring that its own administration becomes carbon neutral by 2030. This goal is stipulated in the NRW Climate Protection Act.

In so doing, the state government is also fulfilling its function as a role model – not least because, with 4,600 buildings and 300,000 employees, this will represent a tangible contribution towards climate protection. To achieve this goal, annual emissions estimated at almost 1.2 million tonnes of CO₂ will need to be prevented, reduced or offset through suitable means. This will be realized with the aid of measures including ambitious energy standards for the state government's existing buildings and the increased use of low emission vehicles.

In keeping with its function of role model, the state administration aims to significantly boost the share of heat and power from renewable energy sources on state-owned land by 2030. 100% of the electricity purchased externally will come from renewable sources.





FOR THE FUTURE

PROSPECTS AND CONCLUSION

North Rhine-Westphalia can achieve its climate protection goals for the target years 2020 and 2050. The road is mapped out by the strategies and measures defined in the first Climate Protection Plan. The Plan additionally presents initial measures with which NRW can prepare to deal with the consequences of climate change. The Climate Protection Plan has thus been systematically drafted to ensure the future of North Rhine-Westphalia; it not only takes account of climatic aspects, but also includes security of supply, companies' competitiveness and social equity. Thanks to social participation from a broad base, we have a Climate Protection Plan defined by members of the public, cities and communities, and industry - a Climate Protection Plan that not only benefits the climate and environment, but also offers numerous opportunities for the various stakeholders.

NEXT STEPS

The state government will begin to implement the measures and programmes contained in the first Climate Protection Plan when it has been passed by the state parliament (Landtag). Information will be provided by the state government to the corresponding target groups, from the general public and industry to cities and communities, through a range of channels. The NRW online portal on climate protection will be the first port of call. Once the Climate Protection Plan has been passed by the state parliament, this is where all the measures and programmes in the Plan and their implementation status will be published.

However, this first Climate Protection Plan for North Rhine-Westphalia is simply the first step in a long process. This process will be overseen by a monitoring committee and various expert committees, such as the Council of Experts and the Coordination Committee, who will analyse changes and relevant frameworks and recommend adjustments, if required.

The state government will update the Climate Protection Plan every five years from the date on which it is first passed; relevant social groups will be involved on an ongoing basis, and a scientific monitoring group will ensure that all the main influencing variables are taken into account in the subsequent climate protection process. These variables include underlying European and international frameworks for climate protection and competition, future technological and economic developments, and demographic change.





For further information concerning the Climate Protection Plan and state climate protection policy in NRW visit www.klimaschutz.nrw.de/english

IMPLEMENTATION PHASE, CLIMATE PROTECTION PLAN FOR NORTH RHINE-WESTPHALIA





Climate and climate change in NRW: LANUV Technical Report 27 published by the State Agency for Nature, Environment and Consumer Protection in North Rhine-Westphalia

YouTube: The new climate protection policy in North Rhine-Westphalia

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