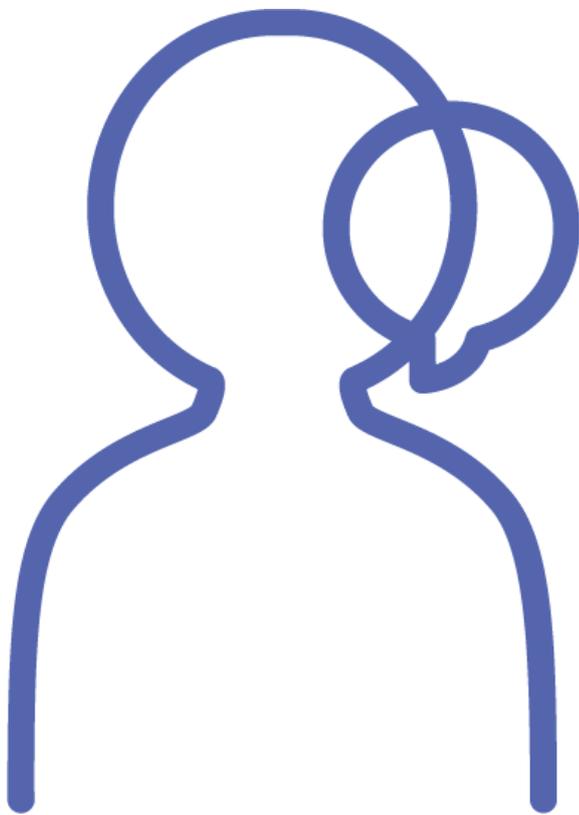


Discussion and Vision Paper for a Society with Low Carbon Dioxide Emissions

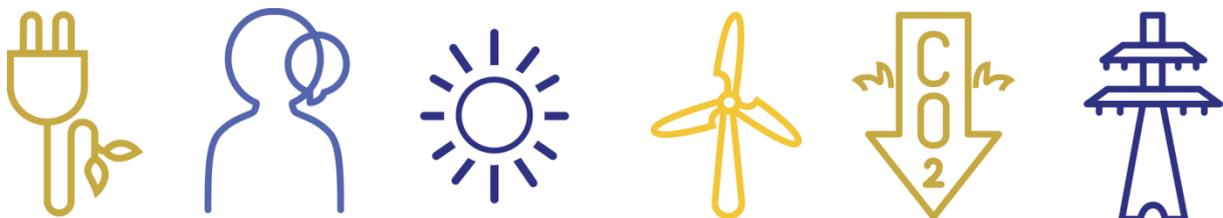


R&Dialogue: Discussion and vision paper for a society with low carbon dioxide emissions

Contents

- 1. Background**
- 2. Introduction**
- 3. North Rhine-Westphalia as a society with low carbon dioxide emissions: Opportunities and limits for regional climate protection**
- 4. Acceptance of energy technologies as the Achilles heel of a society with low carbon dioxide emissions**
- 5. The society with low carbon dioxide emissions as a participatory community**
- 6. Stakeholders applying science: the practical use of technical knowledge on the path towards a society with low carbon dioxide emissions**
- 7. Vision for a low carbon society**
- 8. Conclusion and Outlook**

1



1. Background

In the context of the EU project R&Dialogue, the *Forschungszentrum Jülich* (IEK-STE) organised a dialogue on the subject of a society with low carbon dioxide emissions in North Rhine-Westphalia. The objective of our European Commission-funded project was to improve the dialogue between civil society and the world of research in this sphere of activity, and to identify concrete questions for both groups of stakeholders to work on. Our partners in France, Spain, Portugal, Scotland, Norway, the Netherlands, Italy, the Czech Republic and Greece have each carried out their own series of dialogues.

The integral part of the dialogue was a series of talks in which senior-ranking stakeholders from the energy sector in North Rhine-Westphalia (NRW) discussed a society with low carbon dioxide emissions¹. The role of staff at the *Forschungszentrum Jülich* was to organise and structure the events. They created the space for the dialogue but did not exercise any influence on its content.

Prior to the start of the series of talks, interviews were conducted with 43 experts on the subject of a low carbon society. On the basis of these interviews, themes were identified to be addressed as topics for discussion in the subsequent series of talks. These themes were presented to the experts and the most important four were determined by means of a voting procedure. In this manner, the four areas of 'acceptance', 'participation', 'application of science' and 'opportunities and challenges in North Rhine-Westphalia' were identified. The series of dialogues began on 6 March 2014 with an inaugural event. The next phase was to organise monthly meetings on the four themes. The final event in the series of dialogues, in which a vision for a low carbon dioxide emissions society was drawn up, took place on 4 September 2014.

The first part of this document consists of the **Discussion Paper** (Chapters 2-6), which begins by outlining the challenges, the possible paths to solutions, and the objectives of the participants, which were all identified as being issues that would need to be addressed in order for the transition to a low carbon society to be made. On the other hand, this part also identifies those questions that remain open and which represent sources of disagreement. The discussion paper illuminates the current challenges in the progression towards a low carbon society as seen from the perspective of the stakeholders directly involved. It is therefore characterised by current events and by the contribution from the respective stakeholders participating. The document is consequently to be regarded as a possible point of departure that supplies indications and suggestions for which further steps can be taken.

In the second part, an outline is given for how a low carbon society can look like in 2044, from the perspective of the stakeholders involved. The basis for this was the round of talks conducted on 4 September 2014, at which the first partial aspects of future visions were collected. The vision presented here is intended to reflect the participants' core concepts of objectives and thereby show the basic orientation that guides their proposed actions. The other partner countries will also develop a vision and these different national visions are to be analysed and reflected upon. Important aspects featuring in all of the visions will, accordingly, be

¹ Representatives from the following sectors having headquarters in North Rhine-Westphalia were taking part: associations from the economy and from society, non-profit-making societies and networks, ministries and affiliated advisory bodies, foundations, energy companies and companies from other branches, church societies and research institutions.

defined and highlighted so that they can be compared. The vision should outline a picture of a low carbon society and indicate which role dialogue should occupy in such a society.

The discussion and vision paper describes the statements and the discussion of the respective stakeholders present. Additionally, the complete document was made available to all experts who were invited to participate, so that they may add comments and addenda. The results from the individual events were collated and structured by the staff of IEK-STE, but no changes to content, whether factual or otherwise, were undertaken. Consequently, this document cannot be regarded as being either a scientific treatise and summary of the essential results on the respective themes, or as being a description of the position of IEK-STE on the particular themes covered.

Current events and important determining factors

To achieve a better classifying context for the dialogue, there will first be a short summary of current events and the most important determining factors based on the keynote speeches delivered.²

North Rhine-Westphalia is the most densely populated German state and also the strongest in economic terms. The urban agglomeration of the Rhine-Ruhr region, with its ten million residents, belongs to the 30 biggest urbanised regions of the world, with important key industries. North Rhine-Westphalia has a population of more than 18 million, making it larger than the Netherlands, for example. Its central location has led North Rhine-Westphalia to number among the most intensely developed areas of Europe in terms of its transport infrastructure. In no other state are carbon dioxide emissions in both absolute and specific terms as high as they are in North Rhine-Westphalia. With emissions in the order of 301 million tons of CO₂-equivalents (CO₂eq), the share of North Rhine-Westphalia's greenhouse gas emissions amounts to 33 percent (inventory year 2011) of Germany's total. This can primarily be attributed to the industrial concentration in the areas of the Ruhr and along the Rhine, in addition to the coal mining activity. About 30% of all Germany's electricity production can be accounted for by North Rhine-Westphalia alone. The brown-coal reserves of the Rhine region and its four lignite-fired power plant sites make it the biggest source of carbon dioxide in Europe.

The climate protection law passed by the state parliament of North Rhine-Westphalia in January 2013 sets binding climate-protection targets: The total amount of climate-damaging greenhouse gas emissions in North Rhine-Westphalia are to fall by at least 25 percent by 2020 and by at least 80 percent by 2050, as compared to the total emissions for 1990. During the year, in cooperation with groups of society, the state government produced a climate protection plan which is due to be pronounced upon by the parliament, and which outlines the concrete measures to be taken in order to reach the targets set. Together with the climate protection law, the state government had already drawn up a comprehensive climate-protection programme in June 2011 and had begun to put the key points of its climate-protection plan into action.

In Germany as a whole, and also in NRW, the stance of the public with respect to renewable energies is in general very positive, unlike its general position regarding fossil fuels and nuclear power. However, there are concerns associated with energy, particularly with the cost

² For more detailed descriptions, readers are referred to the 'Initial Inventory' and the 'National Inventory', which were produced in the course of the project by IEK-STE.



of electricity. In addition, concrete projects required to transform the energy system often meet with resistance from the citizens. Lack of trust in technologies, in politics and in the economic stakeholders constitutes some of the reasons for this. An important role is also played by the complexity and uncertainty that accompanies the transformation process.

Participatory procedures in which the citizens can engage in the decision-making process are increasingly in demand. This development has also been promoted by the fact that ever larger sections of the populace are acquiring a higher education, are correspondingly more self-confident, and want to make sure that their own opinion and knowledge have been considered by the decision-making process. This method of decision making promises an ability to weigh up better the different interests and thereby avoid conflicts and legal processes, while improving the mediation and the integration of knowledge. The concrete effect of participatory procedures has not yet been sufficiently evaluated to enable general concluding statements to be made. However, it has been deduced that specific criteria support a successful process: being included; using independent experts for the transfer of knowledge; and ensuring equal opportunities in a transparent and engaging process.

Science has already played a very important role in the course of realising Germany's energy transition, but it is facing ever more new challenges. The transformation to a low carbon society requires the world of science to engage with the increase in technical and social complexity, with the differentiation/pluralisation of demands on knowledge, on interests, values and power distribution. Correspondingly, discussion is taking place to establish how far interdisciplinary and cross-disciplinary processes in learning, communications, reflection, education and design are helpful methods for devising courses of action and scientific recommendations. The co-production of knowledge by society and science promises a better evaluation of the feasibility of possibilities for solutions and a better ability to circumvent areas of uncertainty. The involvement of society in research processes, however, also contains challenges, or rather, it renders the limits of this kind of science visible, with those limits being defined by different power distribution, by firmly held convictions, and by particular interests of stakeholders from politics, economics, science and civil society.



2. Introduction

Based on the interviews conducted, in the run-up to the dialogue event four themes were identified that provided a basic structure to the series of dialogues.

NRW as a society with low carbon dioxide emissions: Opportunities and limits for regional climate protection

What does regional climate mitigation mean? What kind of effect does a society with low carbon dioxide emissions in NRW have on worldwide climate change? Is regional climate mitigation simply ineffective in the context of other carbon dioxide emitters such as China or India, for example? Are we damaging our own economy with such measures? Or, as an industrial region, will we have the effect of setting a leading example to others? What responsibility do we carry for the emissions we produced at a time long before the arrival of the emerging economies and their economic ascendancy?

Acceptance of energy technologies as the Achilles heel of a society with low carbon dioxide emissions?

The society with low carbon dioxide emissions requires a far-reaching overhaul of its energy system. Large infrastructure projects and new power engineering always meet with the resistance of parts of society, however. What are the fundamental causes of the rejection of large infrastructure projects and new energy technologies? Which factors can be relevant for their acceptance? How should the communication between stakeholders and citizens be organised?

The society with low carbon dioxide emissions as a participatory community

The path towards a society with low carbon dioxide emissions is inseparable from deep-rooted change to our society, which will clearly have a significant effect on the life of the citizens. Will they be ready to accept long-term fundamental decisions when they are involved as participants in the appropriate procedures? Can dialogue procedures at the level of the stakeholders ensure a consolidation of the dialogue above and beyond that of electoral cycles? What do the appropriate participation procedures look like? And how do they relate to our representative democracy?

Stakeholders applying science: the practical use of scientific knowledge on the path towards a society with low carbon dioxide emissions

Science does not only contribute to the development of energy management techniques for a society with low carbon dioxide emissions, but also provides models and scenarios for energy systems, for example, or for climate change itself. Nevertheless, it cannot provide us with exact forecasts and operating manuals to follow. Against this background, what role can scientific knowledge play for stakeholders on the path towards a low carbon society? How far can and should accumulated factual evidence be directly related to solutions applied?

The meetings began with a lecture from an expert on the respective theme, which mostly did not belong to the group of the people participating in the dialogue process. After this, there followed the exchange-discourse on the respective theme, which was conducted by applying different discussions techniques.

On the following pages, the discussions on these themes are reflected. The results from the rounds of discussions were structured in 'Challenges', which show how the current situation was evaluated by the experts who participated. Under 'Aims' there is a short summary, re-

spectively, to show what was identified as desirable, and in what way actions should accordingly be adjusted. Under 'Approaches and Instruments', possible measures are named which, in the opinion of the participants, can be used to tackle the challenges described. The matters under 'Open Questions' reflect not only aspects that generated disagreements, but also questions or themes which arose but did not receive an answer during the course of the discussion.



3. North Rhine-Westphalia as a society with low carbon dioxide emissions: Opportunities and limits for regional climate protection.

Challenges

Against the background of the aims of the climate protection law of the German state of North Rhine-Westphalia, the necessity for measures to reduce greenhouse gases was acknowledged by all participants present in the dialogue series. There was disagreement, however, about the speed with which these measures must actually be implemented. Although the influence of regional climate mitigation measures, through which CO₂ emissions are reduced, appear small on the global scale, there was agreement that Germany, and NRW in particular, could assume a pioneering role: If the industrial nation of Germany could succeed in carrying out a transformation process, particularly in its energy sector, this could inspire other countries to follow suit. It was argued that the development of North Rhine-Westphalia could have nationwide influence and that such influence might also resonate beyond Germany. If this industrial heartland could succeed in producing a blueprint for a path to post-fossil-fuel development, it might also come along with a high worldwide multiplying effect. In addition, as a "veteran" industrial location, NRW would have a particular responsibility on the basis of its cumulative emissions since industrialisation.

Besides this point, in the same context some participants indicated possible dangers for the economic location of NRW, given that in its position as an industrial location it will have long-term dependence on affordable energy supplies, both, on a national and international scale. In contrast, an exodus of industry from NRW could occur, and in the context of the European emissions trading system it would be a cause for concern if emissions were not avoided but merely relocated to different parts of Europe ("carbon leakage"). Thus, the corresponding challenge arises to instigate measures and strategies to unify climate mitigation with the preservation of power supply security at its high current level.

The participants agreed upon that Germany will have to undertake a part of the global responsibility for reducing carbon dioxide and thereby also set an example. Not only this leading position, but also that of the broader society was taken to represent a driving force for climate politics: moral and ethical questions have become a core component of the public debate about climate change, and as a consequence, actions at regional and local level ought to contribute to halting the process of climate change. Such developments would receive an additional boost from the high level of agreement and support among the public for the energy transition.

From one perspective, the society was seen by the experts involved as the driver of climate mitigation politics. From a counter perspective, the criticism was offered that the populace does not understand the magnitude of what awaits them. This was offered as a reason for why the consensus within society about which measures would lead to a low carbon society could not simply be reached in the future. Although the effects of climate change could already be detected today, the real problems remained in store for the future. This might impede the implementation of preventative measures, which would be preferable to reacting to the effects of climate change afterwards. The cause was proposed to be a lack of public awareness with regard to the consequences of climate change, and it was also asked whether the costs that are currently being generated by the energy transition, which are in many places perceived to be very high, would in a few years be considered to be relatively

low. In this regard, the media were considered to have an important role to play. They, on the one hand, were a driver of climate protection politics while, on the other hand, they would often forget to communicate the costs of the transition. Communication processes within the society to assist with understanding the collective and the individual costs of the transition to a low carbon dioxide emissions society, and also to explain the effects of climate change, were therefore judged to be a key challenge by the experts participating. (see Chapter 4)

Together with climate mitigation measures, consideration needs to be given to climate adaptation measures, given that an increase in extreme weather events has already taken hold. Here, the need would arise, just as with the climate mitigation measures and as with the energy transition, not only to proceed with due regard for economic and financial matters, but also with a sense of social justice. Measures, instruments and structures must all be designed to enable a better and a more transparent breakdown of costs and benefits. As a consequence, political decision-making processes that enable to address these aspects have to be revised. According to the participants present such a revision had not yet been debated.

The time dimension of the transition was identified by the participants as a further aspect, which would also bring challenges with it. From one perspective, it was argued that rapid action would have to be taken in order to meet the two degree target, and thereby prevent the destruction of living space and further damage to ecosystems. From another perspective, it was argued that specific structures and institutions could not react as quickly to demands for transformations. The restructuring, for example, of the major energy suppliers and of the public utilities companies would be a protracted process. Both of these aspects, namely, coping with the intense pressure to take action as well as with the uncertainties arising during the transformation without creating irreversible dependencies to this path, were seen as a challenge that would have to be dealt with. At the same time, it would also be necessary to devise appropriate measures in conjunction with national and international developments to ensure that the economic position of North Rhine-Westphalia would not suffer.

8

Aims

As an objective, the participants outlined how the climate mitigation goals and the development targets for renewable energies will need to be realised in such a way as to ensure that a socially, economically and ecologically prudent distribution of costs and benefits will result from the transformation process.

Approaches and instruments

Reformation of the emissions trading system was named by the participants as a measure to be taken. There were different reasons for this: the underlying assumption of the emissions trading scheme that renewable energies would become substantially cheaper and that fossil fuel resources would become significantly more expensive, has not yet occurred. It was also argued, however, that the system was working, but that the economic down-turn of 2009 had resulted in a surplus supply of certificates. There will have to be a renewed discussion about emissions trading, that will analyse the inadequacies of the existing mechanism and serve as a basis to convert the system into a more effective instrument. The contribution that North Rhine-Westphalia could make to this was evaluated differently: from one perspective, the opinion was expressed that the region could only make or attempt to make a contribution, which would be to bring about a discussion within the EU. From the other perspective, it was argued that North Rhine-Westphalia, with a relatively high share of ETS-traded emissions,



and also with a high share in absolute terms, could play a more significant role in Brussels if the corresponding will was present.

Admittedly, the creation of a new structure for the electricity market would be a further measure that would have to be discussed as part of the energy transition process. There was a consensus among the participating stakeholders, however, on the opinion that purely economic measures would not be sufficient for the goal of a low carbon society to be reached. The creation of a comprehensive master plan would be essential, in which instruments such as the capacity market and emissions trading would be considered. It would be of decisive importance to create the accompanying conditions to be applied constantly and over the long term, in order to promote investments and innovations with a long amortisation period. In this context, the development of renewable energy sources would also have to be incorporated with, for example, a discussion on an appropriate financing mechanism. A further important aspect in this regard is to address the security of energy supply and to take into account the possible costs for consumers. Based on these dialogues, a new system design with an associated energy supply system could emerge.

Better determining conditions would need to be created to enable habits of power consumption and of daily behaviour to be changed more easily. An example was cited in North Rhine-Westphalia's local public transport, which was considered to be insufficiently developed and which consequently has not yet succeeded in being an alternative to the car.

In the opinion of the participating experts, methods and strategies already exist to help progress along the path to a low carbon society. In particular, local communities were an important stakeholder that is very engaged in this area. Structures should therefore be created to enable towns and local authorities to achieve a better cooperation. There should in general be improved interacting between the stakeholders, to enable a better alignment and coordination between the parallel-running processes.

9

Discussion points left open

There would have to be a discussion on how the separate political levels, each with their own climate mitigation and energy politics could be synchronised, or how the energy politics of the Länder (states) and of the German republic could be integrated into the politics of the EU. In this regard, the debate would have to be expanded to cover, among other points, the advantages and disadvantages, as well as the significance, of the efforts of individual German Länder (states), or of individual regions, to strive towards energy self-sufficiency.

How can the potentials and the capabilities needed for the energy transition be made available to everyone? The participants considered that it was not of decisive importance where or what the capabilities were, but rather that such information was effectively communicated to make everyone aware of it. This may not bring certainty, however, that the potentials and the advantages, as well as the costs and the disadvantages, will be distributed in a manner that ensures that a truly consolidating overall added benefit emerges for the whole society.

The positions for and against the introduction of capacity markets would have to be discussed. Participants raised questions about whether capacity markets could actually contribute to climate mitigation. Others argued that the safeguarding of energy supply through such a mechanism was a necessity. At present, different options and several instruments are ready. Their advantages and disadvantages will need to be discussed and it has to be agreed upon a new market design through the appropriate decision-making processes. How



can an energy system be created that is both to be dominated by renewable energy sources and that guarantees the safeguarding of power supply?

There was disagreement over the speed of the development of renewable energies and also over size of the targets for the reduction of carbon dioxide emissions. The source of this lay in the realisation of the carbon dioxide reduction targets, particularly with regard to the speed with which the targets should be reached. How can be agreed upon what is necessary and what is achievable? How good are the mechanisms to help us in that direction? These questions, in the opinion of the experts, also concern the assessment of the interdependencies and the consequences for the society and the economy. In addition, it seemed to the participants that the measurement of the CO₂-value per capita was leading to a distortion in the evaluation of costs and benefits to a society. Consequently, the question presented itself of how climate-friendly behaviour might be evaluated and whether the costs would be assessed differently in future.



4. Acceptance of energy technologies as the Achilles heel of a society with low carbon dioxide emissions?

Challenges

A society with low carbon dioxide emissions should orientate itself towards the common good. The definition of the common good, however, was judged by the participating stakeholders to depend on the respective perspective and level from which a method or a particular course of action is viewed. Correspondingly, the correct allocations would have to be thought through in a multidimensional manner: what leads to a fairer distribution on the global level might not necessarily lead to a fairer distribution at the local level. An example was offered in how it would be felt to be just if Germany placed itself under an obligation at an international level to reduce its carbon dioxide emissions. At the same time, however, it would not be felt to be fair to forego car journeys in order to save fossil fuels, because at the personal level a car journey would be felt to be an option that costs the minimum amount in time and money terms. This would be reflected in different approaches to methods and options for courses of action towards a society with low carbon dioxide emissions. Striving towards a fair distribution of the burden would become yet more complex when levels of justice were considered within a generation, and indeed between generations.

Furthermore, the extent was discussed to which a common basis of values and a common set of paramount priorities was lacking, in the sense that such values and priorities could serve as a foundation upon which strategies and options for courses of action could be developed to enable the society to better manage the challenge of reducing carbon dioxide emissions. The majority of the experts involved were of the opinion that climate mitigation targets agreed upon at international and at European level, together with their associated expert dialogues, are not sufficient to achieve the acceptance in society of a low carbon future.

Aims

The aim identified by the participating stakeholders was in devising methods that would be used to achieve an understanding of 'the common good', which will then constitute a distribution between the different perspectives, interests and levels that would each bear different costs and enjoy different benefits.

Approaches and instruments

The principal demand, which was repeatedly cited at different meetings, was identified as the need to initiate a higher-ranking dialogue that should lead towards a broad public agreement on clear visions for the transformation to a society with low carbon dioxide emissions. This could be initiated and authorised by the federal government. Similar processes were perceived to be necessary at the levels of the Länder, regions and local communities, in order to support a stabilisation of the expectations that are being placed on the energy transition. Such a process should be inclusive and offer a transparent outcome, and it should also take participants and citizens serious. The process for drawing up the climate mitigation plan in North Rhine-Westphalia, which outlines some 360 suggestions for measures to be taken to achieve the climate mitigation plan targets, and which involved over 400 people in its drafting, had already delivered its initial findings on how a process that fully integrates the society can be practically implemented.

The communication taking place in the course of the planning and decision-making for large projects was judged to be subject to improvement, particularly in the areas of enabling more communication opportunities in advance with the participating stakeholders, and in better transparency of outcomes. This should not only apply to specific phases of the project, but throughout its entire period of realisation.

It was clearly felt that purely economic measures would not be sufficient (see Chapter 3), although they would certainly need to be properly addressed because without them there would be no acceptance of the transformation process and no changes in behaviour would be initiated. An example was given in the partial exemption of companies from the EEG (German Renewable Energy Act) levy with respect to end-users. Thus, the impression developed that the public alone would finance the energy transition. Improved conditions for fostering change in daily behaviour would be a sensible measure and, to a certain degree, there was also perceived to be a need for remuneration for those acting in an environmentally sound and in an energy-saving manner. For as long as a car journey with high CO₂ emissions remained a cheaper and more time-efficient option than an ecologically more preferable train journey, it was felt that the majority would always opt for the car. The same was felt to apply to consumer behaviour in the area of product renewal as opposed to product repair. The path that would lead to a reduction in emissions would, in the final measure, also have to be the most economically advantageous.

Discussion points left open

No agreement was reached over the matter of what can fundamentally be regarded as the consensus of the society and whether political decisions that have already been taken should still be subject to further discussion. What can be taken to have been generally agreed upon within society: the development of renewable energies? A society with low carbon dioxide emissions? Which predictions and scenarios constitute the underlying matters of the discourse? What assumptions is the process based on? Who can/must take part? The process should be as inclusive as possible, but is it possible and essential for every single citizen to be involved? Who bears the costs for such a process?



5. The society with low carbon dioxide emissions as a participatory community

Challenges

The group of stakeholders in society involved with energy production and distribution is changing. This means for society's decision-making processes in particular that a large number of (new) stakeholders now want to be included in that decision-making process. The participants in the dialogue therefore argue that the structures used for decision-making in the past are no longer sufficiently legitimate and effective and that they must therefore be the subject of a new distribution of stakeholder responsibilities and roles. At the same time, it was noted that in the final assessment, in a representative political system, the elected parliaments should decide.

The inclusion and the participation of different stakeholders (citizens, associations, companies, etc.) was seen by participants as an important corner stone for a low carbon society. The desire for more democracy by means of participation would be driven by the lack of trust in current politics and economics, and also by the higher educational level and the improved access to information. From this, there would be a resulting necessity to use the new methods and structures to involve the population in the transformation process.

In addition, it was not felt possible for a low carbon society to be reached only through the application of technological development, but eventually consumers must contribute to the transformation of society by accepting costs, and by changing consumer behaviour and lifestyle. In this respect, this process too would require a certain reworking of the rules of the game that have been in place up to now.

Admittedly, information sources had become more accessible. At the same time, many questions remained open, however, and studies had, to some extent, contradicted each other. From these perspectives, the participating stakeholders argued that the decision-making processes would have to be designed as to ensure that these uncertainties become open issues, so that decision-making processes would become more transparent.

Aims

Among the aims, it was proposed by the experts that new decision-making structures should motivate and enable the citizen to engage with the transformation process in a multi-faceted manner. At the same time, it would be necessary to create instruments to address the feeling of powerlessness among the citizenry, and to win their trust. Communication, information and participation were seen by the experts involved as the key factors for reaching these goals.

Furthermore, it would be necessary for participatory processes to contribute to reaching compromises, to enabling learning processes, to changing perspectives and to exchanging opinions, in addition to providing education and communication mechanisms.



Approaches and instruments

All stakeholders would have to adopt new roles and new responsibilities. Each individual would have to contribute a small part to the transformation of the society to one with low carbon dioxide emissions. The following examples were cited by the participants:

- The media was an essential key stakeholder in helping to form opinions. The media should report in a balanced manner to ensure that the different viewpoints on the complexity of the transformation process were well represented. The media faced the challenge of converting complex content into information that could be understood by the general public, while also remaining neutral and giving fair weightings to viewpoints/arguments. The stakeholders involved expressed their concern that without this there would be a proliferation of unrealistic expectations with regard to the capacity of institutions and companies to take action, and also with regard to the time frame of the transformation.
- Each stakeholder involved would have to recognise and act upon the significance of the process with regard to his/her own sphere of influence, and work out how to achieve involvement. This process could be assisted by those setting leading examples and by the agents of change, who would serve to 'make public' the advantages of new behaviour and new methods, and thereby presage and embody the future. Those setting leading examples/change agents are people who, out of intrinsic motives, are the first to exemplify an altered course of action. In this context, it was felt that their level of effectiveness could be improved by the appropriate communications strategies. Change agents, for example, can have an influencing effect in institutions and companies, in order to change processes operating there, to sensitise and to motivate employees into adopting changed patterns of behaviour. Those who set leading examples in public and who promote changes in behaviour would have to be trustworthy and authentic.
- Support programmes, competitions, and the public recognition and rewards for best-practice examples should all be practised more intensely, in order to stimulate companies into moving towards a society with reduced carbon dioxide emissions. An existing example for this was cited as the "Place of Progress" („Ort des Fortschritts“³).

14

The stakeholders involved put forward the following course of action to help the process of participation to succeed:

- A prerequisite for the successful implementation of participation processes was cited as being the far-reaching consensus over the necessity for decision-taking with regard to the deep underlying problem. Those persons responsible should be recognised as trustworthy and should embody authenticity. Which stakeholders are respected by all others and have the resources to lead such a process?

³In the context of the NRW research progress strategy initiative, since 2011 the Ministry of Science has designated institutions as being a 'Place of Progress' in cases where the field of their activities has led to outstanding success in engaging with the economic, ecological and social aspects associated with contributions to solutions for the major challenges faced by society in our time."

(<http://www.wissenschaft.nrw.de/forschung/fortschritt-nrw/fortschritt-sichtbar-machen/orte-des-fortschritts/>)



- The expectations of the participants and the distribution of roles should be made clear at the start. Furthermore, the posing of the problem statement (which determines the character of the participation) and the sphere of influence must be fully understood.
- It would have to be made clear which experts/specialist knowledge would be called upon for advice in the course of the process. Who will pay for this expertise?
- A continuous communication specific to the target group would be necessary in order to safeguard a transparent development.

Learning processes would have to be initiated in order to create an understanding for the transformation process. Such a learning process should, in the opinion of the stakeholders involved, be characterised by an open and transparent discussion about the effects and the alternatives. In this way it would be possible to manage uncertainties and also to generate a tolerance of mistakes made in the course of realising the targets set. At the same time, over-dependence on a particular path of action could be avoided, and the required flexibility could be achieved for adjusting to constantly changing defining conditions, by means of embedding the transformation in such a learning process.

Transformation research, and transformative research, could deliver findings that could serve as supporting aids. Transformation research concerns itself with the processes of a deep-rooted change of political regimes, of social structures and of economic systems. Transformative research differs in that it actively furthers transformative processes, which means that it can therefore also be put in the category of transdisciplinary research.

Discussion points left open

The demands on the participatory process were regarded as manifold, with each group of stakeholders placing different demands on the ultimate character of their participation. In particular, there appeared to be repeated calls for more inclusion and for faster decision-making processes. In addition, the question of feasibility arose: Who has the time to engage and who can steer these processes?

How is it possible to plan for the long term? How can the needs of future generations also be incorporated into the decision-making processes?

What role could public referendums play? Can these also lead to an improved decision-making practice?

How is the representation of all interests and perspectives being safeguarded?

Liability – the issue had already been discussed in different dialogue processes, but the matter of knowledge transfer had not yet been safeguarded. How can the constant requirement to re-invent the wheel be eliminated?

Participatory processes should already be in action by virtue of the strategic planning in local authorities, etc. Nevertheless, how is it possible for the decision-making processes to reach agreements and compromises at different levels?

Furthermore, it became clear that different participatory methods have different effects, or rather have different advantages and disadvantages. For example, on-site dialogue and



online participation appeal to different groups of people in each respective case, and they demand different competencies and resources from the initiator. On this subject there are already some research findings, but their transfer from theory to practice, together with the improvement of existing methods, has yet to be fully completed.



6. Stakeholders applying science: the practical use of scientific knowledge on the path towards a society with low carbon dioxide emissions

Challenges

Those participating in the dialogue were of the view that the approaches to technology and infrastructure projects are influenced by information sources. The question of whether the information is perceived to be neutral and trustworthy was taken to depend, among other factors, on the respective stakeholders involved, being either these to have produced the information or to be spreading it. There also exists a large number of contemporary studies using different methods and coming to different conclusions. This variety and the multitude of opinions should, according to the participating stakeholders, be preserved. There was agreement on the view that there existed a shortage of competencies, both among scientists and among journalists, in the area of communicating the complexity of scientific information in a manner that made it accessible and understandable to laypersons.

The experts were of the view that research should be a process more open about its outcomes and its technology, which, among other things, needed to deliver neutral information for public discourse on approaches to problems. Correspondingly, science should develop, e.g. models and scenarios to indicate different courses of action instead of producing predictions. At the same time, however, it was also argued that more research of an applied character, and forecasts etc., should be a component of discussions. In this regard, however, the question naturally arose of who should define the problem. The research agenda would be determined for the greater part by institutions/stakeholders, who would also provide the means for conducting the research: the law of research freedom vs. accepting limited resources. Therefore the challenge of identifying problems that were relevant to society and which could guarantee independence of scientific enquiry at the same time existed.

17

Aims

Among the aims formulated was a call for a progression towards an improved knowledge and science communication. Simultaneously, there was a perceived need to bridge the gap between science and society, which is characterised by mistrust and a lack of recognition of different types of knowledge (e.g. layperson's vs. expert's knowledge). An improved exchange between science and society was seen as the goal, but it could not be permitted to endanger the independence of research.

Approaches and instruments

In order for the most neutral information possible to be generated, findings and knowledge from different stakeholders would have to be collated. This could prevent a partisan nature of information. An example could be the status reports of the IPCC, which had been drawn up and commented upon by a great number of authors. In parallel, during the process of integration of the different knowledge, there could emerge a better understanding from the stakeholders involved with respect to viewpoints and perceptions. Further examples could be Germany's ministerial level research and sustainable development programme (FONA, c/o German Federal Ministry of Education and Research (BMBF)), and from North Rhine-



Westphalia's project for setting up a virtual institute for energy transition ("Virtuelle Institut Energiewende – NRW").

A further approach that was identified by the participants was to establish a "Clearing Centre" for knowledge. This would take on the function of identifying best-practice examples and should offer the opportunity to reflect on recent happenings. There was a future possibility that such a clearing-mechanism function could be served by the states' discourse initiative known as "KlimaDiskurs.NRW". This represents a politically independent, common interest society, in which companies, associations and societies, local authorities, scientific institutions, churches and unions have come together to assist the energy- and climate change-related processes by offering constructive criticism. This could additionally contribute to achieving better understanding of disputes and lines of compromise.

The experts were of the view that a space for continual exchange should be created. In this regard, it was of particular importance to ensure that different opinions would be permitted and that openness would be realised for the outcomes. The dialogue would have to be characterised by a sense of esteem and trust, which was felt to be lacking among participants in existing processes. For improvements in these areas, one of the necessities would be for a dissolution of hierarchies. Further, the view was made clear that existing discussion processes and structures were inadequate. New methods should therefore be developed to achieve faster processes.

Knowledge and understanding of scientific results and research projects among the public would, in the view of the stakeholders involved, have to be improved. One measure to be taken in this regard was given as the initiation of regional talks between the scientific establishment and society. In this context it was identified as being of particular importance for a communication to evolve that would be specific to a particular target group. This would enable, for example, a "story" to be told that would depict the benefits and the opportunities from the respective type of research. Naturally, an independent media institution should monitor and assist any such process. But this should also involve a further training of scientists to enable them to give better reports about their work and findings and to communicate more effectively with the wider public. It was of additional importance for the existing "reciprocal mistrust" to be broken down. There was agreement amongst those involved that pure scientific knowledge was not devoid of actual value, and that neither was applied practice without knowledge.

The curriculum at nursery schools, (vocational) schools and universities, as well as that of the many other educational establishments, should be strengthened and aligned with the aim of increasing awareness of the transformation process, and of creating an understanding of the technologies and determining conditions.

Discussion points left open

By whom, and exactly how can the variety of possible courses of action and the aspect of uncertainty be represented/illustrated?

From one perspective, those stakeholders engaged in actual practice should be included in the defining of the problems and the approaches to them, in order to promote the practical, applied value of the research. From another perspective, this approach could cause the independence and the openness of the research to suffer. A corresponding difficulty is repre-



sented by the separation of science and practice. How this issue should be dealt with would have to be discussed.

An additional question arose: Who authorises the people and the institutions that take decisions in relation to the contents of the research when working with the scientific community? How can it be guaranteed that a single interest group does not come to dominate the promotion of research and the setting of research agendas?

The scientific establishment would have to face the responsibility of recognising its social and cultural significance. There is still a need for clarification, however, on how this can be structurally anchored into the research and what is indeed required to achieve this.



7. Vision for a low carbon society

Preliminary remarks

Under the concept of "Vision" a picture of the future is understood which does not necessarily have to be complete and fully functional. The vision should draw a picture of a low carbon society, and indicate the role that dialogue in such a society occupies. Both of these last two aspects are important for enabling the vision to be compared with the visions of the other European partners. The basis for this vision-process were the targets set by the government of North Rhine-Westphalia: "The total amount of climate-damaging greenhouse gas emissions in North Rhine-Westphalia is to fall by a minimum of 25% by the year 2020 and by a minimum of 80% by the year 2050, as compared against the total emissions for the year 1990."⁴

The participants were asked to think ahead to the year 2044, to imagine that the targets given above had already been, or were already being, met, and from that perspective to describe the society with low carbon dioxide emissions. From this exercise, images of the future emerged. As there are many multifaceted approaches, and many orientations with regard to values, for how such a low carbon society can be realised, there are also many variations and part-visions. In what follows there will initially be a description of a vision that reflects the consensus. Thereafter, there will be a depiction of part-visions that indicate which different developments could exist in order for the targets set to be reached.

The underlying common vision

In the year 2044, with the aid of dialogue processes, a low-carbon dioxide society had been achieved, and one that is characterised by a comfortable standard of living. The three key points of the energy economy's triangle of targets had been met: the security of supply, the financial viability, and the environmental compatibility. The measures for the reduction of carbon dioxide in North Rhine-Westphalia are embedded in international agreements. Long-term and predictable determining conditions and rules of conduct for the roll-out of renewable energy sources and for the conversion of the energy infrastructure had been set by the political system. Renewable and conventional energy sources are integrated into the system. The stability of the system and of the grid are safeguarded. In addition, the energy transition is a holistic process that also contributes to solutions for other (global) problems (alleviating poverty and unemployment).

Regional dialogue processes of the past and present have enabled the participation of everyone in the transformation process, and they continue to do so. The costs and the advantages that result from the reduction of carbon dioxide emissions are known to all. The larger part of humanity is also aware of how much carbon dioxide its own actions actually cause. These aspects had become the themes of dialogue processes. The results of the dialogue processes and their implementation by those politically responsible led, and continue to lead, to a fair distribution of the costs and benefits within the society. Trust in dialogue processes and in political courses of action has significantly grown and a culture of "open dialogue on the energy transition" has taken root. North Rhine-Westphalia is still an important industrial centre, and a structural change has occurred. By virtue of the well-designed trans-

⁴ Law on the development of climate protection in North Rhine-Westphalia (2013), Article 1, §3



formation process, opportunities could be exploited and larger negative effects have not materialised. The industry of North Rhine-Westphalia has achieved an important contribution to the reduction of greenhouse gas emissions. As a consequence there is affluence in all layers of society, even though consumption and patterns of behaviour have altered when compared to the year 2014.

Technological progress is an essential guarantee for a low carbon society. Particularly in the area of mobility (whether by road, air or rail), improvements have been realised to enable emissions to be significantly reduced. Examples for this are the increased use of electric vehicles, bicycles and E-bikes, the switch to hybrid engines for heavy goods vehicles and improved infrastructures. Furthermore, reductions in emissions are also proceeding at pace through the use of clean energy and the replacement of fossil fuels with renewable alternatives in our buildings (both existing and under construction). These developments have fostered the implementation of key strategies for a low carbon society, based on the move to renewable energy sources, the extension of the intelligent use of conventional production, and the realisation of very high energy efficiencies.

Differing part-visions

The subtitles under their respective bold print headings represent differing developments in this area.

Degree of change in behaviour and consumption

- A regionalised world: Primarily local products are consumed and foodstuffs have been accorded and increased significance. At the same time, the regionalisation has resulted in the shortening of transport routes, so that less carbon dioxide is emitted. Motorised individual transport is also in decline and, due to the high carbon dioxide prices, aeroplane flights are very expensive and very seldom undertaken. The journey from home to one's place of work is short and there is much more telework from home, in sectors where this is possible. In addition, the energy supply has become decentralised in the majority of cases, often organised on the basis of cooperatives. Meetings for business purposes (conferences, etc.) are, as the norm, conducted virtually.
- A more self-sufficient world: Resources are used more efficiently. Production only occurs for items that are genuinely needed. Sufficiency has become the basic policy, as opposed to growth.
- A globalised world: Developments already evident in 2014 have not been abandoned. Hence, the share accounted for by renewable energy sources is higher by virtue of their on-going development. Basic consumption and patterns of behaviour have hardly changed when compared to 2014.

Energy pricing, efficiency and storage

- Energy storage systems, transfer systems and the distribution grids have been enhanced and developed to a point where renewable energy can be stored without difficulty and by this means, in conjunction with offsetting options to the sectors of heating, transport and alternative usage, there is constant availability of cheap and competitive power.



- On the basis of the low energy price, it is not necessary to cut down on usage and there has been a corresponding lower priority given to energy efficiency.
- However, energy savings are evident due to the need to curtail the demand for land required for renewable energy sources and their associated infrastructure, and thereby avoid problems of acceptance.
- Regional green power products and virtual power stations safeguard opportunities for partaking, acceptance and affordability of the energy system. The flexibility and the stability of the energy system are ensured by techniques including load management, renewable energy production that can be regulated, and by energy storage.
- The energy price is high, in part due to the shortage of cheap options for energy storage. The associated changes in life circumstances are accepted by all. Society is continuing to strive towards the increase in energy efficiency needed.

Carbon Capture and Storage

- Approaches to carbon dioxide storage have been addressed. The first European Carbon Capture and Storage (CCS) demonstration power station has been realised. Progress has been made in techniques for separating carbon content, which can then find application in the chemicals industry, for example. Additionally, through a (Europe-wide) network, carbon dioxide is transported to large off-shore carbon dioxide storage stations. Conventional power stations as well as industry are connected to the carbon dioxide network. The storage of carbon dioxide has been organised on the basis of market forces economics. The connection of private households to the carbon dioxide network will be required after 2044. In addition, industrial concerns completed their first pilot programmes for the commercial recycling of separated CO₂ in large quantities.
- The connection of private houses to the carbon dioxide network has not been undertaken due to the very small quantities of carbon dioxide involved. There may be a future development that sees power generation within accommodation quarters, with the carbon dioxide then being separated on-site from the energy supply installations.
- There are only very small capacities for storing carbon dioxide. Correspondingly, CCS does not play an essential role as part of a low carbon dioxide emissions society.

22

The role of politics

- Politics provides the targets for greenhouse gas emissions and the times by which the emissions reductions should be achieved. Furthermore, it has included all sectors in the business of emissions trading, which is the primary instrument for greenhouse gas reduction. The implementation of this politics, particularly with regard to which sectors and which technologies, is left to the market. This has brought security of investments and freedom of decisions for economic stakeholders. There is more emphasis on the insights and the creativity of the stakeholders involved, rather than intervening with regulatory measures.
- The existence of an effective global regime that reduces emissions in other important states is a prerequisite for the formulation and the implementation of a national climate protection policy.



- In the past, as in the present, Germany remains a classic industrial nation, and international competition sets the essential determining conditions for the reduction of carbon dioxide emissions.
- There is a new EU-wide agreement to ensure that energy efficiency is pursued to its maximum potentials.

Innovative infrastructure in the heating sector

- An intelligently designed heating infrastructure with local and long-distance heating networks has led to the integration of different heat production technologies into a combined distribution and storage network.

Mobility

- Electric vehicles powered by renewable energy are the central foundation of a multi-modal mobility chain, which intelligently links together different transport technologies and provides users with a comfortable combination of several different modes of transport.
- Next to battery-powered electric vehicles, vehicles powered by fuel cells also play an important role. This technology also offers the possibility to guarantee low carbon mobility. In particular, if the raw material costs for petrol increase, this technology also represents an economic alternative.



8. Conclusion and Outlook

In the context of R&Dialogue, the aim was not only to hold discussions about the role and the function of dialogue between society and the scientific community on the path towards a low carbon future, but also experiment dialogue. The individual workshops were designed on the basis of different methods. The methods of 'World Café', 'Future Workshop', 'Dynamic Facilitation' and 'Dragon Dreaming' were all applied and tested. All methods aimed at reaching a consensus among the participants. The methods were evaluated differently by the participants: Many preferred the discussion with all participants involved; others felt that splitting up into small groups led to better outputs. For dialogue procedures within this particular kind of assembly of stakeholders, exist only a few methods and reported experiences. There is a requirement here for further research findings and practical, concrete guidelines.

As the discussion (and vision) paper show, there is, for the greater part, unity of opinion over the existing challenges. There is discord, however, over the evaluation of options for solutions and future developments. This disagreement, which is summarised in the discussion paper under 'points left open', shows clearly those themes and questions that should be addressed, both by the scientific community and by broader society, along the path to a low carbon society.

An important conclusion from the dialogues lies in the consensus about how dialogue itself will remain an important component of future developments. Questions about the types of dialogue processes and who, and at what level, and with whom, should be able to contribute to effective decision-making, must be more precisely resolved through further evaluation of existing processes and through the development and application of new methods.

Furthermore, it was established that dialogue between organised civil society and the scientific community is an important element in working towards well founded and varied possibilities for solutions. By means of the exchange of research findings and experiences between these two groups of stakeholders, a fundamentally more sophisticated examination of the current energy transition will be made, when compared with the positions that would have been adopted within individual disciplines or within the two separate groups of stakeholders. In the case of R&Dialogue, there were no problems of communication or understanding between the participants, which can be explained by the fact that all of the stakeholders are experts in the field. The conflicts that arose were not generated between those stakeholders from civil society and those from the scientific community, but are rather based on the different emphasis put on available information and on different value orientations. In this respect, the discussion flowed in a very factual manner and positions were bolstered with arguments. At the same time, an atmosphere of mutual learning could emerge, in which stakeholders formulated questions for other participants in order to learn from their experience. There was a corresponding tendency for (personal) knowledge gaps to be identified, to be partially closed and reflected upon.

The results of R&Dialogue in North Rhine-Westphalia are being compared with the results of the other nine R&Dialogue series in our partner countries (Greece, Italy, Norway, the Netherlands, France, Scotland, Spain and Portugal). The results will be summarised and reflected in a report. On the basis of these findings, a European vision for a low carbon society will be developed. The results of the project are then submitted to the European Commission.



R&Dialogue ²⁵

