Vision Development towards a Sustainable North Rhine-Westphalia 2030 in a Science-Practice-Dialogue

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Abstract: The paper presents the results of a participatory vision development process in the Federal State of North Rhine-Westphalia (NRW) in Germany. The vision development was part of a scientific research project that accompanied the development of a sustainability strategy for NRW at state level. The Sustainability Strategy NRW was adopted in July 2016 and contains parts of the vision developed in the research project: Sentences from the narrative text vision and proposed targets and indicators that back-up the vision for a sustainable NRW in 2030 were used by the state of NRW. The vision was developed in iterative steps in three consecutive dialogue rounds with different stakeholders from science and practice. The paper presents the methodological approach and the results of the vision formulation process. The paper discusses the lessons learned from the vision development—from both practical and theoretical perspectives of transition management. The paper explores the relevance of setting ambitious targets for sustainable development as part of a state strategy by taking the proposed target of a "4 × 25% modal split" by 2030 as an example. The project demonstrated that a participatory approach for vision development is time and resource consuming, but worth the effort as it improves the quality and acceptance of a vision. Furthermore, the project demonstrated that transformative science contributes valuable inputs for sustainability transitions and for facilitating participatory vision development.

Keywords: sustainability strategies; vision development; targets; indicators; participatory research; Federal State of North Rhine-Westphalia; transition management; sustainable mobility; modal split; transformative science

1. Introduction

Sustainable development is a highly complex and uncertain endeavor that requires new forms of governance, fundamental system changes and long-term guidance [1–3]. It is a cross-cutting task of collective responsibility that can only be achieved with coordinated strategies at global, national, regional and local levels [4]. The Global Earth Summit of the United Nations in Rio 1992 has urged the need for sustainability strategies [5] to meet the pressing challenges of sustainable development.

Besides the United Nations 2030 Agenda for Sustainable Development, adopted in 2015 [6], and the National Sustainability Strategy of Germany, adopted in 2002 and re-adopted in 2017 [7], 15 out of 16 German federal states had adopted statewide strategies by April 2017. Particularly, in the last couple of years, there is an increasing dynamic in the development of state sustainability strategies. Federal states play a vital role in managing transitions towards sustainable development because of their regional competences in legislation and implementation, their regional expertise and their proximity to regions and cities, citizens, civil society and companies [8].

The federal state of North Rhine-Westphalia (NRW), being the most populous federal state of Germany and an important industrial and economic region, adopted its sustainability strategy in July

2016 [9] as the eleventh federal state of Germany. The development of the sustainability strategy in NRW was accompanied by a research project of the Wuppertal Institute for Climate, Environment and Energy [10]. The aim of the research project was to analyze and reflect upon the development and design of a sustainability strategy for NRW from a science perspective. In one out of eleven work packages, a vision "Sustainable NRW 2030" was developed in a science-practice-dialogue ([11]; see [12] for English translation). The vision consists of two elements: A narrative text that describes a desirable picture of a sustainable NRW in 2030 and operationalized targets and indicators, mainly in final scores, that aim at making the vision tangible, measurable and manageable.

Vision development and target formulation are important instruments at the strategic level of transition management [13] (p. 104). They are part of the good governance criteria for sustainable development [14]. Visions are "qualitative, inspiring, challenging and imaginative pictures of the future that define a structurally different, and more sustainable, state of the system" [13] (p. 117). Their "over-arching goal is to stimulate a sense of shared direction and ambition amongst a variety of actors" [13] (p. 118).

For developing the vision "Sustainable NRW 2030", a first draft text version was developed by the Wuppertal Institute. According to the "participatory nature of transition management" which "allows for iterative problem- and goal formulating processes between different types of actors" [13] (p. 118), this draft version was discussed and further developed in three iterative loops in dialogue with experts and stakeholders from science, civil society and administration. The three iterative loops resulted in revising and reworking the vision three times. Changes were made in the length, structure, content and level of detail of the vision.

Overall, the authors argue that the participatory approach for the vision development process lead to an improved quality and broader acceptance of the vision. As a result, a part of the vision developed by the Wuppertal Institute was used by the federal state of NRW for their sustainability strategy: 65% of the words of the vision that now flanks the sustainability strategy were taken from the Wuppertal Institute's vision.

In this paper, an extended version of a conference paper presented at the 2017 World Sustainability Forum (WSF2017) in Cape Town, South Africa [15], the approach for developing a sustainability vision in a participatory approach and the lessons learned will be presented and discussed from a practical and a theoretical perspective of transition management. The role of a state vision, targets and indicators will be analyzed by taking the example of a "4 × 25% modal split" target in the year 2030. The paper concludes that transformative research can contribute valuable inputs for sustainability transitions and for facilitating mutual learning during participatory vision development processes. The lessons learned from the project provide valuable knowledge that can be used for similar vision development processes elsewhere.

2. Historical and Theoretical Background

2.1. Sustainable Development

The term "sustainable development" was coined by the Brundtland Commission in 1987 as a development "that meets the needs of the present without compromising the ability of future generations to meet their own needs" [16] (p. 41). The concept of sustainable development was further elaborated at the 1992 United Nations Conference on Environment and Development (UNCED, Earth Summit) in Rio de Janeiro [5,17] and at the World Summit on Sustainable Development (WSSD) in 2002 in Johannesburg. The conferences strengthened the concept of the three dimensions of sustainability—society, environment, and economy—and emphasized the collective responsibility at local, regional, national and global levels [4].

2.2. Sustainability Strategies

The history of sustainability strategies draws back to the Agenda 21 process that was started at the UNCED in Rio de Janeiro 1992 with a guidance paper on sustainable development [5]. It is the first document to specify the character of sustainability strategies [14]. It called upon the country governments to develop their own national strategies for sustainable development in cooperation with the relevant stakeholders [5] (p. 66). Sustainability strategies are defined by referring to the three dimensions of sustainability and the Brundtland definition of intergenerational sustainability: A sustainability strategy "should build upon and harmonize the various sectoral economic, social and environmental policies and plans that are operating in the country. (. . .) Its goals should be to ensure socially responsible economic development while protecting the resource base and the environment for the benefit of future generations. It should be developed through the widest possible participation" [ibid.].

In the following years, several guidelines for sustainability strategies were developed (e.g., [18,19]). The European Sustainable Development Network (ESDN) highlights that sustainability strategies "put a strong emphasis on procedural and institutional aspects of an iterative governance process in which networks ought to play an increasingly important role" [14]. The ESDN synthesized seven good governance criteria that should be addressed for sustainable development in general and for sustainability strategies in particular: (1) definition of a common long-term vision and strategic objectives; (2) high-level commitment; (3) horizontal integration; (4) vertical integration; (5) participation; (6) implementation mechanisms and capacity-building; and (7) monitoring, evaluation and strategy renewal [14].

Since the UNCED Agenda 21 document from 1992 did not contain a submission date for national sustainable strategies and progress on national levels was rather slow, the General Assembly adopted a "Programme for the Further Implementation of Agenda 21" in 1997 and agreed that all national sustainability strategies should be completed by 2002 [20] (paragraph 24a). Accordingly, the National Sustainability Strategy of Germany was adopted in 2002 (re-approval of a new version in 2017) [7].

However, sustainable development is a cross-cutting task and requires coordinated actions also at local, regional, national and global levels. In Germany, federal states play a vital role in managing transitions towards sustainable development because of their regional competences in legislation and implementation, their regional expertise and their proximity to regions and cities, citizens, civil society and companies [8]. By April 2017, 15 out of 16 federal states in Germany had adopted a sustainability strategy [21].

2.3. Sustainability Strategy of North Rhine-Westphalia (NRW)

The federal state of North Rhine-Westphalia (NRW) adopted its sustainability strategy in June 2016 [9] as the eleventh federal state of Germany. NRW is the most populous federal state of Germany (17.7 million or 22% of the German population in 2015). It is the most densely populated territorial state of Germany with 396 municipalities including 28 cities with more than 100,000 inhabitants. Furthermore, NRW is one of the most important economic and industrial regions in Germany: NRW is home to energy-intensive industries such as steel, aluminum and cement industries. NRW produces one third of the Germany's electricity [22] and uses one third of Germany's primary energy consumption [23]. NRW causes one third of Germany's greenhouse gas emissions (2012) [24].

Based on its coalition agreement 2012–2017 [25], the state government of NRW decided in a cabinet approval (November 2013) to develop a sustainability strategy headed by the environmental state ministry (Ministry for Climate Protection, Environment, Agriculture, Conservation and Consumer Protection of the State of North Rhine-Westphalia (MKULNV NRW)) and with the participation of all other state ministries, the state government and in exchange with stakeholders from civil society, economy, municipalities and science [26]. Thus, the development process included several cooperation and participation elements: an inter-ministerial working group (IMAG Sustainability), annual sustainability conferences, two public consultation rounds in 2014 and 2015 and three accompanying projects: a "lessons learned" project on the "Successful Development of Sustainability Strategies"

by the Bertelsmann Stiftung [27], participation projects by the Local Agenda 21 NRW [28] and an accompanying research project by the Wuppertal Institute [10].

The sustainability strategy of NRW that was adopted in June 2016 and consists of a strategy paper that was also translated into English [9] and a first indicator report that shall be updated every two years [29]. The strategy covers all three dimensions of sustainability (environmental, social, economic) across 19 fields of action including seven priority areas: (1) Climate Protection; (2) Environmental Economics; (3) Biodiversity; (4) Sustainable Financial Policy; (5) Sustainable Urban and Neighborhood Development and Local Mobility; (6) Demographic Change and age-appropriate Neighborhoods; and (7) State initiative "NRW holds together—for a life without poverty and outlawing". Furthermore, the strategy contains roughly 70 indicators and targets for the years 2020, 2030 or 2050. Cross-references are given when indicators align to the United Nations' sustainability development goals (SDGs) of Agenda 2030 [6].

2.4. Accompanying Research Project by the Wuppertal Institute for Climate, Environment and Energy

The research project by the Wuppertal Institute that accompanied the development of the sustainability strategy NRW ran from 2013 to 2017 and was funded by the environmental state ministry (MKULNV NRW). The aim of the research project was to analyze and reflect upon the development and design of a sustainability strategy for NRW from a science perspective. From the beginning, a "TEAM Sustainability" was involved as part of the research project. The TEAM Sustainability is an advisory board of the research project that consists of stakeholders from different institutional and professional backgrounds to represent different contents of the sustainability debate. The eleven work packages of the research project included inter alia the review of existing sustainability activities in NRW [30], the identification of relevant strategies in different fields of action [31] and the compilation and assessment of existing indicators and targets at different political levels [32]. In one work package, a vision "Sustainable NRW 2030" was developed in a science-practice-dialogue [11,12]. The aim of this paper is to present, analyze and discuss the lessons learned from the approach and the results for developing a sustainability vision for NRW.

2.5. The Role of Visions for Sustainable Development from the Perspective of Transition Management

Visions are a central element for sustainable development and sustainability strategies. Modern visioning approaches emerged during the 1980s and 1990s [33,34]. Since then, a variety of visions from planning, policy, stakeholders, experts and stakeholder coalitions have been developed ([35–37]; for an overview see [38]).

Sustainable development is characterized by high complexity and uncertainty. Sustainability challenges such as climate change, urbanization and building an inclusive society are long-term processes that take at least one generation, span over more than one policy cycle and involve multiple topics and sectors, policy levels and stakeholders [1,38]. There are several uncertainties in terms of risks and chances, knowledge, synergies and unintended side-effects [39].

Solving sustainability challenges thus represents an enormous challenge for policy, science and society [1]. It is increasingly recognized that the complex and long-term challenges of sustainable development require new forms of governance, far-reaching approaches and fundamental system changes [1,3], "which cannot be brought about by technological innovations alone but which require (. . .) mutually reinforcing institutional and sociocultural transformations" [1].

As a response to dealing with long-term socio-technical change, the concept of transition management has been introduced and discussed [1–3,40]. Transitions are defined as "large-scale transformations within society or important subsystems, during which the structure of the societal system fundamentally changes" [3]. Transitions are described as a shift from a relative stable system to a new (stable) system [3]. During this shift, transitions go through different subsequent stages (takeoff, acceleration/breakthrough, and stabilization) and alternative solutions are developed in an interplay between different scale levels (macro level/landscape, meso level/regime, and micro level/niches; described as multi-level approach) [3].

The concept of transition management has been introduced to translate the abstract theory of transitions into a practical management framework that explicitly deals with transition processes in complex societal systems [3]. Transition management aims at realizing long-term sustainable development with new forms of governance [3]. Transition management is a cyclical process ("transition cycle") that comprises the following elements [3,13,41,42].

(i) Problem analysis and the development of system knowledge;
(ii) Developing a vision of sustainable development, targets and a transition agenda;
(iii) Mobilizing actors for executing experiments; and
(iv) Learning from the transition experiments by evaluation and monitoring; diffusion of transformation knowledge and adjustment of vision, agenda and coalitions.

The transition management activities can be allocated to different governance levels: The strategic (problem structuring and envisioning), the tactical (network building and agenda setting) and the operational (implementation) level. Overall, the transition cycle represents an iterative, reflexive and exploratory governance approach [43] that encompasses "learning by doing" elements in an adaptive and participatory governance setting [1,13].

In transition management, vision development is a central element at the strategic level of transition processes. According to Loorbach, visions are "qualitative, inspiring, challenging and imaginative pictures of the future that define a structurally different, and more sustainable, state of the system" [13] (p. 117). Wiek and Iwaniec describe visions as "an influential, if not indispensable, stimulus for change" [34] (p. 497). Kemp et al. point out that there is no fixed concept or identifiable end state of what sustainability is [2]. Rather, the concept of sustainability derives from a continuous opinion formation process on what societies consider to be sustainable [2]. Thus, each generation has to take up the challenge anew and formulate their ideas of sustainability [2]. Against this background, visions can help actors by providing direction for actions and behavior, by creating identity and community and by overcoming short-term thinking [34,38]. According to the participatory nature of transition management, the participatory formulation of a joint vision is crucial for achieving a widely accepted vision as it allows for iterative problem and goal formulation and mutual learning processes amongst a variety of stakeholders [13]. Loorbach and Lindt point out that, besides having a shared vision, also "the process of envisioning is just as important as the ultimate visions themselves" [3] (p. 7). Scientists and practitioners should ideally work together for co-producing the knowledge necessary for shaping the complex challenge of sustainable development [44–46]. Mauser et al. argue that the "dialogue between stakeholders and scientists ensures the exchange and interaction of their respective knowledge and thereby ensures the societal relevance of the research" [46] (p. 428).

A long-term vision of sustainability is the basis for setting short- and long-term operationalized targets and for developing action plans and instruments. Wiek and Iwaniec underline that if visions remain abstract, they do not convey. "A key to specifying a vision is the provision of qualitative and/or quantitative targets, thresholds, tipping points, or other normative reference points" [34] (p. 502). Since sustainable development requires considerable system changes in order to reach the conditions described in a vision, scientific foresight methodologies offer a useful tool "for reflecting on how to enable action leading to such fundamental changes" [47] (p. 56). Among these, scenario-building techniques are particularly suitable for exploring possible future paths, because they are "sufficiently formalized for producing outputs which are robust and thus credible for providing policy support" [ibid.]. Wiek and Iwaniec point out that, whereas visions represent a desirable future state that should be, scenarios describe a possible future state (scenarios building), a likely future state (forecasting) and pathways to desirable future states (backcasting) [34] (p. 497).

3. Developing a Sustainability Vision in a Science-Practice-Dialogue—Methodological Approach

In its accompanying research project for the development of the Sustainability Strategy NRW (see Section 2.4), the Wuppertal Institute developed a sustainability vision for a "Sustainable NRW

2030″ in a science-practice dialogue. The vision was developed from January 2015 to May 2015. The task was to develop a sustainability vision that is specific for NRW and could serve as a positive image and reference framework for the Sustainability Strategy NRW. As such, the vision should be as abstract as necessary and as concrete and guiding as possible.

3.1. Process of Developing the Vision

The following figure (Figure 1) visualizes the process of the vision development as part of the strategy development process at NRW state level and as part of the accompanying research project: (a) Cabinet Approval of the NRW State Government in 2013 to develop a sustainability strategy NRW headed by the environmental state ministry. (b) Research funding granted to the Wuppertal Institute for a research project. One of the eleven work packages included the development of a vision in a science-practice dialogue.

(1) In a first step, the Wuppertal Institute set up its research team to develop the first draft vision. The research team comprised research fellows from different scientific backgrounds (economy, geography, policy sciences, urban and environmental planning). For preparing the writing of the vision, literature and relevant documents were reviewed (existing visions, policy documents, targets and indicators). Based on this research, internal working documents were developed about the NRW characteristics and possible guiding principles of a vision. Subsequently, a first draft text version was developed in iterative loops between the members of the research team. (2) In a second step, the Wuppertal Institute discussed the first draft text version in a half-day workshop with experts for social and economic sustainability. With this interdisciplinary workshop, the Wuppertal Institute wanted to back up its own main expertise in environmental sustainability with additional expert knowledge in the social and economic sustainability. Experts came from research institutes and organizations in NRW. The Wuppertal Institute integrated the results of the discussion in the draft text version and created a second draft text version. (3) A second draft text version was then discussed with the members of the TEAM Sustainability (multi-stakeholder advisory board of the research project with stakeholders from institutions and organizations related to sustainability) (see Section 2.4). The Wuppertal Institute integrated the results of the discussion into the vision. (4) A third draft text version of the vision was then discussed with the inter-ministerial working group IMAG Sustainability (leading representatives from all NRW ministries). The Wuppertal Institute integrated the results of the discussion into the draft text vision and developed the final fourth version of the vision. (5) The final vision developed in the research project was published online on the web server of the Wuppertal Institute following the approval of the funding sponsor.

(c) The final version of the vision was submitted to the contracting authority of the Ministry of the Environment (MKULNV NRW). (d) The State Administration used parts of the vision for their vision in the Sustainability Strategy NRW. The draft Sustainability Strategy NRW was given for public consultation. (e) The NRW State Administration submitted the revised Sustainability Strategy to the State Government of NRW. (f) The State Government of NRW approved the Sustainability Strategy NRW in June 2016. A few parts of the vision developed by the Wuppertal Institute became part of the vision in the Sustainability Strategy NRW. (f) The State Government notified the State Parliament about the approved Sustainability Strategy.
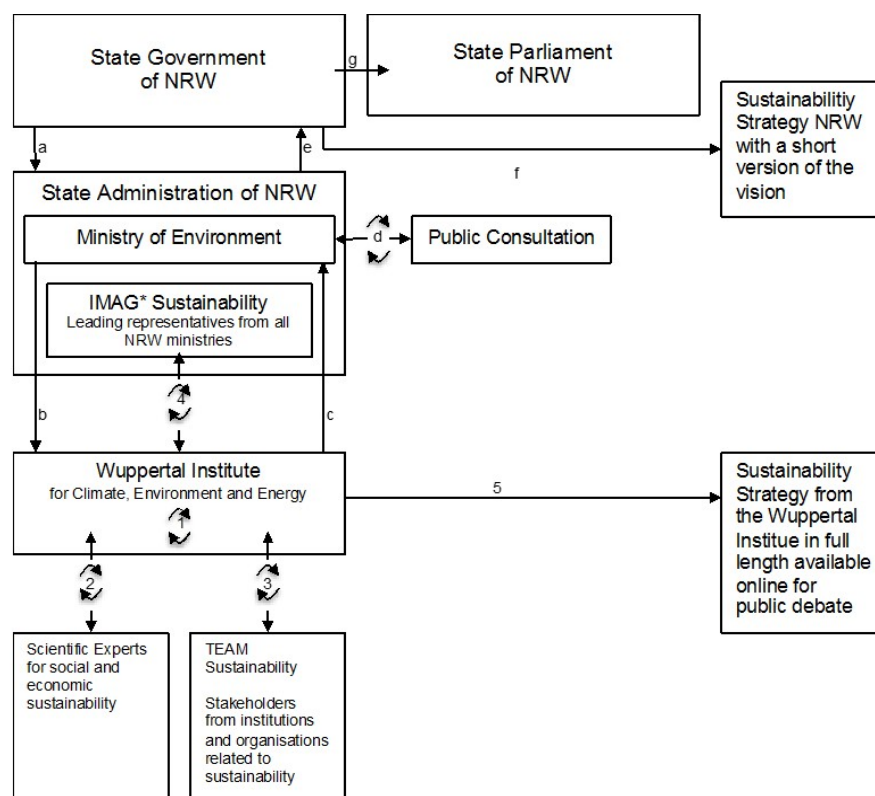
Figure 1. Overview of the vision development process as part of the development process of the Sustainability Strategy North Rhine-Westphalia (NRW). The different elements of the figure are described in the paper text. * IMAG = Inter-ministerial working group.

3.2. Guiding Criteria for Developing the Vision

For drafting the vision, ten guiding criteria were developed (see [34,48] for comparable quality criteria for sustainability visions):

(1). **Normative orientation**: The vision draws a positive and holistic picture of a desirable sustainable future to demonstrate "This is how we want to live!" The purpose of the vision is to inspire and motivate.

(2). **Time horizon**: The target year of the vision is 2030 or 2050 when reasonable (e.g., for climate change). The vision is written in present tense.

(3). **Context**: The vision highlights the specific character and context conditions of NRW but is also generally valid.

(4). **Ambition**: The vision is ambitious, but also feasible; the vision is neither utopian nor naïve.

(5). **Subject**: Subject is the federal state of NRW in the third person ("NRW" and not "we" or an invented individual).

(6). **Target group**: Target group is the informed public.

(7). **Language style**: The vision is systematic, analytical and scientifically sound but also comprehensible for people from outside the scientific community. The language style is objective, factual and with short sentences, but imaginative by created images.

(8). **Content**: The vision draws a holistic picture of sustainable development.

(9). **Level of detail**: The vision contains both a qualitative text and operationalized targets (existing targets at state level or other political levels and proposed targets from the science perspective) to link the vision to implementation and monitoring. The targets developed were quantified, time-related, easy to communicate and (if possible) and conformed to the "SMART" criteria: They

were specific (target a specific area for improvement), measurable (quantify or at least suggest an indicator of progress), assignable (specify who will do it), realistic (state what results can realistically be achieved, given available resources), time-related (specify when the result(s) can be achieved) [49].

(10). **Acceptance**: The vision was discussed with relevant stakeholders from science, civil society and administration to integrate a broad variety of stakeholder views and generate high acceptance.

3.3. Inputs from the Dialogue Rounds with Experts and Stakeholders

The following figure gives an overview of the dialogue sessions and the proposed refinements given by the participants of each discussion round (Figure 2).
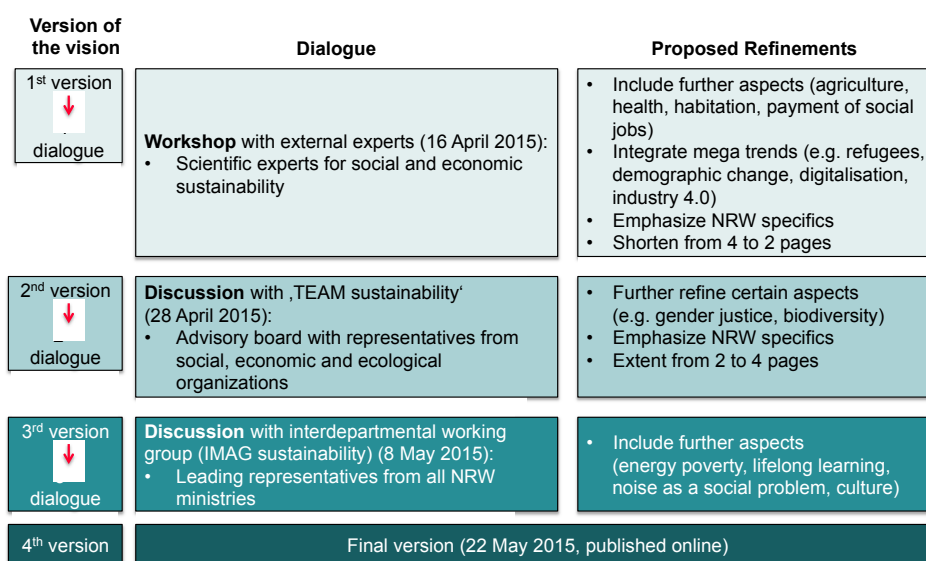

Figure 2. Dialogue Rounds and Proposed Refinements.

In each of the three dialogue sessions, inputs were given on the further inclusion and refinement of aspects (e.g., payment of social jobs, energy poverty, and lifelong learning). In the first dialogue session, participating experts argued to integrate mega trends as they will pose a significant long-term challenge for sustainable development in the upcoming decades and thus should be part of a long-term vision (e.g., demographic change, digitalization, and refugees). In both the first and the second dialogue round, participants stressed to further strengthen the NRW specifics.

Furthermore, the length of the vision has been subject to controversial debate among the dialogue participants: The first draft text vision of the Wuppertal Institute was four pages long. The participants of the first dialogue round proposed to shorten the vision to only two pages because from their point of view it contained too many details. Thus, the Wuppertal Institute shortened the first four-page version to a two-page version. The participants of the second dialogue round then argued that the two-page vision was not informative enough because it was too abstract and vague. Thus, the Wuppertal Institute extended the two-page version back to a four-page version.

4. Vision "Sustainable NRW 2030"—Results

4.1. Structure of the Vision

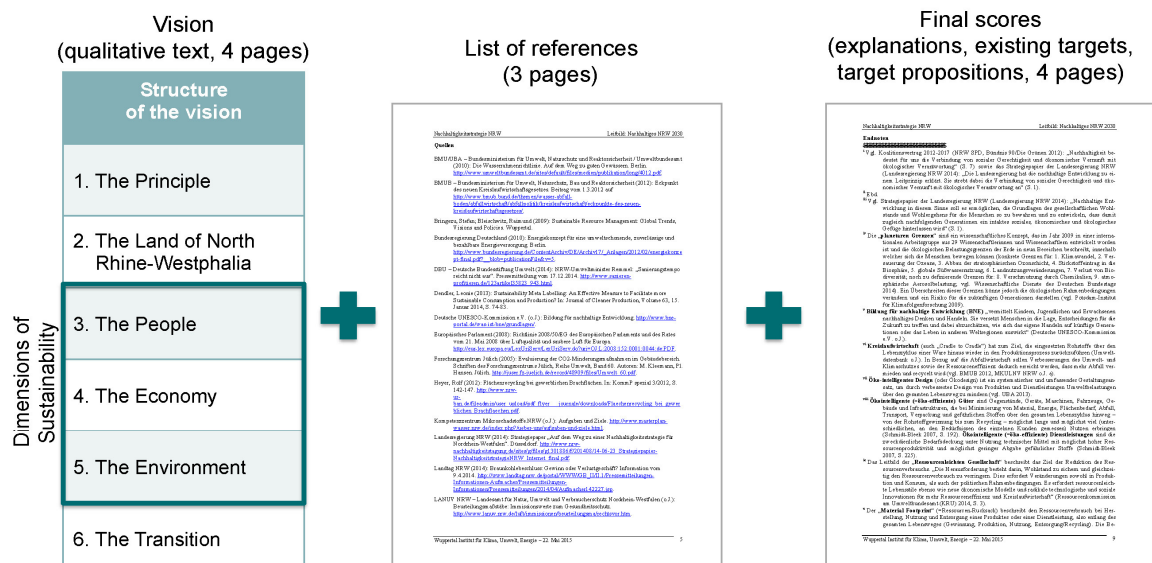The overall document that was produced has the following structure (see Figure 3):

Figure 3. Structure of the Vision Document.

- **Four pages of the qualitative text of the vision** (for description, see Section 4.3) with the following structure (see Figure 3): The first section "The Principle" is a short version of the vision with the most relevant guiding principles. The section "The Land of North Rhine-Westphalia" describes how sustainable development is realized against the background of the specific context conditions in NRW. "The people" represents the social dimension of sustainability that was deliberately chosen to be the first sustainability dimension to underline the relevance of sustainable development for the people. The economic sustainability dimension "The Economy" follows in the second place and the environmental dimension "The Environment" in the third place. In the sixth section "The Change", the authors describe how sustainable development is achieved in terms of the management of change.

- **Three pages of references**. The list of references includes scientific analyses, position papers, administration and policy documents. The reference list underlines that relevant documents were taken into account for vision development and that the vision is scientifically sound and well-grounded;

- **Four pages of final scores** with explanations of technical terms, existing and proposed targets. The final scores were used to give further information so that the vision is understandable also to people that are not familiar with certain technical terms or issues, for example with the concepts of planetary boundaries or education for sustainable development. Furthermore, the final scores were used to link principles of the vision to concrete targets for future development—either with already existing targets or with targets that the Wuppertal Institute proposed based on existing targets at different political levels or normative requirements.

4.2. Content of the Vision—Qualitative Text and Quantitative Targets

In this section, the content of the different sections of the vision is briefly described. The main aspects of each section are mentioned. Tables 1–3 list the qualitative and quantitative targets proposed as part of the vision and their utilization in the state sustainability strategy. The vision is written from the perspective of the year 2030.

Table 1. Proposed qualitative targets of the Wuppertal Institute in the part "The People" (examples) and their operationalization in the Sustainability Strategy NRW.

Qualitative Targets for 2030 as Part of the Vision	Operationalized Targets as Part of the Sustainability Strategy NRW
Older worker are valued.	Increase of the employment rate among elderly people (from age 55 up to the statutory retirement age), especially of elderly women [9] (p. 34).
NRW takes preventative measures against the risk of poverty, particularly among migrants, single parents, the elderly, children and youths.	Reduction of the (gender-specific) poverty risks at an advanced age [9] (p. 34); Reduction of the at-risk-of-poverty rate for people from migrant backgrounds (p. 36).
NRW closely follows the fundamental principle of gender equality in all aspects of social life and works to eliminate discrimination on the basis of sex.	Increasing the percentage of women in management positions in companies and in the supreme state authorities; Reduction of the pay gap between men and women. [9] (p. 39)
Inclusion is embraced in all areas of society.	Continuous increase of the percentage of special-needs students attending regular schools by 2030 [9] (p. 39).

Table 2. Proposed operationalized targets and indicators of the Wuppertal Institute as part of the vision in the part "The Economy" and their use in the Sustainability Strategy NRW (examples).

Targets for 2030 as Part of the Vision	Placement	Target Derived from	Target Included in the Sustainability Strategy NRW?
Halving the material footprint (resource consumption) of private households from 44 tons in 2015 to 19 tons per year in 2030.	In final scores.	Target derived from scientific studies [50].	Partly: Without operationalization ("substantial reduction") [9] (p. 49).
Reduction of final energy demand of up to 20% in 2030 compared to 2010.	In the main vision text.	Target derived from scenario calculations of the Climate Protection Plan NRW [51].	No. Similar target/indicator: "Reduction of final energy consumption of private households" [9] (p. 37).
In 2030, NRW produces around one-third of its electricity from renewable energies.	In the main vision text.	Target derived from scenario calculations of the Climate Protection Plan NRW [52].	Yes, similarly: more than 30% until 2025, more than 80% until 2050 [9] (p. 32).
2% refurbishment rate in buildings in 2030.	In final scores.	Target derived from scenario calculations of the Climate Protection Plan NRW [52].	Yes, but without target year: an average annual energetic renovation rate of 2% is envisaged [9] (p. 32).
4 × 25% modal split in passenger transport (one quarter of all trips by foot, bike, public transport, motorized private transport).	In final scores.	Target derived from the targets of the City of Essen in its application for European Green Capital (4 × 25% until 2035) [53] and the vision of the Ruhr metropolis (4 × 25% without target year) [54].	Similar: 60% walking, cycling and pedelec use of all trips in inner city areas in 2030 [9] (p. 37)
Reduction in the number of people killed in traffic accidents by two-thirds by 2030 compared to 2004	In final scores.	Target derived from the interim target of the NRW State Government: halving the number of people killed in traffic accidents in 2015 compared to 2004 [55].	No.

Table 3. Proposed operationalized targets and indicators of the Wuppertal Institute as part of the vision in the part "The Environment" and their use in the Sustainability Strategy NRW (examples).

Targets for 2030 as Part of the Vision	Placement	Proposed Target Derived from	Target Included in the Sustainability Strategy NRW?
Reduction of greenhouse gas emissions by more than 40% in 2030 compared to 1990 levels.	In the main vision text.	Target derived from the existing NRW targets of −25% until 2020 and −80% until 2050 compared to 1990 according to the NRW Climate Protection Law [56] and the scenario calculations of the Climate Protection Plan NRW for 2030 [52].	Yes, similarly: −25% until 2020 und −80% until 2050 compared to 1990; 2030 is oriented towards the calculations of the climate protection law of around −44% [9] (p. 32).
Doubling organic farming between 2013 and 2030.	In final scores.	Target derived from targets in other federal states.	Partly: Without operationalization (increase of organic farming) [9] (p. 38).
The EU's limit values for particulate matter and nitrogen dioxide emissions are complied with and NRW is well on the way to achieving the more ambitious target values of the WHO [1].	In the main vision text, numbers explicitly named in final scores.	Target derived from the targets of the City of Essen in its application for European Green Capital (compliance with EU limits until 2020, extensive compliance with WHO [1] guidelines until 2035) [57], the EU Directive 2008/50/EC, the German emission laws (BImSchV) and the WHO [1] guidelines [58].	Yes, inclusion of some air targets: Annual mean of 20 μg/m^3 PM$_{10}$ and 40 μg/m^3 NO$_2$ (=both WHO [1] guideline) [9] (p. 25).
Largely avoiding harmful noise levels (65 dB(A) day and night; 55 dB(A) at night) and approaching more ambitious quality targets (55 dB(A) day and night; 45 dB(A) at night), both according to WHO [1] guidelines.	WHO [1] guidelines in main vision text, numbers explicitly in final scores.	Targets derived from the targets of the City of Essen in its application for European Green Capital (for 2035/long-term objective) [55] and WHO [1] guidelines [59,60].	Partly: Reduction of noise in residential areas taking WHO [1] guidelines into consideration (65 dB(A) day and night, 55 dB(A) at night) [9] (p. 26).
Groundwater and surface waters have attained "good status".	In the main vision text.	EU Water Framework Directive (WFD, 2000/60/EC): groundwater and surface waters to have achieved "good status" by 2015, with an extended time limit until 2027.	Yes: All flowing water bodies will reach good status, according to EU Water Framework Directive by [9] (p. 33).
Daily land consumption has more than halved (compared to 2012) and now stands at <5 ha per day; it is approaching net zero in the long-term.	In the main text.	Existing target of the NRW State Government to restrict the daily land consumption in NRW to 5 hectares by 2020 [25] (p. 52).	Yes: Limitation of land use for settlement areas and traffic to 5 ha per day by 2020. The aim is a zero net consumption in the long run [9] (p. 34).

[1] WHO = World Health Organization.

4.2.1. The Principle

The section states that NRW has developed sustainably until the year of 2030 and continues to do so hereafter. Being the most populous federal state of Germany, NRW has demonstrated how change can be achieved while keeping and strengthening industrial structures. The section refers to the three dimensions of sustainability and states that NRW follows its guiding principles of social justice, economic reason and ecologic responsibility. The section refers to the good governance criteria of sustainable development (target setting, monitoring) by saying that NRW has come measurably closer to its targets. Furthermore, the section refers to the intergenerational Brundtland definition of sustainability (preserving a sustainable world for future generations) [16] and the concept of the planetary boundaries. The planetary boundaries are biophysical boundaries that set the limits for a "safe operating space" in which humanity can continue to develop while preserving the Earth [61]. Furthermore, the section describes how this change is achieved: by a joint commitment of citizens, civil society, municipalities, science, education, economy and politics. By doing so, NRW has taken a

pioneering role, contributes to reach sustainability targets at different levels and benefits from new alliances and exchange with other regions in the world.

4.2.2. The Land of North Rhine-Westphalia

The section "The Land of North Rhine-Westphalia" describes the specific challenges and supporting factors for sustainable development in NRW. The section states that NRW is conscious of its particular responsibility by being the most populous federal state and an important economic and industrial region. The section also describes, that NRW is well prepared for the transition challenges ahead because it has learned from former transition processes in NRW, such as industrial change and immigration. NRW makes use of this transition knowledge to realize sustainable development. In this process, NRW addresses major societal challenges, such as demographic change, and considers its specific structures, such as rural and urban areas and growing and shrinking regions.

4.2.3. The People

The section "The People" addresses the social dimension of sustainability and starts with the sentence that the people in NRW enjoy a high standard of living in 2030. Aspects addressed are inter alia a self-determined life in a solidary society, equal rights for participation, gender equality and gender mainstreaming, inclusion, a pluralistic democracy and an open and constructive problem solving culture. The section states that NRW continues to be a land of immigration that strengthens NRW's society and economy. This is achieved because different cultures and people are successfully brought together in a spirit of acceptance and diversity where xenophobia and right-wing extremism have no chance. Social cohesion is strengthened by redressing poverty and marginalization through intensive education and integration programs. NRW's knowledge and education landscape enables lifelong learning and promotes the disadvantaged and highly talented alike. Education for sustainable development and cultural and political education have enabled people to be aware of the significance of sustainable development and to gain the knowledge, creativity and design competence to realize sustainable development. Flexible working time models and day-care centers enable the reconciliation of family and working life. Older workers are valued and the social, economic and municipal infrastructures are better adapted for the challenges of demographic change.

For the section "The People", only qualitative targets were proposed. The following table lists several qualitative targets from the vision that were operationalized by indicators and targets in the Sustainability Strategy NRW (see Table 1).

4.2.4. The Economy

The section "The Economy" addresses the economic dimension of sustainability and starts with the sentence that in 2030, NRW is a modern, dynamic and innovative industrial location and an internationally significant economic region. Aspects addressed in the section are a diverse labor market, fair wages, the smart integration of digitalization and industry 4.0, increased competitiveness, circular economy, the prevention of energy poverty, sustainable mobility and the development of new knowledge through science and the exchange between researchers and practitioners (transformative science). The section states that climate protection, the efficient use of resources and energy, and sustainable development have served as an engine of progress for prosperous business in NRW and as a guarantor for securing and creating jobs. Companies have developed their own sustainability strategies and successfully marketed their own environmental and climate-protection technologies. Municipalities have largely consolidated their budgets and balanced their books and, therefore, have the financial power to act. In 2030, NRW lives up to its special role as an energy state and has helped to ensure that energy transition in Germany makes a great leap forward. In the section, several indicators are included in the main text or in the final scores to concretize the vision (see Table 2).

4.2.5. The Environment

The section "The Environment" addresses the environmental dimension of sustainability and starts with the sentence that in 2030, NRW has achieved ambitious environmental targets in the areas of climate protection, air pollution and noise control, water quality, biodiversity, nature and species conservation in open spaces and areas of settlement. The section continues by referring to NRW as an energy state and that NRW fulfills its role in tackling climate change and respecting the global two-degree limit. NRW continues to be a substantial industrial hub that cleverly combines climate protection and economic development. Mitigation and adaptation are implemented in parallel. The loss of species has been halted and biodiversity increased again. Operationalized targets concretize the section "The Environment" (see Table 3).

4.2.6. The Change

The section "The Change" describes how the transition towards sustainable development has been achieved in NRW by 2030 from a backcasting perspective. The section starts by saying that in 2030, NRW has come far on its path to designing a future-oriented society: The Sustainability Strategy NRW has been implemented and continuously updated. Change has been achieved through the joint commitment of citizens, civic society, municipalities, science, education, business and political and administrative players. With a smart governing strategy, the NRW State Government has successfully brought all of these actors together for the joint advancement of sustainable development in NRW. All State Government actions are reviewed for their sustainability. Sustainability actions continue also beyond the year of 2030.

4.3. Utilization of the Vision—Online Publication and Partial Integration into the Sustainability Strategy NRW

After the vision development process was finished, the final vision was submitted to the contracting authority of the Environmental State Ministry (MKULNV NRW). Furthermore, the Wuppertal Institute published the vision online on its web server, so it is available for public debate. The NRW State Administration then developed its draft sustainability strategy [22]. As a result, some important parts of the vision were used by the state administration for their draft sustainability strategy: In fact, most parts of the state vision are sentences directly taken from the vision developed in the research project. The NRW State Government adopted the revised draft Sustainability Strategy NRW in June 2016 (see Figure 1).

Whereas the full vision developed by the Wuppertal Institute (hereafter referred to as "WI vision") stretches over four pages with additional references and final scores, the vision developed by the NRW State Administration (hereafter referred to as "state vision") is considerably shorter and stretches over half a page [9] (p. 6). Sixty-five percent of the words and sentences from the state vision were taken from the WI vision, most times word-by-word. The following figure demonstrates which words and sentences from the state vision were taken from the WI vision (Figure 4).

All sentences in the state vision that were taken from the WI vision come from the first section of the WI version, "The Principle". Thus, the sentences used in the state vision represent the key guiding principles of sustainable development, e.g., the three dimensions of sustainability, the intergenerational responsibility of sustainable development, global responsibility, the respect of the ecological boundaries of our planet as a framework for action, equal rights for all, a high quality of life and the achievement of ambitious environmental targets. The vision describes that environmental change is managed in an open, democratic and gender-equitable process, by the joint commitment of citizens, civil society, municipalities, science, economy, politics and administration and by exchanging knowledge and learning from other regions and actors around the world. The vision also points out that NRW as the most populous federal state demonstrates how sustainable development is possible while keeping and strengthening its economic and industrial structures. By doing so, NRW takes a leading role and contributes to sustainability processes at national, EU and UN level.

I. Mission statement

The State Government of North Rhine-Westphalia advocates for a successful, equitable and future-oriented development in social, environmental and economic terms and therefore bases its actions on sustainability as a guiding principle. This contributes to the creation of a functioning equilibrium for today's and future generations. As the most populous federal state, we demonstrate how to implement successful change towards sustainable development while maintaining and reinforcing our economic and industrial structures.

NRW preserves and develops the well-being of all people and social prosperity in a healthy and intact environment. Global responsibility for the ecological boundaries of our planet will serve as a framework for action.

All people in NRW enjoy equal opportunities of personal development and a good life. Social cohesion is high. NRW remains an important industrial hub with future-oriented economic structures. Companies are internationally competitive and operate on the basis of social and environmental principles. The environmental quality is improved and ambitious environmental goals are being achieved.

NRW drives its change via an open, democratic and gender equitable process based on sustainable public finances and through the joint commitment of citizens, the civil society, municipalities, science, businesses as well as political and administrative players.

NRW plays an important pioneering role on an international level, contributes in the context of the sustainability efforts of the Federal Government, the European Union as well as the UN, and benefits from a dialogue with regions and other players worldwide.

Figure 4. Sustainability Vision of the Federal State of NRW in its Sustainability Strategy NRW [9] (p. 6). The words and sentences marked yellow were taken from the vision developed by the Wuppertal Institute in its research project.

5. Lessons Learned from the Vision Development Process

The following section reflects upon the lessons learned from the explorative learning-by-doing approach of the vision development in a science-practice-dialogue. In this section, reflections are carried out from a practical point of view: What can be learned from the vision development process for comparable activities to be carried out in the future? What can be learned from the participatory elements of the vision development process?

5.1. Few but Important Sentences Were Taken for the Sustainability Strategy NRW

From the point of view of the authors, it can generally be assessed positively that the federal state of NRW made use of the vision developed by the Wuppertal Institute in a science-practice-dialogue (hereafter referred to as "WI vision") and used it for its own vision (hereafter referred to as "state vision"). The authors appreciate that most sentences for the state vision were taken from the WI vision—in most cases word-by-word. Furthermore, it can be seen positively that relevant sustainability concepts were taken from the WI vision, such as the concept of the planetary boundaries as guiding framework.

However, the state vision that now preludes the Sustainability Strategy NRW is much shorter (half a page) than the WI vision (four pages plus additional references and final scores). Thus, the state vision lacks a clear and appealing vision of what it is worth striving for. This was also a feedback given by the TEAM Sustainability during the public consultation round for the draft Sustainability Strategy NRW (see Figure 1) [62]. Furthermore, whereas the WI vision is written from the perspective of the year 2030, the state vision does not contain a target year and thus is located in an undefined time horizon. It remains unclear until when the change described in the vision shall be reached.

To summarize, one can say that the WI vision could provide valuable input for the strategy development process of the federal state of NRW. However, due to the short nature of the state vision, there is still potential for improvement. According to the cyclical nature of transition management, the vision

could be revised and further developed in iterative cycles for future progress reports of the Sustainability Strategy NRW. Likewise, additional and more detailed visions could be developed, e.g., by different stakeholders (the youth and municipalities) or for specific fields of action (e.g., mobility and energy).

5.2. Length and Level of Detail Matter

The length of the vision was subject to intense and recurring discussion during the dialogue rounds and changed from four pages to two pages and back to four pages. In the end, the longer version was taken because it was considered to be more likely to create appealing images and guide directions. The shorter version was considered to provide too little content and to give too little guidance. However, the TEAM Sustainability also stressed that only the main guideline for sustainable development should be included in the vision and not each and every detail, since the development of a "complete" vision cannot be the target strived for.

Clearly, finding the right length for a vision that addresses such a complex issue as sustainability is a challenging task. The challenge is to find the right balance between drawing a "big picture" of the desired future state without being too detailed and fragmented and providing an appealing and specific basis that future actions can build up on.

The discussion about the right length of the vision also had effects on the structure of the vision. From the beginning, a first section "The Principle" was planned to be put at the beginning of the vision in order to summarize the main guiding principles of sustainable development in NRW. Due to the debate and the different opinions about the right length of the vision, the section "The Principle" gained more importance. The section was extended, for example by a summarizing sentence for each section, so that it now serves as a short version of the entire vision. The subsequent sections then explain more in detail the different sustainability. This approach turned out to be reasonable, because as a result, all sentences of the state vision in the Sustainability Strategy NRW were taken from strong short summary vision ("The Principle").

However, there is no answer to what is the right length of a vision. One can claim that an overall sustainability vision might provide a starting point for further, more detailed visions to be developed—e.g., by different stakeholder groups or for specific topics of the overall vision. Single topic visions can then be more concrete and imaginative compared to an overall sustainability vision. The strength and responsibility of an overall sustainability vision can be seen in reducing the complexity of the sometimes-blurry concept of sustainable development and in emphasizing the key guiding principles of sustainable development (e.g., the concept of planetary boundaries). Furthermore, they provide the opportunity to be developed in a holistic and systematic approach that implies taking carefully into account the possible interrelations and interdependencies between the different sustainability dimensions. Visions for single topics (e.g., with sectorial approaches for energy and mobility) might run the risk to ignore relevant interdependencies (synergies and trade-offs) between different dimensions of sustainability.

In the end, one can argue that different purposes require different lengths and kinds of visions: A shorter vision might be appropriate in the introductory part of a sustainability strategy, where the vision serves as a basis for the strategy to unfold hereafter. Scientifically driven visions on the other hand can take advantage of their relative freedom of thought and be more detailed.

5.3. Finding the Right Words is not Easy

The vision itself consists of a narrative text that describes the vision in a qualitative way (backed up by targets and indicators). Finding the right words for the vision has proven to be a challenge within the project. The aim was to develop a positive picture of NRW that is told from the perspective of the year of 2030. The vision was not supposed to whitewash the situation of NRW in 2030, but to draw a positive picture of it—where not everything is achieved but considerable progress has taken place so that one can say, "This is how we want to live!" (see Section 2).

In the dialogue rounds, phrases that were written too positively were criticized. Thus, the right words for the vision were searched for very cautiously. Expressions such as the following were used for describing that considerable progress that has taken place until 2030, but not all problems are solved yet: NRW "has improved considerably", "is on the right way to ... ", "has paved the way for ... ", and "develops consequently towards ... ".

5.4. Targets and Indicators—Make it Tangible, Measurable and Manageable

To substantiate the narrative text of the vision, operationalized targets were added to the qualitative text where appropriate. The aim was to include targets and indicators that can be considered key for sustainable development in the given context. In the first draft version of the vision, all operationalized targets were included in the narrative text of the vision. However, stakeholders from the dialogue rounds advocated for keeping the vision free of operationalized targets. Only a few, extremely relevant targets were considered to fit also in the narrative vision text, such as the "two-degree-limit" for climate protection. Thus, the Wuppertal Institute replaced target proposals in the text with qualitative expressions and shifted most operationalized targets to the final scores. This way, a combination was created of a qualitative text and quantitative targets.

The authors argue that despite the criticism that they sometimes received for placing targets into the vision, the approach can be considered suitable for substantiating the narrative vision and also for giving concrete guidance for the future paths and action plans at state level. By including operationalized targets, the rather vague content of the narrative text became measurable and manageable. As Tables 1–3 demonstrate, the state ministry even used some of the proposed targets for their Sustainability Strategy NRW.

Interestingly, the proposed targets were no real matter of discussion in the dialogue rounds. Maybe, this is because the focus was rather on the general question whether indicators should be part of the vision or not. Another explanation could be that most of the target proposals derived from existing political targets (in NRW or elsewhere) or scientific analyses and thus were less questionable. This approach also had a mirror function for the state of NRW: By referring to existing state targets, the vision could demonstrate what NRW (or others) is already doing—thus what can also be used for the NRW Sustainability Strategy.

5.5. Character of the Vision—Different Approaches Make Sense

The narrative vision that was developed can be considered a rather technical vision for the informed public. However, sustainable development involves all societal groups. Thus, it is reasonable to develop different types of visions for different target groups. Not only a text can be a vision, but also a film, a poem, a picture or the story of an individual living a normal day in the future. Visions can address and be developed by different societal groups—e.g., children and adolescents, elderly, immigrants, the disadvantaged. Correspondingly, also in the research project, another, very different type of a vision was developed. In a workshop, youth discussed their future ideas in terms of sustainability. An artist graphic-recorded the results during their discussion [63]. The results are two colorful images with short notes of what the youth was discussing. Certainly, this kind of vision is much less analytical, systematic and scientifically sound. However, it provides a very different, valuable input for the discourse about sustainability. In transition management, the need to develop different visions is also highlighted by referring to the need to develop a "basket of visions" [64].

5.6. The Role of Stakeholder Participation—Extension, Focusing, Approval and Debate

The authors argue that, by applying a participatory approach to the vision development process, the quality and acceptance of the vision could be significantly improved. The participatory approach was the consultation of three different stakeholder groups from both science and practice in three iterative loops. This approach added to the quality of the vision because further aspects were included and the vision became more focused on its essentials. Aspects that were added to the vision were for

example megatrends, refugees, lifelong learning and energy poverty. The vision became more focused for example by discussing the reasonable length of the vision. Furthermore, the proposed targets were separated from the narrative text and shifted to the final scores.

Furthermore, the authors claim that the participatory approach added to the acceptance of the vision. Although the development of the vision was mainly scientifically driven because the draft texts were developed by the Wuppertal Institute, the vision was in parts developed in a collaborative approach that included the co-production of knowledge. Stakeholders were able to add further aspects to the vision and shape the design and structure of the vision. Furthermore, a debate was hold among different stakeholders about sustainability that increased their knowledge and awareness of the vision and strategy formulation process in NRW. The stakeholders can bring this knowledge back to their organizations so that certain spillover effects to their institutions can be assumed. Because the full vision is published online, it is also available for further public debates.

6. Discussion: The Role of a "4 × 25% Modal Split" Target as Part of a Vision for 2030

As described above, the narrative text of the vision for sustainable development was backed-up with proposed targets and indicators to make the vision tangible, measurable and manageable. The aim was to include targets and indicators that can be considered a key for sustainable development in the given NRW context. Scientists argue that the complex concept of sustainability and its multiple interpretations have "triggered an explosion of indicators" [65] (p. 407). Another work package of the Wuppertal Institute's research project supports this view: By reviewing 16 sustainability documents from EU, national and federal state level, 342 sustainability indicators were identified. This points at a heterogeneous use of sustainability indicators and the need to identify relevant core indicators [32,66]. Targets and indicators for sustainable development face the specific challenge that they should cover sustainability dimensions and topics as broadly as possible, but at the same time should be limited in number in order to provide guidance and focusing [65].

The role of the vision and the proposed targets and indicators shall be discussed in this section with regard to one example: The proposed "4 × 25% modal split"-target for sustainable passenger mobility. The target means that by 2030, one quarter of all trips shall be made by foot, bike, public transport or motorized private transport (see Table 2). Thus, 75% of all trips shall be made by environmentally friendly modes of transport and only 25% by motorized private transport. In 2008, 58% of all trips in Germany were made by motorized private transport (that mainly consists of car use) and only 9% by public transport, 10% by bike and 24% by foot [67] (p. 45). Thus, according to the proposed 4 × 25% target, a considerable amount of trips with motorized private transport needs to be shifted to the environmentally friendly modes of transport by foot, bike and public transport. In other words: car use needs to be more than halved in a mid-term perspective.

The proposed target can thus be considered to be very ambitious—if not to say radical. Why was this target chosen for representing sustainable mobility and not others, such as the share of electric vehicles in the overall vehicle fleet? The reason is that, when thinking about core indicators for sustainable development, the issue at hand needs to be analyzed systematically by taking all three sustainability dimensions into consideration: What are the trade-offs between sustainability dimensions, and where can co-benefits be achieved?

Reducing car use can be considered a core target for sustainable mobility, because it impacts all dimensions of sustainability: Motorized transport impacts the environment in terms of greenhouse gas emissions [68], energy and resource consumption, air pollution, traffic noise and land consumption. From the social perspective, motorized transport causes traffic casualties and reduces the quality of public space. The negative environmental effects impact the social dimension as well: air pollution and traffic noise are substantial health risks [59–61], climate change is a global risk for humanity [68] and high land usage for cars (driving and parking) reduces spaces available for other purposes, such as comfortable and safe sidewalks, bike lanes and green urban areas. Furthermore, the environmental impacts are distributed extremely unevenly: Households with a low-income, a low level of education,

households affected by old age poverty and often with a migration background are more likely to be impacted—for example, because they can only afford living along main roads where rents are considerably lower due to heavy traffic and its associated environmental impacts. Those societal groups are thus more affected by unhealthy noise and air pollution, and a reduced quality of life. Likewise, children are more at risk to be overseen when crossing streets between parking cars and react more sensitively to air pollution [69]. All the aspects mentioned also impact the economic dimension of sustainability: climate change, land consumption and increased illness rates due to air pollution, traffic noise and traffic casualties pose considerable costs for society (external transport costs) [70]. Furthermore, a transport system that privileges car users and neglects the needs of people not owning or being able to use a car (e.g., children, adolescents, elderly, disabled) cannot be considered a just transport system.

The manifold links of mobility with other sustainability aspects can also be seen when looking at the vision. Nine out of the 12 operationalized targets in the vision are directly or indirectly related to transport (see Tables 2 and 3): material footprint, final energy demand, renewable energy production, modal split, people killed in traffic, greenhouse gas emissions, land consumption, air pollution and noise.

Thus, shifting car trips to environmentally more friendly modes of transport can be considered a key target for developing a sustainable transport system. The modal split indicator represents this task. The indicator was operationalized with the ambitious target of a $4 \times 25\%$ modal split by the year of 2030. The proposed target was developed based on:

- The normative perspective of sustainable mobility that calls for an ambitious shift of car use to environmentally friendly modes of transport with the rule of thumb to halve car use in a mid-term perspective.
- The easy-to-communicate character of a "four quarters" mobility.
- Existing targets in NRW: the City of Essen, located in the Ruhr region, has set the $4 \times 25\%$ modal split target (until 2035) in its successful application for being awarded "European Green Capital 2017" by the European Commission [54]. Furthermore, the Ruhr region has set the $4 \times 25\%$ modal split as a vision for sustainable transport (without target year) [55]. Interestingly, the $4 \times 25\%$ target in Essen and the Ruhr region came into discussion in 2012/2013, when initially the Ruhr region wanted to apply for the award "European Green Capital". The writing of the Ruhr region application was headed by the Wuppertal Institute that developed a $4 \times 25\%$ modal split target for the year 2035 in dialogue with stakeholders from the Ruhr region [71] (p. 19). From that origin, the target proposal found its way into official documents of the City of Essen and the Ruhr region.

The formulation of a $4 \times 25\%$ modal split target by 2030 raises the question of how the target can be reached—especially against the background that the transport sector is characterized by only slow or no dynamics of change towards sustainability. The focus of transport policy often lies on technical improvements rather than on reducing car use. However, sole technological solutions for transport cannot be considered sustainable, as problems such as risk of accidents, land consumption and reduced quality of public space are not solved by technical improvements. Bertolini and Clercq (2003) argue that the fundamental dilemma in attempts to make people use their car less is "the inability of alternatives to match the quality of accessibility provided by private motorized transport" [72] (p. 575). This would mean that "bringing about more sustainable urban mobility patterns is only possible at economic, social, and political costs that are unacceptable in most societies" [ibid.] (p. 575). Thus, in order to achieve a significant shift of car use, the so described "costs" of sustainable mobility patterns need to be reduced. This requires coordinated actions at different political levels and the implementation of both push- und pull measures. Pull measures make sustainable transport modes more attractive, for example by improving cycling and walking paths, extending public transport services and reducing public transport fares. Push measures are restrictive measures against car use, for example traffic calming, increasing parking fees or the introduction of a congestion charge.

There are examples from the real world that demonstrate that change is possible. A good example is the City of Vienna, where the modal split share of cars could be significantly reduced from 40% in 1993 to 27% in 2015 [73,74]. Important success factors were the expansion of the metro network and parking management [75] (p. 10). Furthermore, the City of Vienna has introduced a reduced public transport ticket for 365 Euro per year—that equals the costs of one Euro per day [76]. Another example is the City of Copenhagen that has reduced car use from 36% in 2007 to 33% in 2014 and follows an ambitious cycling policy. The share of cycling could be increased from 26% in 2007 to 30% in 2014 [77,78]. The City of Berlin actively promotes walking with an own walking strategy [79]. The share of walking could be increased from 25% in 1998 and 29% in 2008 to 31% in 2013. Car use could be decreased from 38% in 1998 to 32% in 2008 and 30% in 2013 [80,81].

Such "relatively successful" [82] real-world examples from European cities—that even are capital cities—demonstrate that ambitious change is possible. As alluring good practice examples, they can help to "unite the brain and the heart" for decision making [83]: knowing what change is necessary, these good practice examples demonstrate what is possible and motivate by showing the advantages that can be achieved. As such, these good practice examples provide valuable knowledge that other cities can learn from and serve as "magnifiers". Magnifiers, as defined by Hüger et al. 2015 [84], refer to the need to substantiate visions—with operationalized targets and concrete practical approaches that examine vision for their viability.

To conclude, one can say that a $4 \times 25\%$ target at state level can serve as a valuable starting point for developing strategies, carrying out experiments and implementing measures. Furthermore, a modal split target at state level can send a strong signal to the large parts of urban areas in NRW as the modal shift strategy is a classical field of action for municipalities [85]. This way, a modal shift target can be a meaningful element for the vertical integration of the state sustainability strategy towards the subordinated level of municipalities—if it is accompanied by strengthening interactions and networks between the federal state and the local level and if political support is provided by the federal state for reaching the specific target also at local level.

As a result, the current Sustainability Strategy NRW does indeed contain a modal split target—for local mobility in inner city areas: In inner city areas, local mobility (which includes walking, cycling and using a pedelec) shall reach a 60% modal share of all trips by the year of 2030 [9] (p. 37). This target derives from the target set by the AGFS NRW (Arbeitsgemeinschaft fußgänger- und fahrradfreundlicher Städte, Gemeinden und Kreise in NRW)—a network of NRW municipalities that promotes bicycle and walking-friendly infrastructures as part of their mobility strategies [86] (p. 13). The NRW Ministry for Economic Affairs, Energy, Building, Housing and Transport had adopted the target in its action plan for local mobility from 2012 [87]. Thus, not the exact target proposed by the Wuppertal Institute was taken for the Sustainability Strategy NRW—but the proposed target might have strongly supported the overall consideration to include an ambitious modal split target in the strategy. Thus, important impulses could be given for the targets and indicators that were included in the Sustainability Strategy NRW.

7. Reflections

7.1. What Can Be Learned in Terms of Transition Management?

In recent years, the transition management approach has been widely discussed regarding its relevance for practical transition processes for different topics, policy levels, stakeholders and geographical scales [3,88]. In this project, some elements of the transition management cycle were also addressed: the fields of vision and target development (see Figure 5).

In this case study, the Federal State of NRW can be seen as the transition manager for the process for developing a sustainability strategy at state level. The Wuppertal Institute was one of the stakeholders that participated in the process and brought in its scientific knowledge for facilitating learning processes for the strategy development process. The vision was developed in a participatory

and iterative approach between science and practice to enable mutual learning and the co-production of robust and solution-oriented knowledge for policy support.
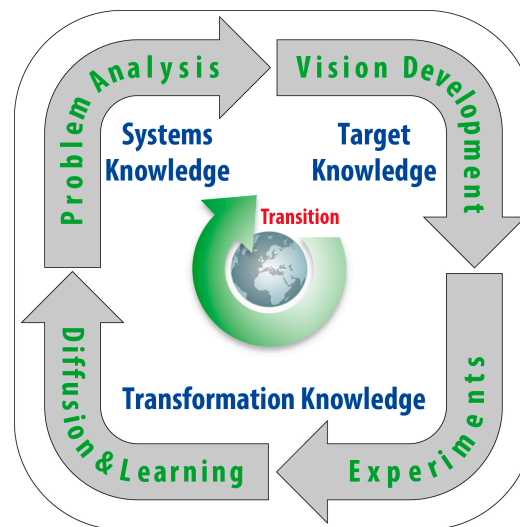

Figure 5. Transition Cycle; Source: Wuppertal Institute.

According to Loorbach and Lindt, envisioning processes can be very labor-intensive and time-consuming [3]. This has also been experienced in this project, as the authors had to considerably re-write the vision during the three iterative dialogue rounds. However, the work can be considered worth the effort: 65% of the state vision that flanks the Sustainability Strategy NRW today are words and sentences directly taken from the vision developed within the research project. Of course, it would have been desirable if even longer parts of the vision had been used for the Sustainability Strategy NRW (the parts taken account for only 7% of the vision). On the other hand, one can say that the short state vision now serves as a kind of "abstract" that sets the course for the Sustainability Strategy NRW at the beginning of the strategy. After the vision, the Sustainability Strategy becomes more concrete by enfolding its different fields of action and operationalized targets and indicators. Some of the targets and indicators used in the Sustainability Strategy are similar or the same as proposed in the vision developed in the research project.

7.2. How Next? Reflections about the Further Implementation of the Sustainability Strategy NRW

Since the vision development process in 2015, two major events have taken place:

1. The Sustainability Strategy NRW was adopted in July 2016 and is now in the implementation process.
2. The federal state elections in NRW in May 2017 have led to a change of government: The "red-green" coalition of the Social Democratic Party and the Green Party were voted out and a conservative-liberal "black-yellow" coalition of the Christian Democratic Union and the Free Democratic Party is most likely to become the next governing coalition.

Against this background, it is difficult to anticipate the further implementation of the Sustainability Strategy NRW and the role of the vision for the implementation process. Certainly, it is still too early to assess or quantify the impacts of the Sustainability Strategy NRW and of the vision. There are several risks and barriers that can hinder the implementation of the sustainability strategy, for example when the strategy remains a "paper tiger" that is not equipped with sufficient budgets and action plans and that does not find its way to the relevant stakeholders to create a broad impact.

Thus, the further implementation process of the Sustainability Strategy should, after a reasonable period of time, be systematically evaluated. The assessment process can be aligned to the good governance criteria of sustainable development:

- Are the targets, indicators and contents of the sustainability strategy adequate and compatible with the sustainability strategies at other political levels?
- Are targets and action programs equipped with the necessary budgets?
- Are the strategy, targets and indicators regularly updated, refined and monitored?
- Is there sufficient horizontal integration of the relevant resorts and fields of action?
- Is there sufficient vertical integration to the super- and subordinated policy levels?
- Is there sufficient stakeholder participation? Are the relevant stakeholders reached?
- How effective are communication activities?

Possible evaluation tools for evaluation are for example document analysis, deviation analysis, budget shift analysis, participatory observations, expert interviews and third-party opinions from external reviewers.

8. Conclusions

The research project presented here demonstrates how transformative research as a science "which goes beyond observing and analyzing societal transformations, but rather takes an active role in initiating and catalyzing change processes" [89] (p. 2) can contribute valuable inputs for transition processes towards sustainability—by using a systematic, trans- and interdisciplinary approach and by involving stakeholders for participatory vision development. The quality and acceptance of the vision developed increased. The approach of developing a narrative text vision that is backed-up by targets and indicators proved to be a fruitful approach, as both parts of the narrative vision and target proposals were used by the Federal State of North Rhine-Westphalia for its Sustainability Strategy. The research project demonstrates how transformative science can have societal impact and provides valuable knowledge on how to perform similar vision development processes elsewhere.

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