Cooperative Local Energy Transitions

A Guide for Socially Just and Ecologically Sound Renewable Energy Self-Sufficiency – with an Emphasis on Bioenergy

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Preface from the RE-Regions Research Team

Achieving self-sufficiency with renewable energies in a socially just and environmentally sound manner is not a simple, but fascinating task - and worth every effort. During the last four years, we have learned a lot about this topic while working in an interdisciplinary team and in collaboration with our four German partner municipalities – the districts of Schwäbisch Hall and Lüchow-Dannenberg as well as the communities Morbach and Wolpertshausen. We were rewarded with a deep insight in and a growing understanding of important aspects of the energy transition on the regional level.

We would like to thank the German Federal Ministry of Education and Research (BMBF) for giving us the opportunity to promote the transdisciplinary project RE-REGIONS: SOCIO-ECOLOGY OF SELF-SUFFICIENCY. We would also like to thank the actors in our partner communities for supporting us during the research and through critical reflection, thus allowing us to learn together through the process.

This brochure is designed as a guide. It is made for all municipalities and regions that aim to provide themselves with renewable energy – socially just and ecologically sound. We hope this work is insightful and according to the premise: Create Together, Add Value, Design Space, Convert Energy and Connect Power!

The RE-Regions Team

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Foreword

Since 2001, the German Federal Ministry of Education and Research (BMBF) has supported “Social-Ecological Research” (SÖF) in its program “Research for Sustainable Development” (FONA). The main objective of SÖF is the development of specific strategies to solve concrete social problems associated with sustainability, such as the implementation of an energy transition. Such problem- and action-oriented research has to leave traditional and purely disciplinary science behind: Ultimately, it is nothing less than scientific support for the ecological reconstruction of the society while ensuring social equity and addressing economic issues. Social-ecological research projects require an interdisciplinary perspective and collaboration from scientists in environmental, natural, and social sciences departments from universities and other research institutions as well as transdisciplinary collaboration with social actors such as consumers, communities, businesses, and non-governmental organizations.

This brochure is an example of such research perspectives. The highly topical issues of renewable energy and energy systems require a holistic perspective - an approach that considers the future energy supply as a social challenge and takes all facets of sustainability into account - consistency, efficiency, and sufficiency. This brochure is presented by the interdisciplinary SÖF research group RE-REGIONS: SOCIO-ECOLOGY OF SULF-SUFFICIENCY.

During the project period from 2009 to 2013, we as advisors had the pleasant task of accompanying this group of young, highly motivated scientists and researchers. On the one hand, this was enjoyable, as our expertise was not only absorbed, but also questioned. On the other hand, we had the opportunity to review our positions and to be part of this interdisciplinary and transdisciplinary project with all its challenges and highlights. With great care, the researchers included our suggestions if possible and enforced their ideas if necessary. This mixture of cross-project consultation, mutual learning, and supervision of individual work was a true pleasure for all of us. To us this brochure seems very suitable to support local and regional governments in their development and decision making processes towards becoming a RE region. Thus, we hope it will have a great impact. We wish all the team members who took part in this ambitious research project all the best for their academic and personal futures.

The members of the Scientific Advisory Board of the RE regions project
Timo Kaphengst, Gerhard Oesten, Peter Schmuck, Christine von Weizsäcker

1 Introduction to the Guide

Many municipalities and regions in Germany have the aim to provide themselves with renewable energies (RE). To do this in a social-ecological way, meaning in a socially just and ecologically sound manner, different challenges need to be overcome. This brochure points out these challenges and presents possible solutions. Further, it supports regional actors in their decision making processes on their way to becoming RE self-sufficient. The target groups for this brochure are specifically visionaries, leaders, and decision makers in government, politics, and economics as well as representatives of citizens' initiatives, NGOs, or the agricultural and forestry businesses. This brochure will focus on electricity and heat production from bioenergy. We define self-sufficiency here according to a time related balance: the final energy supply from renewable sources in a certain period as compared with the municipal and regional consumption in the same period.

In Chapter two, a social-ecological vision is presented. This is to help municipalities / regions orient their own visions. Further, this social-ecological vision reveals the presuppositions the authors dealt with. Chapter three outlines individual steps towards the development of social-ecological RE self-sufficiency in the different operational fields. These fields are looked at in detail in Chapter four. Several possible paths on how to implement a social-ecological energy transition are also included in the chapter. The chapter itself is divided into five main themes: create together, add value, design space, convert energy and connect power. Each main theme includes different fields of action.

This guide was developed within the research project RE-REGIONS: SOCIO-ECOLOGY OF SELF-SUFFICIENCY. It is a translation of a German publication which is the reason why a majority of the sources are in German. These are kept for the English version to showcase some of the many good ideas that have been implemented. Furthermore, the guide was written in the context of the German local and regional initiatives towards the energy transition. The project was funded by the Federal Ministry of Education and Research as part of Social-Ecological Research (SÖF).

How to Use this Guide

The guide highlights several fields of action in the five main themes – create together, add value, design space, convert energy and connect power – and identifies measures that enable social-ecological RE self-sufficiency. Each field of action starts with a problem description (What is it About?), which offers the reader orientation as regards potential fields of conflict. Following this is what a social-ecological ‘ideal’ situation can look like and describes the concept of having a visionary goal for the process, which could be reached by implementing the measures described in the fields of action. Additional Info boxes provide supplementary information and references for further reading. A list of all Info boxes can be found in alphabetical order before the Table of Contents at the beginning of this brochure. References within the text are marked with numbers in brackets and can be found in an extended and complete list of references and internet-links in the appendix of this brochure. A PowerPoint file entitled "Energy Compass" can be found on the EE-Regions website (1, in English) which can serve as a foundation and help to the actors in locating their individual status in the energy transition process (> Chapter 5 Guidelines for Use of the Energy Compass).

2 Social-Ecological Self-Sufficiency with Renewable Energies: What Does this Mean?

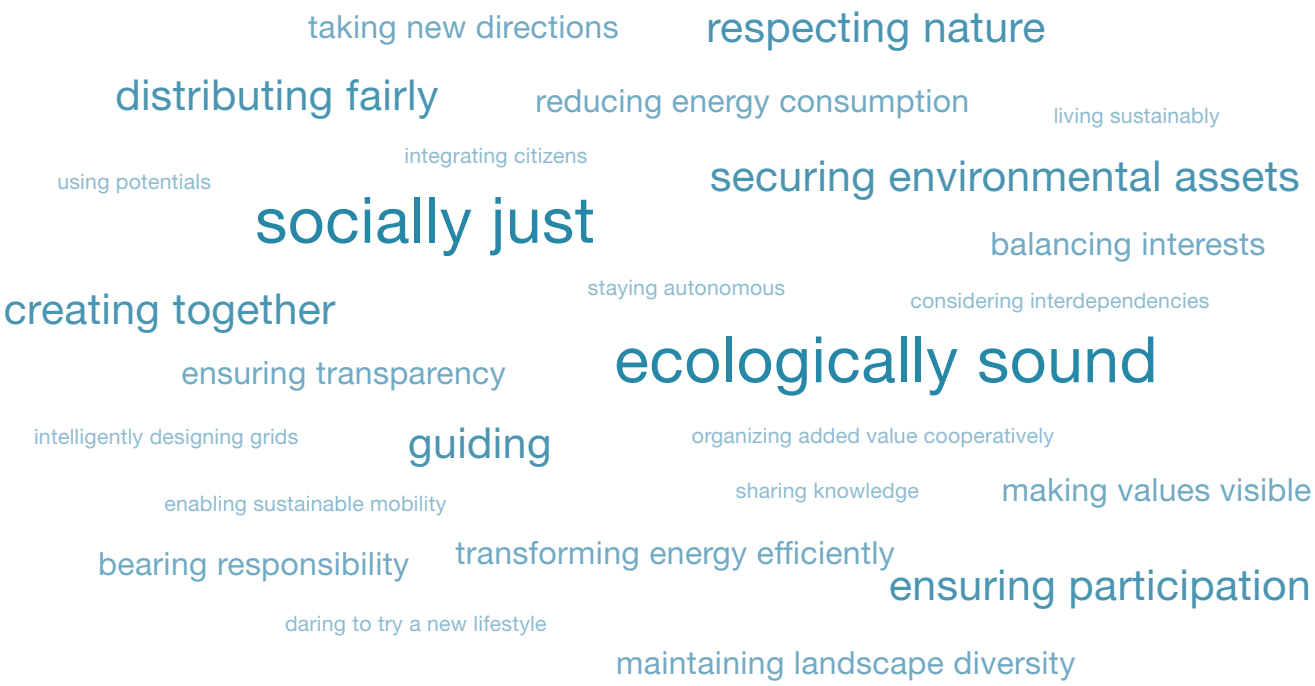
2.1 A Vision of Social-Ecological RE Self-Sufficiency – the Perspective of the RE Regions Project

There are two possible ways to broach for change in the current energy system: either based on past experience or based on a perception of an emerging future. Usually the actions are based on past experiences. However, this may constitute an obstacle by not being aware of or blocking out creative possibilities. To promote something as new as an energy transition, a considerably large vision is needed – a vision where the entirety of social-ecological renewable energies self-sufficiency potential is carved out and illustrated before ones eyes.

"All great historical ideas started as a utopian dream and ended with reality"

Richard Nikolaus von Coudenhove-Kalergi

When a region or municipality develops a vision for social-ecological RE self-sufficiency, it is at the same time realizing its future possibilities. Envisioning the future and its associated possibilities can be a strong motivating factor to shape the vision into fruition. The vision can also encourage greater communication, instigate discussions, and help to develop common measures beyond the status quo. Further, the vision can be carried out and developed in all operational fields of the energy transition and further concretized (> Chapter 4 How to Get Started – Fields of Action for RE Regions).



Vision

A municipality or region, which wishes to realize social-ecological self-sufficiency with renewable energies, sees itself as not only part of the national, but also global energy transition. Self-sufficiency in renewable energies will indeed take place regionally, but the measures will go beyond the local scope. “Think global, act local” – the communities and regions have a great responsibility in terms of a sustainable energy transition. It is the people of a municipality or region who want a new way of supplying energy and who forge ahead and serve as role models. The actors pass the knowledge they gain on to other interested parties. At the same time, the protagonists are open to new ideas and support from outside as long as it does not limit their autonomy.
The social-ecological energy transition is a joint effort. Various interlinked groups shape the transition. Citizens are involved in the process and have the opportunity to express their different interests. Considering existing areas of conflict, a consensus should be striven for. Thus, participation can be secured and transparency established.

Imagine a municipality or region that locally produces all the energy it needs. Therefore, it uses the renewable technologies best suited to convert existing resources into electricity, heat, and fuel. The suitability is not only judged by economical and

technical, but also by social and environmental criteria. The region is keen on using the existing potential from solar, wind, biomass, geothermal, water, and the like in a sustainable and resource efficient way. The construction of new power plants happens according to the local or regional spatial design. While using forests and agricultural areas, the region respects landscape diversity and the habitats of animals and plants. The value of nature is upheld in this scenario and the various usage interests evaluated within this framework. If biomass contributes to the energy supply, it is provided in a sustainable way. For local people, it is important to preserve their habitat even as it is used for a regional, cooperative, and just social-ecological generation of added value. Other possible increased values or financial gains are disclosed, discussed, and in the end, fairly distributed in the region. Local energy consumers understand that an energy transition also means to consume less energy. An economical and efficient use of energy is a matter of course. Consumers are linked to the energy producers via an intelligent infrastructure. Further, the people practice new and individual lifestyles regarding sustainable living and mobility. The communities and regions support this transition by taking advantage of their public power to become a RE region. Lastly, all the actors appreciate their municipality or region as a worthwhile place to live.

2.2 Social-Ecological RE Self-Sufficiency: Socially Just and Ecologically Sound

The path to self-sufficiency with RE is challenging. This is especially the case, if the path is consequently followed in a social-ecological way – meaning the whole process with all its facets is designed in a socially just and ecologically sound manner (> Chapter 4 How to Get Started – Fields of Action for RE Regions). The term social-ecology should elicit the understanding that the dimensions of social justice and ecological sustainability are not disconnected from each other. There are interactions between both which will be expounded upon in the following paragraphs.

Social Justice

While discussing justice in the context of renewable energies, the distribution of causes and effects is often compared: for example, climate change on a global scale (climate justice) or our responsibility to future generations (intergenerational justice). Further, one has to mention the social distribution of the overall costs (e.g. electricity prices, fuel poverty, or responsibility for energy savings) of the transformation. Communities or regions, which wish to become RE self-sufficient, can help by spreading the related costs and benefits as fairly as possible. The process is also an opportunity to mobilize the democratic potential of decentralized renewable energy technologies with the related investment models and develop the energy production into a municipal project. If a municipality or region decides to tackle this challenge, it should take distributive and participative justice into account.
Distributive justice includes an equal or fair distribution of the costs and benefits for developing renewable energy sources (> Chapter 4.2. Value Creation). Costs and benefits do not only include material or financial matters such as jobs or return on investment. Rather, they also include intangibles, e.g. limitation of quality of life due to changes in the landscape or regional identity. However, immaterial costs of renewable energy expansions - such as impairments of the landscape – can never be distributed equally. This unequal distribution should not be a one-sided burden nor disadvantage specific social groups such as low-income households. In addition, user-oriented measures can be taken in order to offset the unfair distribution of costs, e.g. preferred investment opportunities for those directly affected.

> “No problem can be solved from the same level of consciousness that created it”
>
> Albert Einstein

Participative justice means all residents can easily access information and participate regardless of their social status, education, income, gender, etc. (> Chapter 4.1 Creating Together and > Chapter 4.5 Connecting Power). Especially, during the planning process, social inequalities, lack of knowledge, or language barriers, should not lead to unequal opportunities of participation. Possibly disadvantaged groups should be specifically addressed and invited to participate, thus guaranteeing their awareness and access to participation.

Ecological Sustainability

Ecosystems are the basis for the fulfillment of human needs such as food production, housing, and mobility. Thus, the people of a social-ecological system are connected with other ecosystems and each continuously influences, changes, and transforms the other. As long as the creative power of the people is sustainable, the functions of the ecosystem can be preserved or even improved. The functions of an ecosystem are among others, the quality of the soil or the ability of soils to buffer pollutants. If intrusions occur they can completely transform the ecosystem and the original features may no longer be available. This is usually done at the expense of human needs. If, for example, the forest in an exposed location is cleared, it can lead to soil erosion and stop future forest growth. The forest as a resource is then no longer available.
Basically, the richer and more diverse an ecosystem is, the better it is able to cope with stressful events or catastrophes. This ability is referred to as “resilience”. For example: in a fruit region, several groups of

> “The best way to predict the future is to create it”
> Willy Brandt

species are responsible for the pollination. The pollination still takes place even if one species is extinct. The responsibility of humans to use resources in a sustainable way is not only to the benefit of nature, but to ensure their own place and resources as well as evolve within changing ecosystems. This is also called “adaptive capacity”. The generation of knowledge as well as passing it on (“capacity building”) in reference to interacting with ecosystems is of decisive meaning. Furthermore, ethical questions such as the value of nature itself, play an important role. Ecosystem functions do not respect administrative boundaries. They are interwoven from the local to the global level. For example, greenhouse gases are released if grassland is ploughed up and which therefore affects the environment on a global scale.
Transferring this to the use of renewable energies, the following can be said: the development of renewable energies should take place without impairing the ecosystem. Further, natural resources should be used carefully and efficiently (> Chapter 4.3 Designing Space and > Chapter 4.4 Converting Energy). This applies to all environmental goods such as land, water, air, and biodiversity. In addition, it should be ensured that the decisions made in the regional context are in line with national interests. For instance, it can be a driver for the local economy if a region decides to invest in biomass. However, on a trans-regional level this may affect the clean drinking water supply.

3 On the Way to Social-Ecological RE Self-Sufficiency

3.1 Five Steps Towards Becoming a RE-Region

In order to achieve social-ecological self-sufficiency with renewable energies, the path must be tread upon step by step: vision, analysis, objectives, measures, and evaluation. The steps apply to the whole process and can be concretized for the individual fields of action (> Chapter 4 How to Get Started). A networking center can support the involved actors and the joint process. Thus, certain challenges can be overcome, resulting in a socially just and ecologically sound implementation of self-sufficiency.

Forming Visions and Realizing Them

In his book, THE TRANSITION HANDBOOK: FROM OIL DEPENDENCY TO LOCAL RESILIENCE, the Transition-Town-Movement founder, Rob Hopkins introduces generating a positive vision as an important step towards cultivating an altered future: A future in which the people, e.g. use less energy or have more time and less stress. These concrete visions are new stories that illustrate the dream of a sustainable world. According to Hopkins, these visions are a powerful tool for promoting the energy transition. Further, the book contains more fascinating chapters about the transition “From Oil Dependency to Local Resilience”.

Simulation Game: A game by John Croft, founder of the GAIA FOUNDATION, simulates the content and the organizational processes of a project: It includes the stages of “dreaming”, “planning”, “doing” and “celebration”. The game provides, in a way, a checklist to keep everyone up to date on the progress of the project (2, in German).

A useful guide for the development of a vision including comments on workshops and a schedule can be found in: Tischer et al (2006) (3, in German), and 100RE.net (4, in German).

Creating a Vision

The path to social-ecological self-sufficiency with renewable energies starts with developing a common vision or guideline. All aspects that are worthwhile and important to the involved actors should be integrated (> Chapter 2 and > Info box: Forming Visions and Realizing Them).
The vision should leave room for the actors to procure a common concept of the supply of energy in the future. Habitual patterns of thought should be broken through, visionary impulses welcomed, and the objectives - based on developed measures - made concrete.

Analysis of Initial State and Potential

During the analyzing phase a picture of what has been achieved so far in the region is made. What is analyzed in detail depends on the defined fields of action. The analysis includes the current status of renewable energy development, including social and environmental aspects such as civic participation and nature conservation. The analysis is an opportunity to discover undesirable developments that can then be considered while developing a vision or a guideline.
Based on this survey a potential analysis can be prepared. It should cover the natural conditions for the development of renewable energies as well as the social potential of the region (e.g. competence networks, civic participation).

Formulating Objectives

In this step, a path to attaining a vision is laid in the form of specific objectives. The more precise and concrete the objectives are, the lower the chances of aberrations occurring during implementation. The defined objectives should be realistic in order to make success visible. Further, they should be measurable in order to evaluate progress. The objectives should be regularly reviewed in order to easily adapt to any circumstances that arise.

Establishing Measures

For each objective, specific measures should be developed in order to tactically achieve the objectives. The formulated measures should take local market conditions into account and, if necessary, be appropriately adapted. As for the objectives, the measures developed in order to attain them, need to be checked as to whether they are developing in the desired direction. If necessary, they can be modified during implementation.

Evaluating Achievements

In this step, the entire process from finding a common vision to implementation is evaluated. Through such an assessment, actual achievements can be appraised in light of the founding vision. Such a step brings transparency to the process and makes it possible to communicate activity and achievements on a local scale. The evaluation should not only take place at the very end of the process, but at regular intervals. By doing so, the actors are able to evaluate the current state, respond to changing conditions, and adapt objectives and measures. Becoming self-sufficient is not a linear, but rather a recurring sequence of steps. These steps take place in the fields of action and turn the vision into reality (> Figure 1).

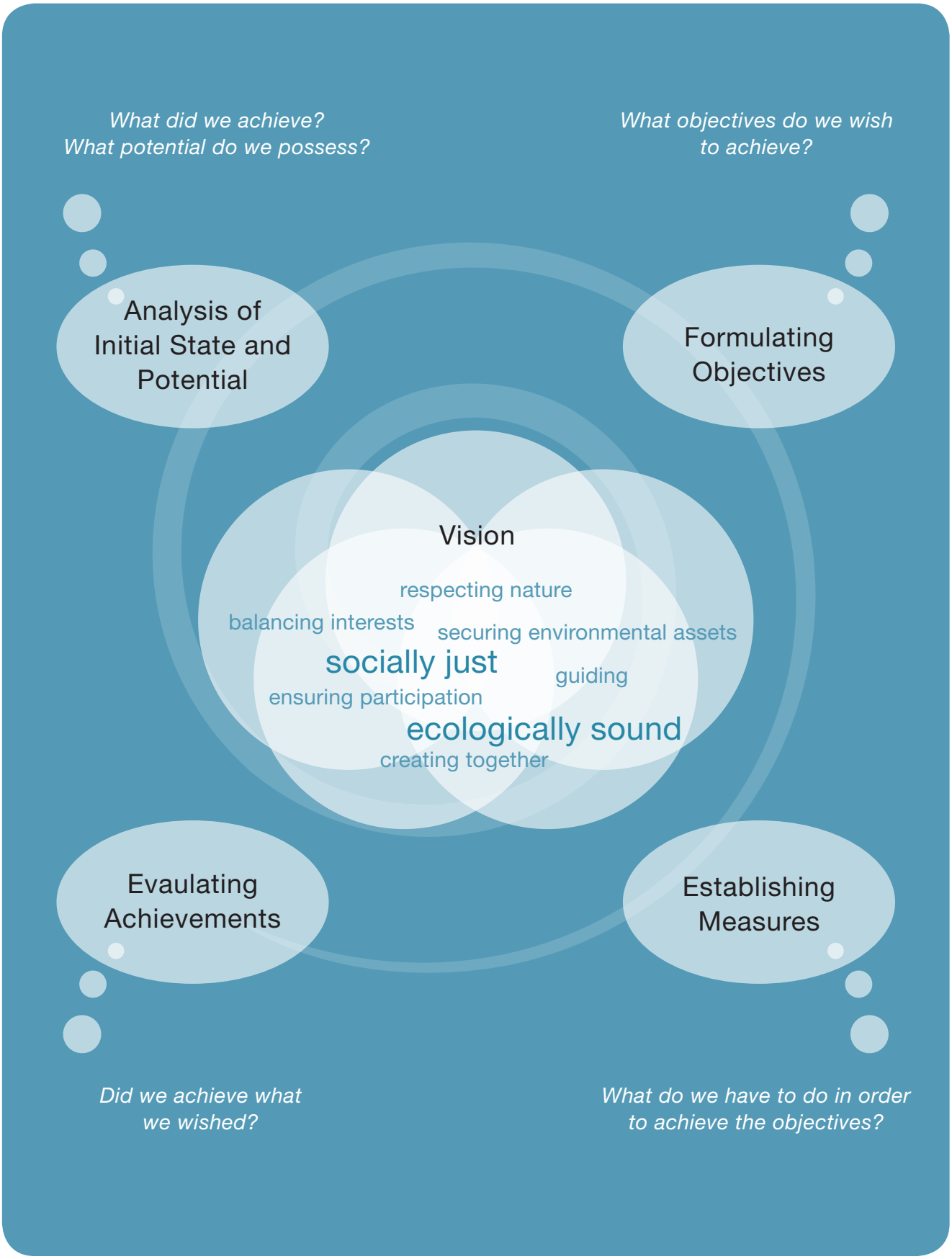


Figure 1: Steps Towards Self-Sufficiency

3.2 Well Coordinated with a “Networking Center”

To be social-ecologically self-sufficient with renewable energies, a lot of planning, balancing, and coordinating has to be done. Various local and regional actors need to cooperate with each other because decisions and actions from individuals can in turn affect a community. These decisions and actions need to be coordinated as the process and the result should be socially just and ecologically sound. A “networking center” can help by coordinating the involved actors. Accordingly, they can act as efficiently as possible without major conflicts, avoid incorrect planning, and forge synergies. With respect to local or regional conditions, such a center can take on diverse forms.

Setting Up a Networking Center

Before setting up a networking center it is necessary to decide at what level it should be located – the municipal, the district, or in the greater region. This decision should be made in accord with the results of the Initial State and Potential Analysis. The analysis should entail cross-border problems as well as synergies. As a result, a decision concerning the geographical demarcation for RE self-sufficiency can be made. The results of the analysis can be used as a basis for decision making and argumentation, e.g. the local level can demand a stronger regional network. This is also important for the cooperation between cities and regions. However, it is important to pay attention to the unique characteristics of each geographical and/ or administrative area. These characteristics should not be lost during the process of becoming RE self-sufficient. In many regions it can be observed that landscape planning could not adequately control the rapid development of renewable energies (mainly bioenergy), i.e. the unique characteristics of a community were affected by the developments. Consequently, negative effects on the landscape and biodiversity occurred due to independent entrepreneurial decisions. By setting up a networking center, it is possible to identify regional social concerns and for actors to create opportunities that serve the interests of the local society in cooperation with local businesses. For example, while cultivating biomass, nature conservation issues can be respected by planting a seed mix. The network center in these cases acts as a mediator between the different levels of spatial planning and tries to bring together the interests of the businesses and communities with the superior concepts of spatial development.

The establishment of a networking center does not necessarily mean that a completely new institution has to be created. It should be checked whether an existing institution can carry out the relevant tasks of a local networking center. Suitable are institutions in municipal ownership such as economic development agencies, energy-related positions in the administration, or working groups on energy. Private operators such as associations, clubs, or cooperatives can take on the task of a networking center as well. Cooperatives provide an additional basis for creating spin-off “projects”, e.g. a biogas plant with citizen participation. If necessary, a new steering committee can be integrated. All involved parties must agree upon the significance of the recommendations of the networking center – including what influence those recommendations have on local political decisions. Importantly, the networking center should not only have a symbolic character, as the credibility of the founders could suffer. All participants should feel

equally committed to the implementation of the center. If a new facility has to be established, the skills of existing facilities should be considered in order to avoid duplications. Existing institutions can be included as partners or via memberships. The skills of the center should match the defined tasks. If skills are missing, certain partners should be approached in order to fill gaps. The financing of the networking center should be secured outright, ensuring long-term support of the project. The costs thereby incurred can be covered by the municipality or the administrative district, through membership fees or income from RE projects.

Tasks of a Networking Center

Which tasks exactly a networking center fulfills should be chosen locally, as the regions may vary greatly. The responsibilities should be clearly defined and communicated so that a discernable profile is visible. Typical tasks include:

Linking Actors

The networking center is an independent contact for RE actors. It connects and coordinates different actor groups. This may involve local political actors from different communities as well as non-political actors such as NGOs and business actors. For the latter the networking center is an important contact to learn about development opportunities along the biomass added value chain or implement projects with high acceptance, in a coordinated manner.

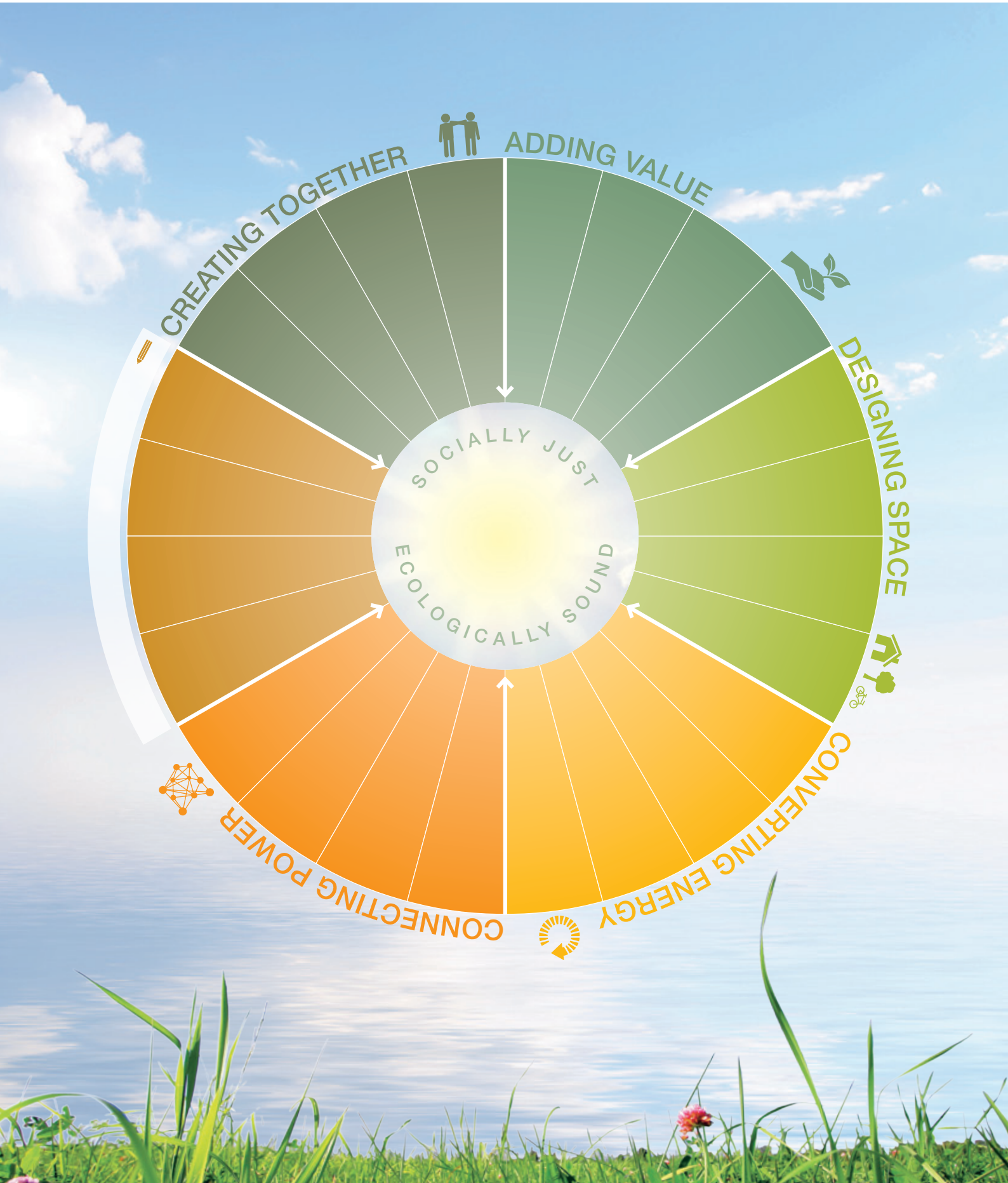
Information, Communication, Mediation

The networking center serves as a first point of contact for information. It can especially contribute by communicating RE news and increasing public participation. If conflicts of interest between actors or their targets occur, the networking center can act as an independent institution of mediation.

Implementation of Measures

The networking center can also appear as an active actor and help develop local or regional RE in a social-ecological way. This includes feasibility assessments, the development of specific measures, or providing participation opportunities for relevant stakeholders and the public. In addition, the monitoring of specific activities or measures, their outcomes, and the evaluation of their results can be carried out by a networking center.

4 How to Get Started – Fields of Action for RE-Regions



4.1 Creating Together

4.1.1 Key Actors and Actor Networks

1. What is it About?

The successful transition to self-sufficiency with renewable energies depends largely on the people in the regions who take the initiative, convince, and mobilize more supporters. The question is, who are these key actors, how do they meet, and how do they want to change the energy system constructively towards socially just and ecologically sound RE self-sufficiency?

2. *Vision*

The key actors have different skills and competencies. They interlink or use existing networks to ensure that different social groups in the region or municipality can participate in the process. They create stable structures that make a RE self-sufficiency and the realization of a social-ecological vision possible. The key actors are open to new ideas from other pioneers from the region and local politics and social decision makers support them.

"True Believers": Leaders and Pioneers

Often there are a few individuals who become leaders in motivating others in the energy transition process. They offer orientation and set new impulses. At the same time, there is the risk that without them the process may be significantly slowed down. If this occurs, it can be counteracted or prevented by making the process structurally permanent (> Chapter 3.2 Networking Center).

Pioneers are a continuous source of inspiration for technical and social innovations such as municipality utilization concepts. They give important impulses for further development towards RE self-sufficiency. These people should be heard, taken seriously, and encouraged by municipality support programs or the organization of round tables to test innovative ideas for their feasibility.

3. Measures

Identifying Actors

To become a RE region, many actors need to work together. These include:

- Energy producers, e.g. utility companies or farmers
- Investors, e.g. banks and construction companies
- Political actors, e.g. city council and citizen groups
- Supporting institutions as multipliers, e.g. local government, NGOs
- Consumers such as private households and businesses (> Chapter 4.1.2 Civic Participation).

Through an analysis of actors (> Info box: Actor Analysis), the relevant individuals and institutions can be identified and characterized. This helps to identify key actors involved in the regional energy transition quite quickly. It is ideal if the analysis can refer to existing working groups and informal cooperations that deal with energy and regional development. An actor analysis is an instrument used to constantly evaluate the actor-side of the process and prevent a crustification of structures by seeing that new actors that add positively to the process are embraced. The identified actors can build a core team who actively participate in the energy transition. The core team is also an important actor-network-tool that links pioneers with leaders, thus enriching the regional energy transition significantly (> Info box: “True Believers”).

Actor Analysis

Key Questions:

- Who is already actively participating in the field of energy - individuals, institutions, research groups?
- Which actors should be integrated due to:
  - their function, their knowledge, their skills
  - their position in society (even independent from the field of energy) and due to social justice views (> Chapter 2.2 Social-Ecological RE Self-Sufficiency: Socially Just and Ecologically Sound)?
- Why do the different actors participate? What are their motivations? What resources do they have and what are their (possible) roles? These types of questions help to prioritize the importance of the actors.
- Which actors are already interlinked and where are links missing, both within and outside of the region?

Methods to Identify Actors:

- Brainstorming the above questions with the initiators. The “snowball” method can help to expand the group: each identified actor can be asked about other relevant actors.
- Stakeholder analysis with different emphases
- Checklists for potential relevant actor groups
- Network analysis and visualization of actor relations (a similar method is the mapping of added value chains, Chapter 4.2.2 Cooperative Added Value)

Details for analysis of actors in the field of renewable energy (including checklists): Tischer et al. (2006) (3, in German).

Visualizing the Goal

An active transformation process includes: developing a vision, formulating goals (> Chapter 3 On the Way to Social-Ecological RE Self-Sufficiency), and initiating flagship projects. These three pillars have to be supported by the key actors. The actors act as the main contact to the public and to the local press. This may raise the awareness of people who do not normally think about renewable energy.

Expanding and Stabilizing the Network

The core team should expand its network gradually. The analysis of the actors can help to access areas such as mobility, city renovations, and education. Depending on the relevance and availability of the actors, independent working groups should be initiated. These ought to be formally and informally linked with the core team. The responsibilities in the core team and the working groups should be divided according to their function and ability. The key actors should also encourage erecting long-term structures (> Chapter 3.2 Networking Center). Further, the networking process should also cross the regional borders (> Info box: Different or Hidden Interests / Conflicts) as this is the quickest way to access valuable information on best practice experiences (> 100% RE Regions Project: 100ee Map (8, in German)).

Different or Hidden Interests / Conflicts

It is understood that different stakeholders have **varying interests** that are more or less visible and communicated. Through an actor analysis both initiators and other actors' interests can be pin-pointed.
Local politics must track many different goals that tie up resources. This is true for the energy transition as well as for other political issues. Often it is difficult to set priorities. A **dialogue** on the various objectives and their trade-offs may help to address conflicts and if appropriate counteract or make decisions more comprehensible.
RE projects are often easier to plan on a regional rather than local level (> Chapter 4.3 Designing Space). However, this can result in conflicts between communities that do not want to give up their freedom in planning or their decision-making authority. The benefits of an **inter-municipal cooperation** and its added value for the participants, needs to be highlighted.

A positive example is the inter-municipal cooperative NEW: New Energy WEST eG (5 and 6, in German). For information on inter-municipal cooperation in general: Frick and Hokkeler (2008) (7, in German).

4.1.2 Civic Participation

1. What is this About?

Major actors of a socially just and ecologically sound self-sufficiency with renewable energies are regular citizens. In contrast to fossil or nuclear energy, citizens can get extensively involved in the design of decentralized energy. However, citizens are often not aware of the opportunities they have. Therefore, two questions should be addressed: How can citizens become more aware of the possibilities they have? Can they be involved in such a way that conflicts and possible delays are avoided?

2. *Vision*

Civic participation is not only a way to increase overall acceptance. Citizens are no longer pure energy consumers. They produce energy through solar systems, they invest in new systems, and design and operate them. How the public can be engaged and is seen in this process has greatly changed: Local and regional authorities are drawing attention to this potential by encouraging citizens to realize their opportunities. Information and education create transparency and enable active participation. This leads to new ventures such as financial participation in the electricity grid. Regional energy policy is enacted in consensus with the citizens. Accordingly, their sovereignty is accepted and conflicts are taken seriously. Any action is guided by the principles of justice. The citizens see themselves as energy-conscious and responsible developers in the energy transition: the premise that “The electricity comes from the socket” has transformed to “We make our own energy.”

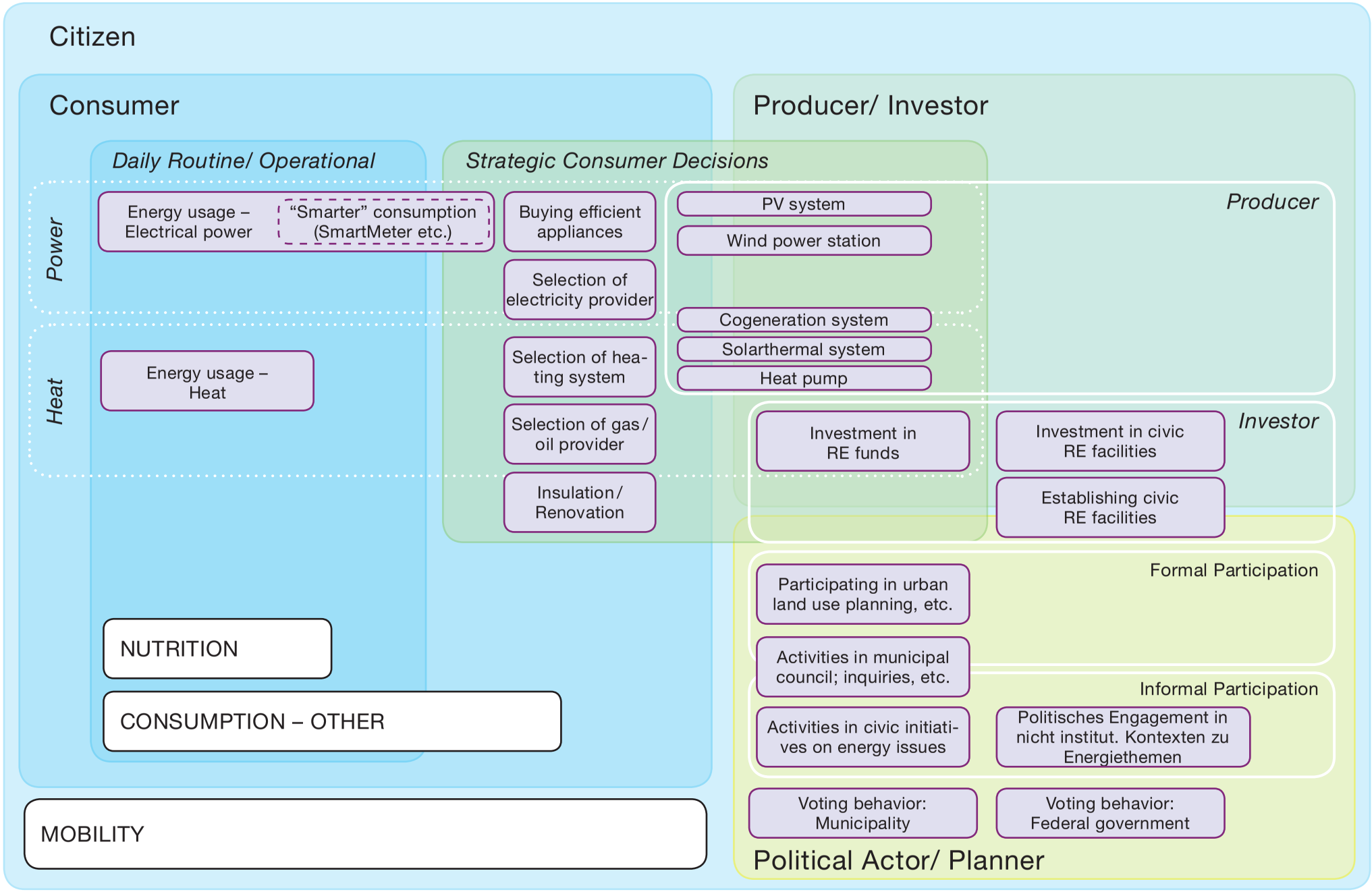


Figure 2: Roles of Citizens and their Possibilities to Influence the Energy Transition

Roles of Citizens and Opportunities for Civic Participation

In the beginning, the many different ways in which citizens can actively influence the energy transition have to be explored – they can be producers, investors, policy-makers / designers and/or consumers (> Figure 2: Roles of Citizens and their Possibilities to Influence the Energy Transition). Daily energy consumption can be influenced by investing in energy efficient appliances or taken into account during strategic investment decisions such as building renovations (> Chapter 4.1.3 Energy Efficiency and Energy Aware Lifestyles). Further, citizens can influence the production of (renewable) energy with their choice of heat and electricity provider. They can invest in renewable energies (for instance by establishing citizen-owned RE systems) or engaging in politics via informal or formal participation opportunities such as civic initiatives.

Analyzing the Status Quo

Before identifying potential investments, regional processes and structures should be analyzed in order to answer the following questions (> Info box: Actor Analysis):

- Do citizen-owned RE systems exist? Are there activists / groups that deal with renewable energies? How is the development of renewable energies within private households in the region (e.g. photovoltaic systems)?
- Are there or have there been conflicts in the municipality associated with the development of renewable energies?

These questions are best answered by political, administrative, and civil society actors of the municipality and coordinated by, e.g. a networking center (> Chapter 3.2 Networking Center).

Concerns About Energy Crops

Surveys during the RE-Regions-project have shown that biogas facilities, out of all renewable energy options, have the least public acceptance. The biggest concerns are the negative effects of energy crop cultivation such as competition with food production, spread of monocultures, or negative impacts on biodiversity (> Chapter 4.3 Designing Space).

Further results of the survey can be found in Kress and Landwehr (2012) (9, in German)

Analysis of Potential for Participation and Continuous Evaluation

After the status quo analysis is complete, it can be followed by a survey of the participation potential. Questions, concerns, and the acceptance by citizens are the focus of this investigation. Further, the willingness to participate, to connect to the grid, and to invest can be queried. The participation potential can be derived by comparing the results with the locally planned measures:

- In which planned projects is citizen participation possible (e.g. RE facilities, electricity grid)? Are there activists/groups, which can be involved in the development of renewable energies? Can their efforts be supported? Is there potential for further expanding private solar systems?
- Are there conflicts that can be associated with the development of renewable energies, in particular bioenergy (> Info box: Concerns About Energy Crops)? Are social justice concerns receiving attention (> Chapter 2 Social-Ecological Self-Sufficiency with Renewable Energies: What Does this Mean?)?

Ideally, these questions are answered directly by the citizens with the help of surveys or discussion groups, such as focus groups, public meetings, or workshops. These methods can also be carried out with professional support (social scientists, mediators, etc.).
Once the potential for citizen participation has been uncovered, the municipality or region can use this power as a catalyst as well as to mobilize and support in various facets (> Chapter 4.1.3 Energy Efficiency and Energy Aware Lifestyles).
As conditions can change, it is useful to regularly re-evaluate participation potential through the use of the above mentioned questions for analysis. Further, the perception and the effects of the measures should be continuously evaluated. If necessary existing measures should be adapted or new measures introduced in order to achieve the objectives.

Offering Information and Participation Opportunities

By informing its citizens as early in the process as possible, a municipality lays solid groundwork for the more ready acceptance of the development of renewable energies as well as its necessary infrastructure (> Chapter 4.5 Connecting Power). Which media and participation methods will be used is dependent upon whether the citizens are being informed or being called to participate in a common decision making process (> Info box: Guidebooks on Communication and Participation). Formal civil proceedings such as the display of plans to the public and official statements should be complemented by other methods such as, e.g. civil dialogues, future conferences and e-participation.

Encouraging Financial Investment and Codetermination

Municipalities and regions can support the financial participation of their citizens in various ways:

- They can initiate, coordinate, and co-finance common facilities, e.g. through the help of a networking center (> Chapter 3.2 Networking Center and > Info box: Guidelines for Citizen-Owned RE Systems)
- Local authorities can also support investments in private RE system installations by offering information, consultancy, or municipal funding. Further, they can create participation opportunities in the grid, e.g. civic participation in a locally run distribution network or in necessary new developments (> Chapter 4.4 Converting Energy and > Chapter 4.5 Connecting Power).

Guidebooks on Communication and Participation

How can communication in the different phases of participation be organized? What can be done if conflicts about certain RE-technologies arise? Among others, the NABU has released a useful guide on how to handle these questions.
NABU: Guideline Renewable Energies. Solving Conflicts and Avoiding Them (10, in German);
NABU: Guide to Communication (11, in German);
100 Percent Renewable Foundation: Acceptance of Renewable Energies (12, in German).

For a socially just distribution (> Chapter 2 Justice) of benefits from the development of renewable energies, the minimum share to invest in a citizen-owned RE system should be as low as possible. As a result, low-income households can also participate. To compensate any potential drawbacks in the eyes of the citizens such as the impairment of the living conditions due to landscape changes or emissions (noise or odor), a mandatory participation possibility could be an option. This could mean that RE system operators are obliged to offer the possibility of financial participation to affected citizens (> Chapter 2.2 Justice).

Guidelines for Citizen-Owned RE Systems

General information about citizen-owned RE systems can be found here:
WindComm: Guide for Civic Wind Farms (13, in German);
LUBW: Citizens Generate Energy (14, in German).
Information especially on energy cooperatives is included in the following sources: AEE/ DGRV: Energy Cooperatives (15, in German);
PKmG: How to Found Cooperatives (16, in German).

4.1.3 Energy Efficiency and Energy-Aware Lifestyles

1. What is all this About?

Renewable energy self-sufficiency can be achieved more rapidly the lower the energy consumption in a municipality or region is. To calculate energy savings, it is important to know how much primary energy (e.g. coal and crude oil) and final energy (e.g. electricity and fuels) is used and by which consumers. This basic information must be systematically collected. An important control variable in saving energy is avoiding energy losses while converting energy (> Chapter 4.4 Converting Energy). Although in recent decades considerable progress in energy efficiency has been reached, so-called “rebound effects” frequently counteract the energy savings made (> Info box: Rebound Effects). Consumers can prevent this effect by consuming in a responsible way: consumer decisions affect energy consumption through the products they buy. Therefore lifestyles play a crucial role when it comes to energy reduction. However, overhauling ones lifestyle and being aware of the environmental consequences that individual actions may have is a difficult task.

2. *Vision*

At local or regional levels, the amount and type of energy consumption should be analyzed and potential ways to save derived. Precise energy-saving measures should thereafter be implemented, regularly monitored, and the progress documented. The local government, with its properties, is a good place to set an example as an energy-saving pioneer. The municipal government can motivate and support other actors to save energy, while taking social differences in the population into account. Citizens may then insist on more energy efficient goods and services and decrease their total demand. Thus, the rebound effect is minimized.

Energy Report for Municipal Buildings

For several years, the district of Schwäbisch Hall has published an energy report. It documents the measures taken for the district-owned properties in the fields of electricity, heat, and water as well as progress made in energy savings. See also: Schwäbisch Hall (18, in German).

Sustainable Procurement and the Exchange of Information

The organization ICLEI – LOCAL GOVERNMENTS FOR SUSTAINABILITY runs an international campaign called “Procuraplus” to motivate local authorities to establish sustainable procurement and to support their efforts. Further, ICLEI offers a platform to communicate results and achievements. On their homepage, a multitude of information can be found concerning tendering as well as official seals for different product groups and best practice examples. See also: ICLEI - Local Governments for Sustainability (19, in English).

3. Measures

The Various Tasks of a Municipality and Region

Municipalities and regions can influence the use of energy in many different ways. A first step is for the municipality or region to take a closer look at their own energy consumption concerning their real estate stock or properties. Through surveying energy use and energy management, total energy consumption can be monitored. Further, the habits of the administrative staff working in these buildings may be able to be influenced.

Energy reports for municipal or regional properties also provide transparency concerning energy consumption, the related costs, and activities (> Info box: Energy Report for Municipal Buildings). Less energy use equals less money spent: the money saved can be used toward other efficiency measures, thus carrying the process forward. Also, procurement and tendering practices can be aligned in a way so that aspects concerning energy get more attention (> Info box: Sustainable Procurement and the Exchange of Information). In addition, municipalities can influence the energy saving behavior of local actors by establishing provisions in their local plans (> Chapter 4.3.2 Settlement Structures).

Creating and Updating Regional Energy Balances

In order to compare municipalities and regions with each other, the analysis and monitoring procedures should display the level and structure of the energy consumption as well as local and regional conditions (> Info box: Creating Regional Energy Balances). With this method, it is also possible to identify and point out pioneering accomplishments in municipalities.

For accounting, system boundaries are significant. Balances should be based upon the territorial-principle as well as the polluter-pays-principle. The first-mentioned type of balancing deals with the final energy consumption of the territory. It documents specific measures and proceedings for the various target groups. With the polluter-pays-principle, the total energy consumption of a population living in a certain area is examined and can be used to calculate individual consumption. In addition to household energy consumption, this approach looks at the energy that is consumed due to the consumption of products, which are manufactured outside the territory. Furthermore, this balance includes the energy consumption generated by people from outside the territory who are visiting the considered area (e.g. staying in a hotel). Although such accounting is very complex and cannot be calculated with municipality specific data, a polluter-pays-balance based on national averages may still show the wide-scale interconnection and the global effects of actions and lifestyle of the citizens.

Energy Balances and Potential Analyses

An overview of the different accounting methods and their advantages and disadvantages is listed in the guide “Climate Protection in Municipalities - a Practical Guide”; German Institute for Urban Studies 2012 (21, in German).

Creating Regional Energy Balances

A software-based tool for creating regional energy balances was developed in collaboration with the Climate Alliance of European Cities, the Indigenous Rainforest Peoples e.V., the national office of the European Energy Award and Ecospeed. Communal consumption can be downscaled for certain sectors of the municipality based on average national values, population, and employment figures. Over time, this data can be replaced by actual values from the municipality. See also: Climate Alliance of European Cities with Indigenous Rainforest Peoples (20, in German).

Modernizing Residential Buildings with Regard to Energy Efficiency

A significant portion of energy consumption in households is heating and hot water. This can be reduced by energy modernization. The use of appropriate communication strategies and management policies can contribute to an increase in the energy modernization rate. Such strategies should be aligned to specific situations. The public awareness for this topic can be heightened by giving citizens the appropriate information when they buy a house or plan to renovate their home (> Info box: Modernizing Residential Buildings).

Professional energy consultation while renovating can lead to greater savings than without prior consultation. Therefore, a neutral-party energy consultation appointment carried out by consumer protection and informational centers, private consultants, energy managers within the municipality or by a regional energy agency can provide significant information. On-site visits can help to develop renovation plans according to individual needs. This provides a more holistic view of the renovation process, including an agreement as far as best practices for implementation.

In order to combine knowledge, it is advisable to set up an open cooperation network of actors who are involved in the renovation of energy systems (architects, planners, banks, craftsmen, accountants, etc.). An internet platform can serve as the first source of information and make it easier for potential customers to select suitable companies (> Info box: AltBauNeu).

If a municipality has the financial flexibility, the establishment of a special funding program for energy related renovations of buildings is a good idea as there is a high potential for energy savings and the additional plus of supporting regional businesses. Each euro can get things started. If this funding program is supported by leasing income from RE plants, a self-reinforcing process can be achieved in the RE region.

Modernizing Residential Buildings

The project “Energy efficient renovation of homes” (Enef-Haus 2010) has released the following publication to allow more residential buildings to be modernized: “Encouraging Renovation – How to Win-over Homeowners for More Energy Efficient Modernization” (22, in German). One of the proposed mechanisms is a folder containing region-specific information on energy modernization that could be provided to the homebuyer by an energy agency or the property management and include legal obligations, possible consultants, information on events, model homes, construction services, and additional services, etc..

AltBauNeu – Network for the promotion of energy related renovation of buildings

ALTBAUNEU is a joint initiative by administrative districts and municipalities in North Rhine-Westphalia, which provides information and contacts about energy related renovation measures on their internet platform. See also: GERTEC GmbH Ingenieursgesellschaft (23, in German).

A Good Life and an Energy-Saving Lifestyle in Tandem

In addition to long-term strategic investment decisions, such as energy related renovations, municipalities can also support the medium-term decisions of individual citizens, e.g. by providing information on energy-efficient appliances. The municipality can try to address daily energy use habits (> Info box: 200 Families Active for the Climate). It has been shown, however, that these offers will most likely reach the citizens who are already aware of efficiency measures. Additional groups may be able to be reached through regulatory measures. A practical instrument for this case could be, e.g. the “eco-bonus”, also called “incentive tax”. In this model, energy prices are artificially increased through an environmental tax or a price increase by the utility. The additional revenue is paid into a fund. Every citizen, in the end, receives the same percentage of this fund. Since those people with low incomes are generally also those with low energy consumption, they contribute less to the fund, but are still reimbursed the same as others who contributed more through their higher consumption, i.e. citizens with higher energy consumption have a higher input into the fund than yield. Accordingly, the “eco-bonus” can help to reduce overall energy consumption. This promotes a social redistribution while allowing for liberal lifestyles and without prohibiting certain activities (> Info box: An Incentive Tax in Basel).

200 Families Active for the Climate

Since 2011, the city of Freiburg supports projects in which citizens change their lifestyles and daily habits. Participants can receive energy consulting, platforms of exchange have been created, and small projects like preparing a vegetarian meal week or a week with locally grown products organized. The city of Freiburg wishes to continue to identify starting points to further promote lifestyle changes. See also City of Freiburg 2012 (24, in German).

An Incentive Tax in Basel

An example of an incentive tax model is the POWER-SAVING FUND Basel, Switzerland, (25, in German), which began in 1999. The public utilities increased the price for each kilowatt-hour sold. At the end of the year, they reimburse every citizen a certain amount. Companies are also included in this model. In the case of companies, the amount paid back depends on the salaries paid by the company to its employees.

4.2 Adding Value

4.2.1 Analyzing the Added Value

1. What is this About?

An important argument for self-sufficiency with renewable energies is that a large part of the added value is generated locally and thus the region will benefit. However, often important information about the added value is missing. What value is being referred to? Who are the winners and losers? How can monetary values be quantified? In addition, data for determining the monetary added value are not readily available. Sensitive company data or private information about actors is often difficult to access. However, to guide the development in the region and for the transparency of the process, especially as concerns citizens, it is indispensable.

2. *Vision*

Renewable energies self-sufficiency has been shown to have a positive impact on regional identity and development such as through increased job security, additional tax revenue for the municipality, and new economic opportunities for farmers. These aspects are important for the social and economic structure of the region and are, thus, targets to aim for on the path towards becoming self-sufficient. It is important that the economic effects and correlations with self-sufficiency are made transparent including: qualitative values, monetary added value, employment effects, added value potential, involved actors, and beneficiaries. However, negative effects should be analyzed and published as well.

Added Value - Who Loses?

With the construction of RE plants, important sources of income and jobs can be displaced to other areas. **Competition** with conventional electricity and heat supply may arise. In bioenergy, we see rivalries between energy use and material use (wood) or energy use and food crops. This is noticeable in the higher lease amounts for agricultural land (> Chapter 4.3 Designing Space). At this point in the process, a transparent communication system and a common understanding of justice are necessary (> Chapter 2 Justice). Compensation measures, financial participation or, if necessary, a fundamental reassessment of the added value calculation can help solve any conflicts that may exist.

3. Measures

The Current State of Knowledge

Values are relative. Thus, it is useful to discuss first which values should be associated with the goal of RE self-sufficiency. Such discussions may be included in an added value concept (> Chapter 4.2.2 Cooperative Added Value). Depending on the perspective, the values of individuals, groups, companies, and municipalities and regions can be distinguished from one another. At the regional level, qualitative values are, e.g. identification with the region or strengthening of the "we" feeling. Quantitatively, a regional added value is the sum of the shares of the involved actors:

- (net) profits of companies
- (net) income of employees
- tax revenues of the municipality

In a comprehensive analysis of the monetary added value, the current state of knowledge should be captured before the actual accounting. Questioning local authorities, citizens' initiatives, and individual experts can help to identify where information is readily available and what new information needs to be collected. For example, farmers' associations could have information about the distribution of biogas plants and energy crops or forestry offices can say what the amount of wood fuel production is. It is important to decide at the beginning to what extent the analysis should be carried out. Further, the variety of economic activities regarded within RE-use (agricultural services, maintenance of the equipment, to financial participation of the citizens) should be discussed as well as how far any negative economic effects should be taken into account (> Info box: Added Value - Who Loses?). It should also be considered in advance, to whom the results should be addressed. Tax revenues, e.g. can be of interest to municipal authorities, while highlighting the jobs and profits from financial participation is interesting for citizens. Depending on the interests of the region, the relevant added value sector can be further analyzed and adjusted.

Added Value – Who Wins?

The installation of a bioenergy plant and especially its operation and regular maintenance can offer long-term job security and income. Here, companies can benefit as well as citizens, workers, and investors. Municipalities receive **tax revenues** from business as well as income taxes. Further, they directly receive revenues through the leasing of land and roof areas. The municipalities could also operate their own plants. All citizens of the municipality benefit from these additional profits.
For the farmers, especially the **cultivation of energy crops** for the use of bioenergy plants can be an economically attractive alternative to farming conventional crops.

Calculating the Added Value

The required input data of an added value calculation (> Info box: Online Added Value Calculator) includes the asset investment and the installed capacity as well as data on the number and sales of companies or individuals who are involved in added value steps and located in the region:

- Planning and installation (equipment manufacturers, craftsmen, operators, planners, contractors)
- Operation and maintenance (technicians, regional banks, operators, farmers)
- Operators' profits (investors: private people, public utilities, contracting companies, farmers, municipalities with own power plants)

For bioenergy, the amount of energy in its various forms, e.g. plants or firewood is needed as an input for the calculation. These data should also be ascertained for the possible expansion of the facilities and future production output. The data collection and the implementation of the added value analysis should be clearly defined and carried out by competent authorities (> Chapter 3.2 Networking Center).

Communicating Value

With the ascertainment of the added value, expansion plans, and subsequent comparison with the added value potential, a diverse amount of information becomes available. This information can be useful to different target groups: investors, civic groups, and energy cooperatives, but also for policy-makers in licensing offices or local politicians. The information can be used to support planning and development processes. It is important to update the collected data regularly. The added value and employment effects generated by the use of RE depends upon various factors which may change at any time and should be incorporated into the added value analysis: new foreign investors, unexpected results of public proposals, or the conversion to other system technologies (> Chapter 4.4 Converting Energy). In addition, the added value calculation should always be connected with the vision and goals of RE development such as climate change targets or goals for energy reduction, but also with broader environmental and social issues.

Online Added Value Calculator

The detailed determination of RE added value effects, generally requires a technical approach. The online calculator developed by the German-based Institute for Ecological Economy Research and the Renewable Energies Agency is a handy and free tool for identifying regional added value and employment of the various RE systems.
The online added value calculator is limited to regionally relevant components (old installed capacity, newly installed capacity, actors in the value chain) of the value chains. Additional to the presentation of numerical and graphical results, the share of RE in the electricity mix as well as the saved CO_2 emissions can be calculated. The online calculator and instructions are available for free on the website of the Renewable Energies Agency (26, in German).
The instructions are in German and the average values used in the calculations correspond to those in Germany.

Using Information

The quality of the results should be evaluated in light of the collected data. Better data sources lead to a more detailed picture of the regional economic structure and are thus more useful. Comprehensive and high-quality knowledge about the regional economic impact with use of RE provides a municipality or region with a triple benefit:

- The measured added value can serve as a reference value. Based on this value, targets can be set and current or future developments can be judged or predicted. The forecasts and fixed targets, such as the regional share of the added value or the value added by newly created jobs, should be regularly monitored and adjusted accordingly. This could be the case when the potential for the involvement of regional actors is not fully exploited, e.g. in financing RE systems through civic participation. In addition, negative impacts of added value generation, such as a reduction in environmental values, loss of biodiversity, or increased leases due to cultivation for bioenergy should be taken into account.
- An added value calculation can provide information on the regional economic benefits of renewable energies in order to increase acceptance in the region (> Chapter 4.1 Creating Together).
- An assessment of the status quo provides a comparison with the potential added value that can be generated when regional actors increase their involvement. If there is a gap between the status quo and the potential, a regional added value concept can explicitly broach this gap (> Chapter 4.2.2 Cooperative Added Value). In such a concept, unrealized potential can be addressed through the reorientation of existing or the creation of new added value chains.

4.2.2 Cooperative Added Value

1. What is this About?

For self-sufficiency in renewable energy, different actors have to work together in value chains in order to guarantee the local RE supply. This cooperation can lead to conflicts when differing interests and values exist and activities are not well coordinated. In the worst case this can lead to breaking off the cooperation and thus to no RE value creation.

2. *Vision*

Added value in a social-ecological RE self-sufficiency scenario is organized in partnership. Hence, it is in the interest of all stakeholders to get involved in the project long-term. In the spirit of a good partnership, the involved actors exchange ideas, reveal their own interests, synchronize their activities, and fairly distribute the costs and benefits across the value chain. Similarities and contrasts are communicated and made transparent. The cooperating businesses wish to stay independent in the long-term, which means that they have to be economically profitable. Fair competition takes place between the various value chains, thus, promoting an economical supply of energy at regional market prices. The actors involved in the value chain are also aware of their responsibility towards the community.

Mapping Added Value Chains

The mapping of added value chains is a method used for a simplified version of actor analysis (> Chapter 4.1.1 Key Actors and Actor Networks). It shows:

- who is part of an exchanging cooperation,
- how the cooperation is designed (e.g. contracts),
- what is exchanged and in what quantity (e.g. price, material flows).

The result shows the regional added value chains with the measured material flows.

Contract Design

With the provision of bioenergy, contracts are crucial in establishing **substrate supply security** in the added value chain. The guide "Becoming a bioenergy village" (27, in German) shows in detail how the contracts could be designed. The appendix also contains sample contracts (for heat and biomass).
More advice on contractual arrangements can be found in the BIOGAS-FORUM BAVARIA (28, in German).

Corporate structures

In the brochure "Climate protection with civic facilities" (29, in German) published by the ENERGY AGENCY NRW, various forms of corporate structures that are ideal for decentralized RE self-sufficiency are presented.

Social-Ecological Label

For marketing the local social and ecological value produced by RE, an individual "energy label" can be created. This is a central point in communication with the customer. It arouses positive associations in relation to the region, but also globally, as it represents clean, CO2-free energy. A **regional label** makes the actual value of locally produced energy visible. Thus, the customer is willing to pay more than for conventional power. This could be a means of continuous expansion of RE without financial support through the Renewable Energy Act.
Another option for funding could be the introduction of a **"social-ecological cent":** One cent of the electricity price is used to assist local social-ecological RE self-sufficiency e.g. through the installation of fish ladders at existing hydropower plants or the thermal insulation of a kindergarten. An example is BUND REGIONAL ELECTRICITY (30, in German).

3. Measures

Regional and Chain Specific Actions

The design of a cooperatively organized value chain, in terms of social-ecological self-sufficiency, includes two levels of action: the region itself as well as the individual chains e.g. bioenergy, solar, or wind. At the regional level, measures can be taken in order to organize an exchange among actors of different RE sectors and the community. The aim is to promote synergies, minimize negative interactions, and ensure fair competition. Appropriate measures can be guided by a networking center (> Chapter 3.2 Networking Center). At the individual chain level, measures are taken in order to facilitate long-term partnerships between protagonists of a single chain and for the benefit of all chain members.

Acting Regionally: Developing an Added Value Concept

A concept of added value is part of a regional model for social-ecological self-sufficiency. When developing the concept, one should enable all stakeholders to collectively adjust the management of the added value chain to accommodate the goal of social-ecological self-sufficiency through RE. The concept should define social-ecological values (> Info box: Social-Ecological Values), determine the relevant actors, and express the principles of a good partnership. For the implementation of the concept, the agreed values should be backed up by indicators (> Info box: Added Value Concept). Further, whether the produced energy should be sold collectively at the regional level, by promoting social-ecological values as a unique selling point, needs to be discussed (> Info box: Social-Ecological Label).

Acting Regionally: Analyzing Added Value Activities

Through the added value analysis the already-generated added value is known (> Chapter 4.2.1 Analyzing the Added Value). Unexploited potential can be used as a starting point for the creation of new added value chains and to re-align existing added value chains. For this, the networking center could bring potential partners together. In a second step, the active added value chains can be

mapped in order to make the involved actors and material flows visible (> Info box: Mapping Added Value Chains). Afterwards, how cooperation in the existing added value chains functions can be seen. The involved actors explore e.g. in group discussions or workshops, to what extent from their point of view the ideal of a good cooperation along the value chains has already been realized. This makes it possible to identify the strengths, weaknesses, opportunities, and risks of the current cooperation. This process could possibly be supported by external moderators (> Chapter 3.2 Networking Center).

Acting Regionally: Enabling Exchange

Considering the principles of good cooperation, the exchange between the added value chains includes the following points:

- The actors exchange their know-how. Experts from outside can also be invited in order to bring in new input.
- The regional price indices are published. Next to the tariffs paid according to the German Renewable Energy Act (> Info box: The Renewable Energy Act), these indices indicate the prices paid in the region for resources, products (such as corn or heat) and for various types of facilities (e.g. photovoltaic panels). The price comparison can assist in negotiating fair prices.
- When conflicts of interest between different RE-actors or in relation to the municipality arise (> Chapter 4.3 Designing Space), a third party such as the networking center can be involved.

The Added Value Chain in Mind: Developing a Business Plan

In order to form an added value with all involved actors, a business plan should be developed together. This plan should relate to the entire chain and include the principles of a good cooperation; as laid out in the added value concept. The actors can include their interests and values e.g. their price expectations. The business plan provides the framework for contracts and the choice of corporate structure.

Added Value Concept

For developing such a concept the following key questions may be helpful:

1. Which economic, social, and ecological values are important?
Values serve as a target that also provides information on how economic profitability, which is socially just and ecologically sound, can be achieved.

2. Who can actively participate?
Which actors have the skills and resources to generate these values (e.g. farmers, citizens, municipalities)? These can be identified through an actor analysis (> Chapter 4.1.1 Key Actors and Actor Networks).

3. How can a long-term cooperation be established?
For cooperation along the added value chain, the principles of good partnership have to be derived. They are like a code of conduct that should be followed in order to secure a long-term cooperation. The principles are based on voluntary self-regulation.

4. Which indicators can be used to evaluate the values and how can they be communicated?
For the agreed values, practicable indicators are designed to reflect the values in the process and to evaluate them. Examples of such indicators are: soil fertility, humus growth, and regional involvement such as educational initiatives in schools.

An example of the successful implementation of such a concept is the REGIONAL VALUE AG (31, in German). Here, a social-ecological added value in the agricultural sector was defined and practical indicators for performance monitoring developed.

The Renewable Energy Act

Since 2000, the **Renewable Energy Act** (Erneuerbare-Energien Gesetz, EEG) is the central support program for electricity from renewable sources in Germany. In 2009, there was the addition of the **Renewable Energies Heat Act** (Erneuerbare-Energien-Wärme Gesetz, EEWärmeG), which supports heating that is supplied by renewable energy. Background information can be found on the website of the Ministry for the Environment, Nature Protection, and Reactor Safety (BMU) (32, in English and German). Further information, especially concerning current legal affairs can be found on the website of the Clearing-Organization EEG (33, in English and German).

The Added Value Chain in Mind: Finding the Right Corporate Structure

To provide the cooperation with an organizational and legal foundation, it can be arranged in various corporate structures (> Info box: Contract Design). The chosen corporate structure regulates the control and participation in a cooperation, but is also responsible for the financial contributions and distribution of profits. According to social-ecological RE self-sufficiency, corporate structures that allow a high degree of participation and the distribution of profits in the region e.g. cooperatives, should be preferred (> Chapter 3.2 Networking Center and Chapter 4.1.2 Civic Participation). Another way to strengthen exchanges with the community is the establishment of an advisory committee composed of actors from relevant groups. Accordingly, the advisory committee can respond to negative interactions in the social and ecological environment as soon as possible (> Info box: Energy Utilization of Residual and Waste Energy).

The Added Value Chain in Mind: Organizing Regular Meetings

Within cooperative added value chains, regular meetings should take place in order to assess what has been achieved by working together and to take further action in implementing the business plan. The meetings can be supplemented by the use of information technology e.g. through shared databases that show selected material flows along the chain (e.g. amount of energy produced).

Social-Ecological Values

Sociological and ecological values complement the value of economic viability. Together they represent the overall performance of a company.

Sociological values can be e.g.:

- the commitment to the region,
- the quality of jobs,
- a pricing that protects the actors against fluctuations in the world market,
- the equitable distribution of added value in the region,
- the equitable distribution of profits along the chain.
- Furthermore, it could be a possibility to supply a portion of the revenue or the revenue of the maximum yield for charitable purposes.

Ecological values can be e.g.:

- positive impacts on soil, water and air, reduced consumption of resources,
- especially while cultivating energy crops: guarantee of the soil fertility or the application of existing ecological criteria such as those from national or international eco-labeling.

The values should also be discussed in light of their interaction with one another i.e. a minimized resource consumption could increase the economic profitability of an enterprise and have positive impacts on ecological values or the quality of jobs.

4.3 Designing Space

4.3.1 Biomass Utilization

1. What is this About?

The use of renewable energies often stands in direct competition with alternative uses for the land in question. The use of biomass to generate energy competes with other forms of utilization like food production, nature conservation, or the direct application, e.g. in the building sector. The use of residual biomass and organic waste can take pressure off the cultivated land. However, it is often not economically viable.

2. *Vision*

In social-ecological RE self-sufficiency, the competition over land utilization determines the exploitation of regional potentials. Utilization concepts, which most balance different interests, are chosen. If biomass is being considered for energetic use, it is investigated as to whether residual biomass or organic waste is available. Agricultural land and forests provide additional sustainable raw materials for providing energy. However, agricultural land also has a great abundance of flowers and forests are richly structured communities with high biodiversity. Impacts on these areas are kept to a minimum. In addition to providing energy, these landscapes serve as a habitat for animals and plants and meet human needs, such as recreation and tourism. Importantly, through the protection of these areas, the precious resources of soil and drinking water are also protected.

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Environmental Effects and Synergies with Energy Crops on Arable Land

When cultivating energy crops, negative effects on the environment can be a side-effect. These include the transformation of grassland or the narrowing of crop rotation. This results in negative impacts on soil, groundwater, flora, and fauna. An overview of the **negative environmental impacts** of biomass production is provided in a publication by the Federal Agency for Nature Conservation, 2011: Landscape Friendly Bioenergy Utilization (34, in German).

A good example of a **successful synthesis** between biomass utilization and environmental protection is the project Energy from Wild Plants published by the Agency for Renewable Resources (35, in German). The project demonstrates how wild plants on the one hand can be used for biogas and on the other hand have a positive impact on the protection of species and soil.

Potential: Looking at Regional Strategies and Concepts in Unison

When considering biomass as an energy source, its potential should be ascertained in light of land-use competition. Doing so can serve as a basis for a regional strategy, but also for the development of specific approaches for the utilization of biomass. The regional strategy itself can also affect the available potentials, e.g. when the cultivation of corn is limited in order to focus more on the use of residual biomass and organic waste. These interactions between strategy and potential should be openly discussed. The various forms of land use and particularly the differences between the types of biomass should be considered (residual biomass and organic waste and biomass from agricultural or forest land). At the local level, for example, individual farms can develop utilization concepts based on the regional strategy, with emphasis on the profitability for each farm. From a strategy point of view, farms can derive proposals that can be voluntarily incorporated into the actual utilization concepts.

Ascertain Potential

It begins with an inventory: How much does bioenergy contribute to the electricity and heat supply? From this point, the various objectives and social-ecological land use can be brought into congruence (Info box: RE Potentials). Furthermore, the current state as well as the difficulties and positive developments associated with the utilization of biomass can be reflected on. This often reveals territorial conflicts. To solve them new objectives can be set. Positive developments, such as synergies can be tested for their suitability, allowing for a more comprehensive approach (Info box: Environmental Effects and Synergies with Biomass Crops on Arable Land).

The formation of objectives for the future needs to not only hold a retrospective view but also answer the question of regional potential. When determining the potential it has to be considered that the theoretical potentials often do not match the actual exploitable potentials. This may be due to technical restrictions, administrative obstacles, or the lack of foreseeable profitability. Therefore, a suitable partner with the necessary expertise is best to carry out an assessment of potential. The regional characteristics, such as the responsibility to protect under NATURA 2000 and the competing land usage should to be taken into account. Based on the assessment, suggestions for sustainable concepts can be proposed and made visual through a geographic information system (GIS). This makes it easier to evaluate and adapt the concept. In a GIS, installed RE systems such as photovoltaic systems and wind turbines as well as possible priority areas can be mapped. As a result, the potential analysis offers a basis for the actual RE developments.

Considering the Use of Residual Biomass and Organic Waste for Energy Utilization

Residual biomass and organic waste energy, e.g. liquid manure, manure, straw, kitchen waste, organic waste, offal, sewage sludge, green waste as well as industrial wood waste and wood residues, can theoretically be used as an energy source (> Info box: Energetic Utilization of Residual Biomass and Organic Waste and Info box: Utilization of Wood Pellets). Its potential, however, is small in comparison to that of forests and agricultural land. Since bioenergy sources are scarce, the untapped resources of residual biomass and organic waste are an option to be considered.

In the case of residual biomass or organic waste utilization, only limited competition is expected but this should be regularly assessed. Also, the efficiency of the utilization is often questioned. There may also be cost-neutral ways to utilize such biomass, e.g. the energy utilization from clippings that are not cultivated for the purpose of agricultural use - such as the lopping of contractual nature conservation areas, of roadside areas, or municipal lawns like sports or playgrounds (> Info box: Utilization of Clippings).

Considering the Use of Agricultural Land for Energy Utilization

If agricultural land is being considered for the cultivation of biomass for energy utilization, the competing uses of natural resources such as soil, water, flora, and fauna must be considered.

The cultivation of corn should be avoided in locations vulnerable to erosion, as the lack of ground cover in winter carries the risk of increased soil loss by water erosion. Additionally, in areas close to water bodies, buffer strips of five to ten meters need to be observed so as few as possible pesticides and fertilizers can enter the water stream. Moreover, according to agricultural best practice and to maintain soil fertility, a tripartite crop rotation should be applied in the long term. Further, ground-nesting species especially benefit from winter grains. For example, the skylark has greater breeding success in winter grain than in fast-growing corn. From the perspective of the animal species that live in agricultural areas, dual crop rotation should be avoided. The harvest date of primary crops, which are used as whole crop silage, usually take place during the breeding and settling time of mammals and ground-nesting birds - the brood cannot escape the harvester.

In the cultivation of grasslands for the utilization of biomass, intensification in production should not take place, as it is associated with a depletion in plant species. In intensively cultivated areas, this reduces the supply of blossoms for insects to a few weeks and just a few plant species (e.g. canola/ rapeseed, clover). In the long term, this carries the risk of species impoverishment and displacement. As the upheaval of grassland sites releases greenhouse gases, measures should be made to avoid this if possible. The utilization of biomass for energy purposes on agricultural land should not only be balanced in regards to environmental factors, but also considering competition with other land users. These include, e.g. organic farmers and refining plants, which process herbal products to animal foods. The biogas farmers have an advantage in the sense that they can use additional revenue from the German Renewable Energy Act (Erneuerbare-Energien-Gesetz, EEG) and are thus often able to pay higher prices for agricultural land. Due to the “food or fuel discussion” (shortage of agricultural land for food production because of energy crops) it has to be discussed on the regional level whether biogas plants should be limited.

Energetic Utilization of Residual Biomass and Organic Waste

The Research Centre Karlsruhe within the Helmholtz Association has published information about the possibilities, opportunities and objectives of the utilization of residual biomass and organic waste (36, in German).

Utilization of Clippings

Clippings can be used as an energy source either in existing facilities with other substrates or in new specifically designed facilities. For economic reasons, the facilities should be small in size in order to keep the catchment area small.

Detailed information can be found in a guideline for the utilization of municipal, herbaceous waste in micro biogas plants and micro component systems (37, in German).

Allowable Cut and Forest Management

The allowable cut, which is determined by forest management, dictates the surface-related annual volume of wood that can be harvested sustainably. The forest management collects data on standing crop, location, and other aspects and calculates the allowable cut for longer periods of time (10 to 20 years). In the long term, the amount of the annual cut should not exceed the amount of wood growing (except for reduction operations). This is the only way a sustainable utilization of the forest as a source of raw materials is guaranteed. However, from an ecological perspective it can be argued whether a sustainable utilization of wood should not be based on other criteria as well. For biodiversity, e.g. the amount of dead wood is important since it provides a lively habitat for many animals and plants. If aspects like this are considered in the calculation of the allowable cut, it usually decreases comparing to a calculation solely based on wood production.

Assess the Use of Forest Wood for Energy Utilization

In most managed forests, the maximum allowable cut is exploited (> Info box: Allowable Cut and Forest Management). With this in mind, it must be critically examined whether the energetic utilization of forest wood in addition to the material use of wood, e.g. furniture, construction, paper, and as a basic material in the future for the biotechnology and pharmaceutical industries, makes sense. Considering climate change, the advantages of both pathways can positively contribute to its hindrance: when utilized for energy purposes, a CO2-neutral energy source is used and when used as material wood, it acts as a carbon sink. New forms of energy utilization from biomass can also compete with 'traditional' energy utilization (firewood). The existing demand should therefore be visualized and checked whether the new forms of utilization for energy are more efficient and provide better marketing opportunities.

Potential in unused forests is often difficult to exploit due to ownership structures. Especially in small private forests, not all potentials are utilized. Mobilizing these potentials could provide additional resources.

The utilization of residual forest wood or woody debris must be critically discussed considering the associated changes in the material flow and for biodiversity. The additional removal of nutrients can lead to a temporary soil acidification. Thereby, not only potential growth is sacrificed, but it could also lead to a shift in the species spectrum and a negative impact on biodiversity. Whether the fertilization with artificial nutrients may avoid these problems must be critically discussed as well as, e.g. erosion may allow fertilizer substances to enter the groundwater. Moreover, the humus loss due to biomass utilization cannot be countered by fertilization.

Next to deciding whether they want to prioritize energy utilization over the material use of forest products, decision-makers could consider a material and energy cascade utilization (> Info box: Material and Energy Cascade Utilization). The latter offers the possibility to combine the advantages of both options, using wood first as a carbon sink and later as a CO2-neutral energy source.

Developing a Regional Strategy

Balancing the competing utilizations while taking regional potential into account should lead to a regional bioenergy strategy. The three areas, residual biomass and organic waste, biomass from agricultural land and forests should be considered collectively. The various interest groups such as environmental groups, farmers, forest owners, and community representatives should work together towards common objectives with regard to the spatial development of the region. Information should also be exchanged with the surrounding municipalities in order to avoid potentials being accounted for more than once (> Info box: Different or Hidden Interests/ Conflicts). Strategies and concepts should therefore be coordinated.

Special attention should be paid to decisions made by individual enterprises, as these can lead to regional effects that influence societal interests, e.g. if several biogas plants are built in the same area, the leases for arable land can increase and thus a high concentration of corn fields. This has a negative impact on the biodiversity and the landscape. The sum of these developments is usually not immediately visible to a single farmer who wishes to build a biogas plant. However, there are currently only limited legal possibilities to control or influence developments on the regional level concerning the erection of biogas plants as well as crop selection in Germany.

Therefore, it is advisable to mediate between societal and economic interests of single companies during the strategy development. Existing instruments can be used or strengthened for this purpose, e.g. in landscape planning it is possible to identify priority areas, an option that so far is rarely used. Another possibility to strengthen societal interests could be the declaration of additional protected areas. For these protected areas, which are accessible for agricultural purposes (e.g. areas according to the European Union Habitats Directive), minimum standards for agriculture can be defined.

These kind of minimum standards for wood and timber harvest for energy needs can take place in coordination with the local forest management. This holds the opportunity to involve local participation, especially in regional and state forests, which serve as a common good. Local actors can proactively discuss potential plans with the forestry office and forest rangers.

The development of a regional bioenergy strategy can be carried out by the networking center, which may also act as a mediator between the local and the regional level (> 3.2 Networking Center). Alternatively, an advisory board at the level of the individual enterprise can be set up to represent the relevant stakeholders such as land users, politicians, and administrative staff. The advisory board can thereafter develop a utilization concept and support its implementation.

Material and Energy Cascade Utilization

In material and energy cascade utilization, the wood is first used as material and later to produce energy. Such an approach must be developed at the regional level and should take into account cross-regional material flows as well. This task could be carried out by a networking center (> Chapter 3.2 Networking Center).

Concretizing Utilization Strategies for Residual Biomass and Organic Waste

Especially in municipalities and on a regional scale, residents and cities can consider the use of residual biomass and organic waste as sources of fuel for existing biomass plants or potentially for ones of their own. Legal aspects concerning waste, emissions and fertilizer have to be taken into account.

Residual biomass and organic waste collection occurs in a decentralized manner due to its diverse sources. The transportation to the facility is therefore a logistical challenge and often associated with considerable costs. As municipalities have to dispose of clippings from some places in any case (such as sports fields and playgrounds), the disposal costs can be deducted from the costs associated with energy utilization (> Info box: Utilization of Clippings).

Concretizing Utilization Strategies for Agricultural Land

Currently corn and rapeseed/ canola dominate the cultivation of biomass for energy purposes. An alternative to corn, which also has an image problem due to its height, is the sugar beet plant. The methane yield is competitive with that of corn. Moreover, the sugar beet does not change the landscape. The sugar beet can also diversify crop rotation and thereby minimize risks for farmers. In short, at the same time, the landscape can be structurally enriched and the poor image of biomass cultivation improved. While the sugar beet is associated with conventional agricultural production, the use of diverse flowering plant mixtures is an alternative that not only enriches the landscape, but also contributes to the protection of soil, water, flora and fauna. Currently the uses of diverse flowering plants for bioenergy are being analyzed in various research projects. The results of the methane yields are 60 to more than 100 percent in comparison to corn. In addition, there are positive effects on biodiversity and pesticides as well as mineral fertilizers are avoided. Another way to enrich the landscape is to plant flower strips, for example on the edge of cornfields or field margins for the protection of arable weeds such as the cornflower (> Info box: Creating Flower Strips).

In many regions a move away from dairy farms has lead to an excess of available grassland areas, much of which could be used for biomass production. These are usually managed grasslands where cultivation can take place, but should not be further intensified in order to prevent a reduction in biodiversity. Another possibility is an agreement between landlord and tenant that only a certain percentage of the grassland is cultivated and the corresponding costs are divided by all tenants.

Creating a Flower Strip

A flower strip should be between three and ten meters wide. It can be cultivated at different places: within a field section (homogenous cultivation), on the headland (the area on which the machines turn during processing), or at the edge of a field. As annual crops are often sensitive towards frost, they should be sown at the end of April, beginning of May. Perennial crops can be sown in fall or spring. They can be protected with mulch or grass clippings.

Further information can be found at the Bavarian Regional League for the Protection of Birds (38, in German).

Concretizing Utilization Strategies for Wood

If regionally managed forests hold potential as a bioenergy source, the logistics as well as the management form should be discussed with the forest managers (> Chapter 4.2.2 Cooperative Added Value) in order to ensure a common understanding of sustainable forest management. Potential may present itself, e.g. if the regional strategy of energy utilization from wood is prioritized over the material utilization or if the potential of previously unused forests can be mobilized. In addition, it should be evaluated whether wood from low and middle forests, forest edges, and landscape conservation can be used as an alternative: are there appropriate areas in the region? Is a cost-neutral utilization possible? Another way to provide additional wood for energy utilization is to plant short-rotation plantations on marginal agricultural lands - such sites where the cost of management and the income can be balanced (> Info box: Alternative Forest Utilization for Energy: Wood Production).

RE-Potentials

The utilization of **biomass potential** should be carried out in coordination with other RE-technologies. Since the area for producing energy is limited, the most efficient use of the potential should be aimed for in order to minimize land consumption and ensure that utilization occurs in a socially and ecologically sound manner.

Based on laser scan data, it is possible to automatically determine the **solar energy potential** of a roof area for photovoltaic and solar thermal energy with the help of a geographic information system. The solar factors of the roofs are derived and then linked with each building via the official cadaster.
The **solar cadaster** Sun Area (44) can be viewed online.

For the calculation of **wind energy potential** on areas in a region or municipality the relevant protected areas are deducted first. The defined distance criteria to settlements also have to be taken into account. Only the leftover areas with the needed minimum wind speeds for a profitable operation are suitable sites for new wind turbines. For determining the yield in these areas, calculations have to be made using, e.g. wind data from the German Weather Service and extrapolating it to the hub height of the wind turbines

The ecological potential of **hydro power** in Germany is already to a large extent exploited. The existing potential can be increased by higher plant efficiency and by the expansion or increase in water levels. Municipalities can inspect and assess the current status of existing hydro power plants. The results will show whether further potential exists or whether new dams in unused water routes could be constructed.
Further readings on the utilization potential of hydro power in Germany can be found through the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) (45, in German and English).

Also the potential for **geothermal** plants should be evaluated. In contrast to deep geothermal resources, near-surface potential can be easily tapped by individual citizens with heat pumps. The site and building characteristics can answer the question of whether utilization is worthwhile.

A publication by the research project “ErneuerbarKomm!” offers an overview on potential analyses of RE (46, in German).

Utilization of Wood Pellets

On the one hand wood pellets are used to supply heat for a single house or a building complex. On the other hand they are also used in large power plants to generate electricity. These two utilization types of wood pellet must be accounted for in different terms.

The private demand can often be covered through residues from the wood processing and treatment industry (e.g. sawmills) or from municipal and regional wood stocks. However, utilization competition and environmental aspects need to be taken into consideration. European pellet producers have the opportunity to get their goods certified with the seal ENPLUS (43, in German). This guarantees a quality standard. However, the seal does not to-date include any environmental targets (11/2012).

The large-scale use of wood pellets in power plants is being promoted in some EU countries in order to reach EU greenhouse emission saving targets. Often the necessary biomass is imported. In these cases, it is difficult to evaluate the social and environmental criteria related to the energy resource.

Alternative Forest Utilization for Energy Wood Production

Selection Forests:

Single trees are cut in selection forests across the whole area. The regeneration as well as the utilization is happening simultaneously, which allows wood production on the same stretch of land for material utilization as well as energy purposes.

Low and middle forests:

In low forests, coppicing is used as a form of woodland management. It is based on the cultivation of tree species, which regrow from the stump or base, such as the hornbeam. Coppicing takes place during the winter months and in the spring, the trees sprout anew. The rotation period is 15-25 years.

In middle forests, two management concepts can be combined: the coppicing for firewood production and the use of high forest for timber production (see also Suchomel and Konold 2008 (39, in German)).

Forest edges:

How forest edges can be utilized, see the Low Forest Project (40, in German).

Wood from landscape conservation:

Wood from landscape conservation can be divided into the following categories:

- Wood from landscape management (agriculture, nature conservation)
- Green cuttings from municipal trees, hedges, and bushes
- Green cuttings from private trees, hedges, and bushes
- Wood from road sides

For more information, please see Nature Foundation David (41, in German).

Short-rotation plantations:

A short-rotation plantation is the cultivation of fast-growing tree species (e.g. poplar and willow) with the aim to produce wood in a relatively short period of time, see also The Wood Energy Portal from the Technical University Dresden (42, in German).

4.3.2 Settlement Structures

1. What is this About?

The energy demand is significantly influenced by the structure of a settlement. For example, the heating demand increases with widespread buildings and the amount of numerous single-family homes. In terms of mobility, the energy requirement increases with the separation of living, working, and leisure places. In addition, the trend towards urban sprawl in many rural areas has been enhanced due to national demographic change and a decline in the total population in Germany. Additionally, an increase of one-person households can be observed. At the same time new houses are being built on the outskirts of the villages for people who actively decide to mix urban and rural living. As a consequence, the consumption of land outside of villages and cities has increased, and in some areas the demand for housing in inner areas has declined. At the same time, existing infrastructures for drinking water and wastewater as well as roads or sidewalks may be less used, which can lead to higher maintenance costs. Vacancies in the centers can also be caused by a shift in shopping opportunities to the outskirts and a fundamental change in the purchasing behavior of the citizens. Due to these structures and behaviors, people use their cars more often and thus fuel consumption has increased. For less mobile people, losing shops in their direct proximity equals losing autonomy and limiting their possibilities for social interaction.

2. *Vision*

A space, land, and mobility policy based on social and ecological criteria combines energy savings with other urgent issues found in rural areas. Creating more compact settlement structures helps to save heating energy and to minimize land consumption. Infrastructure is being utilized and can operate economically. Living, working, and leisure activities take place in spatial proximity. A secured regional supply of everyday goods and services and attractively designed public spaces can reduce the need to cover large distances as well positively influence the social climate in the towns. Innovative mobility concepts that include public and private actors, as well as new technologies, allow all citizens a satisfactory level of regional mobility that is sustainable. This way the total energy demand and the necessity for cars is recuded.

3. Measures

Establishing and Maintaining Compact Settlement Structures

Through city and urban land-use planning as well as with the help of urban and private contracts, a municipality can influence the energy issues that arise in settlement structures. By prioritizing densification of the existing building stock, a compact and energy-efficient residential structure can be created, which promotes local mobility and minimizes space consumption. This includes the use of vacant plots as well as a renovation of the village center, i.e. renovating old buildings or demolishing them followed by new construction. Further, due to densification, the maintenance costs of supply and disposal infrastructure will be spread-out over a larger number of households. In order to promote densification, the development of areas can be restricted or given up completely. However, such regulations could be difficult to implement, since the development of new areas is a common instrument for the recruitment of new residents, especially if the region competes with other municipalities. Alternatively, municipalities can offer residents financial incentives to renovate old buildings or to demolish them and construct new buildings (> Info box: Strengthening Town Centers). In addition, the use of solar radiation to supply energy to individual buildings can be promoted. Standards can be set which require the active use of solar radiation, e.g. through solar thermal panels or the use of passive solar radiation, e.g. windows facing south.

Supporting Local Supply and Mixed Utilization

In addition to the conversion of vacant buildings in towns, the municipality can also promote commercial implementation and subsequent uses. This allows the community to stop or at least slow down the trend, that land use for residential and commercial purposes is increasingly separated. Another approach to support the ("by foot") local supply with everyday products, is the establishment of a new or the conservation of an existing small village store (> Info box: Village Store Network). This supports especially the aging and less mobile population. Furthermore, it can serve as a place for social interaction. By focusing on local or regional products the local or regional identity of the local population is addressed. Under these circumstances it is possible to make social and ecological connections visible such as the energy use for food transport.

Strengthening Town Centers

A good example of how town centers can be actively strengthened is the **town of Morbach** in Rhineland-Palatinate, Germany. Since 2008, the city has a program that provides citizens with funding for the renewed use of vacant buildings for residential purposes and includes renovations and restoration measures as well as the demolition of buildings that are not able to be preserved. See also local government Morbach (2012) (47, in German).

Energy Efficient Urban Land-Use Planning

The "Energy-efficient urban land-use planning" program for the **city of Erfurt** (2007) (48, in German) provides an overview of how urban planning and development design plans can impact the utilization of solar energy and avoid heat loss from buildings.

Village Store Network – Securing the Local Supply in Rural Areas

In 2001, the citizens of the **town of Otersen** in Lower Saxony founded a village store and at the same time a village store network. The internet-networking platform collates information about village stores all over Germany and the necessary and ideal conditions for their implementation. See the Village Store Network GbR (49, in German).

Environmental and Family-Friendly Mobility in Rural Areas

In 2012, the Technical University of Berlin published a guide entitled “Environmental and family-friendly mobility in rural areas” (50, in German). It highlights both the successes and obstacles associated with alternative **mobility forms** as well as many best-practice models, including transportation services in Germany (website and guide are in German, an introductory flyer can be downloaded in English).

Providing Community Cars

Car-sharing not only functions in big cities, but also in rural areas. The cooperative “Regionally Supplied eG” (52, in German) located in Uffenheim, Bavaria, offers **car-sharing** for its members. The aim is to achieve environmental benefits and to build structures that secure mobility in the rural areas despite rising fuel prices.

Developing Alternatives to Private Car Transportation

A key task for local authorities is to offer alternatives to private car transportation and in general achieve lower energy consumption in the mobility sector. It is a major goal, which can only be achieved through a mix of policies: appropriate infrastructure construction, new organizational forms, and new technologies. A new municipal mobility structure could include: (electro-assisted) bicycles as well as other electro-assisted mobility options (> Info box: Electromobility), sharing systems, public transportation, as well as carpooling, and/ or a combination of these types of mobility.

Especially the promotion of bicycles provides effective options for municipalities: on the one hand, a large part of the daily distances covered by car are less than five kilometers and on the other hand many structures are already available (e.g. bicycles and bicycle paths). In addition, new bicycle paths facilitate the use of bicycles and could generate synergies with the tourist cycling traffic. Along with the expansion of cycling infrastructure, the radius of a car-free mobility can be extended by creating the possibility to transport bicycles with public transportation. Bicycles that are supported by an electric motor, often called "Pedelecs" (Pedal Electric Cycle) could lower the hurdles to be mobile by bike in hilly areas (> Info box: Pilot Project "Landrad" – Country Bicycles). Nonetheless, the use of cars needs to continue to be part of a regional mobility concept. Especially for families with children, the use of a car in rural areas is often necessary. However, it is at least possible to reduce the need for a second car through car sharing systems. Such sharing systems can be organized privately or institutionally (> Info box: Providing Community Cars). Increasing individual mobility in general can be fostered by providing mobile services such as transportable bank branches and grocery stores. In an aging society, these concepts have the advantage that older citizens can retain their independence despite their decreasing physical mobility. The use of mobile service providers is an alternative to a village store. Depending on local circumstances, the advantages and disadvantages of both alternatives can be considered (> Info box: Environmental and Family-Friendly Mobility in Rural Areas).

Pilot Project "Landrad" –Country Bicycles

In Vorarlberg, Austria, a hilly region of the country, a pilot project was carried out with over 500 participants and looked at everyday mobility with **Pedelecs** (e-bicycles). The results indicate that this technology has the potential to be developed as an alternative to car transport. See Kairos - Impact Research and Development gGmbh 2010 (51, in German).

Electromobility

Electromobility is a possible way to make the transport sector greener. A review of electromobility options should be carried out under the following aspects:

- **Technology** (especially range, charging cycles, and charging time)
- **Ecology** (is there an improvement in contrast to transport depending on fossil fuels?)
- **Economics** (costs to the user, funding possibilities)
- **Social** (is the new technology accepted?)

4.4 Converting Energy – Converting Biomass

1. What is this About?

The use of RE reduces the use of fossil and nuclear fuels and thus positively affects the environment and the climate. In addition, the use of bioenergy for electricity and heat is theoretically carbon neutral as the plants absorb carbon during their growth through photosynthesis. Simply put, the same amount of carbon is again released during the process of energy conversion. The utilization of biomass for energy has consistantly increased in recent years in Germany due to the Renewable-Energy-Act (EEG). Farmers especially have often invested in biogas plants that are often only for electricity generation. In these cases the waste heat is released into the atmosphere. Meanwhile the heat utilization is a precondition for remuneration under the EEG, but in many older biogas plants there is still potential to increase efficiency.

2. *Vision*

In terms of a social-ecological utilization, the efficient use of bioenergy is an important issue. Through efficient use, emissions and the energy expenditure along the supply chain can be minimized. This also includes, e.g. the release of methane from digestates. As bioenergy sources are used as efficiently as possible, they replace the use of fossil fuels, thus attaining climate protection and resource savings. To prevent other negative environmental impacts, the goods water, soil, and air should be continuously protected (> Chapter 4.3 Designing Space). At the same time, local actors should realize that the potentials are limited and that the construction of a plant will determine material flows for a long time. For the control of material flows and the planning of bioenergy plants, a municipal or regional bioenergy strategy is necessary. This helps to avoid competition for bioenergy sources and to increase the efficiency of existing options through better heat utilization.

Evaluating Technologies

Bioenergy is the most versatile RE source: it can be used for both electricity and heat as well as for fuel. Furthermore, it can be stored, resulting in many opportunities for municipal use.

As the technologies for bioenergy utilization have different characteristics, the installed systems should be adapted to the local conditions. These conditions include:

- existing sustainable potentials (> Chapter 4.3 Designing Space) and their attributes (quantity and availability, quality and cost)
- existing infrastructure
- legal authorization
- different preferences of the actors (> Chapter 4.1 Creating Together)
- financial conditions for the construction and operation of the plant

A good basis for the development of bioenergy utilization is to combine various technologies that are best suited to the location. For this, the locally adapted technologies should be evaluated and compared. Relevant criteria are the potential catchment area, the availability of raw materials, and the heat demand in the region. Tools for the assessment of technologies are essential for this as well as information on how to weight the criteria (> Info box: Evaluating Technologies).

Bioenergy is used for generating controllable power and heat, which is an increasingly important feature of energies in general and RE in particular. A better coordination with other RE sources and unburdening of the electricity grid (> Chapter 4.5 Connecting Power) would be possible if the technical preconditions, e.g. larger biogas storage tanks, are implemented.

Evaluating Technologies

Tool for assessing the feasibility of a bio-technology can be found in: Strategies for Sustainable Energy Utilization from Biomass in Selected Model Regions (53, in German).

Using Bioenergy Efficiently

In principle, it should be distinguished between plants that only produce heat and those technologies that provide electricity and heat: also referred to as combined heat and power plants (CHP). For locations where the heat utilization is not possible, the extraction of gaseous fuels may be an option. This can be biogas that is purified to natural gas quality and fed into the gas grid or biogas that is transported via specially provided pipes to a converting plant.
Whether the supply for the surrounding households and businesses can be organized with a district heating grid or decentralized with building-specific heating systems depends on the location. The combined generation of heat and electricity is characterized by a more efficient use of the energy source. From an ecological perspective it is therefore preferred. The successful development of a district heating network requires the support and involvement of many actors such as customers, heat network operators, and land owners (> Chapter 4.2.2 Cooperative Added Value). It should be considered as well that the heat demand may be reduced in the future due to new insulation in existing buildings and the high standard of insulation in new buildings. This is relevant for the load in the network. It should be noted that building a district heating network in existing settlements may require a significant number of construction projects (> Chapter 4.3.2 Settlement Structures).
Many examples for older bioenergy plants, which are operated for electricity generation, only show that a later inclusion of heat utilization is possible. For this, actors other than plant operators can also invest in a heat supply system (e.g. citizens or municipalities) and agree on the terms and conditions between the heat supplier and service provider (> Info box: Contract Design). Waste heat, also referred to as secondary or low-grade heat, can be used to dry wood, grain, or digestate. With the use of absorption chillers, the waste heat can also be used for cooling, e.g. for cooling milk on farms.
Many older biogas plants have the potential to enhance their efficiency, e.g. through sealing the digestate container. In systems without digestate containers, the residual gas remains unused and climate relevant methane escapes into the atmosphere. Such sealing is found in new plants, but often not in older facilities. Furthermore, the optimizations in the retention time or professional ensiling are technical measures that can improve the efficiency of the system (> Info box: Optimization of Biogas Plants).

Combined Heat and Power vs. Individual Heating

Further reading on the relevant conditions can be found e.g. in “Bioenergy - Examples and Strategies for Local and Regional Bioenergy” (54, in German).

Optimization of Biogas Plants

Recommendations for the design, operation, and optimization of biogas plants can be found in (55, in German).

Quantification of Environmental Impacts

The environmental impact of the different steps of the life cycle for providing final energy from biomass in comparison to conventional final energy provision are highlighted in (56, in German).

Evaluating the Ecological Benefits

What are the ecological benefits of bioenergy in comparison to the existing energy supply? To answer this question, the net effect consisting of positive and negative ecological effects has to be determined. Thus, the effects across the entire value chain have to be analyzed and compared (> Chapter 4.2.2 Co-operative Added Value). The biomass production, transport processes, the conversion to electricity and heat as well as the use of waste materials have to be considered. In order to use limited resources in an ecologically efficient manner, the choice of technologies, the used energy sources as well as the utilization of heat should be considered in light of their ability to contribute to climate protection (> Info box: Quantification of Environmental Impacts). Figure 3 illustrates, for various technologies, how much less carbon dioxide is emitted if the conventional energy sources are replaced by sources using bioenergy. It reinforces the importance of high heat utilization in combined heat and power plants.

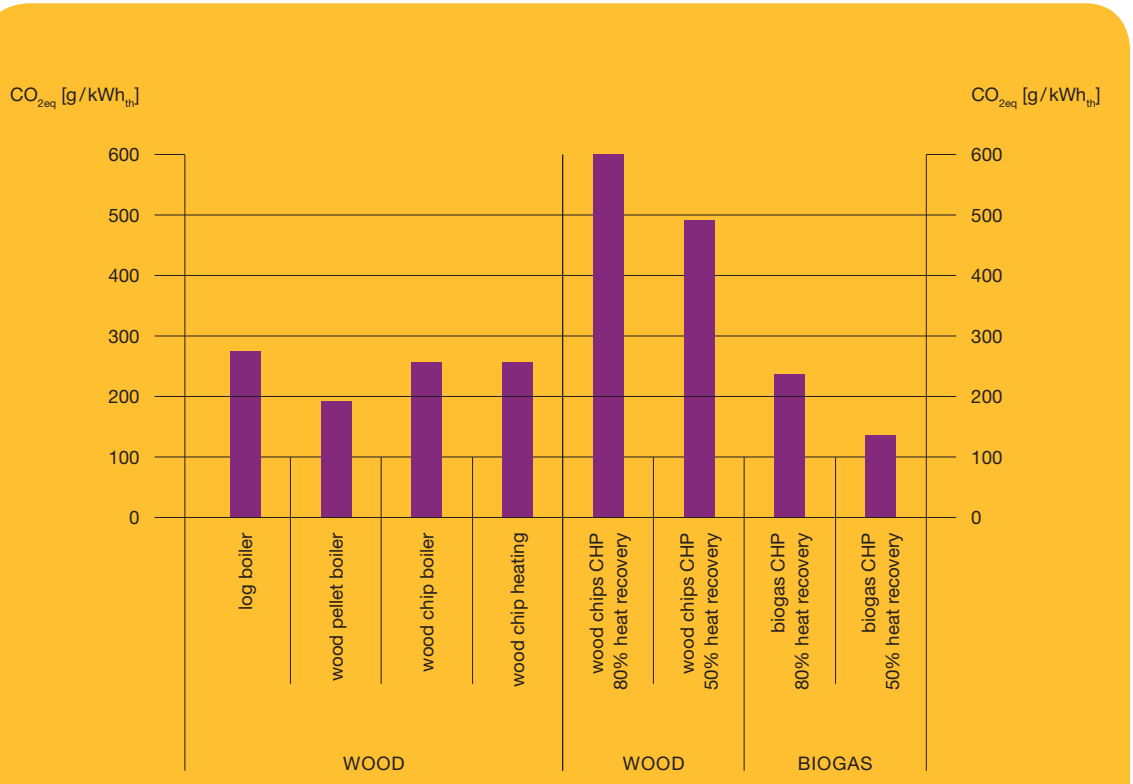


Figure 3: Potential of Different Bioenergy Technologies to Reduce Greenhouse Gases (2012)

Controlling the Expansion of Bioenergy Locally

The expansion process of RE for self-sufficiency consists of many individual activities, which the municipality only partially controls. Nevertheless, the municipality can try to influence the utilization of bioenergy and direct it towards a social-ecological orientation:

- The municipality can directly control the exploitation of its own potential. This includes municipal residual biomass and organic waste as well as municipal forests (> Info box: RE Potentials). Here, the municipality can directly decide, e.g. through contractual arrangements which bioenergy plant should be used and for which application.
- The municipality can provide its own properties with heat from bioenergy plants and thus proactively push the utilization of heat e.g. from combined heat and power plants. In addition, it can also act as an operator of a plant and supply surrounding customers through a heating grid.
- The municipality can offer advice and create networking (> Chapter 3.2 Networking Center). For potential operators of bioenergy plants, a networking center can provide relevant information about the local potential or the local heat consumers. Further, the municipality can offer technical help in order to increase efficiency. Another task can be to bring relevant actors together for the construction of a facility or the utilization of heat.
- If the bioenergy sources have to be imported into the municipality or the region, the ecological aspects should be equally considered (> Chapter 4.3 Designing Space). For municipal systems, this can be considered at the same time as when selecting the suppliers. The municipality can raise the awareness of other operators as pertains to this issue, by providing information and guidance on how a supply of sustainable bioenergy can be achieved, e.g. by informing about labels or naming suppliers (>Info box: Sustainable Procurement and the Exchange of Information).

4.5 Connecting Power

1. What is this About?

For several years, the development of facilities that produce electricity from RE has rapidly progressed. This requires adjustments to the entire power supply system. To further ensure a secure supply of electricity for all consumers, a technical grid-enhancement is necessary. Ideally, grid optimization has priority over grid reinforcement, which in turn has priority over expansion. This can be completed through measures such as storage expansion or the use of information and telecommunication technologies. A particular challenge is to take into account social-ecological criteria: the new construction of transmission networks is often perceived by the public as a negative landscape change and connected to a possible loss in property value. Further, impacts on the environment and electromagnetic fields tend to hold a negative connotation and are suspected as being a potential health hazard. At the distribution level, the German network operators are legally obligated to promote the expansion. However, the operators may face problems such as delays in legal approvals or due to varying interests.

2. *Vision*

Regional RE self-sufficiency is embedded in a power supply system, which is also powered entirely with RE on a national level. This includes high amounts of fluctuating sources and relatively small production units with the grid being expanded in accordance with the regional potential. Transmission and distribution grid capacities are strengthened to balance the increasing distances of power transportation. Alternatives or additions to the grid expansion, such as increasing the flexibility in the system (e.g. increased energy storage, smart grid approaches) are implemented at appropriate places. The system is adapted accordingly to nature conservation issues and with the participation of the involved actors. In particular, the citizens as well as the local authorities and NGOs, which can act as a liaison between planners and the public, have a right to co-decision making. The planning is done quickly and with the optimal solution for the region. This is supported by providing information on technical, ecological and economic aspects, process transparency, and open discussions in the decision-making process. Furthermore, financial participation for affected actors is possible.

3. Measures

Large-Scale Balancing with Transmission Networks

The expansion of the transmission network only directly affects communities and citizens if it already exists on municipal grounds or if it is planned to be located there. Currently, the planning of the anticipated network expansion in Germany is coordinated on the national level by the Federal Networking Agency (> Info box: Public Participation in Grid Expansion). Actions toward network optimization are generally weaker interventions than the new construction of power lines and should therefore, if possible, be preferred. Such optimization measures include, for example, the monitoring of the conductor cable to temporarily increase the transmission capacity and grid reinforcement; meaning the increase in voltage of an existing line. The task of a municipality that is affected by the expansion would be to demonstrate to their citizens on the one hand the necessity of grid expansion and on the other hand ensure that the construction work is carried out in a socially just and environmentally sensitive way. There are different ways to minimize negative effects and increase acceptance in society (> Info box: Starting Points for Local Authorities in the Transmission Grid Development).

Transmission and Distribution Grids

How citizens and representatives of municipalities and counties can influence the local development of transmission and distribution networks differs.

The grid can be categorized according to voltage levels and tasks. With some exceptions, electricity in Germany is traditionally produced in **large central power plants** that mainly feed the high or very high voltage grids, also called transmission grids. The four German transmission grid operators are responsible for the widespread distribution of electricity and the **balancing of the system** in order to achieve a stable consistency between supply and demand. The distribution grids are responsible for the local-level allocation of electricity to end users. They operate at a lower voltage.

The growing proportion of renewable generation units and their geographical distribution (recent years have shown a concentration of wind power in the north and of photovoltaic systems in the south of Germany) has lead to an increased need for an expansion of the transmission grid. The plants are connected to different voltage levels according to their capacity. The transits that occur now, are no longer exclusively from a higher to a lower voltage level. Often an expansion and adaption of the distribution grid is therefore also needed.

Public Participation in Grid Expansion

Public participation should be ensured in a multistep process and regularly encouraged. At different levels, various actors can participate within a certain time frame. These include public agencies (including specialized agencies, affected municipalities, and environmental organizations), initiatives, associations, and interest groups as well as individuals.

In Germany, the planning approval procedure is carried out either on the national or state level, depending on the route of the new transmission line. For more information see Federal Network Agency 2012 (64, in German) and Transmission Network Operators 2012 (65, in German).

Starting Points for Local Authorities in the Transmission Grid Development

Starting Point: What can the municipality do?	Further information:
• The municipality should use their co-decision right in the planning process from the beginning on and act as a link between its citizens and the Federal Network Agency.	Federal Network Agency 2012 (57, in German) and > Chapter 4.1.2 Civic Participation
• The ability to influence new lines should be examined, if applicable, in cooperation with other affected neighboring municipalities.	> Info box: Public Participation in Grid Expansion
• Continuous communication with citizens should be ensured in order to preserve transparency during the process.	> Chapter 3 On the Way to Social-ecological RE Self-Sufficiency and > Chapter 4.1.2 Civic Participation
• The public should be informed concerning possible environmental and health effects.	Forum for Integration of RE (58, in German) and Federal Office for Radiation Protection 2011 (59, in German)
• It should be examined whether financial participation opportunities for citizens are possible and attract interest.	Grundmann 2011 (60, in German)
• The technical options should be disclosed and through the inclusion of the population, the solution that fits the local conditions best should be selected.	
– Illustrate advantages and disadvantages of overhead lines and underground lines	Forum for Integration of RE (61) (in German) & Leprich 2011 (62) (in German)
– Consider new pole design or line construction to improve the appearance and reduction of electromagnetic fields.	Tennet 2012 (63)

Distribution Networks: Regional Distribution of Electricity and the (Re-) Municipalization of Grids

If there is a shortage at the level of distribution networks, there are structural and technical ways in which the distribution network operators, communities, and citizens can deal with them. The expiry of concession contracts can be an opportunity to restructure the network operations and as a result have more room to maneuver. This can be of special interest to communities in which the network expansion is slow and a municipal company does not operate the network. Municipalities in Germany are legally required to announce the end of a contract and the application period for interested providers in the Federal Gazette at least two years before the contract ends. Besides extending the old contract or searching for a new partner who takes over the operation of the network, the municipality also has the option to buy back the network at its current value and convert it into a municipally-owned power grid company. The founding of public utilities that can invest in their own generated units is also a possibility. As various examples have shown, an initiative by citizens can bring this process forward (> Info box: **Citizen-Owned** Grid). The risks and opportunities of a network repurchase should be carefully considered in the respective municipality. Further information about concession contracts and re-municipalization can be found in a brochure by the Association of Municipal Companies 2012 (66, in German).

Citizen-Owned Grid

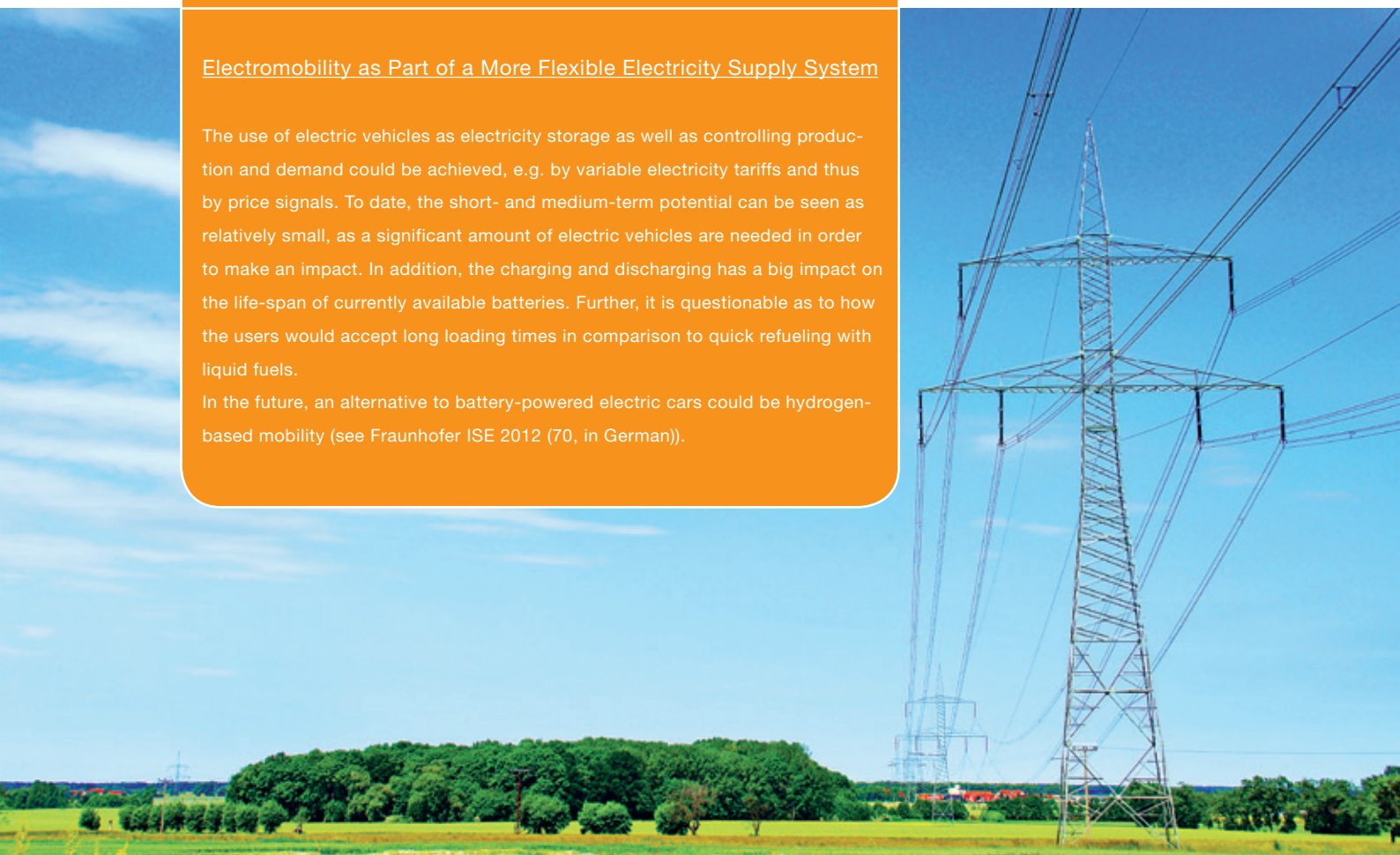
Citizens can not only promote the energy transition as investors in RE systems, but also through influencing the networks. The **EWS Schönau** network operator and green electricity provider is the oldest example of a network purchased by citizens in a rural area, see EWS 2012 (67) (an introduction to the project is available as a pdf on the website in English).
The citizens' initiative **Energy Berlin** 2012 (68, in German) is a current example of the process taking place in a large city.

Distribution Networks: Expansion and Technical Possibilities

Beyond reinforcements or network expansion, on a technical level there are many ways to prepare the network to include additional RE generation capacities. A bioenergy plant can represent such a possibility, as its fuel and the biogas produced can be stored and thus variably used. Bioenergy plants have the potential to compensate for the fluctuating production from wind and solar energy, as well as the change in demand. With this function, they can also play an important role in a local smart grid - an intelligent distribution network. Modern information and communication technology can help to control power generation and demand in smart grids via power storage and comprehensive network management. Electromobility can hereby play a supporting role (> Info box: Electromobility as Part of a More Flexible Electricity Supply System). As well as the expansion of the distribution network, feed-in grids can be tested. These supply the renewably generated electricity directly into the transmission network. Moreover, citizens can participate financially and in the planning process (for more information: German Wind Energy Association 2012 (69, in German)).
So far it is not clear who will pay the price for these new and to a larger extent relatively untested technological approaches. In Germany, only directly grid-related measures are legally regulated and therefore financially sound. Until changes on the state or national level occur and set the necessary incentives, single projects as well as individual or entrepreneurial initiatives are the only options to implement such beacon projects (> Chapter 4.1 Creating Together).

Electromobility as Part of a More Flexible Electricity Supply System

The use of electric vehicles as electricity storage as well as controlling production and demand could be achieved, e.g. by variable electricity tariffs and thus by price signals. To date, the short- and medium-term potential can be seen as relatively small, as a significant amount of electric vehicles are needed in order to make an impact. In addition, the charging and discharging has a big impact on the life-span of currently available batteries. Further, it is questionable as to how the users would accept long loading times in comparison to quick refueling with liquid fuels.
In the future, an alternative to battery-powered electric cars could be hydrogen-based mobility (see Fraunhofer ISE 2012 (70, in German)).



5 Guidelines for the Use of the Energy Compass

The Energy Compass can help you to discover to what extent the process towards becoming a RE self-sufficient region can be organized in a socially just and ecological sound manner. It can serve as a basis for discussion, of joint execution, and as an assessment of which fields of action must be expanded and those that have already been satisfactorily addressed. You can also compare the status quo of your municipality to the goals concerning heat and electricity from renewable sources. It is possible to discuss such questions as, e.g.:

- In which fields of action does further action need to be taken?
- Which fields of action are dealt with sufficiently?
- Are there any other fields of action that are relevant to our region?

The Energy Compass does not offer a complete evaluation of the process, but holds the possibility to develop the various fields of action depending on changing circumstances and objectives. Together it can be reflected upon, which steps on the road to self-sufficiency still need to be taken (> Chapter 3 On the Way to Social-Ecological RE Self-Sufficiency). The destination is the fulfillment of your vision of social-ecological self-sufficiency with renewable energies. The vision can be written into the center of the Energy Compass and the listed as well as the newly identified fields of action are then aligned with it. In the sub-sections under the main themes - Create Together, Add Value, Design Space, Convert Energy, and Connect Power – is room for your own thoughts, ideas, and projects. Moreover, there is room for an additional main theme that may be of high importance to your region or municipality. The Energy Compass is available online as a PowerPoint-file (1, in English) and one version has movable orientation marks, which enable you to see how close you are to your vision of social-ecological self-sufficiency with renewable energies. When shifting these orientation marks the progress within a field of action is no longer abstract, but visible. When fulfillment of the vision is in close proximity, the standpoint moves towards the vision and vice versa. Another option for use of the Energy Compass is to print it and affix it to a flip chart and use small magnets in place of the orientation marks.

To understand the process, the Energy Compass can also be utilized by individuals. However, it is recommended to use it together with other RE-actors in order to develop a comprehensive understanding of the status quo as well as the challenges ahead. Such a set-up makes it easier to progress towards the social-ecological energy transition together. The individual fields of action can be referenced in this guide. For an optimal use of the Energy Compass, the discussion participants should be familiar with the fields of action.

The PowerPoint file on the website www.ee-regionen.de (1, in English) allows you to set the orientation marks according to the current state of the transition and distribute it as a print out or use as a presentation at discussion rounds. In a second file, the fields of action are left blank to give you room for your own concrete projects, which can then be brought into the discussion. Displaying the Energy Compass in public could be an opportunity to show the local developments and act as a starting point to discuss the direction and progress with the local population as well as people from outside the region.

In 2012, the idea of the Energy Compass was discussed with the RE-Regions project partner municipalities. In January 2013, the RE-Regions partners in Lüchow-Dannenberg used the Energy Compass for the first time. We are very grateful to our partner municipalities for their constructive feedback, which helped tremendously in the development of the Energy Compass.

Good luck with the application of the Energy Compass in your own municipality or region!

Literature and Links

1 Introduction to the Guide

1) EE-Regionen.de: ppt-file of the Energy Compass. – www.ee-regionen.de (last access: 06.02.13)

3 On the Way to Sociol-Ecological RE Self-Sufficiency

2) Hopkins, R., 2008: Energiewende – Das Handbuch. Anleitung für zukunftsfähige Lebensweisen. – Frankfurt: Zweitausendeins; besonders: “Die Kraft positiver Visionen”, S. 96-105, “Planspiel”.

3) Tischer, M., Stöhr, M., Lurz, M. & L. Karg, 2006: Auf dem Weg zur 100% Region – Handbuch für eine nachhaltige Energieversorgung von Regionen. München: B.A.U.M. Consult; zu “Leitbild” besonders S. 48 f., zu “Akteursanalyse” S. 92 120.

4) 100RE.net – Der Internet-Marktplatz für Wissen rund um Erneuerbare Energien und Regionalentwicklung. – http://www.100re.net (last access: 18.12.12).

4.1 Creating Together

5) NEW – Neue Energien WEST, 2009: Zukunft gestalten mit Erneuerbaren Energien. – http://www.neue-energien-west.de (last access: 06.02.13).

6) Amschler, H., 2012: NEW – Neue Energien West eG und Bürger-Energiegenossenschaft West eG, zwei Genossenschaften – ein Ziel. Drei Landkreise auf dem Weg in die Energiezukunft. Präsentation auf dem 100-ee-Kongress. Online verfügbar: http://www.100-ee-kongress.de/fileadmin/redaktion/100-ee-kongress/Praesentationen/F6_Amschler.pdf (last access: 29.01.2013).

7) Frick, H.-J. & M. Hokkeler, 2008: Interkommunale Zusammenarbeit – Handreichung für die Kommunalpolitik. – Bonn: Friedrich-Ebert-Stiftung, Texte der Kommunalakademie, Band 4. Online verfügbar: http://library.fes.de/pdf-files/akademie/kommunal/05825.pdf (last access: 06.02.13).

8) Institut dezentrale Energietechnologien gemeinnützige GmbH, o. J.: 100-ee-Map. 100ee-Regionen: Raummuster – Musterräume. http://www.100-ee.de/index.php?id=100eemap (last access: 29.01.13).

9) Kress, M. & I. Landwehr, 2012: Akzeptanz Erneuerbarer Energien in EE-Regionen. Ergebnisse einer telefonischen Bevölkerungsbefragung in ausgewählten Landkreisen und Gemeinden. Online verfügbar: http://www.ioew.de/schriftenreihe-diskussionspapiere/ (last access: 04.02.13).

10) Naturschutzbund Deutschland e. V., 2006: Leitfaden Erneuerbare Energien Konflikte lösen und vermeiden. – Berlin. Online verfügbar: http://www.nabu.de/themen/energie/erneuerbareenergien/allgemein/05394.html (last access: 06.02.13).

11) Naturschutzbund Deutschland e. V., 2008: Kommunikationsratgeber zum Ausbau Erneuerbarer Energien. – Berlin.Online verfügbar: http://www.nabu.de/imperia/md/content/nabude/energie/20.pdf (last access: 06.02.13).

12) Haug, S. & R. Mono, 2012: Akzeptanz für Erneuerbare Energien – Akzeptanz planen, Beteiligung gestalten, Legitimität gewinnen. – Berlin: 100 prozent erneuerbar stiftung.

13) Windcomm Schleswig-Holstein, 2012: Leitfaden Bürgerwindpark MehrWertschöpfung für die Region. – Husum. Online verfügbar: http://www.windcomm.de/Downloads/Leitfaeden/Leitfaden-Buergerwindpark.pdf (last access: 06.02.13).

14) Storz, N., Oelsner, G. ,Müller, T., Milkowski, N., Jenssen, T., Hentschel, T., Velser, L. & M. Roth, 2012: Bürger machen Energie – Rechtsformen und Tipps für Bürgerenergieanlagen. Stuttgart: Ministerium für Umwelt, Klima und Energiewirtschaft Baden-Württemberg. Online verfügbar: http://www.lubw.baden-wuerttemberg.de/servlet/is/221870 (last access: 06.02.13).

15) Agentur für Erneuerbare Energien e. V. & Deutscher Genossenschafts- und Raiffeisenverband, 2011: Energiegenossenschaften – Bürger, Kommunen und lokale Wirtschaft in guter Gesellschaft. – Berlin. Online verfügbar: http://www.kommunal-erneuerbar.de/fileadmin/content/PDF/Energiegenossenschaften_web_normal.pdf (last access: 29.01.13).

16) Prüfungsverband der kleinen und mittelständischen Genossenschaften e. V., 2012: Der Weg zur eingetragenen Genossenschaft – Gründungsleitfaden. – Berlin. Online verfügbar: http://www.pruefungsverband.de/fileadmin/user_upload/website/pdf/Gruendungsleitfaden_PkmG_8_07.pdf (last access: 29.01.13).

17) Frondel, M., 2012: Der Rebound-Effekt von Energieeffizienz-Verbesserungen. – Energiewirtschaftliche Tagesfragen 62/8. Online verfügbar: http://www.et-energie-online.de/Portals/0/PDF/zukunftsfragen_2012_08_frondel.pdf (last access: 29.01.13).

18) Landkreis Schwäbisch-Hall, 2010: Energiebericht. Schwäbisch-Hall: Kreiskämmerei-Hochbau/Gebäudemanagement. Online verfügbar: http://www.lrasha.de/publishNews/redirect.php?id2=9542&id=2437-1301926961-0.pdf (last access: 06.02.13).

19) ICLEI – Local Governments for Sustainability: The Procura+ Campaign. http://www.procuraplus.org (last access: 05.12.12).

20) Klima-Bündnis der europäischen Städte mit indigenen Völkern der Regenwälder / Alianza del Clima e. V., 2012: Energie- und CO2-Monitoring – ECORegion. http://www.klimabuendnis.org/co2-monitoring0.html?&L=1 (last access: 06.02.13).

21) Deutsches Institut für Urbanistik gGmbh (Hrsg.), 2011: Klimaschutz in Kommunen – Praxisleitfaden. – Berlin: S. 213-285. Online verfügbar: http://www.leitfaden.kommunaler-klimaschutz.de/sites/leitfaden.kommunaler-klimaschutz.de/files/pdf/klimaschutzleitfaden.pdf (last access: 06.02.13).

22) Albrecht, T., Deffner, J., Dunkelberg, E., Hirschl, B., van der Land, V., Stieß, I., Vogelpohl, T., Weiß, J. Julika & S. Zundel, 2010: Zum Sanieren motivieren – Eigenheimbesitzer zielgerichtet für eine energetische Sanierung gewinnen. – Senftenberg: Projektverbund ENEF-Haus. Online verfügbar: http://www.enef-haus.de/fileadmin/ENEFH/redaktion/PDF/Zum_Sanieren_Motivieren.pdf (last access: 06.02.13).

23) GERTEC GmbH Ingenieurgesellschaft, 2012: Haus im Glück – Hintergründe und Ziele. – http://alt-bau-neu.de und http://www.hausimglueck.info (last access: 06.02.13).

24) Stadt Freiburg i. Br., 2012: 200 Familien aktiv fürs Klima – Nachhaltige Entwicklung

zum Selbermachen. – http://www.freiburg.de/pb/,Lde/232389.html (last access: 06.02.13).

25) Stadt Basel, o. J.: Lenkungsabgabe, Stromspar-Fonds Basel. – http://www.aue.bs.ch/fachbereiche/energie/lenkungsabgabe.htm (last access: 06.02.13).

4.2 Adding Value

26) Agentur für Erneuerbare Energien & Trägerschaft des Vereins Information und Kommunikation für Erneuerbare Energien e. V., 2008: Gute Nachbarn – Starke Kommunen mit erneuerbarer Energie. – http://www.kommunal-erneuerbar.de (last access: 01.12.12).

27) Ruppert, H., Eigner-Thiel, S., Girschner, W., Karpenstein-Machan, M., Roland, F., Ruwisch, V., Sauer, B. & P. Schmuck, 2010: Wege zum Bioenergiedorf – Leitfaden. Gülzow: Fachagentur Nachwachsende Rohstoffe e. V.
Online verfügbar: http://www.fnr-server.de/ftp/pdf/literatur/pdf_318-leitfaden_bioenergiedorf_2010_web_neu.pdf (last access: 06.02.13).

28) Arbeitsgemeinschaft Landtechnik und landwirtschaftliches Bauwesen in Bayern e. V., o. J.: Biogasforum Bayern. – http://www.biogas-forum-bayern.de (last access: 19.12.12).

29) EnergieAgentur.NRW, 2011: Klimaschutz mit Bürgerenergieanlagen. – Wuppertal: EnergieAgentur.NRW.
Online verfügbar: https://broschueren.nordrheinwestfalendirekt.de/broschueren-service/energieagentur/ klimaschutz-mit-buergerenergieanlagen/1265 (last access: 06.02.13).

30) Bund für Umwelt und Naturschutz Deutschland, BUND: – sicher – günstig – regional – ökologisch – Jetzt zum BUND-Regionalstrom wechseln! – http://www.bund-regionalstrom.de (last access: 01.12.12).

31) Regionalwert AG, o. J.: Bürgeraktiengesellschaft in der Region Freiburg. – http://www.regionalwert-ag.de (last access 19.12.12).

32) Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (BMU) – http://www.erneuerbare-energien.de (last access 25.1.13).

33) Clearingstelle EEG – http://www.clearingstelle-eeg.de (last access 25.1.13).

4.3 Designing Space

34) Ammermann, K., 2011: Landschaftsgerechte Erzeugung von Bioenergie. – Berlin: Bundesamt für Naturschutz.
Online verfügbar: http://www.mvi.baden-wuerttemberg.de/servlet/is/100680/ammermann.pdf (last access: 06.02.13).

35) Fachagentur Nachwachsende Rohstoffe e.V., o. J.: Wildpflanzen für Biogas. – http://www.energiepflanzen.info/projekte/wildpflanzen (last access: 01.12.12).

36) Leible, L., Arlt, A., Fürniß, B., Kälber, S., Kappler, G., Lange, S., Nieke, E., Rösch, C. & D. Wintzer: Energie aus biogenen Rest- und Abfallstoffen – Bereitstellung und Nutzung organischer Rest- und Abfallstoffe sowie Nebenprodukte als Einkommensalternativen für die Land- und Forstwirtschaft – Möglichkeiten, Chancen und Ziele. – Karlsruhe: Forschungszentrum Karlsruhe in der Helmholtz-Gemeinschaft, Wissenschaftliche Berichte FZKA 6882.
Online verfügbar: http://www.itas.fzk.de/deu/lit/2003/leua03a.pdf (last access: 06.02.13).

37) Dunkelberg, E., Aretz, A., Böther, T., Dieterich, M., Heintschel, S. & C. Ruppert-Winkel, 2011: Leitfaden für die Nutzung kommunaler, halmgutartiger Reststoffe in Mikrobiogasanlagen und Bestandsanlagen. – Freiburg: Zentrum für Erneuerbare Energien, Working Paper 05-2011.
Online verfügbar: http://www.zee-uni-freiburg.de/index.php?id=65 (last access: 06.02.13).

38) Landesbund für Vogelschutz in Bayern e. V., o. J., Wo lege ich Blühstreifen an? – http://praxistipps.lbv.de/praxistipps/bluehstreifen-im-acker/einen-bluehstreifen-anlegen.html (last access: 06.02.13).

39) Suchomel, Ch. & W. Konold, 2008: Niederwald als Energiequelle – Chancen und Grenzen aus Sicht des Naturschutzes. – Ber. Naturf. Ges. Freiburg i. Br., 98, S. 61-120.
Online verfügbar: http://www.landespflege-freiburg.de/ressourcen/suchomel_niederwald.pdf (06.02.13).

40) Suchomel, Ch., 2008: Das Niederwaldprojekt: Schutz durch Nutzung – Multifunktionale Entwicklung von Niederwäldern in Rheinland-Pfalz. – http://www.niederwald-rlp.de/projekt.html (last access: 06.02.2013).

41) Naturstiftung David, 2012: Ergebnisse. – http://www.naturstiftung.de/index.php?pageid=61 (last access: 06.02.13).

42) Bemmann, A., 2012: Das Energieholzportal. – http://www.agrofornet.de/ (last access: 30.11.12).

43) European Biomass Association, o. J.: Pell-Cert Project. – http://www.enplus-pellets.eu/pellcert/ (last access: 06.02.13).

44) Steinbeis-Transferzentrum Geoinformation und Landmanagement, 2012: Sun-Area. – http://www.sun-area.net/ (last access: 30.11.12).

45) Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, 2010: Potentialermittlung für den Ausbau der Wasserkraftnutzung in Deutschland. – http://www.bmu.de/erneuerbare_energien/downloads/doc/47027.php (last access: 04.02.13).

46) Klärle, M., Langendörfer, U., Olschewski, A. & A. Albinus, 2011: Potenzialanalysen für Erneuerbare Energien. Ein Leitfaden für Kommunen und Landkreise. Frankfurt: Fachhochschule Frankfurt am Main.
Online verfügbar: http://www.fh-frankfurt.de/de/fachbereiche/fb1/ansprechpartnerinnen/professorinnen/geomatik/klaerle/forschung/erneuerbar_komm.html (last access: 06.02.13)

47) Gemeindeverwaltung Morbach, 2012: Kommunale Förderung durch die Gemeinde Morbach. – http://www.morbach.de/foerderung_gemeinde_morbach.html (last access: 06.02.13).

48) Goretzki, P., 2007: Gutachten – Energieeffiziente Bauleitplanung – Erfurt: Stadtverwaltung Erfurt.
Online verfügbar: http://www.erfurt.de/imperia/md/content/stadtplanung/ip_gk/en_bp/gutachten_energieeffiziente_bauleitplanung.pdf (last access: 06.02.13).

49) Dorfladen Netzwerk GbR, 2012: Dorfladen-Netzwerk – Sicherung der Nahversorgung im ländlichen Raum. – http://www.dorfladen-netzwerk.de (last access: 30.11.12).

50) Ahrend, Ch. & M. Herget (Hrsg.), 2012: Umwelt- und familienfreundliche Mobilität im ländlichen Raum – Handbuch für

nachhaltige Regionalentwicklung. – Berlin: Technische Universität Berlin.
Online verfügbar: http://www.verkehrsplanung.tu-berlin.de/ufm-handbuch.pdf (last access: 06.02.13).

51) Kairos – Wirkungsforschung & Entwicklung gGmbh, 2010: Landrad – Neue Mobilität für den Alltagsverkehr in Vorarlberg. – Bregenz.
Online verfügbar: http://landrad.at/ fileadmin/downloads/110103_bericht_landrad.pdf (last access: 06.02.13).

52) Krämer, Ch., 2012: Das Gemeinschaftsauto - CarSharing geht auch auf dem Land! – http://regional-versorgt.de/projekte/gemeinschaftsauto. (last access: 04.02.13).

4.4 Converting Energy

53) Baur, F., Bemmann, U., Müller, N., Ziegler, C., Fritsche, U., Rausch, L., Hünecke, K., Effinger, A., Heck, P., Gebhardt, R., Wern, B., Hoffmann, D., Thrän, D., Lenz, V., Langheinrich, C., Hiebel, M., Stahl, E. & J. Krassowski, 2007: Strategien zur nachhaltigen energetischen Nutzung von Biomasse in ausgewählten Modellregionen. – Saarbrücken: Institut für ZukunftsEnergieSysteme, besonders S. 54 ff.
Online verfügbar: http://www.bioregio.info/cms/upload/pdf/BioRegio_ENDBERICHT.pdf. (last access: 5.12.12).

54) Baur, F., Bemmann, U., Franzen-Reuter, I., Müller, N., Schlegelmilch, S., 2007: Bioenergie – Beispiele und Strategien für eine kommunale und regionale Bioenergienutzung – Eine Chance für Kommunen und Regionen. – Radolfzell & Saarbrücken: Deutsche Umwelthilfe e. V. & Institut für ZukunftsEnergieSysteme, S. 14 ff.
Online verfügbar: http://www.duh.de/uploads/tx_duhdownloads/Bioenergie_Broschuere_klein.pdf (last access: 06.02.13).

55) Winterberg, R., Fischer, E., Postel, J., Rensberg, N., Daniel-Gromke, J. & H. Böker, 2012: Bioenergie Region Altmark. Empfehlungen zur Auslegung, zum Betrieb und zur Optimierung von Biogasanlagen. Gülzow: Fachagentur Nachwachsende Rohstoffe e.V.
Online verfügbar: http://www.bioenergie-portal.info/fileadmin/bioenergie-beratung/sachsen-anhalt/dateien/Handlungsleitfaden_Biogasanlagenbetrieb.pdf (last access: 29.01.13).

56) Dunkelberg, E., 2013: Ökobilanzen technischer Optionen zur Bioenergiebereitstellung und –nutzung. IÖW-Schriftenreihe 203/13.
Online verfügbar: www.ioew.de/schriftenreihe-diskussionspapiere/

4.5 Connecting Power

57) Bundesnetzagentur, 2012: Mitreden – Wer kann mitreden? – http://www.netzausbau.de (last access: 25.01.13).

58) Deutsche Umwelthilfe e. V., o. J.: Forum Netzintegration Erneuerbare Energien – Natur & Umwelt. – http://www.forum-netzintegration.de (last access, 17.12.12).

59) Bundesamt für Strahlenschutz, 2011: Strahlenschutz beim Ausbau der Stromnetze. Salzgitter: Bundesamt für Strahlenschutz.
Online verfügbar: http://www.bfs.de/de/bfs/publikationen/broschueren/elektromagnetische_felder/stromversorung_haushalt/Strahlenschutz_beim_Ausbau_der_Stromnetze.pdf (last access: 06.02.13).

60) Grundmann, M., 2011: Grüne Bürgernetzgesellschaft. – Breklum: ARGE Netz GmbH & Co. KG. Online verfügbar: http://www.arge-netz.de/fileadmin/template/uploads/dokumente/111006-Bürgernetzgesellschaft_0.2_01.pdf (last access: 06.02.13).

61) Deutsche Umwelthilfe e. V., o. J.: Forum Netzintegration Erneuerbare Energien. Stromnetz – Freileitung und Erdkabel – Vergleich Freileitungen – Erdkabel. – http://www.forum-netzintegration.de (last access, 17.12.12).

62) Leprich, U., Ritzau, M., Igel, M., Guss, H., Macharey, U., Diegler, J. & K. Weiler, 2011: Ausbau elektrischer Netze mit Kabel oder Freileitung unter besonderer Berücksichtigung der Einspeisung Erneuerbarer Energien. Saarbrücken: Institut für ZukunftsEnergieSysteme, Büro für Energiewirtschaft und technische Planung & Institut für elektrische Energiesysteme, Hochschule für Technik und Wirtschaft des Saarlandes.
Online verfügbar: http://www.bmu.de/files/pdfs/allgemein/application/pdf/studie_netzausbau_bf.pdf (last access: 17.12.12).

63) Tennet 2012: The Wintrack pylon. An innovative solution for new high-voltage lines. - http://www.tennet.org/english/images/0512078%20TEN%20Wintrack%20brochure%20EN_1_tcm43-18932.pdf (last access: 25.01.13).

64) Bundesnetzagentur, 2012: Netzausbau – Der Ablauf: Netzausbau in fünf großen Schritten - http://www.netzausbau.de (last access: 30.11.12).

65) 50Hertz Transmission GmbH, TenneT TSO GmbH, Amprion GmbH & TransnetBW GmbH, 2012: Neue Netze für neue Energien. Der NEP 2012: Erläuterungen und Überblick der Ergebnisse.
Online verfügbar: http://www.netzentwicklungsplan.de/content/netzentwicklungsplan-2012-1-entwurf (last access: 29.01.13).

66) Verband kommunaler Unternehmen (VKU) 2012: Konzessionsverträge. Handlungsoptionen für Kommunen und Stadtwerke. Berlin.
Online verfügbar: http://www.vku.de/fileadmin/get/?21833/Pub_VKU_Konzessionsvertraege__2_.pdf (last access: 29.01.13).

67) Netzkauf EWS eG, 2012: Guter Strom beginnt im Kopf. – http://www.ews-schoenau.de/ews/geschichte.html (last access: 17.12.12).

68) BürgerEnergie Berlin eG i. G., 2012: Wir kaufen unser Stromnetz. – http://www.buerger-energie-berlin.de (last access: 17.12.12).

69) Bundesverband WindEnergie e. V. (Hrsg.), 2012: Bewertung von Einspeisenetzen, Kurzstudie. Berlin: Bundesverband WindEnergie e. V.
Online verfügbar: http://www.wind-energie.de/sites/default/files/download/publication/bewertung-von-einspeisenetzen/bwe_studie__einspeisenetze_2012_final.pdf (last access: 06.02.13).

70) Fraunhofer Institut für Solare Energiesysteme, 2012: Mit Sonne und Wasser Auto fahren – Fraunhofer ISE weiht solare Wasserstoff-Tankstelle ein. - http://www.ise.fraunhofer.de/de/presse-und-medien/presseinformationen/presseinformationen-2012/mit-sonne-und-wasser-auto-fahren-fraunhofer-ise-weiht-solare-wasserstoff-tankstelle-ein (last access: 06.02.13).

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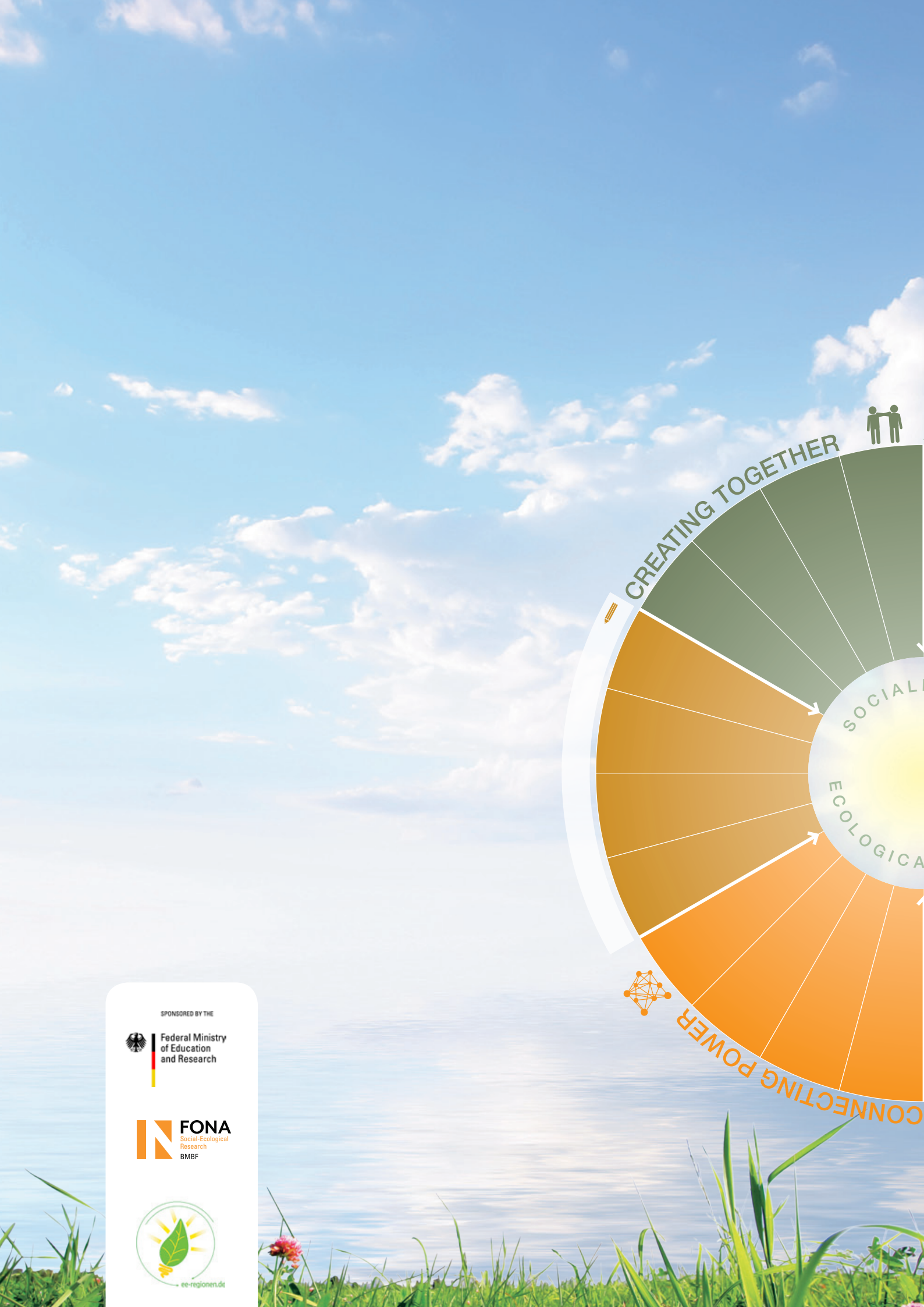

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