

# **Renewable Energies – A Chance for New Regional Industry Development?**

## **The Case of the ‘Living Lab Energy Avant-Garde Anhalt’**

# Renewable Energies – A Chance for New Regional Industry Development? - The Case of the ‘Living Lab Energy Avant-Garde Anhalt’

- ▶ The German “Energy-turnaround”: What does it mean in reality?
- ▶ Why Living Labs? Concept, Peculiarities and Prospects
- ▶ Living Lab Energy Avant-Garde Anhalt
  - Industrial History and Development of the Region
  - The Challenge and the Concept
  - The Focus on Regional Development
  - Three Projects:
- ▶ Some Research Questions: Renewable Energies a Chance for Regional industry Development

# The German “Energy-turnaround”: What does it mean in reality?

- ▶ The German ‘Energiewende’ (Energy-turnaround) is based on two pillars
  1. Abandoning the use of all fossil energy sources and shift to renewable and sustainable sources of energy supply
  2. Abandoning nuclear energy
- ▶ In simple terms this means:
  1. To abdicate **domestic** fossil sources of energy (brown as well as black coal)
  2. To shut down **all nuclear power plants** (and with that make all the investments in these facilities worthless)
- ▶ The challenge for Germany therefore is to transform the largest economy in the EU and the fourth largest economy in the world (only next to the USA, China, and Japan) and base its energy supply on renewable sources of energy.
- ▶ CAN THIS SUCCEED???
- ▶ IT HAS TO, BECAUSE ...

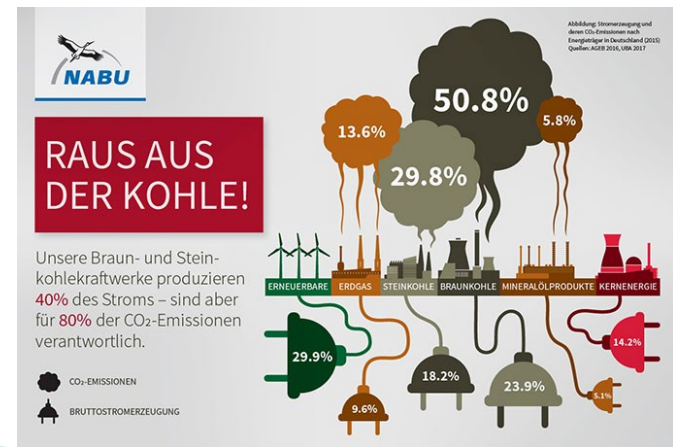
# The German “Energy-turnaround”: What does it mean in reality?

- ▶ Nuclear Energy has absolutely **no social acceptance** in Germany as a source of low carbon energy production
  - Risks of Nuclear Power Plants in densely populated Germany and Europe (vicinity to France or Czech Republic)
  - Perception of nuclear energy being a ‘Dinosaur technology’
  - Costs of Nuclear Energy (when taking waste handling costs into account, nuclear energy is by far the most expensive energy source – final costs still unknown or incalculable)
- ▶ With the decision of the German Bundestag on the 30<sup>th</sup> of June 2011 to end nuclear energy the last nuclear power plant is scheduled to close in 2022!



# The German “Energy-turnaround”: What does it mean in reality?

- ▶ Exiting Coal Energy Production
  - At the moment there is no legal basis for exiting production of coal based energy production.
  - However, in order to meet the EU and the domestic objectives for a carbon neutral economy and society (until 2050), coal is not an option for the future
- ▶ In Germany’s energy mix today, coal is providing ‘just’ 42.1% of electrical energy, however, it accounts for 80.6% of all CO2 emission related to electrical energy production!
- ▶ Therefore the end of the coal age is inevitable!!!
- ▶ Is Germany able to manage that?
- ▶ ANSWER: IT HAS TO





# The German “Energy-turnaround”: What does it mean in reality

Current Situation of the Brown Coal Industry in Germany

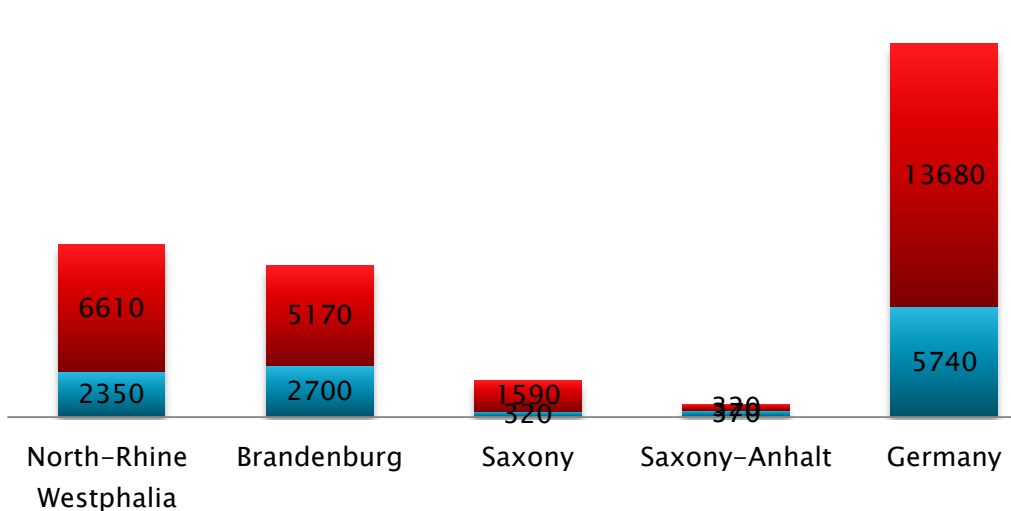


# The German “Energy-turnaround”: What does it mean in reality

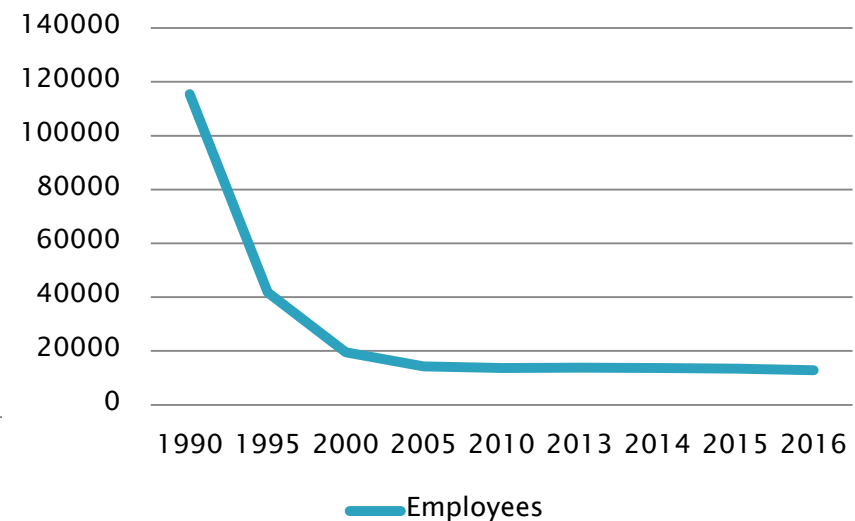
- ▶ Due to high automation, employment shrank drastically since 1990

## Brown Coal Related Employment

■ Brown Coal Power Plant ■ Brown Coal Open-Cast Mining



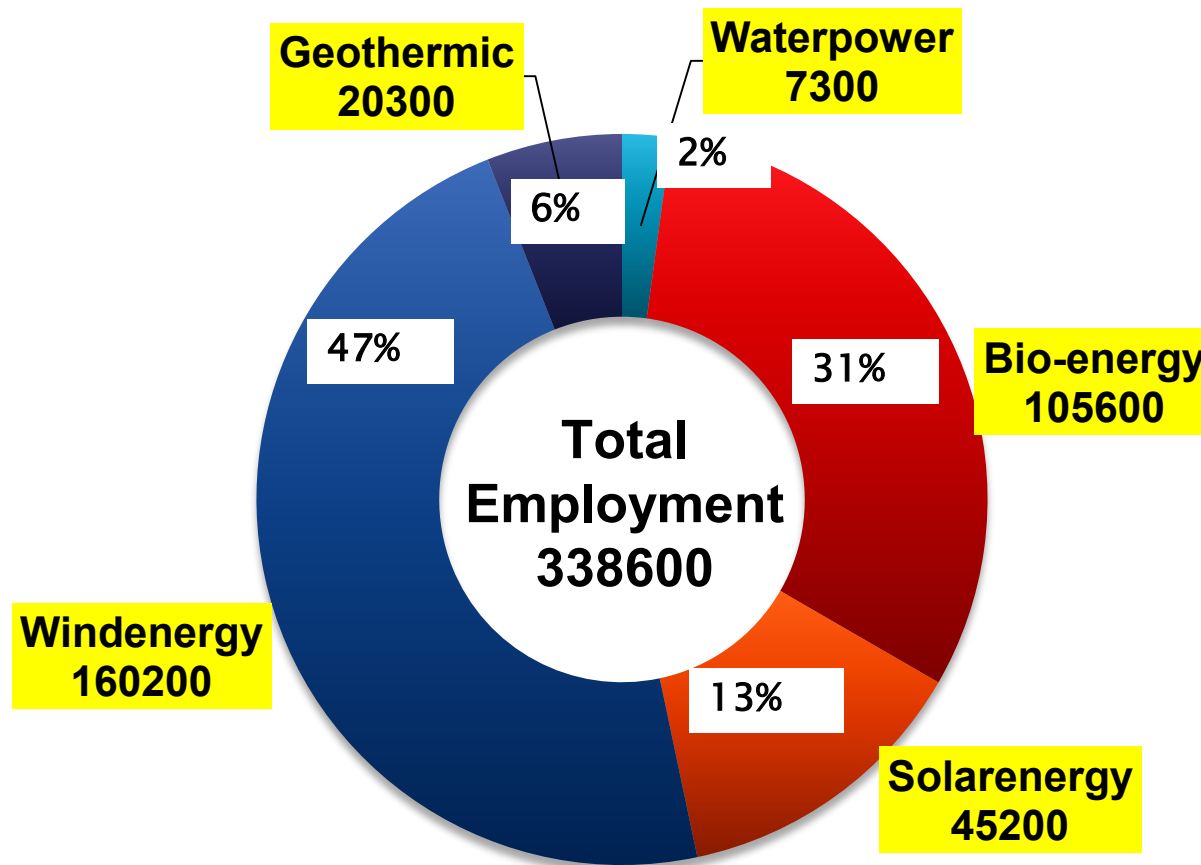
## Employees in German Brown Coal Mining and Processing



- ▶ Brown coal related employment in Germany accounts only for 0.07% of total employment

# The German “Energy-turnaround”: What does it mean in reality

- ▶ Employment in the Renewable Energy Sector in Germany 2016



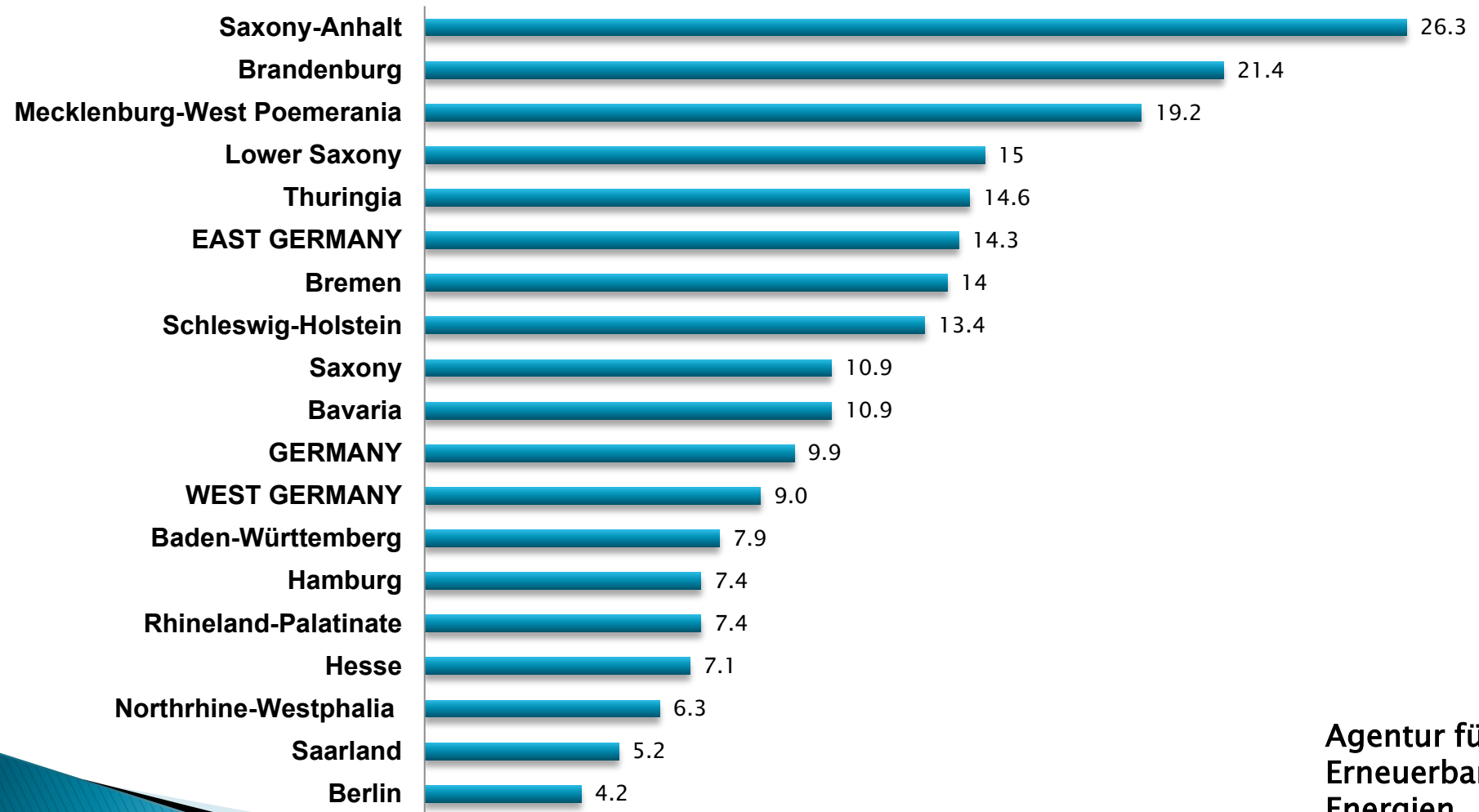
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Energien

- ▶ Taking the whole value creation and related services into account there are estimates that employment in the German renewable energy sector is equal to employment in the automobile industry



# The German “Energy-turnaround”: What does it mean in reality

## Gross Employment by Renewable Energies per 1000 Employees



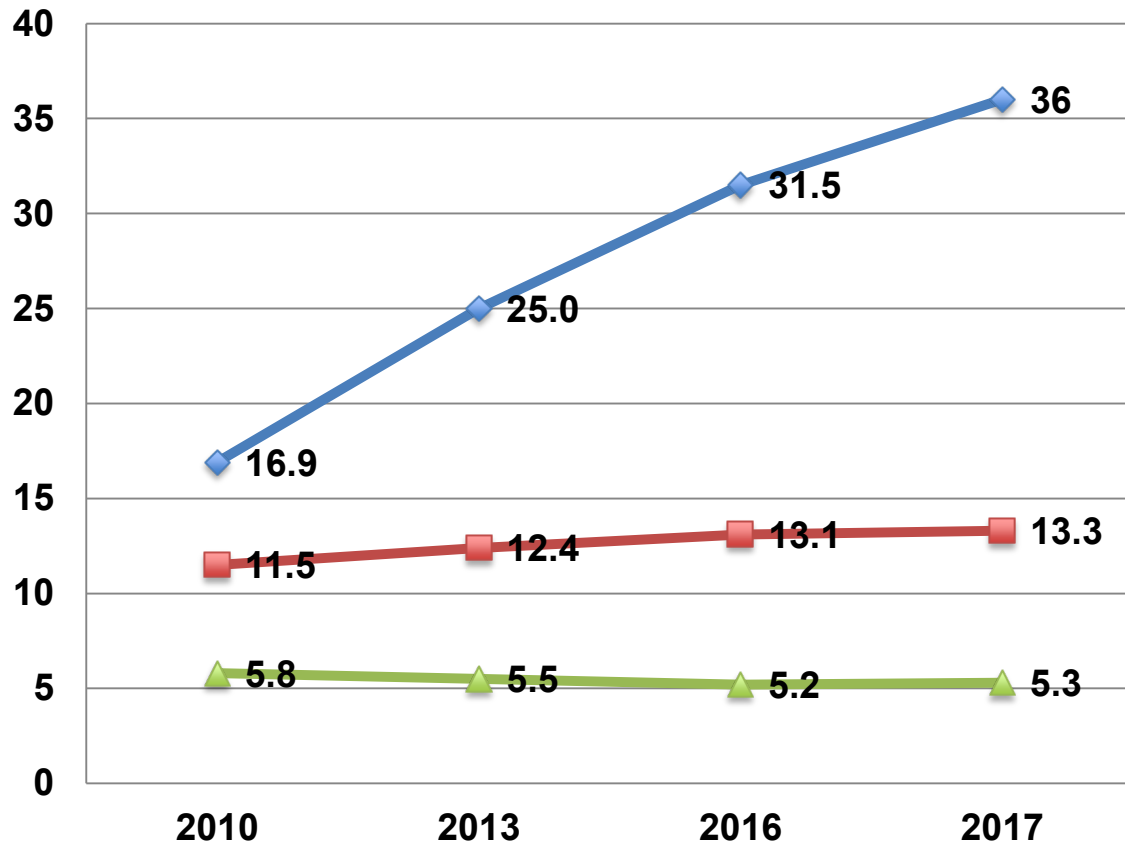
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# The German “Energy-turnaround”: What does it mean in reality?

- ▶ The driving forces behind the ‘Energy Turnaround’
  - Need for decarbonization of the whole energy sector to reach the climate goals (not just electricity from renewable sources)
  - Fast increase in cost-performance of photovoltaic and wind energy generation
  - Competitiveness of PV and wind energy
  - Digital revolution
- ▶ The key factors for success are
  1. Sector integration (electricity, heating and cooling, mobility)
  2. New regulations and market design (old regime – new regime)
  3. Regional Value Creation (regional spatial development plans)
  4. Prosumer (producer-consumer) participation: Participation of many actors in production and consumption of energy (contributing to energy network stability)

# The German “Energy-turnaround”: What does it mean in reality?

## Renewable Enregy Consumption in the Three Sectors



- Electricity
- Heating and Cooling
- Traffic



# The German “Energy-turnaround”: What does it mean in reality?

- ▶ However, there were and are serious concerns that have to be overcome:
  1. Is it OK, or can or should one experiment in the energy sector at all, which provides vital services for the public?
  2. Is a Living Lab not putting the security of energy supply at risk?
  3. Aren't the established structures so well established (**inflexible**) and the traditional actors so powerful (**lobby groups**) that change is impossible?
  4. Is there enough social pressure for change to make the established actors agree to hand over some of their sinecure or even assets (**loss of monetary income**)
  5. Maybe there will be a technical breakthrough in the near future (tech-fix)

# Why Living Labs?

## Concepts, Peculiarities, and Prospects

- ▶ For achieving the energy turnaround some problems and difficulties have to be overcome
  1. There is no manual or master plan
  2. High spatial requirement
  3. The higher the share of renewable energies, the more need for balancing volatility and insecurity of energy supply
  4. There will be winners and losers
  
- ▶ Why Living Labs?
  - Living Labs provide the opportunity for experimenting
  - They are not aiming at a breakthrough
  - Their task is to test what is possible and achievable in reality



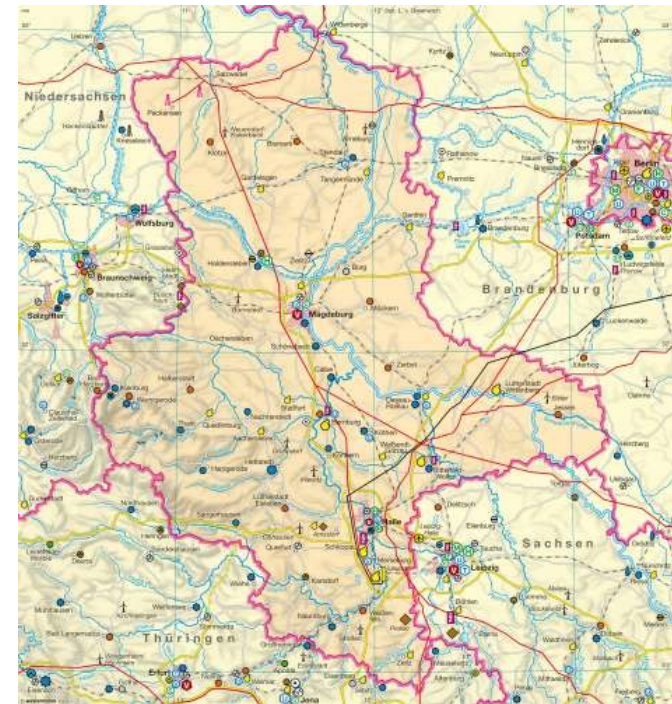
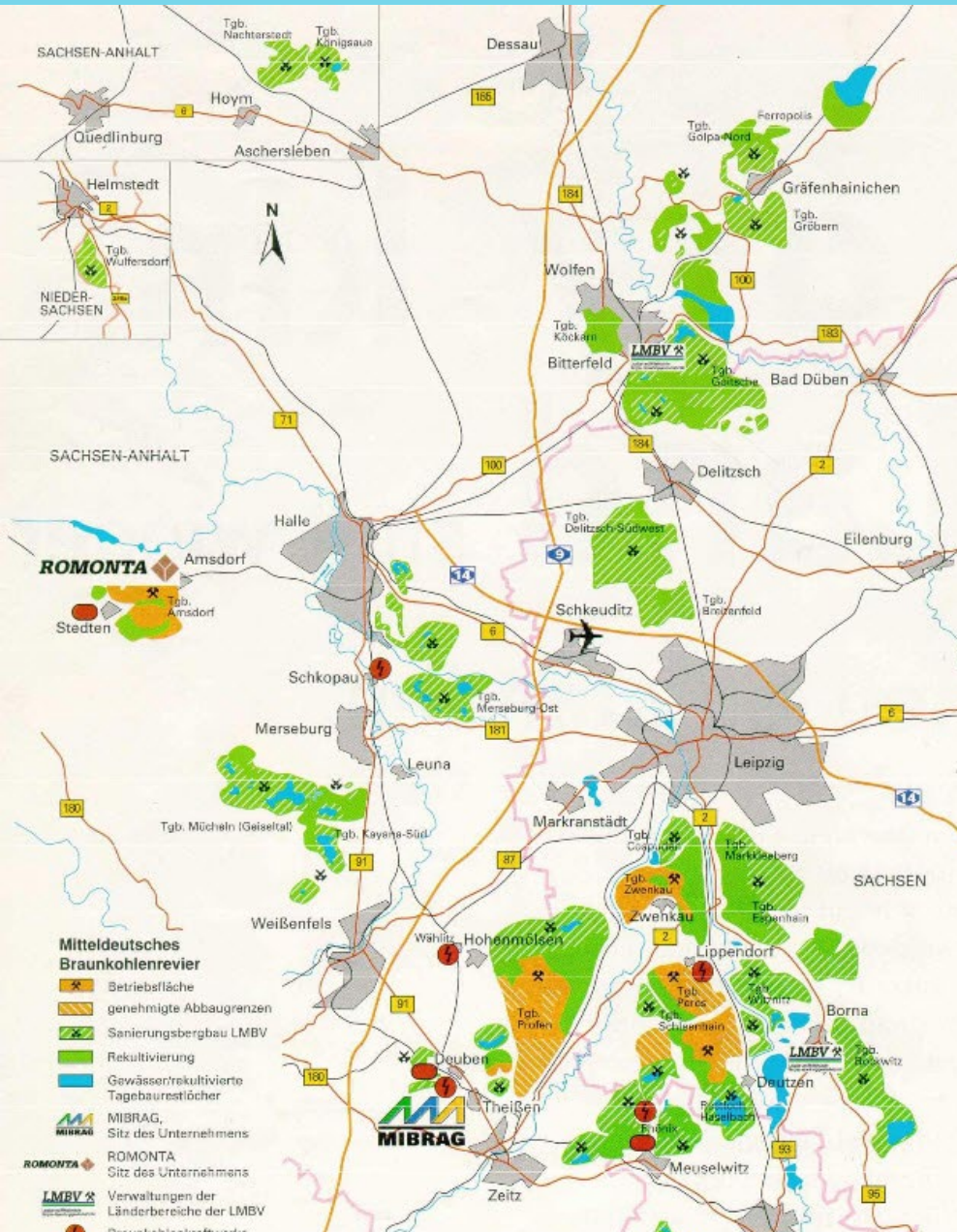
# Why Living Labs?

## Concepts, Peculiarities, and Prospects

- ▶ Opportunities of Living Labs?
  - Temporary and restricted to a well defined spatial area
    - Regulations can be altered, and privileges of established actors can be challenged
  - Provide a laboratory for testing and for collecting experiences
  - Provide the opportunity for technical and social innovation
    - Prosumer support
    - Sector integration
  - Can offset economic disadvantages

# The 'Living Lab Energy Avant-Garde Anhalt': Industry, Economy and Regional Development

- ▶ The Middle German Coal Mining Region



# The 'Living Lab Energy Avant-Garde Anhalt': Industry, Economy and Regional Development

- ▶ Coal mining in the region dates back more than 160 years, however, large-scale industrial mining only started after 1919
- ▶ In the GDR, Saxony-Anhalt developed into one of the most important industry and brown coal surface mining regions of the GDR with tremendous devastation of the environment
- ▶ Roughly 51000 people were relocated
- ▶ After reunification of Germany most of the mining sites became unprofitable and were shut down
- ▶ With that land restoration became an urgent task
- ▶ Due to the decline of industry and unfavorable structural conditions, many people left the region
- ▶ Unemployment is still considerably higher than in other regions
- ▶ Still today the most important industrial sector is the chemical industry (Leuna, Schkopau, Bitterfeld)
- ▶ The chemical industrial sites are linked by pipelines!



# The 'Living Lab Energy Avant-Garde Anhalt': Industry, Economy and Regional Development

- ▶ However, the region always was particularly culturally important and a place of industrial innovation



**Reformation and Martin  
Luther 1517**



**1915 largest coal electricity  
power plant opened in  
Zschornewitz**



**Civil aviation started from Dessau  
with the Junkers company**

# The 'Living Lab Energy Avant-Garde Anhalt': Industry, Economy and Regional Development

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**Bauhaus Dessau  
revolutionized architecture  
and design**

**And Q-Cells started mass  
manufacturing of solar  
panels in 2005**



**And in 2015, the Energy-  
Avant-Garde Anhalt was  
established**



**ENERGIEAVANTGARDE  
ANHALT**



# The 'Living Lab Energy Avant-Garde Anhalt': Challenge and Concept

- ▶ Basic Concepts:
  - ▶ The regional energy turnaround is a huge technical, economic, and social challenge
  - ▶ At the same time however it provides also big opportunities
- ▶ Keyword Decentralization:
  - Many new decentralized energy producers enter the market and deliver energy exactly where it is need
  - All producers are interconnected by an intelligent network connecting producers with small, medium and large size consumers to the split second
- ▶ Keyword Participation
  - All actors work together in order to profit together
  - The aim is to realize value creation generated by the energy turnaround locally in the region

# The 'Living Lab Energy Avant-Garde Anhalt': Challenge and Concept

## ▶ Key Actors:

1. Economic actors
2. Political actors
3. Actors in the field of research and development
4. Energy providers and prosumers

## ▶ Pursue three objectives:

1. Establishing a highly efficient regional energy system
2. Technological and economic innovations for the region
3. Social transformation in education, culture and tourism

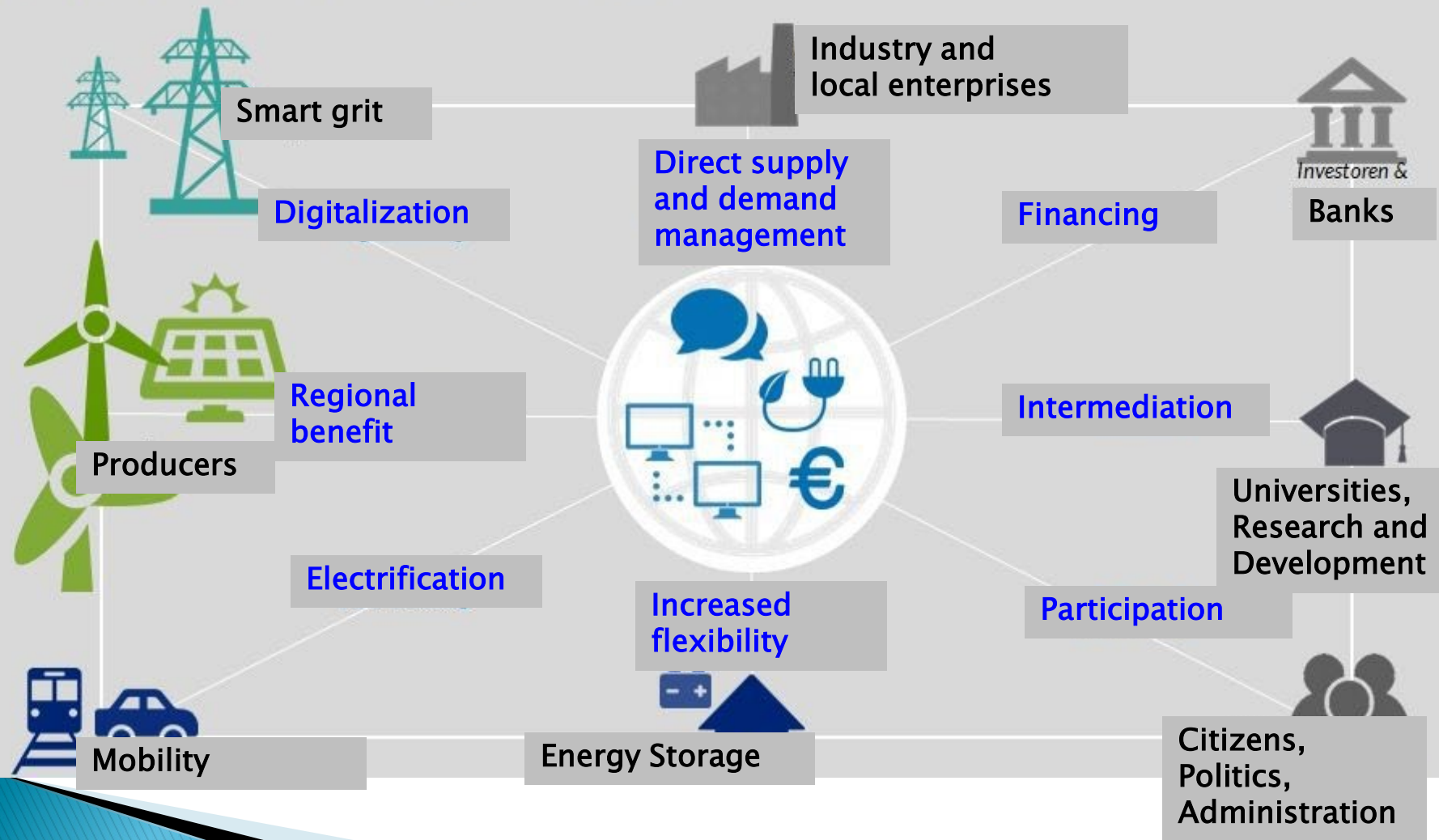
For the collective good and for a sustainable environment

# The 'Living Lab Energy Avant-Garde Anhalt': EAA – A different Approach

- ▶ Focus: Regional Approach
- ▶ Energy sector is a complex sector economically
  - technically
  - regulatory
  - cultural
  - social
  - and REGIONAL
- ▶ Different to centralized conventional energy supply systems, where there is one large provider in the center of the network
- ▶ Renewable energy supply can only be organized regionally
- ▶ Larger spatial requirements necessary for 'collecting' energy
- ▶ Consumption of energy, where energy is produced
- ▶ Necessity to integrate sectors where energy is needed

# The 'Living Lab Energy Avant-Garde Anhalt': Challenge and Concept

## Concept of a Living Lab in Reality



# The 'Living Lab Energy Avant-Garde Anhalt': The Regional Approach: Three Areas

## 1. Regional Energy System

- ▶ Regional system based on renewable energies
- ▶ Supplying energy exactly to consumer demands
- ▶ Operates profitable

## 2. Innovation and Development

- ▶ Design of future innovation and transformation processes
- ▶ Integrating social, cultural and spatial development innovations

## 3. Participation and Intermediation

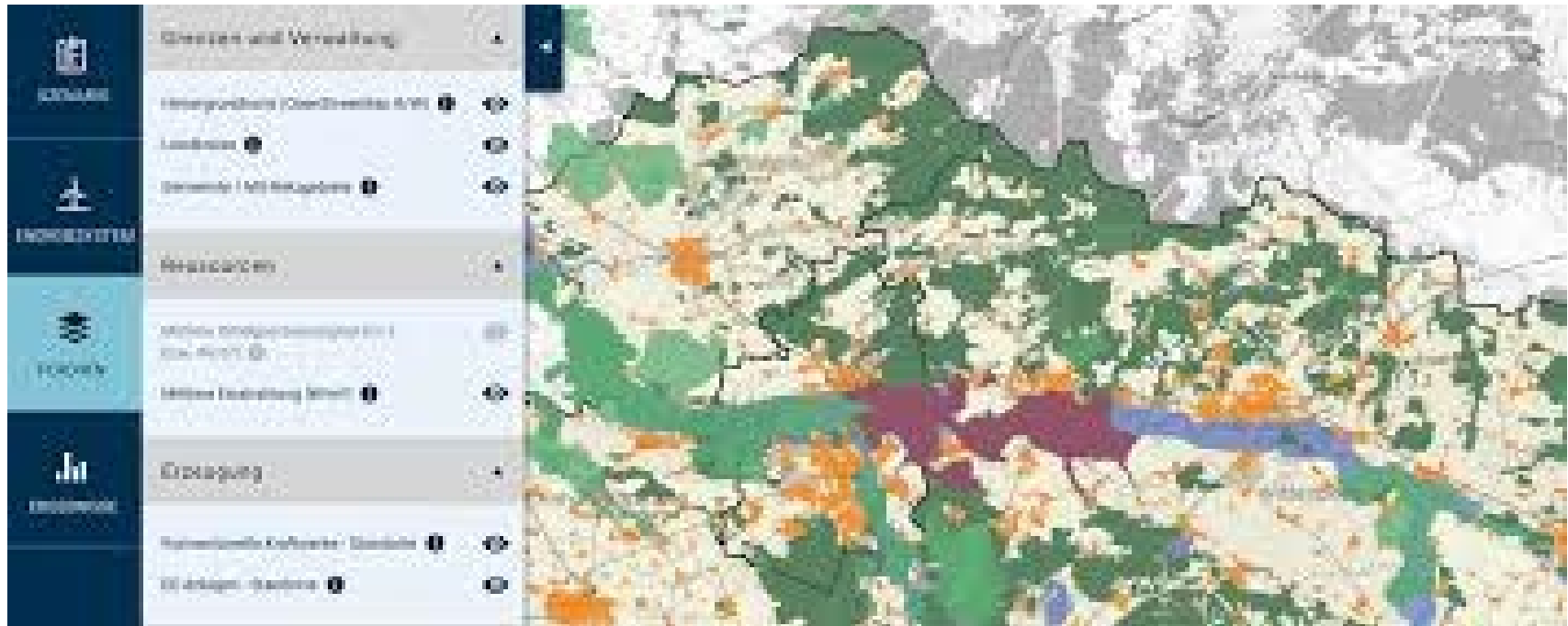
- ▶ Initiating communication between all regional actors
- ▶ And encourage them to participate in the transformation process





# The 'Living Lab Energy Avant-Garde Anhalt': First project: StEmp Tool

- ▶ The StEmp Tool (stakeholder empowerment tool) is a computer simulation that visualizes measures and their effects in transformation of the energy system



# The 'Living Lab Energy Avant-Garde Anhalt': Second projects: HYPOS – Hydrogen

- ▶ The project aims at generating Hydrogen exclusively from renewable **excess** energies mainly for industrial purposes, but also for transportation (rail transportation on not electrified railway lines)
- ▶ Storage and transport of Hydrogen is accomplished by reusing the old infrastructure of the chemical and gas industry in the region (pipelines and storage facilities)



# The 'Living Lab Energy Avant-Garde Anhalt': Third project: Ferropolis – Industrial Dinosaur

- ▶ Ferropolis is recreation and event area with an museum that explains the opencast mining history in the region
- ▶ It is located at a lake (that resulted from opencast mining)
- ▶ It can host events up to 25000 people, with all waste produced almost completely recycled
- ▶ Energy supplied only by renewable sources
- ▶ Transport by historical rail locomotives and wagons



# The 'Living Lab Energy Avant-Garde Anhalt': Further Research Questions:

1. How does the Living Lab EAA effect the development of regional industries, companies, commerce and tourism?
2. What policies other than energy are supporting the regional industrial and economic development? Are there spill-over effects observable?
3. What are the effect on employment, regional GDP etc.?



# The Road Ahead!

- ▶ All projects introduced today are designed and rely on the active involvement of actors and civil society in the investigated regions in Japan and Europe.



- ▶ 皆様のご協力を得られますように、宜しくお願い申し上げます。



Thank You so much for your  
attention and for your participation  
in today's event!

ご静聴を誠に有難うございました

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