



Dr. Tilo Schmid-Sehl

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Int. Symposium - Klimapolitik als Chance für
Regionalentwicklung: Beispiel Deutschland
OAG Haus Tokyo



Aligning organizations across borders.
組織や異文化を超えた体制づくり

1. High Share of Bioenergy among Renewables

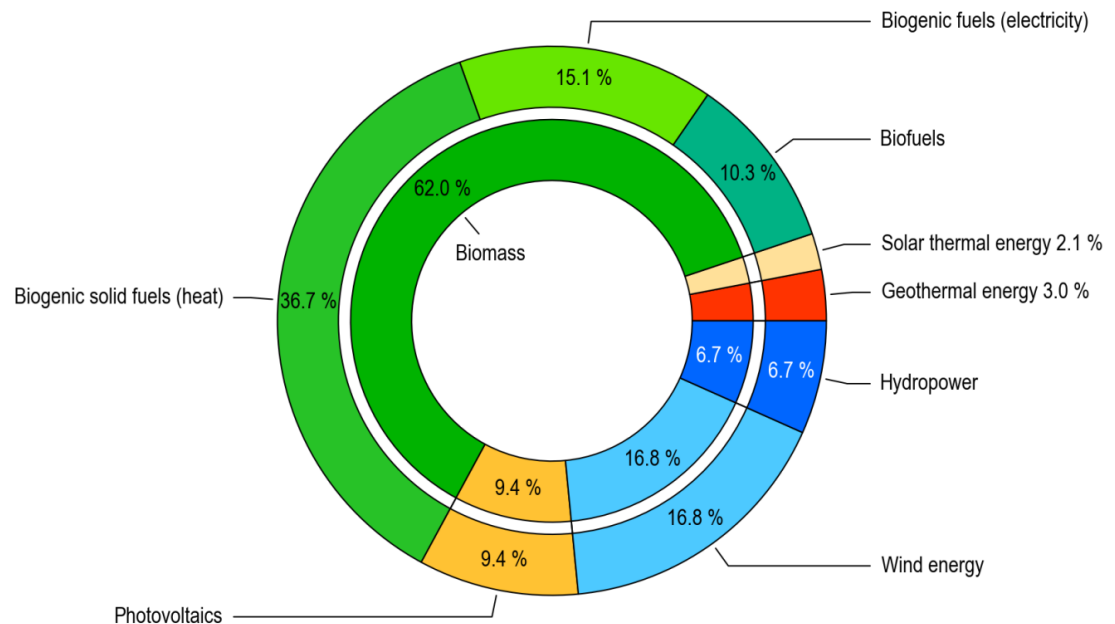
2. Main Challenges in Germany
3. Example Bioenergy
4. Our Vision – Circular Economy
5. Best Practise Examples – New Technologies
6. Conclusion

Biomass most important for renewables

- The share of biomass energy is very high as biomass produces a lot of important heat
- The share of heat is relatively higher as CHP produce heat which is used for multiple purposes

Structure of renewables-based final energy supply in Germany 2013

Total: 318.0 billion kilowatt hours



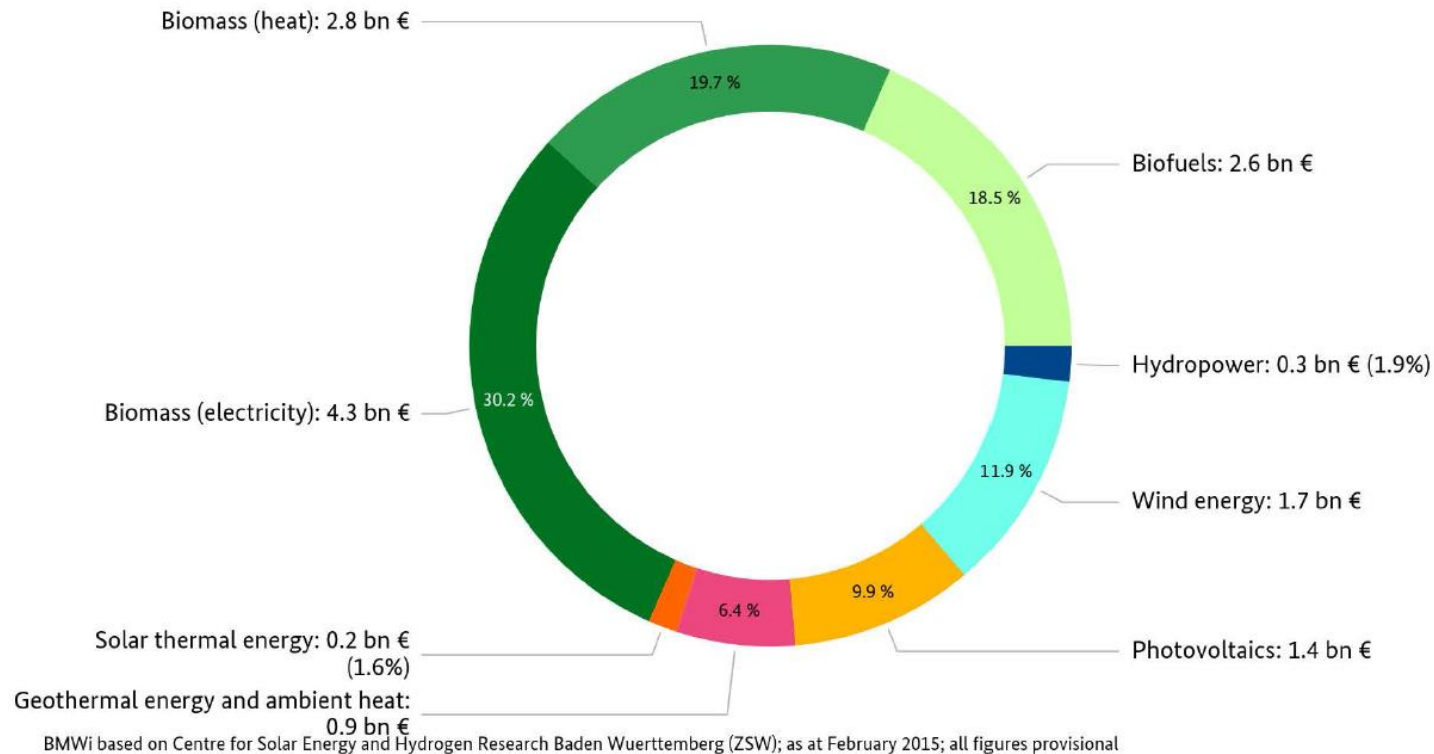
ZSW according to Working Group on Renewable Energy-Statistics (AGEE-Stat); as at February 2014; all figures provisional

Renewable energy revenues – a big factor

Turnover from the operation of renewable energy installations in Germany 2014

Total turnover: 14.1 billion Euro

- Nearly 70% of revenues support the biomass industry
- Farmers and foresters benefit most of the energetic use of biomass resources



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Renewables break up oligopolistic structure

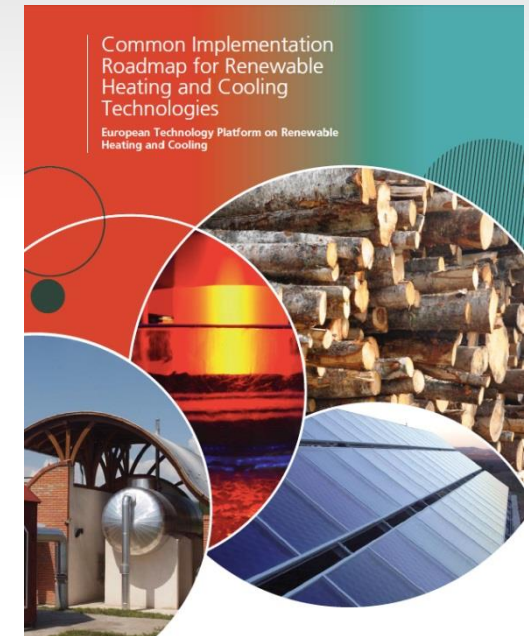
- Renewables require a decentral supply structure
- Private investors participate and invest in new energy facilities
- Cooperative energy companies engage and motivate private households to produce and utilize their own energy
- More and more people are proud to become self-sufficient from central energy supplies
- At the same time this is a great opportunity for regional development in rural areas



This is a threat to the traditional utilities, strong opposition is a natural reaction

EEG Reform of 2014

- Integration into markets
- FIT reflecting the current cost dynamics
- Faster expansion of renewable energy: 40-45% by 2025 and 55-60% of total electricity by 2035
- Slow down the rise of surcharges for renewable energies
- The Renewable Energy Heat Act promotes the production and usage of heat
- A certain percentage of the heat supply for new homes must come from renewable sources
- Market Incentive Program to utilize heat
- Promotion of combined heat and power systems
- Biomass to concentrate more on waste utilization

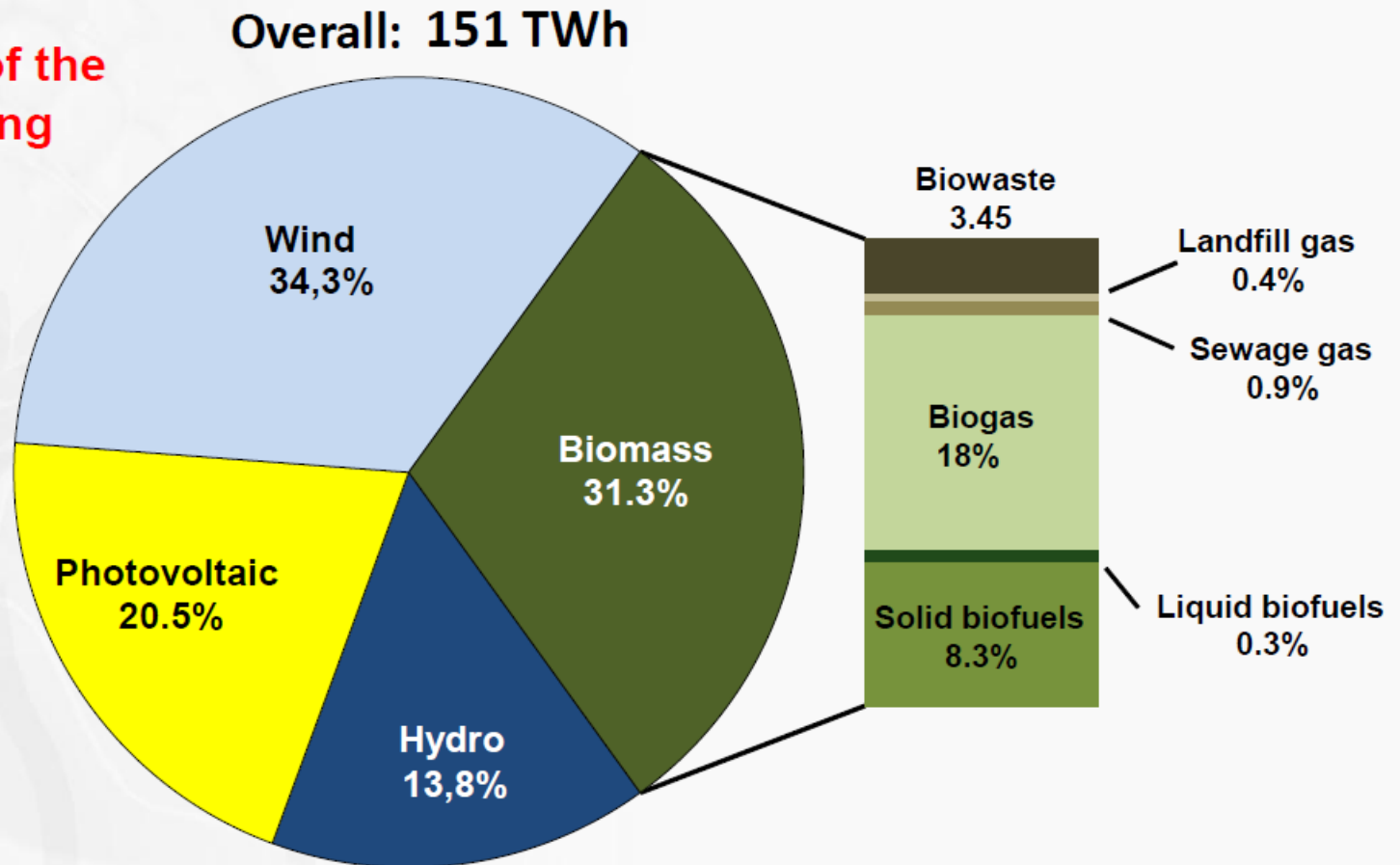


➔ **Germany plans further growth of renewables
with a shifted focus on waste and heat utilization**

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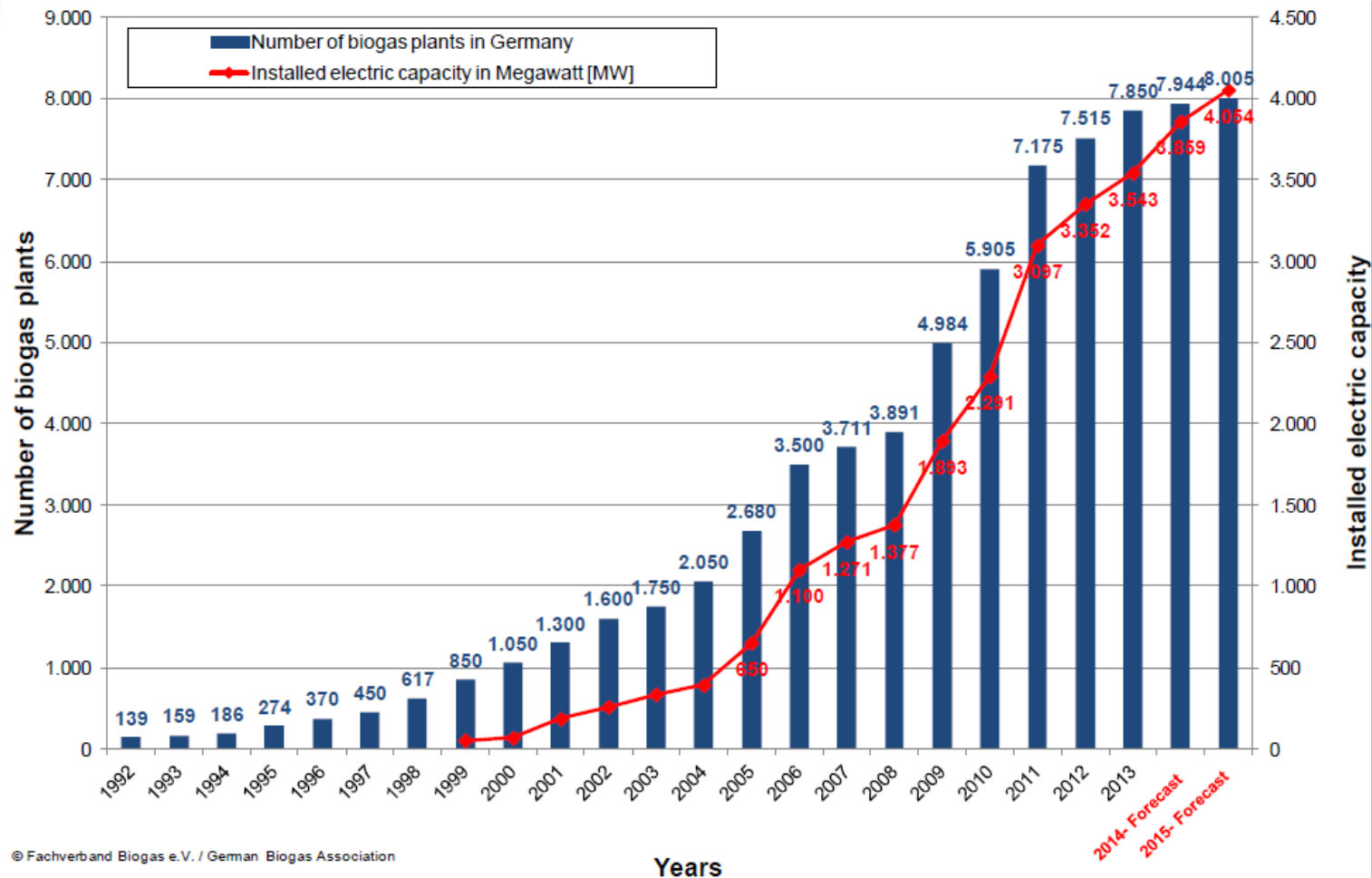
Structure of the German power production from renewable energy sources (2014)

More than 50 % of the
RES are fluctuating



Source: FvB based on BMU 2014

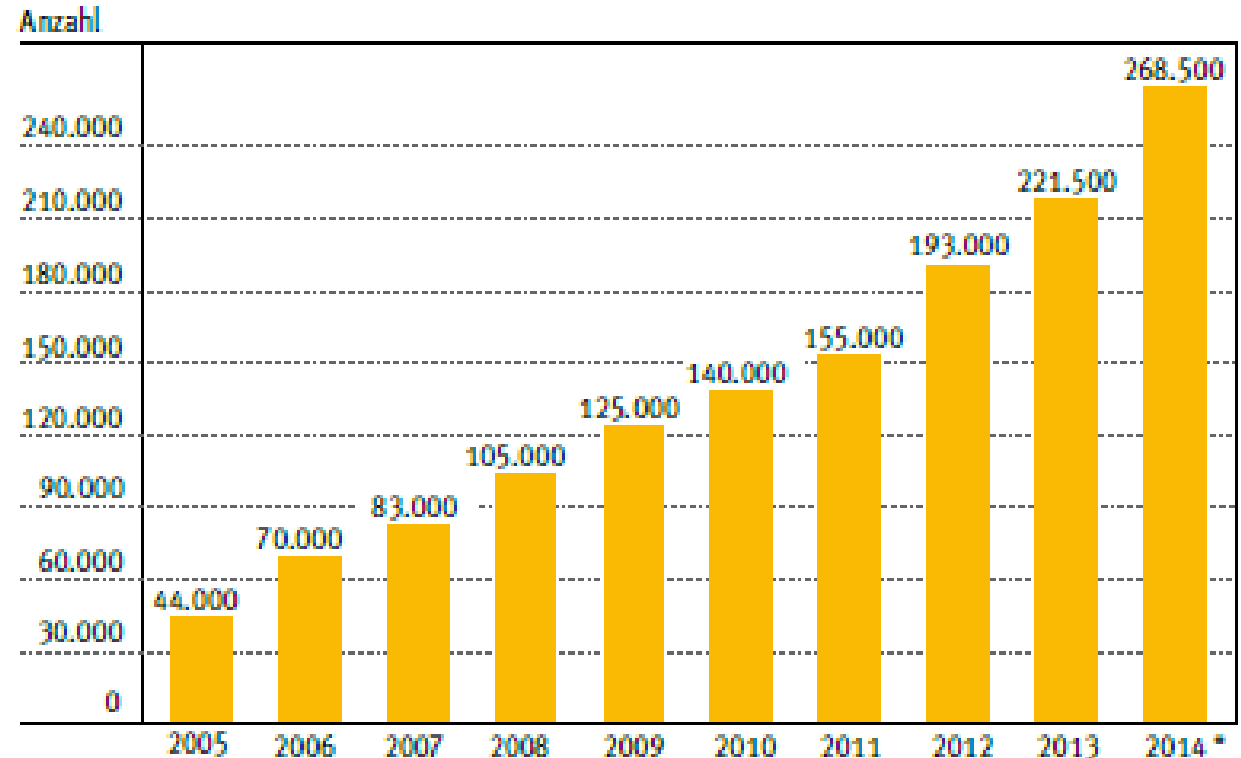
Number of biogas plants & installed electric capacity



Number of pellet boilers in Germany (as of 1/2013)

- Pellet Boiler are very favorable, also for private households

Gesamtbestand an Pelletheizungen



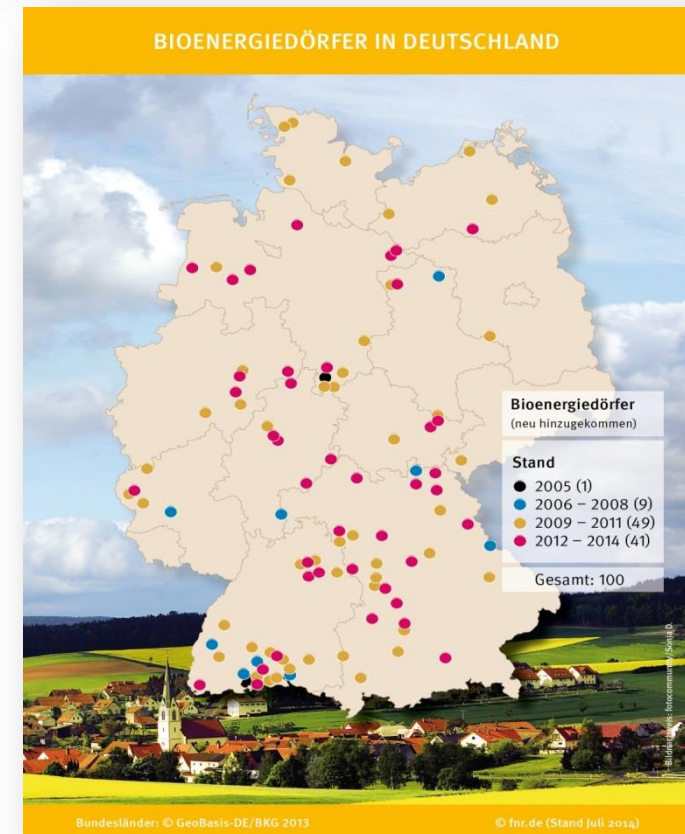
* Prognose

Quelle: DEPI auf Basis Biomasseatlas.de, ZV, HKI (2014)

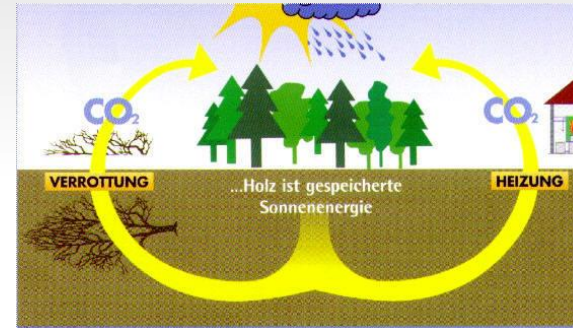
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BioEnergy Village: A Success Story – Strengthened Community Spirit

- Constantly increasing number of participating villages: 175 by end 2014
- BioVillages must produce 50% of their energy, some produce up to 200%, feedstock needs to be sourced locally
- Citizens shall participate in the financing
- Full cost of renewable energies are cheaper than fossil fuel based energy by up to 50%
- Villages ensure sufficient supply of biomass resources through sustainable management
- Social factors like strong village community spirit
- Trust-based cooperation between all stakeholders
- Local authorities support the projects
- Transparent and flexible to citizen's needs and their financial participation



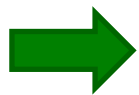
BioMass Energy– Special Support for Rural Development



- BioEnergy Villages: strive to become independent to produce energy
- BioEnergy: Many people contribute, many people benefit (social, democratic)
- Natural resources for industries with high energy needs (pulp&paper, house building, chemical etc.)
- Green villages are a good counter measure against rural depopulation
- Forestry has a great impact on labour and regional development
- Forestry is labour intensive
- Forestry can be organized by the villages themselves: Co-operative, volunteers etc.
- Utilization of the wood where it is produced

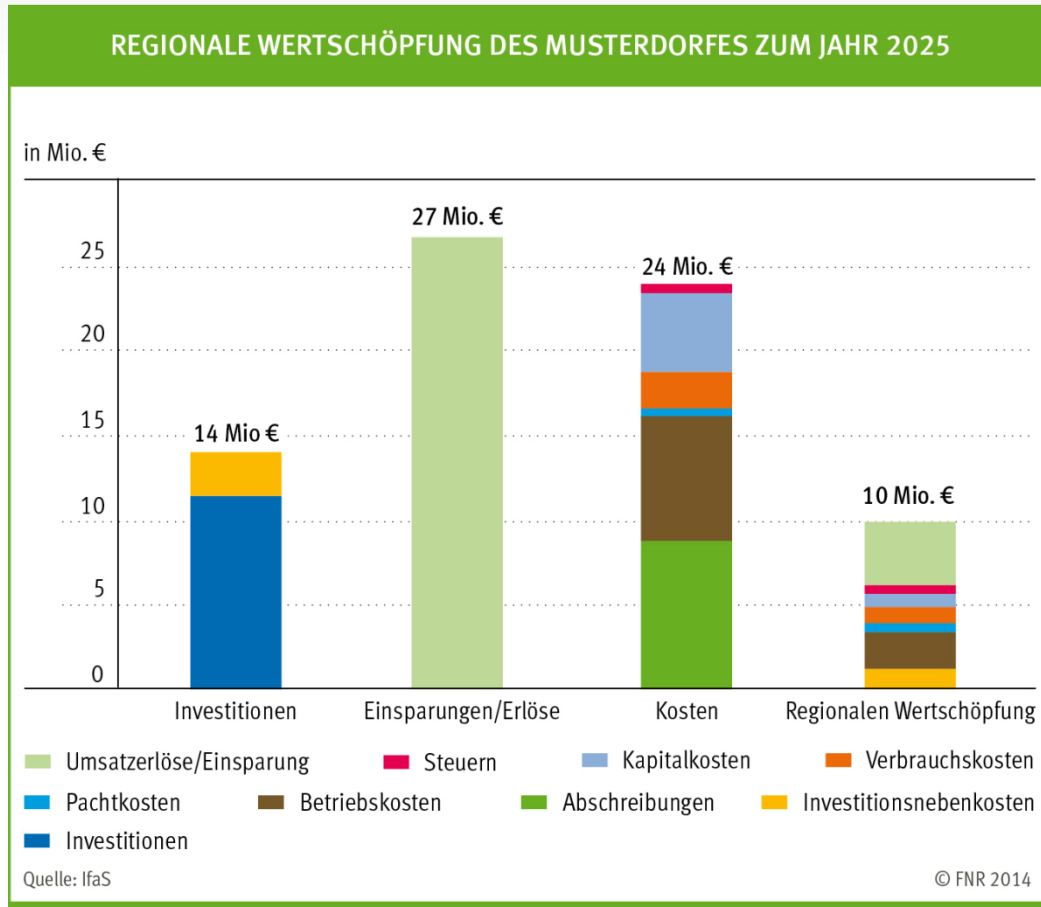
Biomass – Value Added

- Value of woody materials per ton:
 - Freshly cut wood log (long) 6300 Yen (solid cubic meter)
 - Freshly cut wood log (short) 10000 Yen (solid cubic meter)
 - Dried wood log (short) 14000 Yen (stacked cubic meter)
 - Wood chips (dried) 23000 Yen (stacked cubic meter)
 - Wood pellets 32000 Yen (loose cubic meter)
- High efficiencies lead to competitive cost of biomass energy production. 1kWh of oil energy costs appr. 8 Yen and 1 KWh of biomass energy costs based on wood chip* 19 Yen
oil:wood = 1 : 2,375 times *300kg per stacked meter
- Local value added: Wood Chips dried vs. Freshly cut wood = 23000 Yen – 6300 Yen = 16700 Yen per stacked cubic meter = 14 Yen per kWh
- Net Cost:
Oil 8 Yen per kWh vs. wood chips (19 Yen-14 Yen = 5 Yen)
oil:wood = 1 : 0,55 times *300kg per stacked meter




Including local value added wood chip utilization for energy production is cheaper than oil

BioEnergy Village – A model case of Federal Ministry of Food and Agriculture (20 years)




- Village with 450 people
 - 150 houses
 - 450 MWh power consumption
 - 4,5 Mio kWh heat consumption
- ➔
- Investment of 14 Mio Euro
 - Savings/Income 27 Mio. Euro
 - Additional cost 10 Mio. Euro
 - Regional Value Added 10. Mio euro

St. Peter - BioEnergy Village in Black Forrest



Power Consumption: 7 Mio kWh/a
Power Production: 21 Mio kWh/a



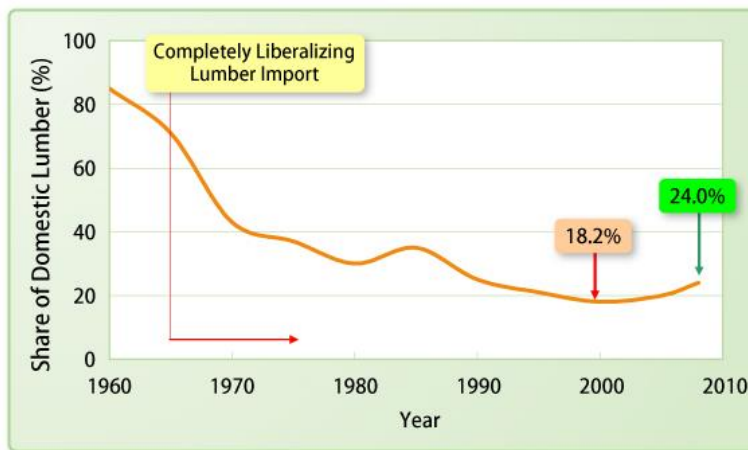
Heat Consumption: 12.000 MWh/a
Heat Production: 9.600 MWh/a

A mix of Renewables to produce heat and power

- Energy association has 200 members
- 20 farmers supply biomass
- Own forestry used

- Photovoltaik (1.18 Mio. kWh/a power)
- Solar Thermal (40.000 kWh/a heat)
- Hydro Power (400.000kWh/a power)
- Wind Power (18,4 Mio. kWh/a power)
- Biomass
 - Wood Chip Boiler (7.500 kWh/a heat)
 - Pellet CHP (2.100 MWh/a heat, 1.400 Mio. kWh/a power)

Potential Biomass (Wood): Win-Win for Environmental and Social Infrastructure



Source: MAFF White Paper 2010

A Comparison:

Germany

32% forested
growing stock: 3.4 bill. m³

Japan

> 60% forested
growing stock: 6 bill. m³

But:

- Forestry has been neglected for 50 years in Japan
- Low use of Biomass Energy

Typical Japanese Mountain with Forest



Forestry and Biomass Energy creates great benefits

Environ-
ment

- Need to develop the Forest Sector (aging forests)

Employ-
ment

- Great Job Opportunities

GDP

- Strengthen Rural Infrastructure and Economy

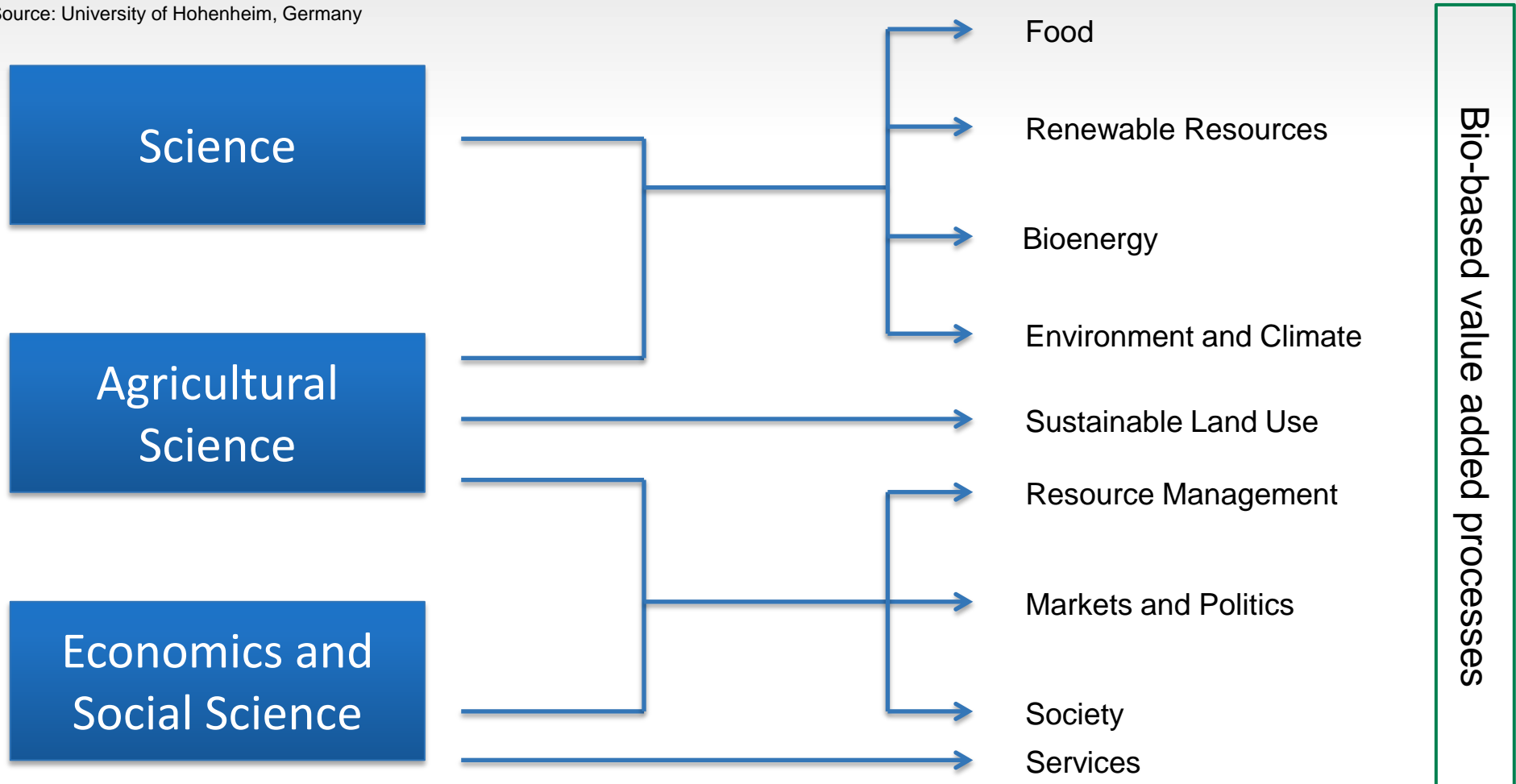
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Aiming for a circular economy and society, where agricultural and forest resources become the main source of heat and power

- Create an economic system with intensive use of agriculture, forestry, aquaculture and waste management
- Create a BioEconomy based value chain
- Create a BioEconomy to utilize biological resources for the production of all kinds of products
- Strengthen the rural economy by utilizing local resources (wood, bio-waste, agricultural products etc.)
- Create new labour by utilizing local resources

Philosophy: Agricultural Science as the nucleus joining natural and social sciences

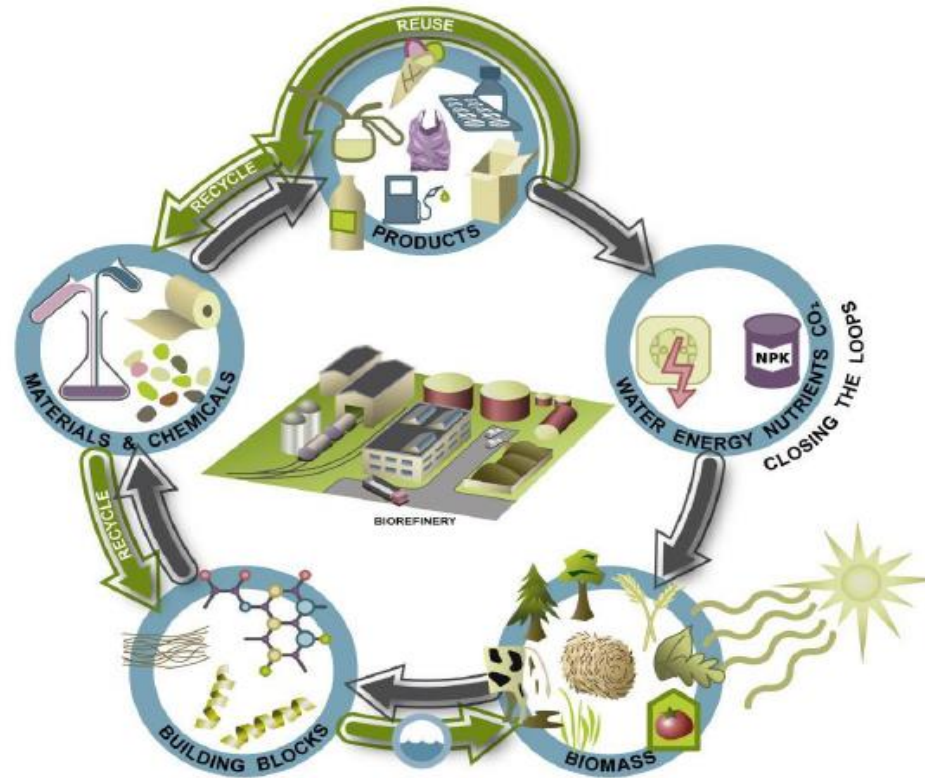
Source: University of Hohenheim, Germany



Example: A German University with special focus on BioEconomy
(University of Hohenheim)

Bridge 2020 eu: A Public Private Partnership to build biobased Economy by cross-industry cooperation and innovation

Integrated and circular value chains



The BRIDGE transition



Stage 1. Reinforce innovation and extend current infrastructure across the economy

The BRIDGE transition



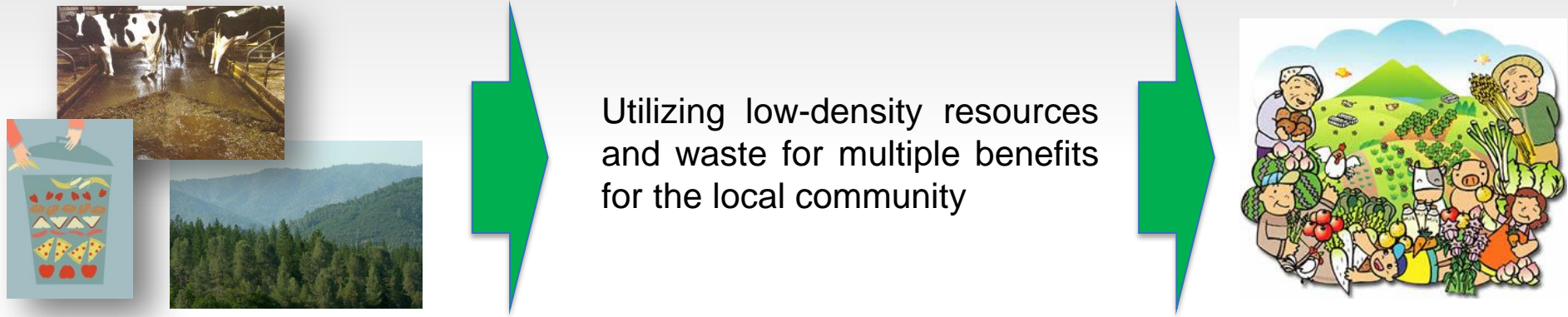
Stage 2. Build and strengthen value chains
across industry sectors

The BRIDGE transition



Stage 3. Realise a connected biobased economy from field to end consumer

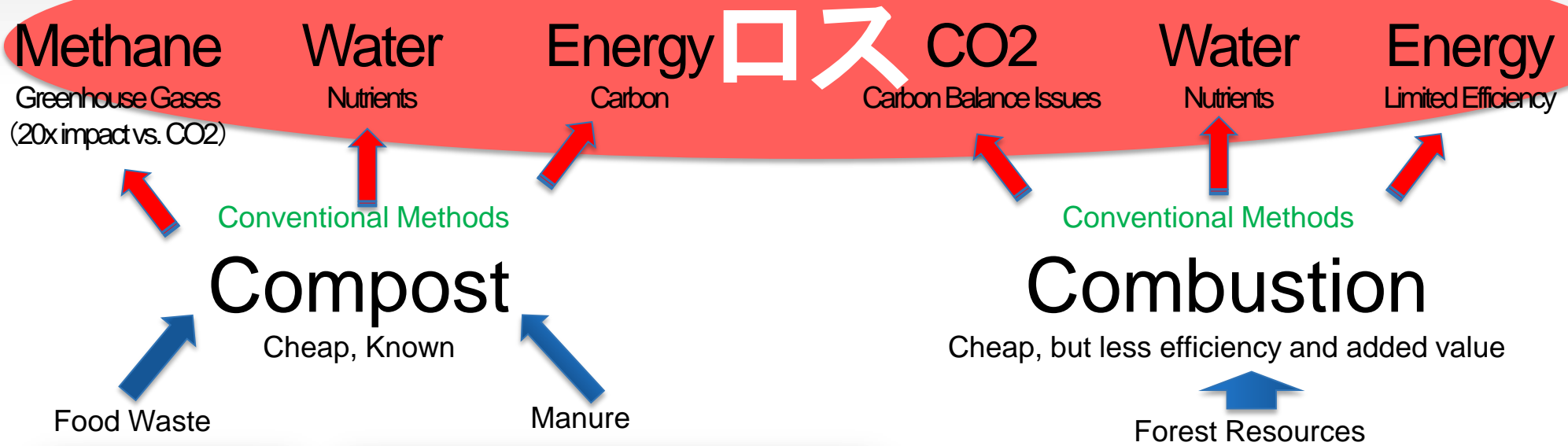
Advantages for Utilizing Biomass for Energy Production



- Renewable energies: sustainable, CO² neutral or even CO² reduction
- Alternative to fossil fuel
- Fertilizer and cheap side products
- Income for rural population
- Preserves landscapes in rural areas
- Maintains or even increases biodiversity
- Keeps farmland available for recreational activities

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Issues Related to Wet or Small Biomass



Organic Waste (proteins)



Lignocellulose

Issues Related to Wet or Small Biomass

Problems with conventional energy conversion

Fuel/Energy

Need to get rid of water content first:
Need for external energy input and often fossil fuel use
(negative carbon balance, high cost)

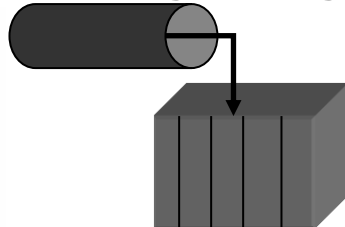
Energy for Drying
(Fossil Fuel)



Manure



Sewerage Sludge



Bark, grass, leaves, wet wood



A technology that bridges different sectors and realizes resource circulation

Lignocellulose Biomass



Technical Barrier

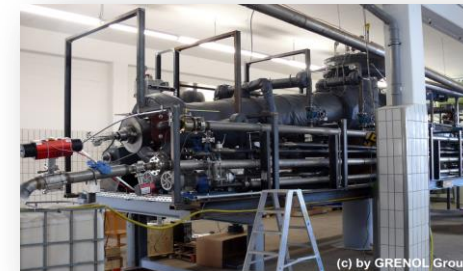


Wet Biomass



Small-Medium Scale Gasification
(Dry Biomass Gasification for power)

Technical Barrier



Hydrothermal Carbonization
(Low-Temp Carbonization of Wet Biomass)

HTC Processed Biocokes

Readily available local
biomass (organic waste)



50~70% water
content
biomass mix



Rice Husks

Sewerage Sludge
Fermentation Sludge



Manure



Bark

Branches, Greencut

The Current System in Operation



Organic Resources



HTC Reactor



Cogeneration

Electricity & Heat



Gasification

Separation

Dry

Process Water

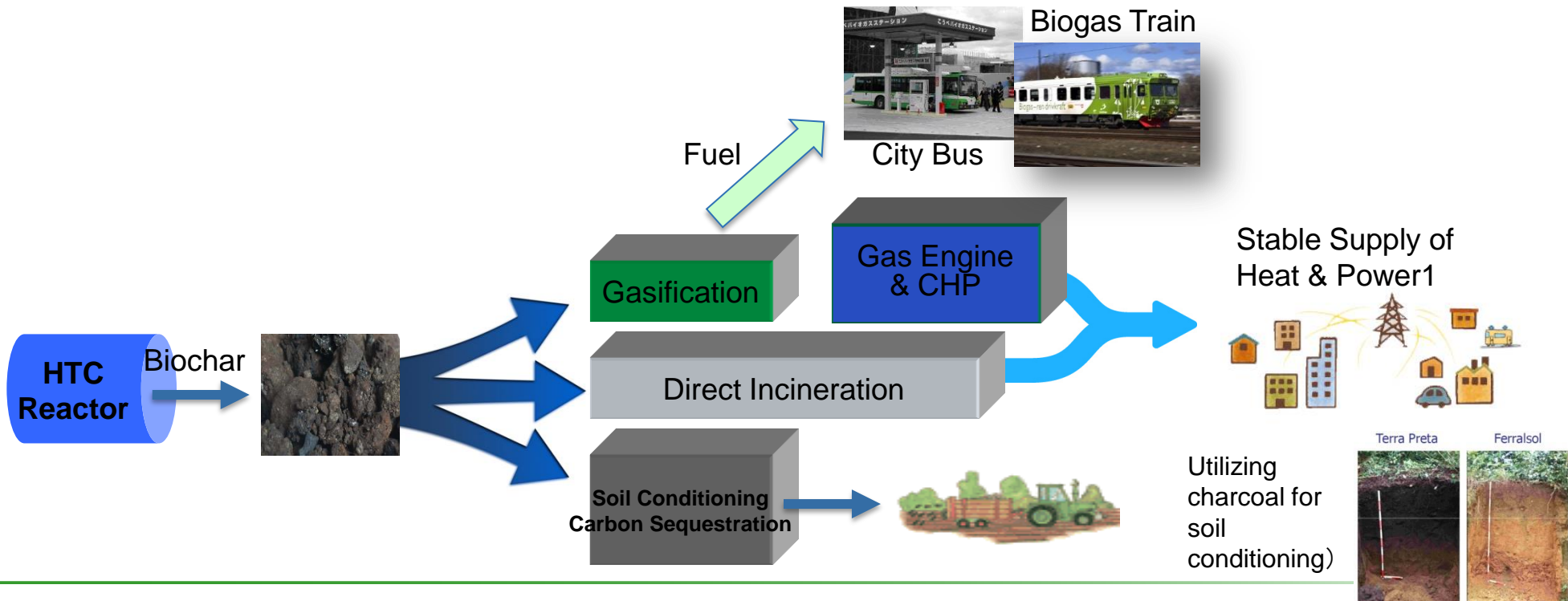


Hydroponics using process water or production of high-value fertilizer

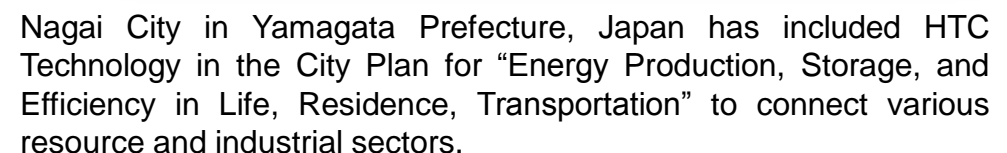
Carbon

How to use BioCokes

- Energy storage (storable and transportable fuel)
- Heating with boiler or direct incineration (individual homes, public facilities)
- Gasification to produce heat and power (CHP)
- Transportation: Fuel source for steam/gas trains
- Conditioner for soil (terra preta) & Carbon neutral or negative farming



- BioCokes converts waste to storable high caloric energy resource
- BioCokes allows base and peak load management for the energy production
- BioCokes is produced from variable resources and is very flexible
- Waste utilization and energy production create local jobs



Forestry and Agriculture in Rural Areas provide the right Potential for Economic Growth

Rural Resources shall be used for:

- Energy storage (storable and transportable fuel)
- Heating with boiler or direct incineration (individual homes, public facilities)
- Gasification to produce heat and power
- Transportation: Fuel source for steam/gas trains
- Conditioner for soil (terra preta) & Carbon neutral or negative farming



Economic Effects in Rural Areas:

- Forestry and Farming is labor intensive, stabilizing and creating new employment
- New investment in new technologies
- Maintaining beautiful landscape
- Supports Tourism
- Attracts young talents



Biological Resources (nearly unlimited) build a sound base for revival, if new technologies and business concepts are successfully implemented

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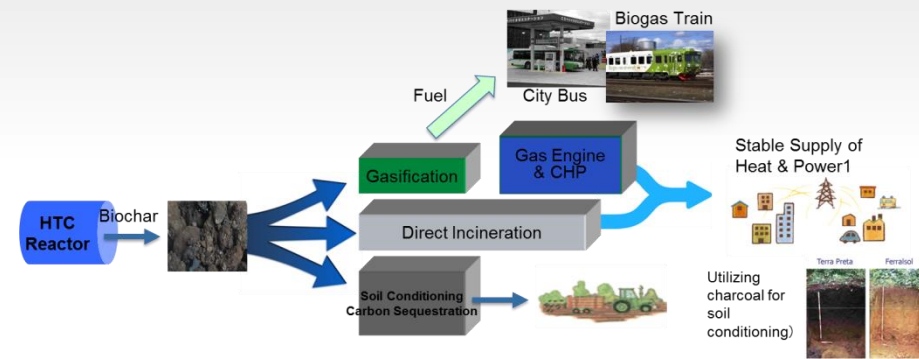
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Conclusion:

BioEnergy is a great contributor to regional development

It is:

- Sustainable (nearly unlimited)
- Economical (new income, labour, investment)
- Social (community based, collaborative)
- Democratic (decentral)



It provides a great opportunity to support and revive economic (re-)development of rural areas

➡ Rural Economies can lead the energy revolution (!!!)

Thank you very much for your attention

ご清聴ありがとうございました！



Aligning Organizations Across Borders.

Food Waste



Carbon Negative Farming



Biochar & Biocoal



Soil Nutrient Circulation

技術に関するお問い合わせやお見積り依頼など、お気軽にご連絡下さい

RenEn
Energy

Renewable
Crossborder

地域発、循環型バイオ経済の未来へ
Rural Leadership towards a Circular BioEconomy



本社

代表: シュミットセール・ティエロ

担当: 須本 エドワード

住所: 〒222-0037 神奈川県横浜市港北区大倉山2丁目34-15

電話: (050) 5534-3566

担当: (070) 6921-2692 (須本)

メール: Esumoto@re-crossborder.com

Japan Headquarters

Chief Rep.: Tilo Schmid-Sehl

Japan Manager: Edward Sumoto

Address: 2-34-15 Ookura Yama, Minato Ki-ta-ku, Yokohama City, Kanagawa 222-0037

Tel: +81 (50) 5534-3566

Agent: +81 (70) 6921-2692

Email: Esumoto@re-crossborder.com



ヨーロッパ本社

代表: シュミットセール・ティエロ

住所: Schickhardtstrasse 38
D-72770 Reutlingen, Germany

電話: +49 721 1387 178

直通: +49 162 2819 418

メール: tschmid-sehl@re-crossborder.com

Germany Headquarters

Chief Rep.: Tilo Schmid-Sehl

Address: Schickhardtstrasse 38
D-72770 Reutlingen, Germany

Tel: +49 (721) 1387-178

Direct: +49 (162) 2819-418

Email: tschmid-sehl@re-crossborder.com

Gasification



Rural Industry Revitalization

Anhang



Aligning Organizations Across Borders.
