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Background information
from the German Renewable Energies Agency

Value Creation for Local Communities through Renewable Energies

Results of the study by the Institute for Ecological Economy Research (IÖW)

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Renewable Energies Agency

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Association of German Biofuel Industries (VdB)
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)
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Contents

How Can Municipalities Profit from Renewable Energies?

The successful development of renewable energies has been a decentralized phenomenon in Germany. In almost every municipality in the country, a wide variety of stakeholders have in recent years brought many thousands of renewable energy systems into operation. Some 2.2 million solar collectors and photovoltaic systems, 400,000 heat pumps, 22,000 wind energy systems and 4,500 biogas plants had been installed in Germany as of 2009. In addition, several million households are heating with wood.

In a number of ways, the municipalities have played an important part in the development of renewable energies in Germany, and will continue to do so in future. They have far-reaching instruments of control with regard to the authorization and installation of systems. They partially fund the installation of renewable energy systems, or are even involved in their operation as lessors, through their municipal departments of public works. Increasingly, they are adopting their own renewable energies development goals, and trying to attract companies active in the renewable energy industry to invest in their areas.

Municipalities profit from the positive regional economic developments generated by the use of renewable energies by:

- saving fossil fuel costs
- creating jobs
- obtaining tax and lease revenues.

Numerous cities, municipalities and regions have made strengthening of regional economic circuits with renewable energies the goal of their development strategies, in order to improve their municipal budgetary situations and their attractiveness as industrial sites. Economists often call these positive effects "value creation", a term which describes all economic activity - such as that of a certain "value creation chain", or of a region - and the benefits they produce.

The extent to which municipalities can profit from the value creation of renewable energies, and how much its effects can grow in accordance with their degree of development and type of technology, has not been fully recognized. One reason is the complex value creation chains of renewable energies are rarely installed entirely within the boundaries of a single municipality, and thus are difficult to assess.

The **German Renewable Energies Agency** (AEE) therefore engaged the **Institute for Ecological Economy Research** (IÖW) and the **Centre for Renewable Energies** of the **University of Freiburg** (ZEE) to develop a tool-kit to unravel the various value creation effects of renewable energies at the municipal level as of the end of 2009, in order to compare them.

This background paper presents the results of the IÖW/ZEE study, published in September 2010 under the title *Kommunale Wertschöpfung durch Erneuerbare Energien* (Municipal value creation from renewable energies).

What is Value Creation from Renewable Energies?

The concept of value creation is used in various ways in economics. In the study of municipal value creation from renewable energies, it is defined as the sum of:

- net profits of the enterprises involved
- net income of the employees involved, and
- taxes paid to the municipality.

The study distinguishes a total of 16 value creation chains of various renewable energy technologies, ranging from wind energy systems to biofuel production. It calculates the specific turnover of enterprises and subcontractors involved at each stage of the particular value creation chain, its average profit and numbers of employees, as well as the tax revenues to be derived from it.

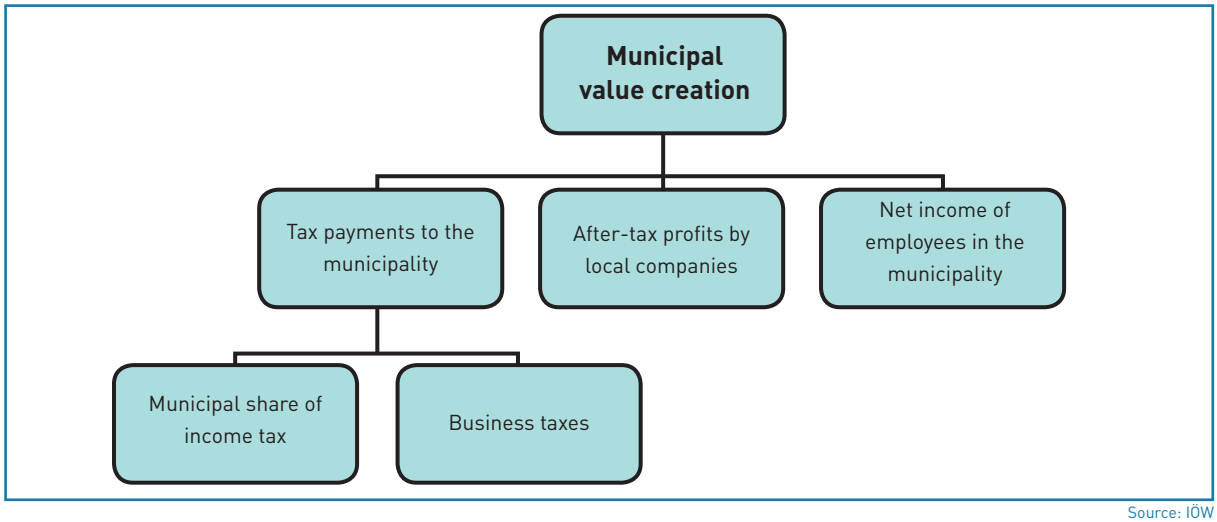
The value creation chains of renewable energy technologies examined

Renewable electric power	Renewable heating	Biofuels
1 Onshore wind energy systems	10 Small solar thermal energy systems	14 Plant oil
2 Repowered wind energy systems	11 Large solar thermal energy systems	15 Bioethanol
3 Small photovoltaic systems	12 Geothermal pumps	16 Biodiesel
4 Large photovoltaic systems, roof-integrated	13 Wood-pellet heating	
5 Large photovoltaic systems, ground-mounted solar parks		
6 Small hydroelectric plants		
7 Small biogas plants		
8 Large biogas plants		
9 Wood-fired power stations (chips)		

Source: IÖW

The value creation chains for large hydroelectric, offshore wind energy and deep geothermal energy systems were not examined in detail, since these – so far at least – are hardly relevant from the point of view of municipal value creation, or are limited to a few sites.

The value creation effects of renewable energies in municipalities



Source: IÖW

In the following, the key methodological features of the study are to be briefly explained, using the example of wind energy systems. However, the methodological procedure may vary depending on the specific characteristics of a particular value creation chain, as well as on the available data. An overall standard method for ascertaining particular value creation effects of renewable energy technologies does not and cannot exist.

Value creation in the form of profits

The profits at each stage of a value creation chain are determined from the profit-turnover ratio of the enterprises involved, i.e., the relationship over the course of a year between the turnover, or sales volume, achieved by a company, and the profits realized. The study has carried out balance-sheet analyses for this purpose, and evaluated corporate financial statements. The "average turnover yield" refers to the average of the years 2000 through 2007. Moreover, a distinction is made between private companies and joint-stock corporations. In the case of a wind energy company for example, the profit is calculated from the proceeds from the sale of electricity fed into the grid, minus business expenses, interest on loans, depreciation and other expenditures. The profits are stated in terms of kilowatts (kW) of the installed output capacity of a facility.

Value creation in the form of income

In the study, there is a breakdown of the staff into professional groups at each stage of the value creation chain, e.g. engineers and technical designers in a typical planning office which might design a wind energy system plant. Average gross annual incomes are assigned to each of the professions involved. In this way, the income effects can be represented in terms of kilowatts of installed output capacity. The income effects of the access of outside capital and of regular insurance payments of a facility are also taken into account (indicators: bank employees per euro of credit allocated, or insurance employees per euro of policy payments).

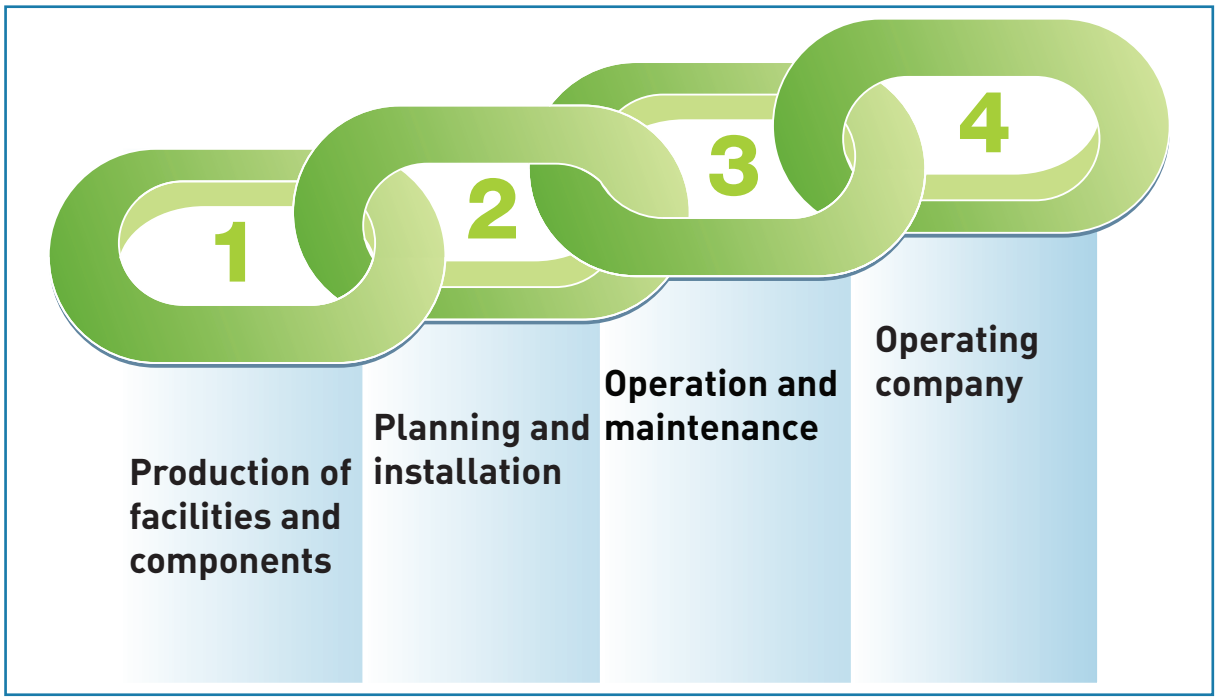
Value creation in the form of taxes

From the point of view of the municipalities, the study first of all distinguishes between taxation of enterprises and the taxation of income from waged work, i.e. the income tax. For the business tax, the currently applicable business tax rate is used. In the case of private companies, the income tax is added. Municipalities levy the business tax independently; it is one of the most important sources of municipal tax revenue. The different regulations which apply for various renewable energy systems also have to be taken into account. Thus, in the case of wind energy systems, the communities where wind parks are located normally receive 70% of the business tax, while those where the operating company has its office get 30%.

In addition, municipalities get a 15% share of the nationally established income tax. To be able to determine the income tax payments to a municipality, the average tax burden of the various professional groups at the various stages of the value creation chains are ascertained to calculate the municipal share of the income tax. Thus for example, the study ascertains the average tax burden of engineers and of technical designers at the value creation stage "planning and installation". Finally, the tax receipts can be proportionately represented per kilowatt of system output. The municipal shares of the VAT and of the flat taxes on interest and capital gains are negligible.

What Are Value Creation Stages?

The renewable energies value creation chain



In every value creation chain, the entire lifespan of a system is broken down in terms of costs and sales. Thus for example, in the value creation chain of a wind energy system, the various economic activities occurring within its lifespan are investigated: from the production of the facility (e.g., manufacture of the rotor blades, the generator, the tower etc.), through the planning and installation (including preparation of the site and connection to the grid), and the operation of the system (maintenance, maintenance personnel, land expenditures, lease payments), to the expenses of the operator company, such as interest on loans, taxes and salaries, and its income from the production of electric power. Profits, incomes and taxes are generated at each of these value creation stages.

What are the limits to municipal value creation?

Very rarely do all the value creation stages occur completely within the boundaries of a single municipality. For instance, the production of systems and components for wind energy systems occurs in only a few municipalities in Germany. On the other hand, in each value creation stage, most actors do not limit themselves exclusively to a single municipality. A planning office for wind energy systems is likely to generate profits, income and taxes through projects in neighbouring municipalities or even in other regions.

The more parts of value creation stages are locally based, and the more activities locally based companies carry out, the higher the municipal value creation from renewable energies will be. The study takes the fact into account that foreign imports too will be incorporated into some value creation stages. If for instance a producer of wind energy systems in a German municipality buys components from a subcontractor in Denmark, the full value creation effects cannot be attributed to Germany; these inputs are therefore deducted. On the other hand, the sales in the stage "system production" which are attributed to the export of systems abroad are incorporated, which raises profits, incomes and taxes accordingly.

Application and practical relevance of the results

For each value creation chain, the study ascertains average values for typical systems currently available on the market for new installation. The results are expressed in euros per kilowatt of installed system output. That permits comparison of all stages, both within each value creation chain and between them. Thus, the value creation effects of the operation of a wind energy system can be compared with those for a photovoltaic roof system.

Since the study always provides a scalable indicator of euros per kilowatt of the installed output of a system, the value creation effects of various system sizes can be ascertained, e.g. those to be provided by the construction of a 20 MW wind park if certain portions of the value creation stages are installed locally and the necessary corporate data are available. Thus, municipalities can assess the value creation effects of their existing renewable energy system, or of its future state of development.

The Value Creation Effects of Typical Renewable Energy Systems

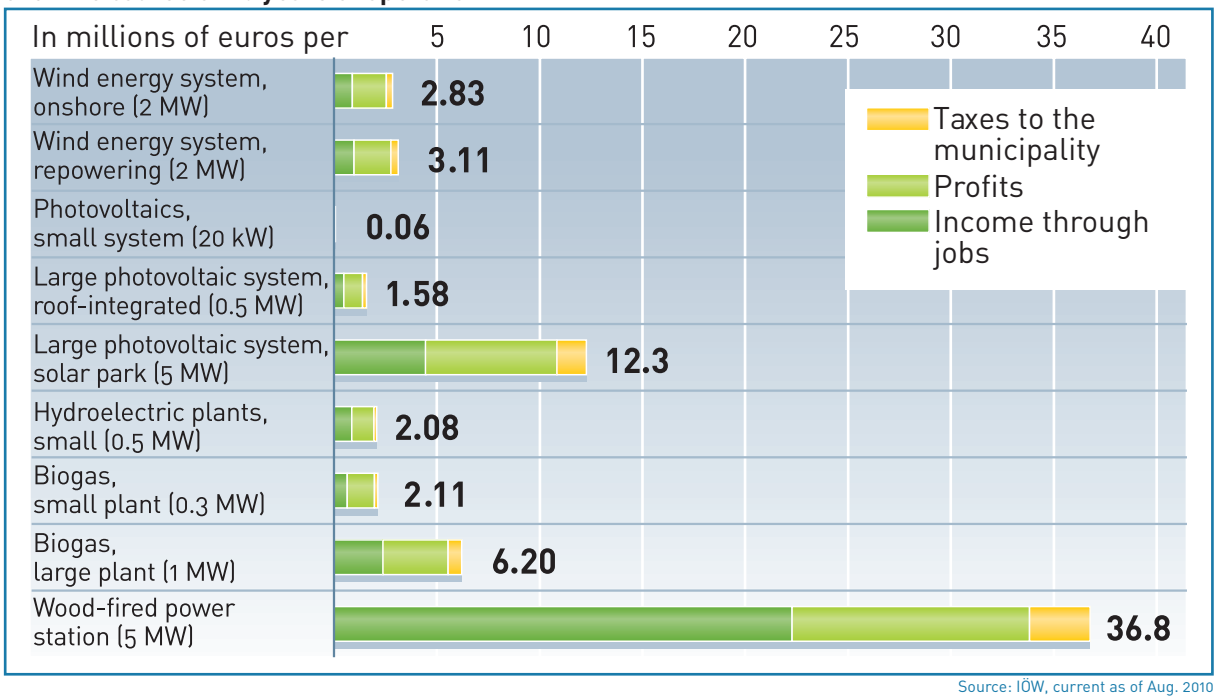
Below, we will examine which value creation effects each system provides to what extent – not simply comparing the indicators of euro per kilowatt, but also multiplying them to represent the typical system sizes of various renewable energy technologies.

The value creation effects of renewable electric power generation systems

A comparison of the value creation effects of typical renewable energy systems in the area of electric power production must take into account that such apparently superior high value creation facilities as a 5 MW wood-fired power station (€36.8 million of municipal value creation over the course of 20 years of operation), or a 5 MW photovoltaic solar park (€12.3 million in 20 years of operation) can only be built once in a community.

The value creation effects of typical renewable power generation systems

over the course of 20 years of operation



Source: IÖW, current as of Aug. 2010

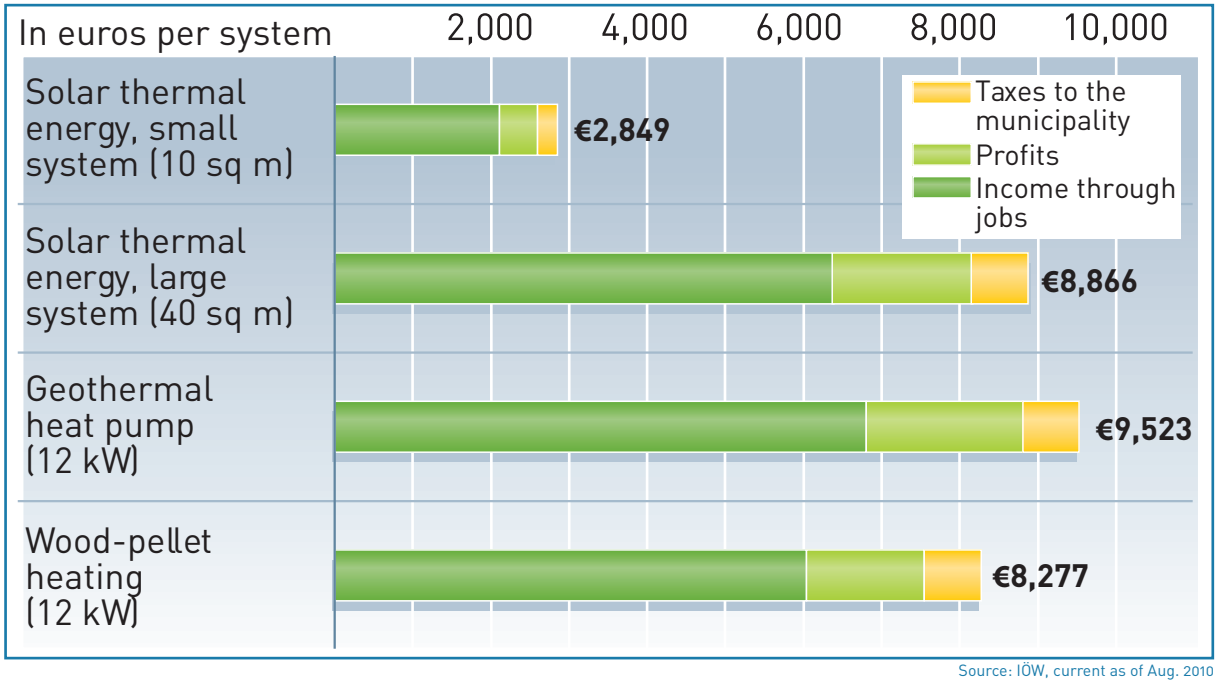
By contrast, there are many communities which contain several dozen 2 MW wind energy facilities (€2.8 million/2 MW output /20 years), or several hundred small photovoltaic systems (€62,000/20 kW output/20 years) within their boundaries. Unlike wind and photovoltaics facilities, bioenergy systems can enhance certain value creation effects due to the fact that for instance, there is always an additional annual turnover related to fuel (e.g. energy crops, wood).

The value creation effects of renewable heating systems

The graphic shows typical systems for detached homes in the area of renewable heat. While a geothermal heat pump or a wood pellet heating system with 12 kW of output can provide a detached home completely with heat and hot water year-round, a solar thermal energy facility can normally only cover about a quarter to a third of the annual heat requirements of an average detached home. By way of comparison, a large solar thermal energy facility for a multi-unit residential building is also shown. Local and large-scale district heating networks providing renewable heat have not been considered.

The value creation effects of typical renewable heating systems

over the course of 20 years of operation



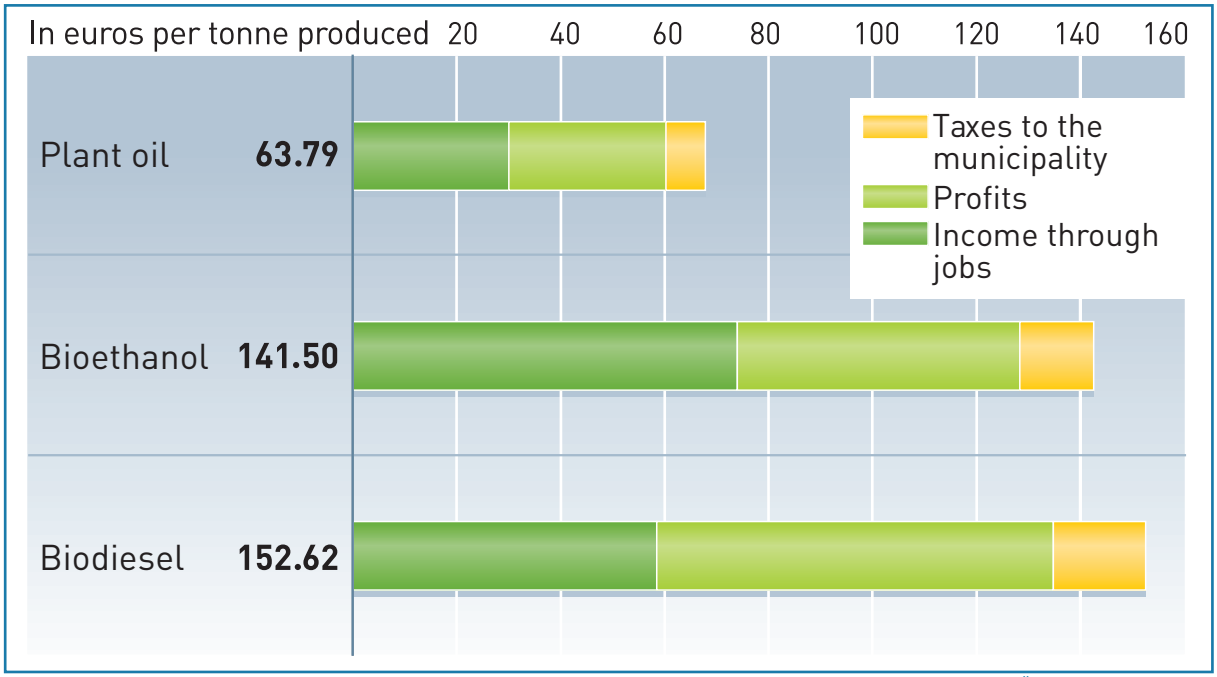
Source: IÖW, current as of Aug. 2010

The value creation effects of biofuel systems

With biofuel production, the value creation is expressed not in kilowatts, but rather in euros per tonne produced. Since the production process of pure plant oil involves primarily the pressing of rapeseed in an oil mill, this value creation chain yields less turnover. However, all three value creation chains of biofuel production have in common that the by-products help increase value creation. These by- products of processing, such as rapeseed grist, glycerine and malt residue, are put to use as feedstuff, as an energy source or as raw materials in the chemical industry, and thus generate additional value creation effects, which flow into the overall account.

Value creation effects of biofuel production

over the course of 20 years of operation



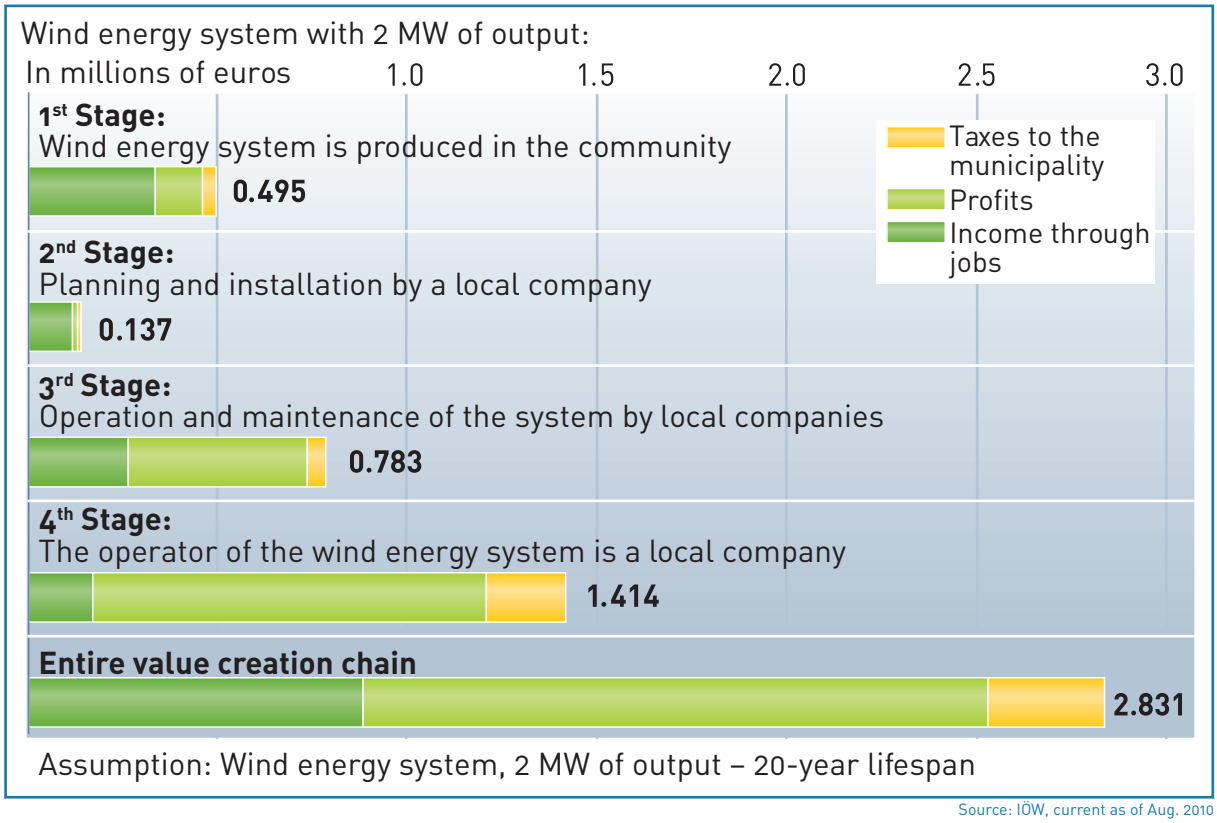
Source: IÖW, current as of Aug. 2010

An Example of the Value Creation Effects of a Wind Energy System

A typical 2 MW wind energy system will generate municipal value creation of €2.8 million (cf. p. 8) in the course of its 20-year lifespan. Even in its first year of operation, it will generate a major share of its municipal value creation effects – after all, the system is produced, purchased and installed, which involves considerable one-time payments.

A complete value creation chain means more profit for the community

The more stages of the broadly diversified value creation chain are located in a community, the more income, profits and taxes will be generated.



Source: IÖW, current as of Aug. 2010

The value creation stage "facility production" generates a total of €495,000 of added value, which consists primarily of the value creation effect income, since this stage is relatively job intensive. In addition, in the first year of installing the facility, there is the one-time value creation factor "planning and installation" (€137,000).

Over the course of its 20-year lifespan however, the major share of value creation effects will be generated by the annually recurring effects from the stages "system operation and maintenance" and "operator company". The value creation by the former adds up to €783,000. The latter provides the most important share of the value creation, with €1,414,000, of which the value creation effect "profit", with €1 million, is the largest component. Thus, the operator company is also the most important source of municipal taxes (€210,000), while the employment effect is relatively low, with incomes amounting to only €170,000, since usually, the only employee of an operator company who must be considered as apportioned to a wind energy system is one managing director.

How can a municipality profit from a wind energy system?

Even if no system manufacturer is locally resident, and even if the planning and installation of the wind energy system is carried out by actors from outside the community, the construction of a 2 MW wind energy system can generate value creation effects of €2.2 million. In this case, the prerequisite is that the system operation and maintenance be provided by local companies during the 20-year lifespan of the system, and that the operator of the system be a local resident, and hence taxable. The municipality will otherwise receive only 70% of the business taxes paid by the operator, with the other 30% going to the municipality where its home office is located.

Tax payments to a municipality for a 2 MW wind energy system

Value creation stages	Business tax		Municipal share of income tax		Total (20 years)
	euros / year	euros / 20 years	euros / year	euros / 20 years	
... if system is manufactured in the community	€19,700*	€19,700	€18,740*	€18,740	**€38,440**
... if planning and installation are provided by local companies	€2,820*	€2,820	€5,320*	€5,320	**€8,140**
...if system operation and maintenance are provided by local community	€1,360	€27,200	€1,060	€21,200	**€48,400**
... if the operator is locally resident (30% of business tax yield to the municipality where the operator has its office, 70% for the municipality of the system site)	€8,440	€168,800	€2,160	€43,200	**€212,000**
... if the operator is not locally resident (70% for the municipality of the system site)	€5,920	€118,400			**€118,400**
Total (with only 70% of business tax yield)	€29,800	€168,120			**€256,580**
Total (with 30+70% of business tax yield)	**€32,320**	**€218,520**	**€27,280**	**€88,460**	**€306,980**

Source: IÖW

*One-time tax payment in the year of system installation

In the model of a typical 2 MW wind energy facility presented, municipalities obtain tax revenue from both the business tax and the municipal share of the income tax. The largest portion comes from the business tax which the operator company pays.

Even if only the system operation and maintenance and the offices of the operator company are located in a community, the average annual business tax revenues amount to almost €10,000 (system operation and maintenance: €1,360/year, operator: €8,440 /year), plus €3,220 from the municipal share of the income tax. In this case, the tax revenue accruing to the municipality over the course of 20 years would rise to €260,400 (system operation and maintenance: €48,400; operator: €212,000).

If the operator is not locally resident at the system site, and no other value creation stages are realized locally, a 2 MW system will nonetheless generate €5,920 in business taxes per year. The 70/30 breakdown rule applies here (see pp. 6 & 12). In this case, the business tax revenues to the municipality alone would amount to €118,400 over the course of 20 years.

Lease proceeds for the municipality

In addition to tax revenue, the lease of municipal lots as sites for wind energy facilities is an attractive extra revenue source. For a 2 MW system, average annual lease payments of €17,280 are estimated, which are counted as part of the value creation stage "system operation and maintenance". If the municipality leases the site for more than 20 years, gross lease proceeds of €345,600 are obtained.

Total Municipal Value Creation from Renewable Energies in Germany in 2009 and 2020

The described value creation effects refer not only to typical renewable energy facilities, but can also be ascertained for certain municipalities or regions, with their respective system parks. The study contains a projection of the value created for municipalities for all of Germany in 2009 and in the future. First of all, the municipal value creation effects from the use of all renewable energies in Germany in 2009 were ascertained.

Municipal value creation was then calculated for two development scenarios of renewable energies through 2020. The study compares the value creation effects given the assumption that the development targets stated in the lead scenario of the Federal Ministry of the Environment (BMU) will be implemented by 2020, with those assuming the industry forecast of the German Renewable Energies Agency (AEE) and the German Renewable Energy Federation (BEE) will be realized. The latter calculations take into account that the expenditures for renewable energy systems will drop further in future, i.e. that for example an investment cost reduction of approximately 10% is to be expected for wind energy systems by 2020.

In addition, a perspective for the development of local value creation in 2010 and 2011 is provided (as of October 2010). It shows the possible fluctuations in total annual municipal value creation which may result from various expansion volumes and specific properties of certain value creation chains.

Comparison of the Federal Ministry of Environment (BMU) Lead Scenario 2020 and the AEE/BEE industry forecast for 2020

Share of renewable energies.	BMU lead scenario, 2020	AEE/BEE industry forecast for 2020
...of electricity consumption	34.7 %	46.8 %
...of heat consumption	17.1 %	25.1 %
...of fuel consumption	11.5 %	21.4 %

Source: AG Energiebilanzen

The AEE/BEE industry forecast projects a higher share of renewable energies in electricity, heat and fuel consumption than does the Federal Ministry of the Environment (BMU) lead scenario, and thus, too, a higher degree of further development and a greater stock of operating systems in 2020. In 2009, the municipal value created by renewable energies in Germany totaled €6.8 billion. That includes wind energy as the largest contributor of the value creation chain with €2.1 billion, and photovoltaics with €2.4 billion. The high share of photovoltaics can be explained primarily by the large amount of additional construction of new systems and the resulting high turnover in 2009.

Fluctuating local value creation from renewable energies in 2010 and 2011

The great importance of the installation of new photovoltaic systems for the annual amount of municipal value creation is reflected in the outlook for the years 2010 and 2011. The assumption was an increase in the number of photovoltaic systems by 8,000 MW in 2010 and by 5,000 MW in 2011. For each of the other value chains too, specific expansion rates for 2010 and 2011 have been assumed, in accordance with the development trend of the AEE/BEE industry forecast for 2020. Under this prognosis, the total of municipal value creation in 2010 increased from €6.8 billion to €10.5 billion. The value creation from PV systems more than doubled, from €2.4 billion to €5.8 billion, thanks to the strong growth of new systems. Additional increases of approximately €200 million each are to be contributed by wind systems and biofuel plants.

Municipal value creation from renewable energies, 2009 – 2011

Wertschöpfungskette	2009	2010	2011
Wind energy	€2,050 million	€2,241 million	€2,246 million
Photovoltaics	€2,445 million	€5,764 million	€3,882 million
Small hydroelectric plant	€30 million	€129 million	€76 million
Biogas	€557 million	€584 million	€673 million
Biomass (wood)	€537 million	€563 million	€675 million
Geothermal heat pumps	€253 million	€282 million	€305 million
Solar thermal energy	€354 million	€224 million	€347 million
Biofuels	€557 million	€747 million	€745 million
Total	**€6,785 million**	**€10,533 million**	**€8,948 million**
... of which taxes to the municipality	€624 million	€904 million	€841 million
... of which corporate profits	€2,878 million	€3,743 million	€3,795 million
... of which income through employment	€3,283 million	€5,887 million	€4,311 million

Source: AG Energiebilanzen

The assumed decline in the volume of the expansion of photovoltaic systems in 2011 to 5,000 MW will cause an annual drop in municipal value creation from systems of this technology from €5.8 billion in 2010 to €3.9 billion. Total municipal value creation in 2011 will drop to €8.9 billion.

While in 2010, more than 80% of total municipal value creation was generated by photovoltaic systems in the first two value creation stages ("plant production" and "planning and installation"), this drops to 60% in 2011. In the case of the total of municipal value creation from wind systems however, the share of the third and fourth stages of value creation ("plant operation and maintenance" and "operating company") remains greater. In 2009 and 2010, only approximately one third of total municipal value creation was generated by expansion. Since for 2011, an expansion of only 1,800 MW has been assumed, its contribution drops to below 30%. However, the total municipal value creation from wind systems remains constant through 2011 at €2.2 billion, with a growing stock of systems.

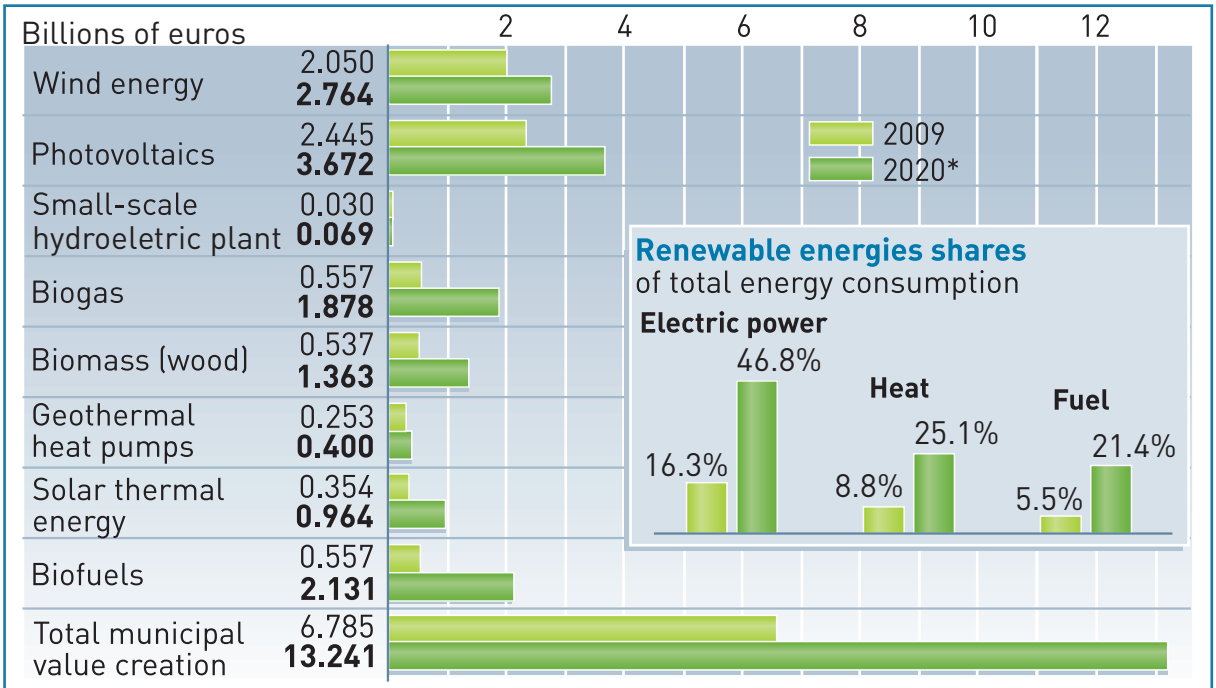
In the bioenergy supply chains investigated, annual fluctuations are lower, since constant expansion is assumed, and the third and fourth value creation stages ("plant operation and maintenance" and "operating company") are structurally much more important for the entire value creation for each of these technologies.

Municipal value creation from renewable energies in 2020

If the installed output forecast of the Federal Ministry of the Environment (BMU) lead scenario for 2020 for the various renewable energy technologies are multiplied by indicators of value creation effects (euros/kW of output), the result is that municipal value creation increases slightly from €6.6 billion to €7.2 billion. Although in this scenario, the stock of systems, and hence value creation, do increase in the stages "system operation and maintenance" and "operator company", the additional construction is to some extent less dynamic than in 2009, or else involves lower investment costs. Thus for instance, the turnover and the resulting value creation effect in the stages "system production" and "planning and installation" will stagnate or drop for the value creation chains of wind energy and photovoltaics.

On the other hand, a considerable increase in municipal value creation, to a total of €13.2 billion in 2020, does emerge from the AEE/BEE industry forecast. It results primarily from more optimistic assumptions regarding the development of wind and photovoltaic output, compared with the Federal Ministry of Environment (BMU) lead scenario. AEE/BEE assume an installed on-shore wind energy output about one third higher than does the Federal Ministry of Environment (BMU), and an output of photovoltaic systems almost twice as high in 2020. At €3.7 billion, photovoltaics thus provides the largest contribution to total municipal value creation in 2020, followed by wind energy with €2.8 billion, biofuels with €2.1 billion. and biogas with €1.9 billion.

Total municipal value creation from renewable energies, 2009 and 2020*



*Growth of renewable energies by 2020, according to the AEE/BEE industry forecast

Source: IÖW, current as of Aug. 2010

Limitations to ascertaining value creation effects

Both the projection of the total value creation for 2009 (€6.8 billion) and the calculations for the two variants of the development path up to 2020 (€7.2 billion or €13.2 billion) must be considered conservative results, since not all renewable energy technologies have been examined. The value creation chains for offshore wind energy system, large hydroelectric facilities and deep geothermal energy have not been considered, nor have, for methodological reasons, power and heat generation from log wood, plant oil, and landfill and sewage gas.

In the production area, the study has addressed direct effects, including component production and foreign trade, but not indirect effects. Thus it has been assumed that the provision of biomass will generate no additional value creation effects, even for the various bioenergy value creation chains. The study rather assumes that a farmer who e.g. cultivates grain for a biogas plant on a certain field would have achieved harvest revenue even without the biogas plant. If he could not sell his crop to a biogas system, he could obtain comparable proceeds by selling it for use as food or feedstuff. Under no circumstances would he give up his farm and become unemployed if there were no biogas plant, i.e. the biogas plant value creation chain alone provides no new incentive for agricultural activity. However, such effects as the use of by-products, such as those occurring in biofuel production, were taken into account, as they can for example be used as feedstuff; i.e. additional value is created.

Jobs from municipal value creation

The projection of the municipal value creation through renewable energies in Germany in 2009 yields a net employment figure of 116,000 full-time jobs. That covers the jobs in the 16 value creation chains investigated, with the exception of the chains mentioned above, and without such employment effects as in agriculture. This results in a difference from the gross employment figures of the renewable energies industry, which, according to calculations of the Federal Ministry of the Environment (BMU), provided 340,000 jobs in 2009.

Municipal value creation and direct employment: The example of the small photovoltaic systems value creation chain in 2009

Value creation stages, small photovoltaic systems	Total value creation	Net employees
System production	€382 million	9,000
Planning and installation	€325 million	11,400
System operation and maintenance	€43 million	830
Operating company	€297 million	0
Total	€1,048 million	21,200

Source: IÖW

The employment effects in the 16 value creation chains investigated are distributed very differently amongst the various value creation stages. While in wind energy, particularly system production and maintenance are job intensive, the jobs in the value creation chain of small photovoltaic systems are concentrated in planning and installation. Some 11,400 people worked in this stage in 2009. The fact that planning and installation had slightly greater employment effects than did system production in 2009 was due to the high additional construction rates of small photovoltaic systems in that year. Overall in 2009, some 160,000 new photovoltaics systems were installed, with 3,900 MW of output.

Since it can be assumed that small systems have been installed almost exclusively as roof systems on private homes, the employment effect of a local operator company is obviated. However, such effects are indeed relevant in the value creation chains of the large photovoltaic facilities, both on roofs and in ground mounted solar parks. Altogether, the gross employment of the entire German photovoltaic industry in 2009 was 65,000 jobs, and total turnover amounted to €15.2 billion.

Turnover of the entire photovoltaic industry in Germany, 2009

(including large-scale systems and ground-mounted solar parks)

Investments in new systems:	€12.0 billion
Total earnings from operation of systems in Germany:	€3.2 billion
Operational earnings in Germany:	€15.2 billion

Source: BMU/Renewable-Energies-Statistics,Section, Aug. 2010

An Example of Value Creation Effects in a Community

The example of a sample municipality can serve to illustrate the development of municipal value creation through renewable energies. Our municipality has 75,000 inhabitants, and within its boundaries has value creation chains of all 16 renewable energy systems. The number of systems has reached a degree which corresponds exactly to the German average shares of renewable energies of power and heat consumption in 2009 (16.3% of renewable energies in electricity consumption, 8.8% in heat consumption and 5.5% in fuel consumption.

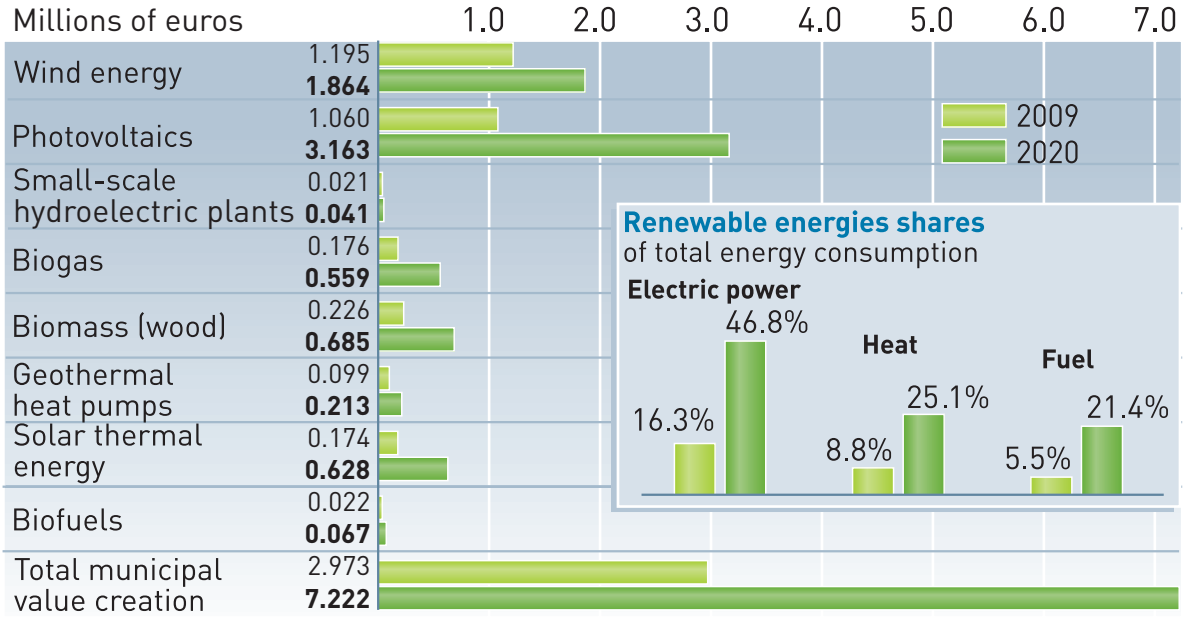
The sample municipality harbours companies of all value creation stages except system manufacturers and operator companies: planning and installation, system operation and maintenance, and also banks and insurance companies. The total value creation in the sample municipality is derived exclusively from the activities of local companies, and comes to a value creation of €3 million; it yields € 235,000 in municipal tax revenues. Municipal value creation per capita from renewable energies amounts to €40. Even by attaining the average degree of development in 2009, the sample municipality already profits from the use of renewable energies in the area of power, heat and fuel:

- It avoids expenditure for fossil fuel imports amounting to €2.9 million (€981,000 for hard coal, €920,000for natural gas and €585,000 for oil).
- It avoids carbon dioxide (CO2) emissions amounting to 64,000 tonnes.
- It provides 50 full-time jobs in the renewable energy companies.

If the sample community continues to keep pace with the development of renewable energies and achieves the degree of expansion by 2020 that the AEE/BEE industry prognosis has predicted (46.8% share of renewable energies in electricity consumption, 25.1% in heat consumption, 21.4% in fuel consumtion), the entire community value creation will increases from €3 million in 2009 to €7.2 million, of which €575,000 would be municipal tax revenues. The municipal value creation per capita would then amount to €96.

Growing municipal value creation from renewable energies in 2009 and 2020*

Sample community with 75,000 inhabitants. Value creation per inhabitant: 2009: €39.35; 2020: €95.39



*Assumptions: Further development of renewable energies at the national average in each case; all system technologies and value creation stages apart from systems production and offices of operator company are local.

Source: IÖW, current as of Aug. 2010

In 2020, the sample municipality would, if it were to attain the average nationwide degree of development as predicted by the AEE/BEE industry forecast, profit more strongly than in 2009 from the use of renewable energies in the areas of power, heat and fuel:

- It would avoid expenditures for fossil fuel imports amounting to €3.6 million (€9.7 million for hard coal, €10.6 million for natural gas and €17.3 million for oil).
- It would avoid CO2 emissions amounting to 176,000 tonnes.
- It would provide 115 full-time jobs in renewable energy companies.

Conclusion: Economic Advantages through Broad-Scale Local Development

The study "Value Creation for local communities through Renewable Energies" of the Institute for Ecological Economy Research (IÖW) and the Centre for Renewable Energies at the University of Freiburg (ZEE) has for the first time presented a systematic and comparable analysis of the value creation effects of renewable energies in Germany. The detailed breakdown of the different effects on the value creation stages of the 16 value creation chains investigated is a basis for statements on particular systems, municipalities, or even Germany as a whole.

Total municipal value creation will increase from €6.8 billion in 2009 to at least €13.2 billion in 2020, if the degree of further development which the AEE/BEE industry forecast predicts is attained. That will permit the avoidance of at least €34.8 billion in fossil fuel imports in 2020.

Altogether, German municipalities can expect at least €1.2 billion a year in tax revenue from the use of renewable energies by 2020. The more job-intensive a system technology or a value creation chain is, the more tax revenue municipalities can expect from their shares of the income tax. However, municipalities primarily profit from business tax receipts, which account for 64% of their tax revenues from renewable energies. Accordingly, the greatest municipal taxpayers in 2020 will be the particularly high-turnover industries – wind, bioenergy and photovoltaics. Such value creation chains as wind energy systems can provide municipalities with high proceeds in addition to tax revenues by leasing plots for energy facilities.

Although photovoltaics in 2009 accounted for only a relatively small share of renewable power generation (6.2 billion kWh, 1.1% of total German electric power consumption), its share of municipal value creation was disproportionately large (€2.4 billion, 36% of the total), since it is a particularly job intensive and high turnover value creation chain. In 2010, it accounted for some €5.8 billion, or more than half of total municipal value creation, thanks to the strong expansion of an assumed 8,000 MW of capacity.

New investment in a system pays off for a municipality over the average lifespan of 20 years, even if initially, the value creation effects apparently occur primarily where the system is produced. The key to maximum municipal value creation is the local presence of many stages of the value creation chains, first and foremost the operator of the system, which ensures the highest business tax revenues.

A comparison of the value creation effects in various municipalities, which is now possible with the help of the tool kit developed by the IÖW and the ZEE, also shows that a municipality need not have a particularly large area to be able to generate high value creation. Although municipalities in rural areas have an advantage with regard to rapid mobilization of their bioenergy potentials, urban communities too can profit from the wide variety of value creation effects of renewable energies by the targeted development of solar power, by participation in wind parks, or by attracting job-intensive and high-turnover companies.

Thus local concentration on one single technology should be avoided, not only due to the necessity for a broad and balanced development of mutually complementary renewable energies, but also because a municipality would miss out on concrete economic advantages if it were to neglect the development of various additional potentials for renewable energies within its boundaries.

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