# SWOT-analysis in the field of renewable energies for the administrative district of Schwäbisch Hall

on behalf of


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# 1 Introduction

The project VIS NOVA aims to promote renewable energy sources and to improve energy efficiency, especially in rural areas. The partner regions in Germany are ‚Schwäbisch Hall' and the ‚Dübener Heide'. Furthermore, partners from Austria, Hungary and Poland are involved in this project.

A comparative SWOT-analysis in accordance with the methodology and the structure jointly developed by all partners serves as a basis of the project. In addition to the data collection the present analysis for the district of Schwäbisch Hall includes the regional potentials in the field of renewable energies and energy efficiency.

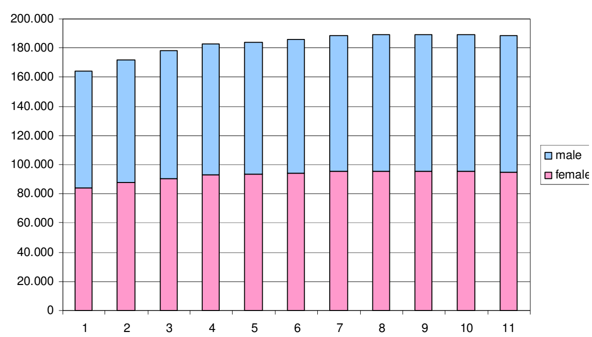
# 2 The administrative district of Schwäbisch Hall

## 2.1 Demography and society

The district of Schwäbisch Hall is located in the northeast of Baden-Württemberg in the Heilbronn-Franken region. Neighbouring districts are the Main-Tauber in the north, the Bavarian district of Ansbach in the east, the Ostalbkreis in the south, the Rems-Murr-Kreis as well as the district of Heilbronn in the southwest and the district of Hohenlohe in the west.

**Graph 1: Location of the district of SHA**

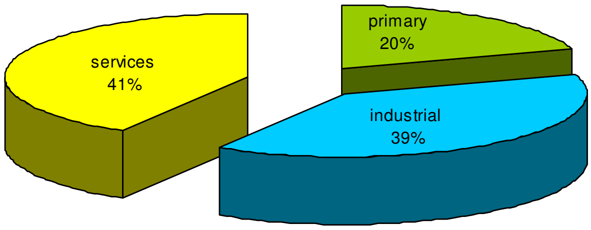
The landscapes covered by the district are parts of the "Hohenloher Ebene" (Hohenlohe plain), the "Schwäbisch-Fränkische Waldberge" (Swabian-Franconian forest hills) and the "Frankenhöhe". The two rivers Jagst and Kocher, which are tributaries to the Neckar, flow through the district.




**Graph 2: Population development in the district of Schwäbisch Hall**

The total area of the district amounts to 148.401 ha. At the end of 2010 the total population was 188.420. Thus, with a population density of about 127 inhabitants per km², the district of Schwäbisch Hall is among the sparsely populated areas of Germany (on an average about 230 inhabitants/km²). In contrast to the declining trend in Germany, the population has increased by about 20.000 and stabilized at approx. 188.000 inhabitants over the last 20 years (see graph 2).

## 2.2 Economics and finances




**Graph 3: Share of enterprises in the corresponding economic sectors**

Agriculture is an important economic factor in this rural region. 20 % of the local enterprises practise farming. The medium-sized industry playing a major role in the district of Schwäbisch Hall is characterized by a particularly balanced mix of trades and industries. Besides mechanical engineering being the main focus of the manufacturing industry, wood processing, plastics industry, electrical engineering and food industry are also well represented.

In addition the service industry is extraordinarily well developed in this district. Special mention should be made of the nationwide well-known Bausparkasse Schwäbisch Hall for being the largest employer. The unemployment rate of less than 4 % remains significantly below the national average.

## 2.3 Structural data of energy

In recent years the structure of energy supply has changed considerably in Germany. Within a few years the share of renewable energy sources has strongly increased and thus amounted to approx. 17 %[1] of the total power generation in 2010. In addition large generating units will be disconnected due to the nuclear phase-out. More flexible electricity generation plants such as modern and highly efficient gas power plants as well as decentralized small CHPs (combined heat and power units) producing electricity and heat at the same time through the cogeneration of heat and electricity, will become increasingly important. This development reflecting a decentralization of energy supply will increase even more in Germany in the future.

Another important issue is the integration of renewable energies into the grid. The increasing share of renewable energies in the generation of electricity will also entail rising fluctuations in the electricity grid. For instance, electricity generated with wind turbines is subject to high wind-related fluctuations. There are also fluctuations in power feed-in during day and night with photovoltaics or differences in the heat requirement with CHPs. All these fluctuations are transferred to the electricity grid and need to be balanced. Electricity generated in biogas plants or biomass power plants is fed into the grid 24 hours a day.

A demand-responsive generation of energy is becoming increasingly important.
For instance, the favourable outlook for wind energy has already been taken into account. Thus, balancing energy produced by power plants will gain increasing importance.

[1] Source: BMU (2011) in Erneuerbare Energien – Innovationen für eine nachhaltige Energiezukunft

In the district of Schwäbisch Hall several energy suppliers are network operators. As regional providers they are managing the major part of the energy supply even after the liberalization of the electricity and gas market.

District heating networks and the corresponding heat generation plants are being operated by the Stadtwerke Schwäbisch Hall AG and the Stadtwerke Crailsheim GmbH in the district of Schwäbisch Hall. Especially in the field of biogas plants more decentralized small heating networks are currently being developed.

Large power plants do not exist in the district of Schwäbisch Hall. Due to the transformation of the energy system, however, Germany is moving towards a decentralized energy supply. In particular, the field of renewable energies and combined heat and power is becoming more important.

The same applies for the district of Schwäbisch Hall already being far advanced compared to the rest of the country. This is also reflected in the national ranking in the field of solar energy. In the "Solarbundesliga[2]" (competition based on solar energy) the district of Schwäbisch Hall takes first place among all German districts. Even in the divisions of medium and small cities, several towns and municipalities of the district secured a position among the top 10.

The progress in the district of Schwäbisch Hall cannot only be attributed to innovative individuals and enterprises, but also to an active energy consulting. This activity is the result of a network of actors and energy consulting. In this context, the EnergieZENTRUM providing consulting services for renewable energies and energy saving should be noted in particular. As a project the Wirtschaftsförderungsgesellschaft (WFG = Business Development Corporation) of the district of Schwäbisch Hall offers consulting services for private persons, municipalities, business enterprises and agriculture in the entire district of Schwäbisch Hall.

In addition there are some modern, innovative and regionally based energy suppliers such as the Stadtwerke (municipal utilities) in Schwäbisch Hall and Crailsheim strongly pushing the use of renewable energies and efficiency technologies. The Novatech GmbH also located in this district, is active in the field of biogas, solar heat and photovoltaics and contributed considerably to the expansion of these fields.

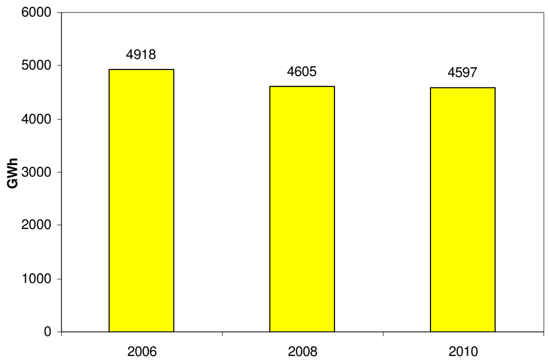
[2] The national ranking of the solar industry is available at www.solarbundesliga.de.

## 2.4 Final consumption of energy

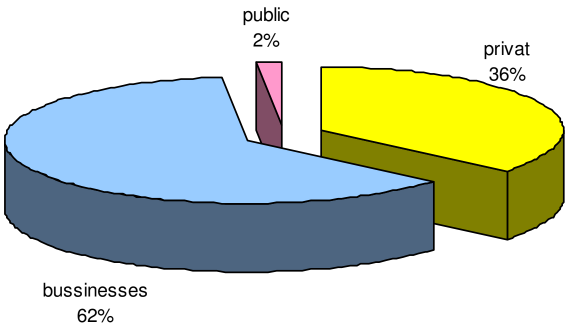
| | final consumption of energy | final consumption of energy according to consumer group and type of use in GWh/a | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | private | | | | businesses | | | | public | | | |
| | | heat | electricity | mobility | total | heat | electricity | mobility | total | heat | electricity | mobility | total |
| **2006** | 4918 | 1102 | 392 | 234 | 1727 | 2154 | 691 | 258 | 3103 | 59 | 20 | 8 | 87 |
| **2008** | 4628 | 1070 | 389 | 234 | 1692 | 1911 | 685 | 255 | 2851 | 57 | 20 | 8 | 84 |
| **2010** | 4574 | 1039 | 381 | 234 | 1653 | 1921 | 670 | 248 | 2839 | 55 | 19 | 8 | 82 |

**Table 1: Final consumption of energy according to consumer group and purpose**

Table 1 provides a detailed breakdown of the final consumption of energy divided into consumer groups such as private, businesses and public and of the type of use such as heat, electricity and mobility.




**Graph 4: Development of final energy consumption in the district of Schwäbisch Hall**




**Graph 5: Final energy consumption according to consumer groups**

In 2010 the end energy consumption amounted to 4.597 GWh in the district of Schwäbisch Hall with a slightly decreasing trend. With an end energy consumption of 62 % the industrial sector (businesses) is thus the main consumer followed by the private sector which accounts for 36 % of the final energy consumption. 2 % of the total end energy is consumed by the public sector in the district.

### 2.4.1 Building structure and heat generation plants

| | total number of buildings | number of residential buildings | number of non residential buildings | number of residential buildings according to dwelling units | | |
|---|---|---|---|---|---|---|
| | | | | 1 dwelling unit | 2 dwelling units | 3 and more dwelling units |
| **1990** | 63.946 | 37.713 | 26.233 | | | |
| **2000** | 75.537 | 44.549 | 30.988 | | | |
| **2010** | 82.396 | 48.594 | 33.802 | 32.066 | 11.571 | 4.957 |

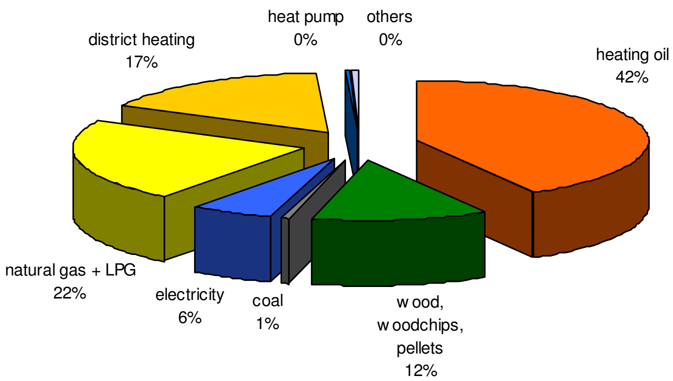
**Table 2: Survey of buildings in the district of Schwäbisch Hall**

In the district of Schwäbisch Hall there are 82.396 buildings (without garages and sheds) with a total base area of 16.120.130 m². The buildings are divided into 48.594 residential buildings and 33.802 non-residential buildings. Table 2 shows the current age structure of residential buildings in the district of Schwäbisch Hall.

| age of residential units – built... | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **before 1919** | **1919-1948** | **1949-1957** | **1958-1968** | **1969-1978** | **1979-1983** | **1984-1995** | **1996-2000** | **2001-2006** |
| 5.831 | 4.859 | 5.345 | 7.289 | 7.289 | 3.402 | 5.831 | 6.317 | 2.430 |

**Table 3: Overview of age structure of residential buildings in the district of Schwäbisch Hall**

59 % of all buildings and 39 % of the base area are privately used, 39 % of the buildings and 57 % of the base area are used for commercial purposes as well as 2 % of the buildings and 4 % of the base area are used by the public sector.

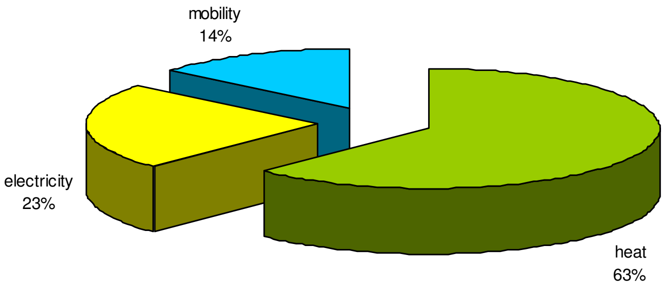



**Graph 6: Main heating systems in the district of Schwäbisch Hall**

The main heating systems being used in the district of Schwäbisch Hall are oil-fired heating systems representing the largest share with 41 %, followed by natural gas with 22 % and the supply via district heat representing 17 %.

The use of wood, woodchips and pellets is comparatively high with 12 %, as well as electric heating with a share of 6 %.

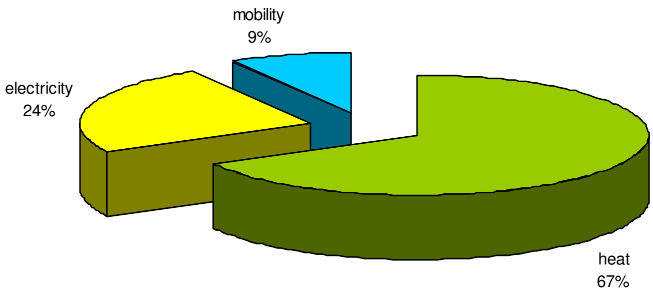
### 2.4.2 Energy consumption in the private sector




**Graph 7: Final energy consumption in the private sector according to the type of use**

In the field of heating a slight decline in consumption could be registered with private households. The areas electricity and mobility have shown more or less constant consumption levels within the past few years.
With a share of 63 % final energy is mainly used for heating purposes. 23 % of the end energy is consumed as electricity within the private sector. With a share of 14 % in final energy consumption of the private sector, mobility is comparatively high.

### 2.4.3 Energy consumption in the commercial sector



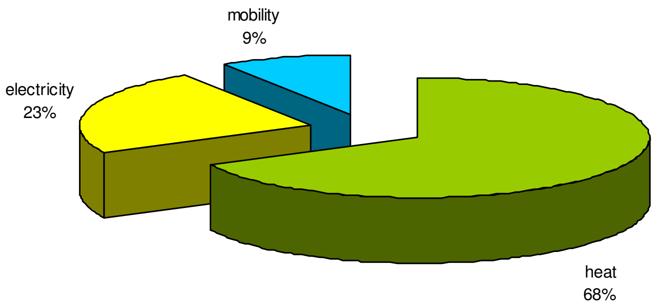

**Graph 8: End energy consumption of businesses according to type of use**

In the commercial sector the final energy consumption is divided up into 67 % in heating, 24 % in electricity and 9 % in mobility.

Despite of a much more restricted number of companies the industry shows by far the highest energy consumption compared to other commercial subsectors. For instance, a share of 75 % of the heat sector is required by the industry.

Mobility consists of rail freight traffic and road transport. Inland waterway transport as well as aviation only play a secondary role in the district.

### 2.4.4 Energy consumption in the public sector




**Graph 9: Final energy consumption in the public sector according to type of use**

In the public sector 68 % of the energy is required for heating. 23 % of the energy is used as electricity and a share of 9 % is caused by public traffic.

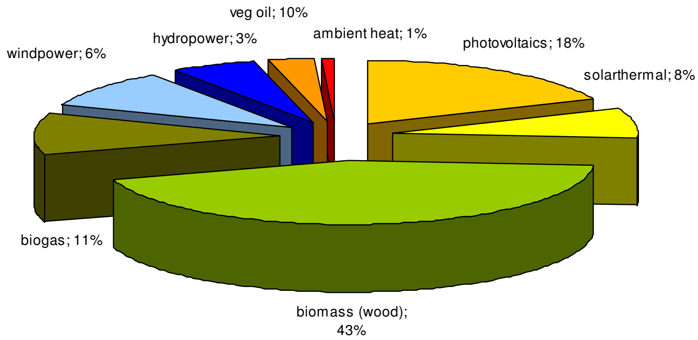
In the district of Schwäbisch Hall public traffic is composed of public transport of passengers by rail and by road.

## 2.5 Renewable energies

The district of Schwäbisch Hall has a number of plants using different renewable energy sources for the generation of electricity and heat, namely:

- Biomass plants
- Biogas plants
- Wind turbines
- Hydropower plants
- Photovoltaic systems
- Solar thermal systems
- Vegetable oil CHPs
- Heat pumps

In 2010 these plants produced a total of 635 GWh of energy. 339 GWh of this energy are being used as electricity thus covering about 31 % of the district's total power requirement amounting to 1.070 GWh through renewable energies.
About 10 % of the heat requirement of 3.014 GWh can be covered by renewable energies.
By far the greatest share was produced by biomass plants with a total amount of energy of about 281 GWh per year. Approximately 82 GWh of this energy are used as electricity being generated by 14 biomass fired combined heat and power plants located in the district. The remaining 199 GWh are energy in form of heat produced in numerous biomass heating systems mainly used in private households, – beside the waste heat resulting from biomass power plants during the generation of electricity. These biomass heating systems are either fired with wood pellets, split logs or wood chips.




**Graph 10: Share of the different plants in energy generation from renewable energy sources**

Photovoltaic systems represent the second largest share in energy production from renewable energy sources. Overall, about 8.500 photovoltaic systems produced 118 GWh of electricity.

43 biogas plants are being operated in the district of Schwäbisch Hall. Besides the use of slurry, most of these plants are fired with energy crops such as maize or cereal. Furthermore, in 5 of these plants biogenic waste e.g. slaughterhouse waste is fermented to form methane and to be converted into electricity. Apart from electricity, biogas plants also produce heat that may be used for heating the fermenter or for domestic heating via district heating pipelines. As the main focus is

on the generation of electricity and most of the biogas plants are quite a distance away from the residential area, only part of the generated heat has been used so far. In 2010 a total of about 75 GWh produced through biogas plants was used.

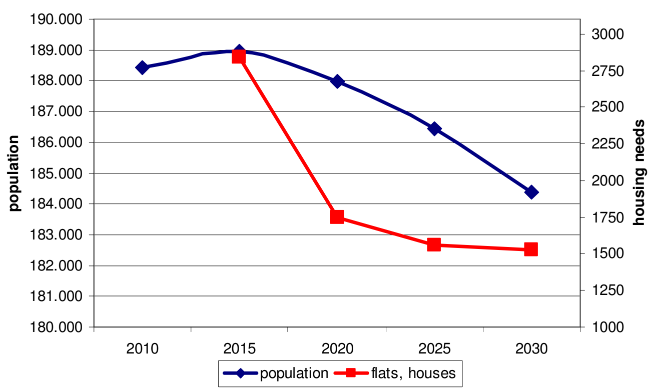
About 10 % of the energy is produced in 27 vegetable oil fired power stations (CHPs). Unlike the biogas plants they are mainly producing heat. Electricity represents about 30 % of the total energy production of 62 GWh.

Solar thermal systems produce heat and are mainly used for water heating. However, to some extent they are also supporting the heating system. In total the 6.277 solar thermal systems of the district generated about 48 GWh of thermal energy.

The 20 wind turbines were able to produce 35 GWh of electricity. With an energy production of 19 GWh the 88 hydropower plants provided about 3 % of the total energy generated in the district. 6 GWh of thermal energy were supplied by the 381 heat pumps.

# 3 Potential study

## 3.1 Development of population and existing buildings




Graph 11: Development of population and housing needs until 2030

The total population will probably slightly decrease by about 4.000 inhabitants by 2030 (refer graph 11). This represents a decrease of about 2 % compared to the year of 2010.

This will thus result in a decline in future housing needs. The housing need shown in the graph consists of the annual need for new housing (new buildings) and the need for housing replacement (renovation/modernization). While the demand for new buildings will decrease significantly and almost drop to zero by the year of 2030, the number of buildings to be renovated respectively modernized will increase.

Both the decline in population and the change in housing needs will have impacts on the energy consumption and the use of renewable energies.

## 3.2 Development of energy consumption

Primary energy consumption will strongly depend on the economic development. Baden-Württemberg relies on a continuing positive economic development with a constant power consumption at the same time. Unlike the German Government assuming that energy consumption will decrease, the federal state government of Baden-Württemberg is expecting energy consumption to stay on the same level in the medium term.

This forecasting for the federal state of Baden-Württemberg may also be applied to the commercial sector of the district of Schwäbisch Hall. The forecasts regarding population and existing buildings are rather declining in the medium term. Moreover, if the potential for energy saving in the area of renovation and the use of more efficient systems is taken into account, a decline in energy consumption may be expected in the private sector.

All in all, the energy consumption is likely to fall slightly in the district of Schwäbisch Hall within the next 15 years to come.

## 3.3 Potential for energy saving

A sustainable energy supply may only succeed if an efficient and economical use of energy will be ensured. However, regarding energy saving and improved energy efficiency the economic implementation has to be considered as well beside the technical potential. Furthermore, the potential for energy saving also depends on the period under consideration and the measures used. The following analysis of potentials for energy saving in the district of Schwäbisch Hall is a medium-term assessment (over a period of 15 years) under technically and economically viable conditions.

### 3.3.1 Private households

About one third of the total energy consumption is required for the heating of buildings and water. Thus, this area offers a substantial saving potential.

Hereby thermal insulation measures in the building envelope but also heat generation itself represent a considerable saving potential. For instance electric heating systems, which are extremely inefficient in terms of primary energy (mainly night storage heating systems) should be mentioned. With about 6 %, the use of night storage heating systems in Baden-Württemberg is above the national average of 4,1 %.

Heat pumps causing about 10 % of the energy consumption in private households represent another significant saving potential in the private sector. By using highly efficient heating pumps and a simultaneous hydraulic compensation, 90 % of the energy could be saved.[3]

A further considerable saving potential is to be found in the use of more efficient devices and the non-use of stand-by mode.

Through these measures a total theoretical saving potential of about 35 % in the field of heating and about 10 % in electricity could be expected in the private sector.

However, the saving potential is strongly influenced by the usage pattern and the motivation of private persons. Therefore, legal regulations such as the energy saving regulation (EnEV 2009) and the „Renewable Energies Heat Acts" released by the Federal Government and the Land of Baden-Württemberg (EWärmeG, EEWärmeG) aim to push the development of this potential also in the district of Schwäbisch Hall.

Realistically, these measures may only succeed to develop part of this potential. This derives already from the fact that the biggest potential is to be found in the modernization of existing buildings. The cycles of renovation, however, are very long. Due to low renovation rate of existing buildings, only a renovation of less than 2 % of the buildings may be expected per year. It will take respectively long to develop this potential for existing buildings regarding both insulation of buildings and heat generation.

### 3.3.2 Industry and commerce

Both industry and commerce also hold great potentials with regard to thermal insulation of building envelopes. The „Energy Saving Regulation" and the „Renewable Energies Heat Acts" of the Federal Government and the Federal State Government (Land) of Baden-Württemberg apply here as well. The potentials for heating of buildings also reach a share of about 30 %.

However, in the manufacturing industry the major part of the heat required is process heat. The greatest saving potentials are here to be found in the efficient use e.g. by using heat recovery and state-of-the-art facilities.

A further saving potential of about 30 % can be achieved through the use of compressed air systems. In addition, there are more energy saving potentials associated with the use of electric motors, pumps and lighting. A more efficient energy production in accordance with the state-of-the-art as well as the consideration of waste heat potentials will open up new possibilities of energy saving through increased efficiency. Particularly noteworthy is the greater use of cogeneration (trigeneration).

As the saving potentials in the commercial sector may vary from company to company, the introduction of a suitable energy management system is being supported in Germany. Moreover, initiatives like the „Modell Hohenlohe" – a network

[3] Source: Wirtschaftsministerium BW (2009): Energiekonzept Baden-Württemberg 2020

for corporate environmental protection and sustainable economic management – are promoted as well. This network includes several businesses located in the district of Schwäbisch Hall. As a consequence energy management systems (DIN EN 16001 and ISO 50001) and environmental management systems (EMAS and ISO 14001) are quite frequently used.

The saving potential in industry and commerce is estimated to be between 20 – 25 % both in the heat sector and the electricity sector.

The development of the potential for buildings in the industrial and the commercial sector turns out to be rather difficult - similar to the situation with private households.
In the manufacturing industry a major implementation potential may be expected, as energy saving in production processes simultaneously involves cost savings. For competitive reasons businesses are increasingly focusing on developing this potential. The widespread use of energy management systems also contributes to unlock this potential.

### 3.3.3 Public sector

In the public sector there are also potentials for energy saving especially with regard to building envelopes and energy production. Comparable to the private and the commercial sector more energy could be saved by an effective use of lighting, stand-by mode and more efficient devices.

Furthermore, the energy saving potentials for street lighting and traffic lights partly go beyond 70 %.

In the public sector the total energy saving potential amounts thus to approximately 20 % both in the heat sector and the field of electricity.

The capacity for implementation regarding building envelopes and energy production also depends on the renovation cycle in the public sector. In the case of street lighting efficient light sources are partly being used already and a general use will be feasible. Serving as a role model, the public sector will press ahead with the development of this saving potential and will to a large extent be able to put it into practice.
The district and some communities have already established a functional energy and building management pursuing these goals as well in the future.

### 3.3.4 Mobility

Traffic and transport volume is expected to grow slightly in Baden-Württemberg in the future, both in transport of goods and transport of passengers.

In general the saving potentials are to be found in the technological advancement of drive technology and the reduction of road traffic.

With regard to passenger transport saving potentials can be developed by greater use of public transportation, energy efficient way of driving, reduction of short distance driving. Only the motivation to change the people's behaviour may lead to an improvement. Rising fuel prices will also raise the public's awareness in private passenger transport.

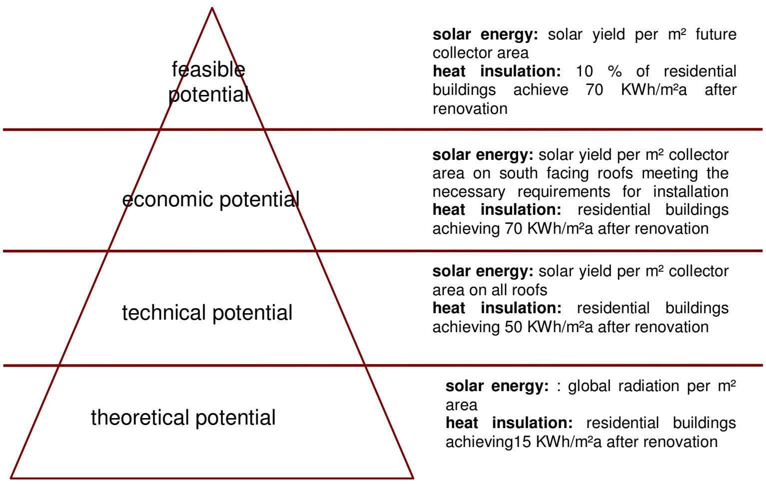
The energy saving potential for freight traffic mainly consists of an increased use of railways instead of road transport. There are even more saving potentials available by preventing empty runs and making logistics more efficient.

In the long distance freight transport by rail, fuel consumption strongly depends on acceleration and braking processes. Hence, an increase in efficiency can be achieved by optimizing the traffic flow. A general avoidance of long distance transports through regional added value and a product design suitable for transport could open up further saving potentials.

Basically, there is a potential for fuels from renewable energy sources in the mobility sector. The field of electromobility is considered to be an important future technology.

The development of the saving potential together with the changeover to electromobility and fuels from renewable energy sources could in the long term lead to a 100 % conversion, away from fossil energy sources. However, especially in the mobility sector problems in terms of acceptance and great efforts to motivate the public are to be expected. In the medium term though, the saving potential feasible with today's technology is about 18 %.

## 3.4 Potentials for renewable energies



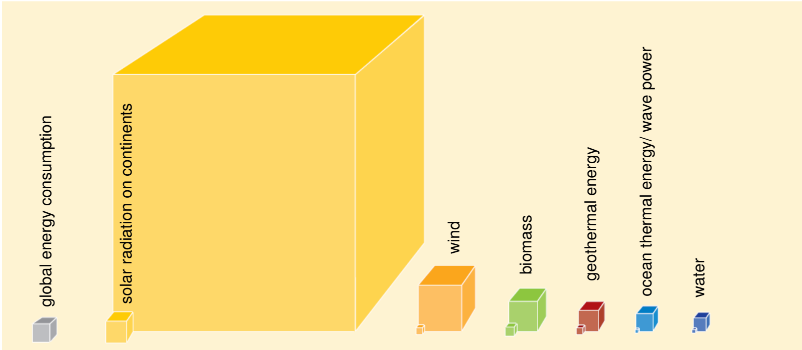

**Graph 12: Pyramid of potentials**[4]

By looking at the potentials for renewable energy sources a distinction must be made between the theoretical total potential, the technical and economic potential as well as the feasible potential.

The theoretical total potential shows the overall energy supply being physically usable. The technical potential indicates the potential feasible with today's technology. The economic potential takes economic aspects into account and the feasible potential reflects in addition the maximum potential to be achieved realistically. The pyramid for the different potentials including examples is shown in graph 12.

[4] Source: Deutsches Institut für Urbanistik (2011): Klimaschutz in Kommunen - Praxisleitfaden

The following analysis aims to investigate the technical potential of the respective renewable energy source. Furthermore, the economic aspects and the feasible potential are discussed briefly.




Rear cube: The natural sources of renewable energies are extremely large. Front cube: The amounts of energy that may technically be converted into electricity, heat and chemical energy sources are six times higher than the present global energy consumption (grey cube on the left).

**Graph 13: Worldwide sources of renewable energies[5]**

The natural sources of renewable energies on earth are extremely large and offer in principle a multiple of the global energy consumption. The technical potential as well as the feasible potential are shown in graph 13. However, the supply of energy from renewables varies considerably depending on the geographic position. For instance, the maximum potential for using solar thermal power stations is located along the equator between the latitudes 20 and 40.

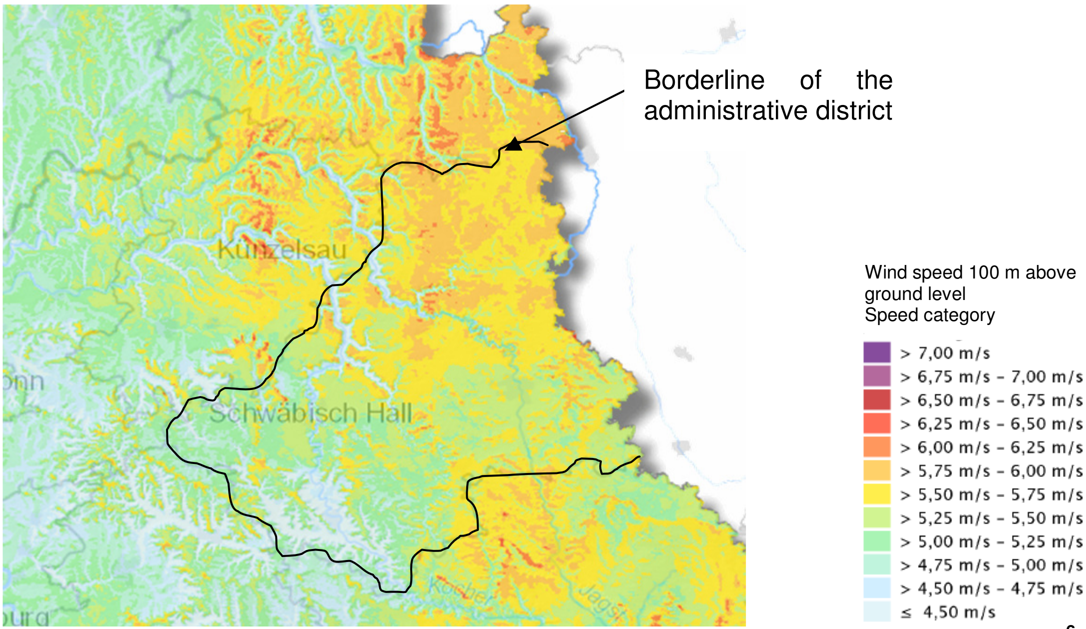
The potentials for the use of renewable energies are substantial both in Germany and the administrative district of Schwäbisch Hall. They are listed in detail as follows:

### 3.4.1 Wind power

The potentials for offshore wind power are generally significantly higher than they are for onshore wind energy. Even within these two areas there are considerable differences. The North Sea, for example, counts among the stormiest regions in the world. However, even onshore there are locations providing excellent conditions for wind power stations. Especially the new generation of wind turbines with large hub heights and larger rotor swept areas enables to increase the output of wind turbines even at lower wind speeds.

On the whole, the wind speeds are rather low in southern Germany thus belonging to the low wind speed areas. In Baden-Württemberg the greatest potentials for wind energy are to be found in the Swabian Alb (Schwäbische Alb), the Black Forest (Schwarzwald) and the Hohenlohe Plain (Hohenloher Ebene). The district of Schwäbisch Hall covering parts of the Hohenlohe Plain (Hohenloher Ebene) counts among the areas with good wind resources in Baden-Württemberg.

[5] Source: BMU (2011): Erneuerbare Energien – Innovationen für eine nachhaltige Energiezukunft




**Graph 14: Wind resources in the district Schwäbisch Hall at 100 m above ground level**[6]

Wind energy can technically be used starting from an annual mean wind speed of about 5 m/s. Small wind turbines are able to produce energy at even lower wind speeds. At present it is assumed that only wind speeds of 5,5 m/s at a 100 m height above ground level allow an economic use of wind energy. This corresponds to the areas marked at least yellow in graph 14. Approximately half of the area of the district of Schwäbisch Hall complies with this requirement. Furthermore, only areas not being used as urbanised zones are possible sites for the use of wind energy. In addition, a minimum distance of about 800 m away from residential buildings has to be kept for immission control reasons. As the district of Schwäbisch Hall is rather sparsely populated, there are still quite a few areas suitable to be used for wind energy.

Nature reserves and protected landscapes are also excluded from the use of wind energy. In particular the areas surrounding the Jagst and the Kocher should be considered in this context.

However, there is still a substantial potential for the use of wind energy even after the exclusion of these areas.

Presently 20 wind turbines with a total power output of 27,75 MW are installed in the district. By repowering these 20 wind turbines, an output of 2,5 MW per turbine would be reached thus opening up a potential with a capacity of 50 MW.
This corresponds to an additional potential of about 28 GWh per year. However, for a possible repowering the special site conditions for wind energy have to be considered.

Based on the district's share in the total area of Baden-Württemberg, a potential of 1.855 GWh can be assumed for the district of Schwäbisch Hall. Due to the district's

[6] Source: Kartendienst des Landesamt für Umwelt, Messungen und Naturschutz Baden-Württemberg (LUBW)

favourable location in Baden-Württemberg, a well above-average potential of about 2 TWh may be expected.

In 2010 the electricity consumed in the district amounted to 1.070 GWh. As a result the potential for wind energy would enable to cover almost twice the electricity required in the district.

Currently, both the federal government and the Federal Land of Baden-Württemberg are strongly promoting the development of wind energy. Hence, a strong expansion of wind energy is to be expected within the next years.

The „Landesplanungsgesetz“ (State Planning Act) of Baden-Württemberg is presently being amended. The draft has recently been introduced to the Landtag (State Parliament) and is supposed to be adopted on May 9, 2012. The draft law provides that regional associations may only designate „white“ priority areas for future wind turbines of regional importance, i.e. areas permitted for wind turbines. “Black” exclusion areas, where the installation of wind turbines is prohibited, are no longer possible then.

In the course of this rethinking process many communities are presently designating priority areas for the use of wind energy. At the same time they are revising existing areas already designated for the use of wind energy. As a rule these areas are covered with wind turbines in the relatively short term due to the economically favourable terms guaranteed by the Renewable Energies Act (Erneuerbare-Energien-Gesetz). National investors are also frequently active in this field.
The potential actually feasible is well below the technical potential, as the priority areas for the use of wind energy only release part of the technical potential. This is in particular due to the lack of acceptance in the public mainly caused by the aesthetic impact on the landscape. Nevertheless, this attitude is likely to change in favour of an increased use of this potential in the medium term.

### 3.4.2 Solar energy

Solar energy has a greater potential in the south of Germany. Therefore, the use of solar energy is particularly favourable in the federal states of Bavaria and Baden-Württemberg.

The land use for solar energy is relatively high compared to other renewable energy sources. For this reason solar use is already pressed ahead mainly for existing areas, in particular roof areas. However, open areas or noise barriers are also well suited.

In the district of Schwäbisch Hall there are presently 1.870 ha of mere roof areas available. Not all of these areas though are suitable for the use of photovoltaics. This may be due to the lack of adequate bearing capacity. In addition only part of the buildings are facing south. As gable roofs are the most common type of roof in the district, only half of the south facing building’s roof area can be used.

Thus, only a share of 10 % of these roof areas is technically available for the use of solar energy. This corresponds to a roof area of 1.869.824 m².

There are two technologies available in the field of solar energy use: solar thermal systems and photovoltaics. Solar thermal systems will only make sense, if the energy is used directly in form of heat thus avoiding energy-conversion loss. Photovoltaics, however, enable to produce electricity at almost any place and to feed it into the grid. This results in a useful separation of the areas available for both technologies with about 20 % for solar thermal systems and 80 % for photovoltaics.

Hence, the potential would be 172 GWh for photovoltaics and 150 GWh for solar thermal systems on the roof areas available in the district of Schwäbisch Hall.

Further potentials are to be found in the use of ground mounted systems in particular with photovoltaics. For instance the motorway A6 running through the district provides slopes that are ideally suited for the use of pv systems.

In the district of Schwäbisch Hall the use of solar energy has been strongly promoted and is hence well above the national average. Here, special mention should be made of Germany's largest solar thermal plant in Crailsheim, which is designed for supplying 50 % of the total heat demand (hot water and heating) to a residential area via a local heating network.

However, political objectives regarding the expansion of photovoltaics are changing. Starting from mid-2012 the strong reduction in feed-in tariffs might only allow an economic exploitation of photovoltaics in individual cases. Therefore, a decline in the development of photovoltaics should be expected in the future.

Yet, due to the „Renewable Energies Heat Acts" released by the Federal Government and the Land of Baden-Württemberg, a certain share of renewable energies to be used in new buildings is required by law.
In particular, solar thermal systems offer an interesting option to meet these requirements. Thus, an increase in solar thermal energy used in new buildings can be expected also in the industrial and the commercial sector.

3.4.3 Biomass

With a share of more than 50 % of the total energy generated from renewable energies, biogenic energy sources are currently the most important ones. They can roughly be divided into two groups. Namely, energy generated through the combustion or gasification of wood and energy produced by the fermentation of biomass in biogas plants.

## Wood

At present, wood is by far the strongest contributor to using biomass for energy production. Wood is for example used in form of wood chips, split logs or wood pellets both in large CHPs and in private households for domestic heating. The wood types used for energy production can be divided into:

- forest wood
- landscape conservation wood
- industrial scrap wood
- waste wood

About 33 % of the district's area is forested (national average: 31 % forest cover). This corresponds to an area of 48.470 hectares, which is equivalent to a stock of wood in form of living trees of about 14,5 million cubic metres. Every year about 350.000 cubic metres of usable wood are able to regrow. In order ensure sustainability in the long term, only approx. 200.000 cubic metres of wood may be cut down per year[7]. By far the greatest part is processed into construction timber, furniture, packaging etc. by the wood industry. Approximately 10 % of the wood is used in the paper industry. Thus, only about 20 % of the logging is available for energy production. This corresponds to a quantity of 40.000 cubic metres per year.

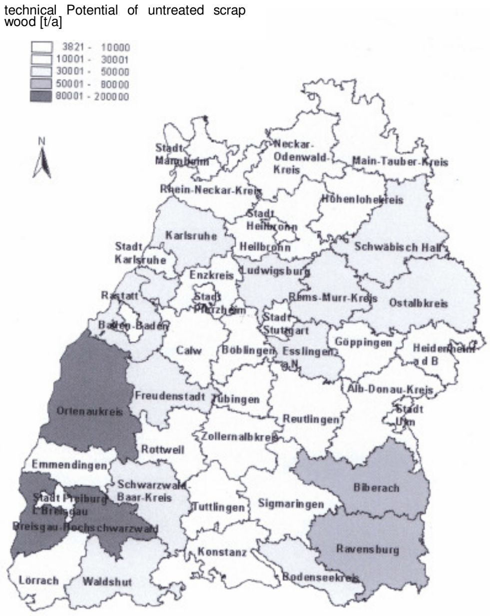
All in all, a sustainable forest management alone could open up an annual energy potential of about 110 GWh without any competition with the wood industry.

An additional energy potential represents the use of untreated scrap wood. It includes scrap wood from industry and landscape conservation.

[7] Source: Landratsamt Schwäbisch Hall - Forstamt

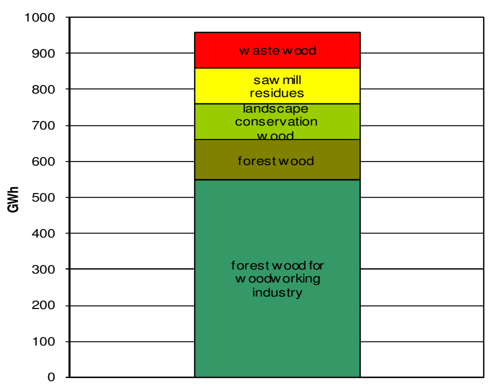
Landscape conservation wood arises from the maintenance of roadsides, hedges for windbreak, and riparian wood. This results in an annual volume of about 20.000 tons of landscape conservation wood for the district of Schwäbisch Hall. This volume could almost exclusively be used for energy purposes thus offering an energy potential of another 99 GWh. At present only 5 %[9] of the wood arising from landscape conservation is being used for energy production. The major part is currently still being composted, left in situ or used for soil improvement.

Industrial scrap wood is residual wood occurring in the wood processing industry. They occur in the form of wood shavings, sawdust or even wood chips and may represent up to 50 % of the main product sawn timber. The annual sawmill residues are estimated to amount to approx. 40.000 cubic metres for the district of Schwäbisch Hall (compared to Germany as a whole with about 17 million cubic metres). About a quarter of the sawmill residues are presently being used for the production of wood pellets. The rest is mainly used for the manufacturing of chipboards or the paper industry. Assuming the sawmill residues would exclusively be used for energy production, another potential of about 100 GWh would be available.




**Graph 15: Potential of untreated scrap wood in Baden-Württemberg[8]**

95 kg of waste wood are annually produced per capita. The inhabitants of the district of Schwäbisch-Hall thus have a waste wood volume of about 18.000 tons. In case of an exclusive use for energy generation this would correspond to another energy potential of about 100 GWh.




**Graph 16: Composition of the total wood volume in the district of Schwäbisch Hall**

In purely theoretical terms the district of Schwäbisch Hall has annually about 960 GWh in form of wood at its disposal. Due to the competition with sustainable management and other industries only 409 GWh can be used to produce energy. On average biomass plants reach an efficiency of about 85 %. In other words, 350 GWh of energy can be made available from the existing wood

At present all of the district's small-scale biomass plants with a capacity of up to 1 MW require about 93.000 m³ of wood[10]

[8] Source: Wirtschaftsministerium Baden-Württemberg (2008): Holzenergiefibel
[9] Source: Wirtschaftsministerium Baden-Württemberg (2008): Holzenergiefibel
[10] Source: Unique GmbH (2011) Regionalstudie Holzkompetenz³

altogether. This corresponds to approx. 41.000 tons. The larger biomass plants and biomass CHPs have to be included. Altogether 80 % of the district's wood potential has thus already been exhausted. An expansion resp. an increased use of wood or pellet heating systems for domestic heating is still possible. There is no more potential yet for another large biomass CHP in the district.

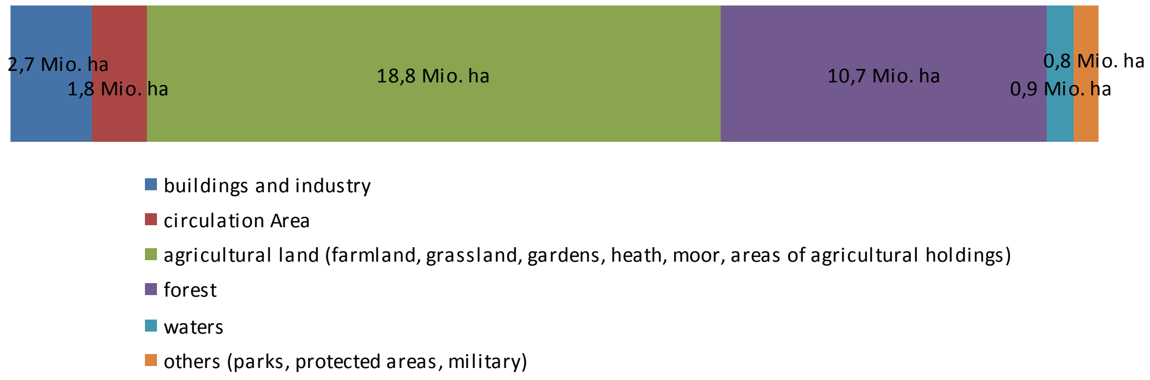
In order to achieve an optimum use of energy it is very important to fully use the waste heat especially from biomass CHPs. At present the main focus is on the production of electricity and the waste heat remains unused. As a result an efficiency of only 40 % is reached. However, efficiencies of up to 90 % could be achieved, if the waste heat was completely used.

There is another potential in the use of short-rotation plantations. These depend on the available areas specified under biogas.

## Biogas

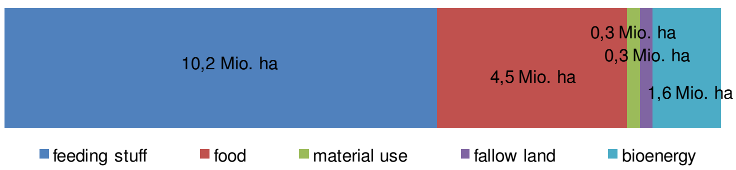
Besides residual products such as liquid manure, harvest residues, scrap wood and bio-waste, energy crops are also used for bioenergy. They have to be grown on the areas available for energy crops. With the expansion of biomass use, a competition regarding other possible uses of the available areas should be expected. In particular food production must still correspond to the food demand.

The major part of Germany's surface area (see graph 17) is covered with farmland, grassland and forest.



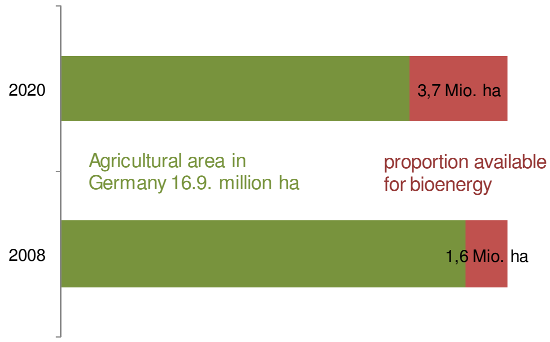

**Graph 17: Land use in Germany**

Agricultural land is shown in graph 18. More than half of it is used for feed production. A substantial part of it is used for food production and further areas are intended for for material use and as fallow land. In Germany 1,6 Mio ha are being used for bio-energy.




**Graph 18: Use of agricultural areas in Germany in 2008**

Presently, a potential of 9,5 % of the areas can be activated for bioenergy. It could even go up to about 21,9 % by 2020. About 6 % of these additional areas result from a yield increase, about 5 % from using fallow land and other areas. Approx. 2 % can be attributed to the declining demand for feed and food due to the decrease in population. At the same time a loss of surface area of about 1 % for residential and traffic areas has to be considered.




**Graph 19: Areas available for bioenergy in Germany**

With an above-average share in the economy, agriculture is strongly represented in the district of Schwäbisch Hall. Finishing plants are particularly widespread. 57 % of the turkeys and 22 % of the pigs in Baden-Württemberg are kept in the district of Schwäbisch Hall, even though the share in surface area only amounts to 4,2 %[11]. Accordingly an above-average quantity of feeding stuff has to be produced and excrements have to be spread on the land, too.

The agricultural area amounts to about 77.000 ha in the district of Schwäbisch Hall. Due to the large number of agricultural holdings and the type of agriculture, only about 10 % of the available areas can be used for energy production. This corresponds to about 7.700 ha in the medium-term.

The available land is divided among energy crops such as rape, sugar beet, grain (e.g. wheat, triticale...) maize, poplar and pastures. The harvested energy crops enable to produce biodiesel, veg-oil, bioethanol, biogas and wood pellets or wood chips.

[11] Source: Landwirtschaftsamt Schwäbisch Hall

In 2010 the biogas plants located in the district of Schwäbisch Hall generated a total of 12.131 kW of energy, thus being able to feed 62 GWh of electricity into the grid. Assuming a land consumption of 0,5 ha per installed kW[12], the land use would already be 6.006 ha. This means that about 78 % of the potential of 7.700 ha have already been exhausted. This corresponds to a potential still available of about 17 GWh of electric power.

As yield increases and additional potential areas have been considered in this potential assessment until 2020, it can currently be assumed that this potential is nearly exhausted.

However, in the field of energy recovery there is a potential to be developed yet. Altogether, the potential for land use enables to produce not only 78 GWh of electricity but also 84 GWh of heat (without process heat). So far, only a share of 22 GWh has been used, so that there is still a potential of 62 $GWh_{th}$ available.

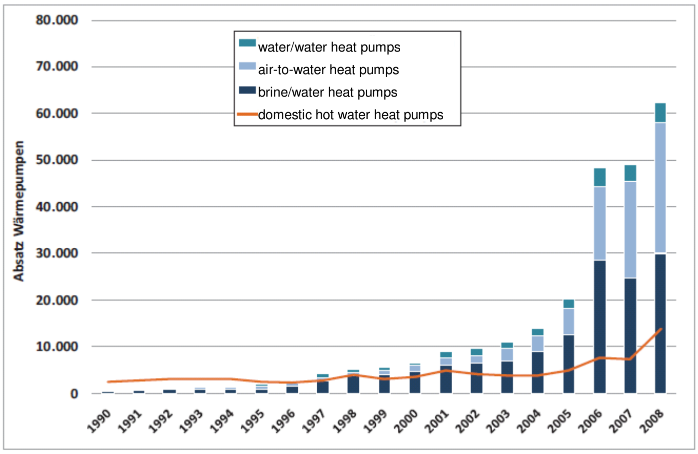
Up to now, the potential has mainly been used during wintertime. However, it is presently being developed further by many biogas plant operators by building for instance local heating networks or drying plants. A short-term development in large parts of this potential can be expected.

Further potentials can be found in the use of waste material such as liquid manure, manure, straw, crop residues, organic waste or used grease. Due to the increased number of finishing plants in agriculture, the corresponding agricultural waste material is also available. For instance, the three large slaughterhouses located in the district also deliver additional substrates suitable to be used for biogas and to increase the gas yield.

The potentials for bioenergy generated from waste material can be estimated at about 131 GWh for electricity and about 118 GWh for thermal energy in the district of Schwäbisch Hall.

[12] Source: statistisches Landesamt Baden-Württemberg

3.4.4 Heat pump




**Graph 20: Sales of heat pumps in Germany**[13]

According to the Bundesverband Wärmepumpe (BWP) (Federal association for heat pumps) sales for heat pumps have increased considerably in the past few years in Germany. This clear trend is also noticeable in the district Schwäbisch Hall on the basis of the number of installed heat pumps. In 2010 349 heat pumps were registered. The number of heat pumps has thus more than doubled since 2006.
Heat pumps can be split into 3 types according to the heat source used.

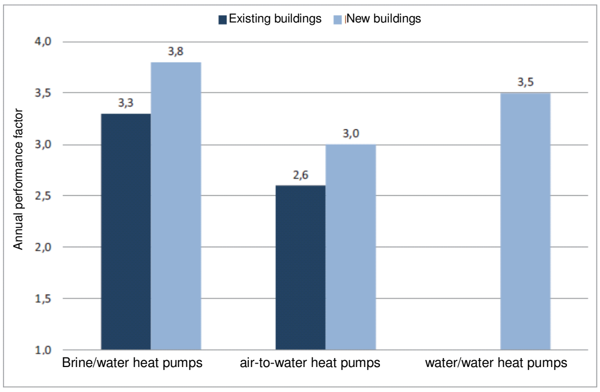
These are:

- Heat source soil (geothermal heat)
- Heat source air / exhaust air
- Heat source water / waste water

With a share of 57 % of the heat pumps installed, brine/water heat pumps are presently of the utmost importance. The heat is withdrawn from the soil by means of a mixture of water and antifreeze (brine). The geothermal heat exchangers are mainly designed as vertical geothermal probes or collectors installed below the earth's surface. The area required for these collectors is about twice the living space to be heated. Depending on the groundwater and soil conditions, it might be difficult, however, to obtain an authorisation for deep drillings. As a summary it may be stated that in urban areas and other high density residential areas without any garden or plot area the use of a brine/water heat pump may practically be excluded. Only one out of five buildings meets the requirements regarding required area and nature of soil to permit the use of a geothermal heat pump for heating.

The second highest importance is currently attached to air-to-water heat pumps. Since the heat source air is available almost everywhere, air-to-water heat pumps could be used as additional heating system in each building. However, due to relatively low outside air temperatures during heating periods (winter), the efficiency of air-to-water heat pumps is significantly lower compared to brine/water heat pumps. This is also reflected in the much lower average annual performance factor of 2,8. Apart from these two types of heat pumps, water-water heat pumps only play a secondary role at present. This type of heat pump using groundwater as heat source is also only suitable for buildings having a high groundwater level.

[13] Source: Geothermiezentrum Bochum (2010); Analyse des deutschen Wärmepumpenmarktes




**Graph 21: Annual performance factor of different types of heat pumps**[14]

In general each building, whether existing or new, can be heated by means of a heat pump. However, in particular with existing buildings the use of heat pumps is mostly only useful and efficient after a complete renovation of the heating system (e.g. use of panel heating or large radiators).

The potential is thus being calculated based on the average performance of 10 kW, the annual operation time of 1.950 hours and the annual performance factor. The annual performance factor results from the ratio between the useful heat provided for domestic heating and hot water, and the electrical energy required by the heat pump.

Overall, the potential for heat pumps in the field of residential buildings amounts to about 800 GWh, whereof only approx. 5,5 GWh are being exploited at present.

So far, about 97 % of all heat pumps have been used for domestic heating in the private sector. Whereas only 3 % of the heat pumps have so far been installed in the industrial sector for the heating of e.g. office buildings, even though this area offers a considerable potential, too. While heat pumps with a capacity of about 10 kW can be used for domestic heating, much larger systems with a capacity of up to 400 kW and more can be added for heat production in the industrial sector. The thermal energy required to heat office buildings amount to approx. 500 GWh/a. About 80 % of this energy demand can be covered by heat pumps. This corresponds to a potential of 400 GWh, whereof only 0,6 GWh have been exploited so far.

Heat pumps are also perfectly suited for the public sector. 80 % of the heat requirement of about 55 GWh can also be covered via heat pumps. At the moment an exploitation of this potential is still comparatively negligible.

However, it has to be borne in mind that it will not be possible to cover 100 % of the heat demand as especially in winter the efficiency of the heat pumps is very low due to the cold temperatures of the heat sources. Therefore, an additional heating source is usually necessary. Nevertheless, the potential for heat pumps with a total of about 1.350 GWh[15] is enormous.

By exploiting the potential for ambient heat via heat pumps, this large potential is made available by means of easy-to-use technology. Yet, heat pumps have a very high power consumption. Their widespread use in turn would require to generate this electricity from renewable energy sources e.g. wind turbines.

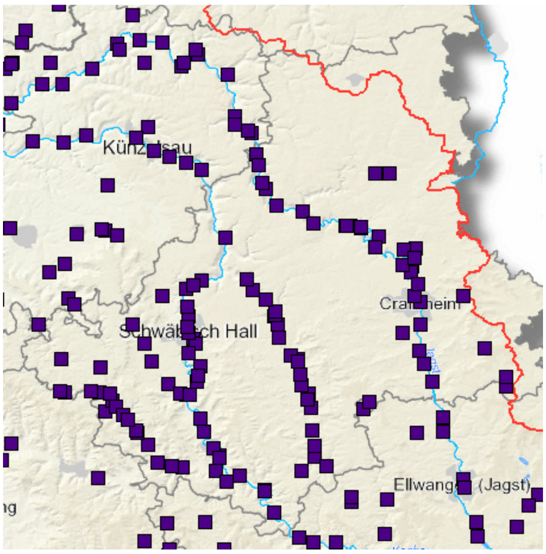
[14] Source: Geothermiezentrum Bochum (2010); Analyse des deutschen Wärmepumpenmarktes
[15] Attention: This is the „net energy production". The power requirement has already been deducted.

### 3.4.5 Hydropower

Hydropower is traditionally a major source of renewable energy. The management of brooks and rivers, however, needs to be in harmony with ecology. Ecologically intact flowing waters have to be preserved. Apart from other impacts, the use of hydropower has already affected flowing waters with regard to their role as habitat for fishes and other aquatic organisms.

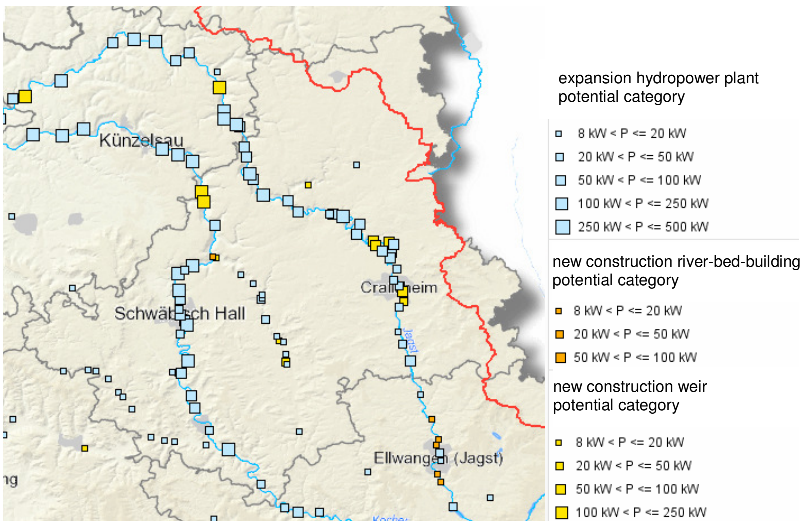
In order to evaluate the potential for hydropower, the potential for the expansion of existing sites and the potential for new constructions in existing transverse structures not having been used so far, have to be considered. Thereby, the requirements of the Water Framework Directive of the European Community regarding ecological management goals have to be met. These directives are in particular aimed to ensure natural migration of fish fauna and minimum flow of rivers and brooks.

The district of Schwäbisch Hall is almost entirely located in the river basin of the Neckar. The most important flowing waters are the rivers Kocher and Jagst.



**Graph 22: Existing hydropower plants in the district of Schwäbisch Hall[16]**

Due to the traditional use of water power in this region, 88 hydroplants are already existing. Thus, there is hardly any potential for new hydropower plants. Partly, transverse structures not being used anymore can be activated for water power utilization. Yet, the modernization of existing plants, the so-called repowering, offers the greatest potential.




**Graph 23: Potential expansion of hydropower utilization in the district Schwäbisch Hall[16]**

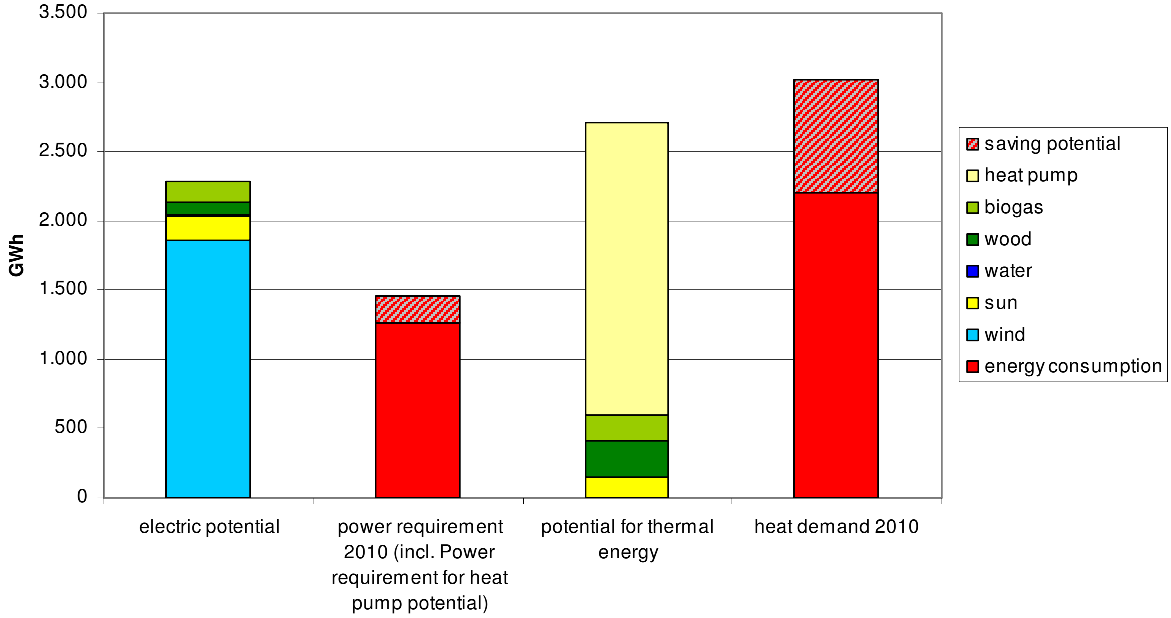
On the whole, the utilization of water power constitutes an additional potential of 19 GWh for the district of Schwäbisch Hall. Together with the 19 GWh per year already available now, a doubling of the energy from hydropower would be possible.

The development of this potential depends on the operators of the plants. Operators are mainly small companies or

[16] Source: Kartendienst des LUBW

private persons. Therefore, this potential is likely to be developed in the long-term only.

### 3.4.6 Summary




**Graph 24: Comparison potential and energy requirement**

The comparison of the identified potential for renewable energies including the saving potential for heat and electricity are shown in graph 24. In case of the power requirement in 2010 the additional power needed for heat pumps has been added, and the hatched area shows the energy saving potential. Taking these potentials into account, 181 % of the power requirement and 123 % of the heat demand can be covered. Thus, it is possible to provide the district of Schwäbisch Hall with the required energy through the available potentials for renewable energies, not only fossil-free but also independently.

In 2010 about 32 % of the total power requirement has already been generated from renewable energies. 12 % of the heat demand was covered by renewable energies. This corresponds to a 14% share of renewable energy in the overall energy consumption.

While the potentials of some energy sources such as wood and biogas have already been close to being exhausted in 2010, other sources e.g. wind power or heat pumps are right at the beginning and still have an enormous growing potential to be exploited as shown in the table below.

| | Solar energy | | | Biogas | | | | |
|---|---|---|---|---|---|---|---|---|
| | PV | Solar-thermal energy | wood | Energy crops | Biogenic waste | Wind power | Hydropower | Heat pump |
| **Total potential [GWh]** | 172 | 150 | 350 | 114 | 265 | 1.855 | 38 | 1.350 |
| **Exploited up to now [GWh]** | 118 | 48 | 281 | 69 | 6 | 20 | 19 | 6 |
| **Exploitation expressed** | 69% | 32% | 80% | 61% | 2% | 1% | 50% | 0% |

| as percentage | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|

**Table 4: Potentials for renewable energies and their exploitation rate 2010**

The figures regarding the exploitation of the biogas potential are, however, misleading. A development of only 61 % is indicated in this field. It is true, however, that there is hardly any space available for the cultivation of energy crops. Nevertheless, only an exploitation of 61 % of the potential is reached, as there are still potentials available regarding the utilization of heat in particular during summer. Yet, especially in this field a change is taking place and many biogas plants are building local heating grids etc. Thus, a further development of this potential should be expected in the near future.

# 4 SWOT-Analysis

SWOT analysis is a strategic planning method used to evaluate the strengths, weaknesses, opportunities and threats of a situation, in order to analyse future developments.

| Strengths: | Weaknesses: |
|---|---|
| Factors encouraging and promoting the development of RES | Barriers hindering the development of RES in the district |
| **Opportunities:** | **Threats:** |
| Potential positive effects | Potential negative effects |

**Table 25: General SWOT-Matrix**

In consideration of the SWOT-matrix, the strengths and weaknesses as well as the opportunities and threats involved in the use of renewable energy sources in the district of Schwäbisch Hall are summarized below.

## 4.1 Wind power

| Strengths: | Weaknesses: |
| --- | --- |
| – Good wind conditions mainly in the north-eastern part of the district SHA<br>– Low population density in the district<br>– Good assessment of potentials and general location study through the wind atlas available to the public in Baden-Württemberg<br>– Financial incentives through interesting support for RES<br>– Political efforts on the part of Bund and Land aiming to promote wind power | – Designation of priority areas for the use of wind energy is still pending in some cities and municipalities<br>– Nature reserves and protected landscapes are also excluded from the use of wind energy<br>– Despite of political guidelines there are still some municipalities being against the expansion of wind power |
| **Opportunities:** | **Threats:** |
| – Wind energy can make an important contribution to the development of RES in the district of Schwäbisch Hall<br>– Through an extensive use of wind energy a considerable contribution to achieving the goal of a 100 % fossil-free district can be made. | – Installation of wind turbines at locations with less favourable conditions<br>– Lack of public acceptance<br>– Risk for bats and birds like the red kite |

**Table 26: SWOT-Matrix for the use of wind energy**

## 4.2 Solar thermal systems

| Strengths: | Weaknesses: |
|---|---|
| – As the district is located in the south of Germany, solar radiation is comparatively high<br>– Good network of energy consultants and service providers in the district<br>– Flagship project through large-scale solar thermal plant „Hirtenwiesen Crailsheim“ | – Solar thermal energy is only beneficial when the heat can be used directly<br>– Comparatively high consumption of surface |
| **Opportunities:** | **Threats:** |
| – Renewable Energy Heating Acts released by Federal Government and State Government are promoting the use of solar thermal systems in new buildings<br>– Well accepted due to widespread use | |

**Table 27: SWOT-Matrix for the use of solar thermal systems**

## 4.3 Photovoltaics

| Strengths: | Weaknesses: |
|---|---|
| – District is located in the south of Germany thus having a comparatively high solar radiation<br>– Widespread use in the district Good network of energy consultants and service providers in the district | – Comparatively high consumption of surface<br>– Economic efficiency presently only in individual cases |
| **Opportunities:** | **Threats:** |
| – In contrast to solar thermal energy, solar electricity can be generated independently of the electricity consumer<br>– Well accepted due to widespread use | – Lack of political support<br>– Land sealing in case of ground-mounted systems |

**Table 28: SWOT-Matrix for the use of photovoltaics**

## 4.4 Biomass - Wood

| Strengths: | Weaknesses: |
| --- | --- |
| – Biomass plants possible in any size and any field<br>– Both heat and power generation are possible<br>– Cogeneration with power generation<br>– Large forest areas with potential for wood fuel<br>– Wide acceptance of traditional and modern wood-fired heating systems<br>– Exemplary wood heating systems installed | – Potentials almost exhausted<br>– Frequent loss of unused waste heat produced during power generation<br>– Competing use with wood processing industry<br>– Particulate matter emissions through small furnaces |
| **Opportunities:** | **Threats:** |
| – Optimum use of waste heat generated during power generation in biomass CHPs<br>– Fertilizer generated from combustion ashes of untreated wood | – Sustainable forestry threatened by expansion of biomass plants |

**Table 29: SWOT-Matrix for the use of biomass in the form of wood**

## 4.5 Biomass - Biogas

| **Strengths:** | **Weaknesses:** |
| --- | --- |
| – Biogas production already widely used<br>– High share of agriculture in economy → wide acceptance of farmers as producers of energy resources<br>– A great deal of agricultural by-products available for biogas production | – Fierce competition with feed and food production due to high share of agriculture and especially finishing plants<br>– Large areas used for spreading of liquid manure → competition with application of fermentation residues<br>– Potentials for cultivation of energy crops are nearly exhausted |
| **Opportunities:** | **Threats:** |
| – Utilization of agricultural residues for energy production<br>– Utilization of residual material arising from the agricultural products processing industry e.g. slaughterhouses, dairies<br>– Another main pillar to secure agriculture as an traditional economic sector | – Competition with food production<br>– Application of fermentation residues might only be partly possible as there is not enough land available<br>– Erosion by increased cultivation of maize and other monocultures |

**Table 30: SWOT-Matrix for the use of biomass for biogas production**

## 4.6 Heat pump

| Strengths: | Weaknesses: |
|---|---|
| – Air as heat source available everywhere<br>– Offer large potentials, heat pumps hardly used so far<br>– Besides heating, cooling is also possible in summer<br>– Can be used in any sector (private, industrial, public)<br>– Fairly simple technology<br>– Adaptable to individual needs regarding size/capacity | – Relative high power requirement<br>– Mostly not sufficient if heat pump is used as the only heating system, since efficiency is very low in winter due to low outdoor temperatures<br>– Not every type of heat pump can be used in every building<br>– Use of heat pumps in existing buildings mostly only possible in combination with a complete renovation of the heating system |
| **Opportunities:** | **Threats:** |
| – Utilization of alternative heat sources such as waste water/industrial and domestic water for improved energy efficiency<br>– Simple technology with comparatively low investment costs<br>– Funding possibilities available | – Contamination of soil and ground water through escaping fluids<br>– Risk of mixing groundwater storeys associated with deep drilling<br>– Increased power requirement in winter through comprehensive use of heat pumps needs to be balanced by renewable power generation<br>– Especially brine/water heat pumps might not be approved due to different risks (deep drilling) |

**Table 31: SWOT-Matrix for the use of ambient heat**

## 4.7 Hydropower

| Strengths: | Weaknesses: |
| --- | --- |
| – Very common due to traditional use of water power<br>– Through upgrading of existing plants power generation can be expanded | – Rather low potential for expansion |
| **Opportunities:** | **Threats:** |
| – No additional impacts on environment through repowering of existing plants resp. partial improvement compared with existing plants | – Repowering difficult as plants are owned by smaller companies and private persons<br>– Hydropower plants can affect the continuity of waterbodies |

**Table 32: SWOT-Matrix for the use of hydropower**

# 5 Analysis of stakeholders in the district of Schwäbisch Hall

In the district of Schwäbisch Hall there are several potential stakeholders in the field of energetic use of resources. Most of them are already strongly pushing energy saving, increase in energy efficiency and the use of renewable energies. The stakeholders are listed in table 5. The district of Schwäbisch Hall consists of 30 cities and municipalities. The two biggest cities Schwäbisch Hall and Crailsheim are included in the following list as representatives.

| No. | Name | Street | Po-stal code | City | Field of activity |
|---|---|---|---|---|---|
| 1 | energieZENTRUM | Haller Straße 29/1 | 74549 | Wolpertshausen | superior, energy consul-ting |
| 2 | EnBW Ostwürttemberg DonauRies AG | Unterer Brühl 2 | 73479 | Ellwangen | energy supply |
| 3 | EnBW Regional AG - Regionalzentrum Neckar-Franken | Badstraße 80 | 74072 | Heilbronn | energy supply |
| 4 | Energieversorgung Gaildorf OHG | Burg 2 | 74405 | Gaildorf-Unterrot | energy supply |
| 5 | EBT Elektritätswerk Braunsbach-Tullau GmbH | Orlacherstraße 1 | 74532 | Ilshofen-Obersteinach | energy supply |
| 6 | Stadtwerke Schwäbisch Hall GmbH | An der Limpurgbrücke 1 | 74523 | Schwäbisch Hall | energy supply |
| 7 | Stadtwerke Crailsheim GmbH | Friedrich-Bergius-Straße 10-14 | 74564 | Crailsheim | energy supply |
| 8 | Novatech GmbH | Frankenstraße 6-8 | 74549 | Wolpertshausen | PV, biogas, solar thermal energy |
| 9 | Modell Hohenlohe Netzwerk betriebli-cher Umweltschutz und nachhaltiges Wirtschaften e.V. | Weststraße 37 | 74629 | Pfedelbach | in-house environmental protection |
| 10 | IBBK Fachgruppe Biogas GmbH | Am Feuersee 6 | 74592 | Kirchberg/Jagst | biogas |
| 11 | Energieinitiative Kirchberg e.V. | Baron-Kurt-Straße 34 | 74592 | Kirchberg/Jagst | energy initiative |
| 12 | Baugenossenschaft Crailsheim eG | Grabenstraße 17 | 74564 | Crailsheim | residential building |
| 13 | Maschinen- und Betriebshilfsring Schwäbisch Hall e.V. | Steinbrunnenstraße 4 | 74532 | Ilshofen | agriculture |
| 14 | Maschinenring Crailsheim | Altenfelden 10 | 74586 | Frankenhardt | agriculture |
| 15 | Maschinen- und Betriebshilfsring Blaufelden e.V. | Großbärenweiler 15 | 74575 | Schrozberg | agriculture |
| 16 | Handwerkskammer Heilbronn-Franken Geschäftsstelle Schwäbisch Hall | Stauffenbergstraße 35-37 | 74523 | Schwäbisch Hall | craft |
| 17 | IHK Geschäftsstelle Schwäbisch Hall | Stauffenbergstraße 35-37 | 74523 | Schwäbisch Hall | industry and craft |
| 18 | Landratsamt Schwäbisch Hall | Münzstraße 1 | 74523 | Schwäbisch Hall | superior, public sector |
| 19 | Stadt Schwäbisch Hall | Am Markt 6 | 74523 | Schwäbisch Hall | public sector, municipality |
| 20 | Stadtverwaltung Crailsheim | Marktplatz 1 | 74564 | Crailsheim | public sector, municipality |

**Table 5: Stakeholders in the district of Schwäbisch Hall**

The stakeholders are firmly anchored in this region and networked to each other. The existing networks should be noted here in particular. The „Modell Hohenlohe“ represents a network of enterprises dealing with in-house environmental protection and sustainable economic management. Many companies located in the district are participating in this network.

Another network is for instance the „Arbeitskreis Energie“ (working group on energy) initiated by the energieZENTRUM, in which various actors of the energy sector are involved. Furthermore, there is the relatively new ‚Lebensmittelcluster’(food cluster) which is constitutes an association of the food industry and has created a subgroup for energy issues. Since 2007 the packaging industry has also been operating a successful similar network called ‚Packaging Valley e.V.' that originated in the district of Schwäbisch Hall.

Cooperation and networking are already far advanced in the district and have gained wide acceptance among the stakeholders.

# 6 Support Programmes

The use of efficient technology and renewable energy is being supported in the district of Schwäbisch Hall. Besides the subsidy programmes of the federal government and the state government there are also regional supports available. An overview of the support programmes can be found in table 4. For more information a detailed elaboration of the individual supports is also attached.

| current subsidy programmes and other financial supports | | | | | |
|---|---|---|---|---|---|
| | | | | max. rate | |
| subsi-dy | supported field (RE or EE) | Funding authority / institution | applicant | % of investment | upper limit in € |
| yes | Renewable energy and energy efficient replacement of heating system calorific value, CHP, district heating or the combination with solar thermal system, biomass or heat pump | KfW funding programmes for energy efficient renovation | private existing buildings | 7,5 | 3.750 € per accommodation unit |
| no | Renewable energy and energy efficient replacement of heating system calorific value, CHP, district heating or the combination with solar thermal system, biomass or heat pump | KfW loan for energy efficient renovation | private existing buildings | loan | |
| yes | Energy efficient replacement of heating system and installation of a solar thermal system, biomass, heat pump and the possible combination with calorific value or CHP | Bafa market incentive programme | private businesses existing buildings | | depending on the measure |
| no | Installation of solar heating system, biomass, heat pump, CHP | L-Bank Living with the future renewable energies | private | loan | |
| no | Renewable energies feed-in remuneration regulated by law | EEG (Renewable Energy Source Act) / network operator | private businesses municipality | remuneration | depending on year of construction and capacity |

| | | | | | |
|---|---|---|---|---|---|
| no | Feed-in remuneration regulated by law | CHP / network operator | private businesses municipality | remuneration | |
| yes | CHP, heat pump, solar-hybrid-systems innovative pilot projects | KEA support programme for climate protection | businesses municipalities districts | 15 | 200.000 |
| yes | Biomass, solar thermal system, heat pump | KEA EFRE heating and heat grids with renewables | businesses municipalities | 50 € for each avoided ton of $CO_2$ max. 20 % | 200.000 |
| yes | Energy efficient techniques not yet introduced onto the market | UM BW support of demonstration projects | businesses municipalities districts | up to 40 % | |
| yes | Energy efficient techniques not yet introduced onto the market | UM BW bioenergy competition | businesses municipalities districts | up to 40 % | 250.000 |
| yes | Investments for the supply of bioenergy villlages | UM BW bioenergy villages | businesses municipalities districts | up to 20 % | 100.000 |
| no | Solar thermal system, CHP | L-Bank programmes for environment protection and energy saving | businesses | loan | |
| no | biomass, biogas plants, photovoltaic systems, wind energy, hydropower | L-Bank „Neue Energie - Energie vom Land“ | businesses | loan | |
| no | Photovoltaic systems, Biomass, heat pump, wind energy, hydropower, CHP | kfW renewable energies standard and premium | businesses | loan with redemption subsidy | |
| no | Energy efficiency measures also in the field of heating engineering | KfW ERP-environmental and energy efficiency programme | businesses | loan | |
| no | Demonstration projects | KfW BMU-programme for innovations regarding the environment | businesses municipalities | loan | |
| no | Replacement of heating systems | KfW energy efficient renovation municipality | municipality | loan | |
| no | Replacement street lighting | KfW „Kommunal Investieren“ (municipal investment)- energy efficient street lighting | municipality | loan | |

| | | | | | |
|---|---|---|---|---|---|
| no | Heat pump, solar thermal system, biomass | KfW promotion of measures encouraging the use of renewable energies | municipality | loan with redemption subsidy | |
| no | Wind energy | KfW programme for offshore wind energy | | loan | |
| yes | Bonus for the conversion to natural gas heating | Stadtwerke Crailsheim | private businesses municipality | | up to 350 |
| yes | Bonus for the conversion to natural gas heating | Stadtwerke Schwä-bisch-Hall | private businesses municipality | | up to 600 |
| yes | Bonus for the conversion to natural gas heating | EnBW | private businesses municipality | | up to 545 |
| yes | Natural gas vehicles | Stadtwerke Crailsheim | private businesses municipalities | | 400 |
| yes | Natural gas vehicles | Stadtwerke Schwä-bisch-Hall | private businesses municipalities | | 500 |
| yes | Purchase of low-emission trucks | KfW purchase of low-emission trucks | businesses | | up to 6.050 |

**Table 6: Overview of financial supports and support programmes in the district of Schwäbisch Hall**

# 7 References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